FOURTH NATIONAL COMMUNICATION OF THE REPUBLIC OF TAJIKISTAN UNDER THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE








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Government of the Republic of Tajikistan

Committee for Environment Protection under the Government of the Republic of Tajikistan

Agency for Hydrometeorology of the Committee for Environment Protection under the Government of the Republic of Tajikistan

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Dushanbe 2022

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The following state agencies and their profile institutions participated in the preparation of the Fourth National Communication:

- Ministry of Economic Development and Trade of the Republic of Tajikistan
- Ministry of Energy and Water Resources of the Republic of Tajikistan
- Ministry of Industry and New Technologies of the Republic of Tajikistan
- Ministry of Agriculture of the Republic of Tajikistan
- Ministry of Transport of the Republic of Tajikistan
- State Committee of Land Management and Geodesy of the Republic of Tajikistan
- Committee on Environmental Protection under the Government of the Republic of Tajikistan
- Agency for Hydrometeorology of the Committee on Environmental Protection under the Government of the Republic of Tajikistan
- Agency on Statistics under the President of the Republic of Tajikistan
- Agency of Forestry under the Government of the Republic of Tajikistan
- Agency on Land Reclamation and Irrigation under the Government of the Republic of Tajikistan
- Academy of Sciences of the Republic of Tajikistan
- State Unitary Enterprise of Housing and Communal Services

Public Organization:

- NGO Peshsaf

The Agency for Hydrometeorology of the Committee of Environmental Protection under the Government of the Republic of Tajikistan is responsible for the development of the National Communication under the UNFCCC on Climate Change.

Contact information:
373, B.Gafurov Street, Dushanbe, Tajikistan, 734025

Tel: (992 44) 600-02-15
Fax: (992 37) 223-18-21
E-mail: office@meteo.tj website: www.meteo.tj

FOREWORD

Tajikistan ratified the United Nations Framework Convention on Climate Change (UNFCCC) in 1998 and the Kyoto Protocol in 2008, becoming a non-Annex I Party to the Convention.

In October 2015, Tajikistan submitted its estimated Initial Nationally Determined Contribution (INDC) to implement the relevant decisions adopted by the 19th and 20th COPs of the UNFCCC, including the Lima Call on Climate Action (Lima, Peru, December 2014).

In 2017, the Parliament of Tajikistan ratified the Paris Agreement to the United Nations Framework Convention on Climate Change.

Tajikistan developed its First Biennial Updated Report on Greenhouse Gas Inventory in accordance with the Non-Annex I Guidelines for Biennial Reports, which it submitted to the UNFCCC Secretariat in 2019.

In October 2019, the Decree of the Government of the Republic of Tajikistan adopted the National Strategy for Adaptation to Climate Change for the period up to 2030.

In October 2021, the country prepared an updated Nationally Determined Contribution (NDC). Under the new NDC, the country plans to meet the unconditional target and, if financial and technical support is received, the conditional target.

The Fourth National Communication (4NC) of the Republic of Tajikistan under the UN Framework Convention on Climate Change has been prepared in accordance with Articles 4.1 and 12.1 of the UNFCCC in accordance with the requirements for Parties to the Convention that are not included in Annex I.

4NC consists of 9 sections containing information about the problem of climate change in Tajikistan and the impacts of these changes for natural resources, sectors of economy, public health, response measures, financial and technological needs to address the problem of climate change. Greenhouse gas inventory for the period 1990-2016 and the forecast of future greenhouse gas emissions up to 2030, carried out as part of the Fourth National Communication, formed the basis of the updated NDC. We hope that the 4HC will be of interest both for the purposes of the UNFCCC Conference of the Parties and for the local and international community. More than 50 experts and specialists from state authorities, the National Academy of Sciences, international partners and non-governmental organizations took part in the preparation of the 4NC.

I express my gratitude to the heads and specialists of key ministries and departments who submitted the materials on the basis of which this document was compiled.

I also express my gratitude to the Government of the Republic of Tajikistan, the United Nations Development Program in Tajikistan and the Global Environment Facility for administrative and financial support, as well as the UNFCCC Secretariat for the overall coordination and assistance in the preparation of this document.

Sheralizoda B.A.

Chairman of the Committee for Environmental Protection
under the Government of the Republic of Tajikistan

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LIST OF ABBREVIATIONS, DEFINITIONS AND MEASUREMENT UNITS

ADB	Asian Development Bank
AF	Adaptation Fund
AfDB	African Development Bank
AFA	Afghani – Currency of Afghanistan
AFOLU	Agriculture, forestry, land use
AKT sub-region	Afghanistan, Kyrgyzstan and Tajikistan
AR	Assessment Report
AR5	Fifth Assessment Report
ASEAN	Association of South East Asia Nations
AWS	Automated Weather Station
BAU	Business as Usual
CAES	Central Asian Energy System
CAMP	Central Asian Mountain Partnership / Центрально-азиатское горное партнёрство
CASA-1000	Central Asia South Asia Electricity Transmission and Trade Project
CAWa	Central Asia Water network / Региональная сеть «Вода в Центральной Азии»
CC	Climate Change
CCRA	Climate Change Risk Assessment
CDM	Clean Development Mechanism
CIF	Climate Investment Funds
CIS	Commonwealth of Independent States
CMIP5	Coupled Model Intercomparison Project 5
COP21	21st Conference of Parties to the UNFCCC (December 2015)
CO_2-eq	CO_2 equivalent
CPI	Climate Policy Initiative
CRI	Clobal Climate Change Risk Index
CSO	Civil Society Organizations
CTF	Environmentally Clean Technologies Fund
CWA	Central and Western Asia
DABSh	Da Afghanistan Breshna Sherkat
DC	Direct current
DFID	Department for International Development
DI	Development Institutions
DMC	Developing Member Countries
DRR	Disaster Risk Reduction
EaEU	Eurasian Economic Union
EBRD	European Bank for Reconstruction and Development
ECA	Europe and Central Asia
EIB	European Investment Bank
ENVSEC	Environment and Security Initiative
EoI	Expression of Interest
FAO	UN Food and Agriculture Organization
FAR	IPCC Fifth Assessment Report
FDI	Foreign Direct Investments
FIP	Forestation Investment Program
FNC	First National Communication
FSF	Flexible Support Funding

GCF	Green Climate Fund
GCM	General Circulation Model
GCOS	Glogal Climate Observing System
GCW	Global Cryosphere Watch
GDBD	Global Database on Disasters (EM-DAT)
GDP	Gross Domestic Product
GEF	Global Environmental Fund
GHG	Greenhouse Gases
GIS	Geographic Information Systems
GIZ	Gesellschaft für Internationale Zusammenarbeit
GLIMS	Global land ice measurements from space
GNI	Gross National Income
GWe	Gigawatt (million watt)
GWh	Gigawatt-hour
HPP	Hydro Power Plant
IAM	Integrated impact assessment model
ICSD	Interstate Commission on Sustainable Development
ICWC	Interstate Commission for Water Management
IFAS	International Fund for Aral Sea
IDB	International Development Bank
IIASA	International Institute of Applied Systems Analysis
IMF	International Monetary Fund
INDC	Intended Nationally Determined Contributions
IPCC	Intergovernmental Panel on Climate Change
IPY	International Polar Year
ISDR	International Strategy for Disaster Reduction
IWRM	Integrated Water Resource Management
KGS	Kyrgyz Som
LDC	Least Developed Countries
LDCF	Least Developed Countries Fund
LEDS	Low Emissions Development Strategies
LUCF	Land Use Change and Forestry
m.a.s.l.	meters above the sea level
MCA	Multi-Criteria Analysis
MCGGE	Marginal Costs of Greenhouse Gas Emissions
MDBs	Multilateral Development Banks
MENAAP	Middle East, North Africa, Afghanistan, and Pakistan Region
MHSPP RT	Ministry of Health and Social Protection of Population of RT
MM	Mass Media
MS	Mitigation scenario
NAP	National Adaptation Plan
NAPA	National Adaptation Program of Actions
NC	National Communication
NDC	Nationally Determined Contributions in GG emissions
ND-GAIN	Notre Dame University Global Adaptation Index
NEPSI	North-East Power System
NGO	Non-Government Organization
NMHS	National Meteorology and Hydrology Service
NIAM	Net Impact Assessment Model
ODA	Official Development Aid
OECD	Organization for Economic Cooperation and Development
PAGE09	Policy Analysis of Greenhouse Effect, Version 9
POP	Persistent Organic Pollutants
PPCR	Pilot Program for Climate Change Resilience

PPP	Purchasing Power Parity
PRC	People's Republic of China
QELRO	Quantified Emissions Limitations and Reductions Objectives
RCM	Regional Climate Model
REDP	Renewable Energy Development Program
RHC	Regional Hydrology Center under IFAS
RT	Republic of Tajikistan
RUB	Russian Ruble
SAR	South Asian Region
SCCF	Special Climate Change Fund
SCF	Strategic Climate Fund
SDC	Swiss Development Cooperation
SEES	South East Power System
SIC	Science Information Center
SPACC	Strategic Program on Adaptation to Climate Change
SPPS	Specialized Programs for Private Sector
SRES	Special Report on Emissions Scenarios
TA	Technical Assistance
TARD	Technical Assistance in Research and Development
TB CAREC	Tajik Branch of the Central Asian Regional Environmental Center
TB IAELPS	Tajik Branch of the International Academy of Ecology and Life Protection Sciences
TJS	Tajik Somoni
TPP	Thermal Power Plant
UNDP	United National Development Program
UNEP	United Nations Environment Program
UNESCO	United Nations Education, Science and Culture Organization
UNFCCC	UN Framework Convention on Climate Change
USA	United States of America
USAID	United States Agency for International Development
USD	US Dollar
WB	World Bank
WBG	World Bank Group
WCDR	World Conference on Disaster Reduction
WDI	World Development Indicators
WGMS	World Glacier Monitoring Service Zurich
WMO	World Meteorological Organization

CHEMICAL FORMULATIONS:

CH_4	Methane
CO	Carbon monoxide
CO_2	Carbon dioxide
N_2O	Nitrogen oxide
NOx	Nitrogen oxides
PFCs	perfluorocarbon
SO_2	Sulfur dioxide
SF_6	Sulphur Hexafluoride

MEASUREMENT UNITS:

°C	Celsius temperature
g	gram
Gg	giga-gram
ha	hectare
J	Joule
kWt/h	kilowatt/hour
$kWt/h/m^2$	kilowatt/hour per a square meter = 3,6 MJ/m^2

kg	kilogram
kcal	kilocalorie
km	kilometer
m	meter
m.a.s.l.	altitude in meters above the sea level
m/s	meters per second
m^2	square meter
m^3	cubic meter
m^3/s	cubic meters per second
MW	megawatt = 1 000 000 watt
mln.	million
bln.	billion
mm	millimeter
ppm	part per million
t	ton
toe	ton of oil equivalent = 29 308 kJ = 0,7 tons of oil equivalent
t/person	ton/person
TJ	terajoule = 1 000 000 000 000 J
ths	thousand
ths t	thousand tons

INTRODUCTION

The climate in our planet is changing. The climate change trends are dangerous, the number and strength of natural hydrometeorological phenomena are increasing, many sectors of the economy, natural ecosystems and public health are becoming more vulnerable to adverse weather events and long-term sustainable climate change trends. One of the causes of climate change is currently a large amount of greenhouse gases emissions into the atmosphere due to unregulated economic activities of people. The UN called on all countries to solve the Problem of climate change by limiting greenhouse gas emissions into the atmosphere, having prepared the Framework Convention on Climate Change (UNFCCC) in 1992.

Realizing the fact of climate change and its consequences for Tajikistan, the Government of the Republic of Tajikistan is taking important steps to solve the problem, and also directs all efforts to mitigate the risks caused by climate change. The country ratified the UN Framework Convention on Climate Change in 1998 and the Kyoto Protocol in 2008, committing itself as a non-Annex I Party to the Convention.

The Government of the Republic of Tajikistan developed and submitted its first national communication in 2002, the second national communication in 2008 and the third national communication in 2014.

The Republic of Tajikistan, pursuant to the relevant decisions of the UNFCCC Conference of the Parties COP-19 and COP-20, including the "Lima call for climate action" (Lima, Peru, December 2014), in October 2015 submitted its intended nationally determined contribution (INDC). In February 2017 ratified the Paris Agreement and thus INDC became the first NDC of Tajikistan. On 12 October 2021, ahead of the Glasgow Climate Summit COP-26, Tajikistan submitted an updated version of the Nationally Determined Contribution (NDC) to the UNFCCC.

In 2018, the Republic of Tajikistan developed its first Biennial Updated Report (BUR) in accordance with the Guidelines for the submission of biennial reports containing updated information by Parties not included in Annex I to the Convention", which are provided in annex III to decision 2/CP17 and submitted it to the UNFCCC in 2019.

Tajikistan has created a legislative and institutional framework for actions aimed at solving problems related to climate change. Taking into account the urgency of global environmental problems and their close relationship with local conditions and the state of the environment, the country has joined and ratified a number of important international agreements.

The Government of the Republic of Tajikistan has adopted more than 30 laws and regulations in the field of environmental protection, developed more than 10 State programs and action plans, and ratified a number of conventions that take into account environmental safety issues. National centers have been established to coordinate and solve environmental problems on a national and global scale.

The National Development Strategy of the Republic of Tajikistan for the period up to 2030 and the Medium-term Development Program of the Republic of Tajikistan for the period 2021-2025 have been developed.

The Government of the Republic of Tajikistan has approved the National Strategy of Adaptation to Climate Change of the Republic of Tajikistan for the period up to 2030.

The fourth national Communication on Climate change of the Republic of Tajikistan was developed in accordance with Articles 4.1 and 12.1 of the UNFCCC and in accordance with the Guidelines on National Communications of Parties not included in Annex I to the Convention (2003).

EXECUTIVE SUMMARY

The Fourth National Communication of the Republic of Tajikistan under the United Nations Framework Convention on Climate Change was developed in accordance with Articles 4.1 and 12.1 of the UNFCCC and in line with the Guidelines for the Preparation of National Communications by Parties not included in Annex I to the Convention (2003). This document was prepared with the financial support of the Global Environment Facility (GEF) through the United Nations Development Programme (UNDP) in the Republic of Tajikistan.

NATIONAL CIRCUMSTANCES

Geographical location. Tajikistan is a landlocked country located in the southeastern part of Central Asia. The country covers an area of 142,100 km^2. It borders Kyrgyzstan in the north (the length of the border is 987,5 km), China in the east (the length of the border is 495 km), Afghanistan in the south (the length of the border is 1,374.2 km), Uzbekistan in the north and west (the length of the border is 1332 km).

Three mountain systems – Tien Shan, Gissar-Alay and Pamir - occupy about 93% of the country's territory. The height of the terrain ranges from 300 to 7495 meters above sea level, while almost half of the country's territory is located at an altitude of more than 3000 meters above sea level.

Administrative organization and population. The territory of Tajikistan is divided into the following administrative-territorial units: Gorno-Badakhshan Autonomous Region, Sughd Region, Khatlon region, 62 districts, 18 cities, 57 settlements and 370 rural administrative units (jamoati dehot). The districts of republican subordination (DRS) include 13 districts in the central part of Tajikistan. The capital, Dushanbe, has a separate administrative status and is divided into four districts.

Tajikistan is experiencing very rapid population growth. Over the period from 2000 to 2019, the country's population grew by 52% from 6.13 million to 9.31 million people. The average annual population growth rate for this period of time was 2.1%. In the total population structure in 2019, the share of rural population was 73.7% and urban 26.3%. In Tajikistan, the number of children under the age of 17 is more than 40% of the total population of the country.

Climate conditions. The climate in the country is continental, however, a large amplitude of heights combined with a very complex relief structure determines the formation of unique regional and local climatic zones with large temperature differences, characterized by significant daily and seasonal fluctuations in weather conditions. There are sharp changes in the amount of average annual precipitation - from a minimum level of less than 100 mm in the Eastern Pamirs to 500-600 mm in the valley of the Vakhsh River in the south and a maximum value of more than 2,000 mm on the southern slopes of the Hissar ridge. Depending on the hypsometric levels and the location of the mountains, precipitation and air temperature vary dramatically. At an altitude of 1,500-2,000 m, Central Tajikistan receives 1,800 mm of precipitation per year, while in the south of the republic, at an altitude of 300–500 m, there is 200 mm, and in the Eastern Pamir, at an altitude of 4,000 m, only 60 mm. The air temperature also fluctuates within different heights and districts. In the south, in the Shaartuz district, in winter it can reach + 22°C, while in the Pamir, in the area of Lake Bulunkul, it drops to - 63°C.

Water resources. There are 947 rivers flowing through the country, with a length of more than 10 km, which is about 60% of the hydro resources of Central Asia. There are about 1,300 lakes and reservoirs of various origins in the republic with a total area of about 1,200 km^2. They contain

about 44 km^3 of water, of which 20 km^3 - fresh waters. The largest lakes (Karakul, Rangkul, Zorkul, Sarez, Yashilkul) are located in the Pamirs. Significant water reserves - over 500 km^3 are concentrated in the glaciers of Central Tajikistan and the Pamirs. Their area is about 8,476 km^2 and occupies more than 5% of the total area of the republic. The total flow of rivers passing through the territory of Tajikistan is 65.11 km^3. About 50% of the total annual flow of the Aral Sea is formed on the territory of the country.

Forest resources and biodiversity. In 2020, the total land area of the State Forest Fund of Tajikistan was estimated at 1.9 million hectares. After the collapse of the Soviet Union, Tajikistan experienced extreme deforestation. Today Tajikistan is one of the most sparsely forested countries (MSFC). The country's forest area is about 423,000 hectares, or 3% of the total land area. The exact figures for the mitigation potential in the forestry sector are unknown. Forestry is the least explored sector in terms of climate change impacts and potential contributions to mitigation and adaptation.

About 5 thousand higher flowering plants, about 1,000 species of algae, more than 1,500 species of fungi, about 500 species of lichens and 500 species of mosses have been characterized on the territory of Tajikistan. At the same time, about 10 genera and more than 1,000 species grow only on the territory of the country and are rarely found outside its borders. About 400 species of medicinal plants are widely used by the population. More than 100 types of food and vitamin-bearing plants and about 60 species and 3 ether-bearing plants grow in the republic.

Economic structure. The economy of Tajikistan is agrarian-industrial, its basis is agriculture: cotton growing, crop production, animal husbandry, as well as industry: mechanical engineering, aluminum production, mineral fertilizers, textile and light industry, energy and consumer goods production. Relative remoteness and communication isolation from the existing global transport infrastructure, high-altitude terrain, lack of access to the sea determine the unfavorable economic and geographical position of the country.

Tajikistan's total GDP in 2019 was USD 8.1 billion, or USD 840 per capita. In the structure of GDP, 19,8% are agricultural products, 15.1% - industry, 15% - construction, 35% - services, 10% - transport and 6% - tax on net products.

Of the total employed population, 46% are employed in agriculture, 6.8% - in industry, 8.6% - in construction, 12.2% - in trade and services, 4.6% - in the public administration system, 4.1% - in health care, 8.1% - in the education system and 9.3% - in other sectors of the economy (finance, communications, science, etc.).

Sustainable development and poverty eradication. It is important to emphasize that Tajikistan was included in the list of 10 countries with the fastest rates of poverty reduction over the past 15 years. The poverty rate decreased from 81% in 1999 to 29.7% in 2017. Accordingly, the level of extreme poverty decreased from 73% to 14%. Analysis of data from 2003 to 2018 showed that the factors of poverty reduction were, among other things, wage increases, money transfers from other countries, timely pension payments.

In the world ranking on the Human Capital Index (HCI), Tajikistan ranked 57th among 130 countries in 2018 with an indicator of 0.53. According to the Human Development Index (HDI), Tajikistan ranked 129th among 187 countries in 2019 with an indicator of 0.656, and according to the Gender Inequality Index (GII) in 2019, Tajikistan ranked 84th with an indicator of 0.377.

The agricultural sector *is one of the leading sectors of Tajikistan's economy.* The Government of Tajikistan recognizes the need to reduce the vulnerability of the agricultural sector to climate

change, especially given that agriculture contributes significantly to GDP and employment in the country: it accounts for 19.8% of GDP and employs more than 60% of the population of Tajikistan. In the production of gross agricultural output by the end of 2019, the share of crop production accounted for 69.1% and animal husbandry 30.9% of the output. Of the total agricultural output, 6% was produced in the public sector, 56% in households and 39% in dehkan (farming) households. At the same time, it should be noted that more than 93% of livestock products and 39% of crop production were produced in the subsidiary farms of the population. As of 2019, the total area of agricultural land was 3669411 hectares. In the total area of agricultural land, the share of arable land is 18%, pastures - 76.8%, perennial plantations - 4.1%, deposits -0.7% and 0.4% of hayfields. In 2019, there were 182756 dehkan (farming) households in Tajikistan, which is more than twice as high as in 2013. In 2019, on average, one dehkan farm accounted for 15 hectares of agricultural land, including 3.1 hectares of arable land, 0.7 hectares of perennial plantations and 11 hectares of pastures.

The modern development of industry *in Tajikistan* is based on a large stock of raw materials for the metallurgical, chemical and construction industries. At present, more than 600 deposits of precious stones, non-ferrous and rare metals have been explored in the country, which in total contain more than 50 types of mineral raw materials. In 2019, compared to 1990, the number of enterprises in the industrial sector increased from 300 to 1,996 units, enterprises in the construction complex from 30 to 997 units, the chemical and petrochemical industry from 10 to 58 units. Despite the COVID-19 pandemic in 2020, the industrial sector accounted for 21.9% of GDP.

Power resources and energy. Tajikistan has quite large reserves of energy resources. A special place in this context is occupied by hydropower resources with the potential to generate 527 billion kWh. Tajikistan is a world leader in terms of hydropower potential per unit of territory (3.6 million kWh per 1 km^2 per year), and almost all of the country's electricity needs are met by hydroelectric power plants. 54.2% of the potential hydro resources of Central Asia are concentrated in the republic, with a specific weight of 11.2% of the territory. The hydro energy potential of Tajikistan is three times higher than the current electricity consumption throughout Central Asia. The largest part of the potential and technically possible hydropower resources for operation is concentrated in the Vakhsh and Pyanj rivers. To date, the cascade of hydroelectric power plants on the Vakhsh river consists of: operating — Nurek, Baypazin, Sangtuda-1 and 2, Golovnaya, Perepadnaya and Centralnaya; under construction - Roghun; projected - Shurob. The total capacity of the Vakhsh cascade is estimated at 9.0 million kW with an annual electricity generation of about 35 billion kWh.

Tajikistan's transport sector includes road, rail and air subsectors, while more than 90% of freight and passenger traffic within the country is carried out using road transport. In the structure of GDP, the share of the transport and communications sector in 2019 was 8.9%. The total length of highways in Tajikistan is 26,300 km, 14,339 km of which are general-purpose roads. The infrastructure of general-purpose roads mainly consists of local roads (62%), international highways (23%) and republican roads (15%). The total length of railway tracks in Tajikistan is 987 km, none of which is electrified. The share of freight and passenger traffic by rail is very small, which can be partially explained by the current state of the national rail network.

Tourism development. Due to the unique climate conditions, diverse landscape, untouched nature, authentic historical monuments in Tajikistan, there are opportunities for the development of various types of tourism. According to the World Tourism Organization (WTO), in January-December 2019, the share of tourism services of Tajikistan in the total gross domestic product (GDP) averaged 10.4%, and the direct share of tourism in GDP was 2.2 percent. Tajikistan has a simplified visa system for citizens of more than 114 foreign countries. The registration period for

foreign passports of foreign citizens arriving in Tajikistan from June 1, 2018 has been increased from 3 to 10 days, and for tourists the validity period of a tourist visa is no more than 45 days. In order to develop tourism in Tajikistan, travel companies are exempt from income tax for five years of their activities. Equipment and construction materials imported for the purpose of construction and reconstruction of tourist infrastructure are exempt from VAT and customs duties.

The COVID-19 pandemic has had a direct impact on the lives and livelihoods of the population, as well as on entrepreneurship. The economic crisis provoked by COVID-19 makes it difficult for small and medium-sized enterprises to survive and maintain their activities due to cash flow problems, labor shortages, supply and demand disruptions, as well as their limited ability to respond to global shocks. Perhaps the greatest immediate negative effect has been on employment, exacerbating socio-economic vulnerability and weakening the ability to withstand economic shocks.

The tourism sector is perhaps the most sensitive to the COVID-19 outbreak and related restrictions on the movement of people and goods, with the exception of civil aviation and cross-border trade. The restrictions imposed in connection with the COVID-19 outbreak led to the fact that the tourism sector produced only 34.9 million somoni, which is equivalent to only 0.11% of GDP.

Government expenditures on social sectors accounted for 46.8% of the state budget, which corresponds to the expenditures of the public administration sector in the first six months of 2020 and gradually increased until 2021. The largest reduction in government spending compared to the initial plan was recorded in public administration (41.7%), education (21.8%), culture and sports (18.6%), industry and construction (15.8%), social insurance and social protection of the population (15.3%).

Tajikistan has developed an Action Plan to prevent and reduce the exposure of the national economy to potential risks of COVID-19. The COVID-19 Preparedness and Response Plan consists of 23 broadly defined measures to be implemented from March to December 2020, including:

- Health and social protection package to help the poor and vulnerable;
- Set of economic measures to ensure food security;
- Package of economic measures to protect small and medium-sized enterprises that are seriously affected.

On March 19, 2020, the Ministry of Health and Social Protection of the Population prepared its own National Preparedness and Response Plan, which identified priority areas in the ten main areas of strategic response to the COVID-19 outbreak.

GREENHOUSE GAS INVENTORY

During the inventory of greenhouse gases for the preparation of the 4th National Communication of the Republic of Tajikistan on Climate Change, all calculations were based on the methodology of the 2006 IPCC Guidelines, instead of the methodology of the 1996 IPCC Guidelines. Initially, the GHG inventory covered the period 2004-2016, but taking into account the Update of the Nationally Determined Contribution (NDC), the period 1990-2016 was covered. This is because the previous set of greenhouse gas inventories from 1990 to 2003 was calculated using the methodology of the 1996 IPCC Guidelines, and the inventory from 2004 to 2016 was calculated using the methodology of the 2006 IPCC Guidelines. Consequently, the updating and approval of

the greenhouse gas inventory influenced greenhouse gas emissions for the base year, which is 1990, with a subsequent increase in the total value of greenhouse gas emissions in the country from 25.52 million tCO_2eq to 35.53 million tCO_2eq. The main increase in greenhouse gas emissions is associated with new estimates in agriculture and Industrial Processes and Product Use (IPPU).

The Republic of Tajikistan considers the updating of its greenhouse gas inventory as a significant improvement of the updated NDC in order to ensure greater transparency, clarity and understanding, including for mitigation purposes.

Analysis of greenhouse gas emissions by sector shows that in 1990, 60% of total greenhouse gas emissions in the country were from the energy sector, 35% from agriculture and 9% from Industrial Processes and Product Use (IPPU) of total greenhouse gas emissions in the Republic of Tajikistan, respectively. Waste and Land use, land-use change and forestry (LULUCF) were negligible in the country's total greenhouse gas emissions in 1990.

Despite the fact that overall growth is observed in the base year, it should be emphasized that according to the results of the 2016 inventory, it is 39% of the total GHG emissions produced in 1990. Thus, the Republic of Tajikistan has achieved a significant GHG reduction, which contributes to the achievement of common goals to reduce global greenhouse gas emissions, and with the support of the international community, the Republic of Tajikistan can achieve low-carbon development.

PROJECTIONS AND SCENARIOS OF GREENHOUSE GAS EMISSIONS

Several scenarios have been used to predict future scenarios of greenhouse gas emissions. The first step was to identify macroeconomic and other general parameters that were used to determine the baseline scenario and mitigation scenario.

The second step was to formulate bottom-up models for each sector. The following industries are considered: 1) Energy; 2) Agriculture; 3) Forestry (LULUCF); 4) Transport; 5) Industry and construction. Greenhouse gas emissions estimates have been integrated into common country scenarios, following a sectoral assessment.

To make projections of greenhouse gas emissions in the Republic of Tajikistan until 2030, three scenarios were formulated:

Baseline scenario. This scenario considers that any mitigation measure would be successfully implemented;

Unconditional scenario. This scenario considers all existing mitigation measures that will be implemented by the country's efforts until 2030; and

Conditional scenario. This scenario considers additional mitigation measures, for the implementation of which the Republic of Tajikistan will need the full support of the international community.

The results of the formulation of the three above-mentioned scenarios in accordance with the baseline scenario will be 23.54 million tCO_2eq by 2030 with an intermediate economic growth of 5-6%. The last assumes that under this scenario, total greenhouse gas emissions in the Republic of Tajikistan will reach 66.25% of existing greenhouse gas emissions in 1990.

According to the unconditional scenario, the expected greenhouse gas emissions by 2030 will be 21.87 million tCO_2eq. The last represents 61.55% of the existing greenhouse gas emissions in 1990 or a reduction of GHG emissions by 7% compared to the baseline scenario.

According to the conditional scenario, GHG emissions by 2030 will be 17.83 million tCO_2eq, which means 50.10% of GHG emissions from 1990 or a 24% reduction in greenhouse gas emissions compared to the baseline scenario.

NATIONALLY DETERMINED CONTRIBUTION (NDC)

It is important to highlight that the Republic of Tajikistan defined the target limit of emissions in its initial NDC: **the unconditional target** was to limit emissions from 80 to 90% of greenhouse gas emissions at the 1990 level, and **the conditional target** was to limit from 65 to 75% of greenhouse gas emissions from the 1990 level. The unconditional target, expressed per capita, was from 1.7 to 2.0 tCO_2eq by 2030. Whereas the conditional target, expressed in per capita emissions, ranged from 1.4 to 1.7 tCO_2eq.

For the updated NDC, mitigation targets were determined based on three greenhouse gas emission scenarios formulated for the Republic of Tajikistan. Consequently, based on the projections of greenhouse gas emissions, the Republic of Tajikistan will have an unconditional target, which is to limit emissions from 60 to 70% of existing greenhouse gas emissions in 1990. The last means that the Republic of Tajikistan should not go beyond 21.32-24.87 million tCO_2eq emitted in 2030. While the conditional target would be an emissions limit of 50 to 60% of greenhouse gas emissions emitted in 1990. Thus, this represents a limit of 17.76 to 21.32 million tCO_2eq emitted in 2030.

The last, expressed as greenhouse gas emissions per capita, indicates that the unconditional target is from 1.9 to 2.2 tCO_2eq, and the conditional target is from 1.5 to 1.9 tCO_2eq capita by 2030.

Quantitative Information on the Reference Point

Reference year	1990
Quantitative information on the reference indicators, their values in the reference year	Greenhouse gas emissions of Tajikistan in 1990 were estimated at 35.53 million tCO_2eq. Gases covered: greenhouse gases not controlled by the Montreal Protocol - Carbon Dioxide (CO_2), - Methane (CH_4), - Nitrous Oxide (N_2O). Sectors Covered: 1) Energy: 21.37 million tCO_2eq; 2) Industrial Processes and Product Use: 3.1 million tCO_2eq; 3) Agriculture, Forestry and Other Land Use: 10.5 million tCO_2eq; a. Agriculture: 12.33 million tCO_2eq; b. Forestry and Other Land Use (FOLU): -1.82 million tCO_2eq; 4) Waste: 0.50 million tCO_2eq. Methodology: 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

Target indicator compared to the reference indicator	The Republic of Tajikistan is committed to an unconditional target, which is 60 to 70% of GHG emissions from the 1990 level by 2030 that will amount to 21.32-24.87 million tCO_2eq by 2030, or from 1.9 to 2.2 tCO_2eq per capita. The conditional target to reduce greenhouse gas emissions in the Republic of Tajikistan will have an upper limit of emissions from 50 to 60% of the 1990 level, which by 2030 will be from 17.76 to 21.32 million tCO_2eq or 1.5-1.9 tCO_2eq per capita, if financial support, technology transfer and technical cooperation are provided.

ENHANCED TRANSPARENCY FRAMEWORK

The basic document for the collection, processing and analysis of statistical data in Tajikistan is the Law "On State Statistics of the Republic of Tajikistan" and other regulatory documents.

The GHG inventory is the responsibility of the Republic of Tajikistan within the framework of its commitments to the UNFCCC. The compilation of the GHG inventory in Tajikistan is based on the international methodology of the Intergovernmental Panel on Climate Change (IPCC). The inventory is carried out as part of the preparation of national communications and biennial update reports (BURs) with the involvement of a working group to arrange an inventory and monitor greenhouse gas emissions.

The main body currently responsible for the preparation of the greenhouse gas inventory in Tajikistan is the Agency of Hydrometeorology (Hydromet) of the Committee on Environmental Protection under the Government of the Republic of Tajikistan. The Agency on Statistics under the President of the Republic of Tajikistan plays a core role in collecting information on GHG emissions. All information from key ministries and departments in accordance with the Law "On State Statistics" is transferred to the Agency on Statistics. In particular, specialists from the Agency on Statistics, together with other key ministries and departments, are involved in the preparation of national communications.

GHG emissions and removals for the BUR covering the 2004-2014 inventories were estimated using the Tier 1 and Tier 2 methodologies of the 2006 IPCC Guidelines. The Tier 2 methodology of the 2006 IPCC Guidelines was used for the solid waste category in the waste sector, while the Tier 1 methodology of the 2006 IPCC Guidelines was used for all other categories and subcategories in all sectors. Three previous national communications on GHG inventories used the 1996 IPCC Guidelines.

MONITORING, REPORTING AND VERIFICATION

The Government of the Republic of Tajikistan has outlined the following stages for the implementation of the Monitoring, Reporting and Verification (MRV) system.

The first stage may cover the period from 2020 to 2025, and its main task will be to improve the existing methodological and institutional framework for the implementation and operation of the MRV system with the involvement of key sectors of the economy.

The second stage covers the period from 2025 to 2030, and its main task will be the adoption of a regulatory framework aimed at improving the MRV system of greenhouse gases.

The third stage will begin after 2030. It is expected that the commitment to report GHG emissions will be extended to all organizations whose emissions exceed 50 thousand tCO_2eq per year.

Based on the above, the Republic of Tajikistan has the potential and desire to increase the transparency of reporting and review of the country's emissions information, mitigation and adaptation efforts, as well as the support received. In addition, the Republic of Tajikistan actively supports the dynamic process of updating the NDC and contributes to the global outcomes of successive five-year cycles. Nevertheless, the Republic of Tajikistan needs support to expand opportunities to create adequate capacity while complying with the reporting requirements established by the Enhanced Transparency Framework (ETF).

As part of the transformation of the Enhanced Transparency Framework, the current system of measurement, presentation of information and verification should be further integrated into optimized data management systems. It should receive new technical capabilities, improved analytical capabilities and ensure active coordination between all stakeholders. Even though some efforts have been made to establish a national system of measurement, reporting and verification, and a strategy for its development has been adopted, it is currently fragmented and requires the development of a sustainable national GHG inventory management system, including “Finance”, “Capacity Building”, “Technology Transfer” and “Private Sector Contribution” components. The development of a common platform and mechanisms will strengthen the capacity of relevant national institutions to increase transparency over time.

To move to the Enhanced Transparency Framework, it is required:

- improvement of legislation;
- improved data management (filling in missing data and improving the quality of data collected; data collection and processing);
- enhancing institutional mechanisms, including the involvement of new intersectoral groups (within the government and between public institutions and the private sector);
- integration of existing fragmented monitoring and reporting systems;
- human potential development;
- ensuring access to the newest technologies and financial resources.

Tajikistan, as a member of the PPCR, has gained experience in monitoring and evaluating adaptation measures. To coordinate projects related to climate change, the PPCR Secretariat was established in 2011, one of the tasks of which was to monitor and evaluate the activities of the PPCR.

The recognized M&E monitoring system of adaptation measures within the framework of national programs and strategies in Tajikistan is currently an integral part of the implementation of the Medium-Term Development Programs of the Republic of Tajikistan. The existing M&E system can be fully used as a tool to track the progress of adaptation measures at national, regional and sectoral levels.

The M&E system of adaptation measures should be developed to track progress in achieving the goals, identify positive experiences and existing problems in the implementation of the NDS-2030, the NSACC-2030, the Medium-term Development Program for the period 2021-2025, the National Strategy for Disaster Risk Reduction for the period up to 2030, the National Action Plan of the Republic of Tajikistan for Climate Change Adaptation under the UNFCCC, the revised NDC, the Sendai Framework for Disaster Risk Reduction 2015-2030 and the SDGs for the period up to 2030.

The inclusion of adaptation measures in the planning process at the national and regional levels requires the definition of quantitative and qualitative indicators.

Qualitative indicators of adaptation measures at the national level may include:

- the level of integration of climate change adaptation measures into national plans;
- strengthening government capacity;
- mechanisms for coordinating climate change resilience.

Indicators of risks, impacts and adaptability to climate change can be used as *quantitative indicators* of adaptation to climate change.

Another important part of the Enhanced Transparency Framework is tracking progress in fulfilling commitments. In this regard, it is necessary to develop/improve the structure of deep involvement of line ministries, implementation plans, indicators for the report on the monitored progress in the implementation of NDC, as well as relevant actions defined in national, sectoral strategies, as well as efforts for continuous improvement.

Tracking financial investments for climate change adaptation and mitigation measures by both development partners and the private sector, as well as government involvement, are important elements of the M&E of the updated NDC. This requires the development of indicators to determine the contribution of development partners, the private sector and the government. Monitoring procedures should include budgeting procedures from national and subnational funding sources. However, there is a need for improved management monitoring, evaluation and training to comprehensively track progress in mitigation and adaptation, identify experiences and continuously improve the effectiveness of policy measures. The country will benefit from an integrated MRV system that covers both adaptation and mitigation and can help track the progress of both domestic and international support measures, as well as help the Republic of Tajikistan fulfill its international commitments.

INSTITUTIONAL MECHANISMS AND LEGAL FRAMEWORK

The Government of the Republic of Tajikistan has adopted more than 30 laws and bylaws in the field of environmental protection, developed over 10 state programs and action plans, and ratified a number of conventions that take into account environmental safety issues. National centers for coordination and solution of environmental problems of national and global scale have been established.

All key government departments and program implementers, including those in the field of ecology, are accountable to the Executive Office of the President of the Republic of Tajikistan. The relevant departments of the administration monitor and coordinate the policies and measures of various ministries and departments, assist in informing the highest officials of the state in the adoption of national programs and action plans.

Majlisi Oli (Parliament) plays a key role in the formation and improvement of legislation and bringing it in line with international agreements, including those related to climate change. Members of the Parliamentary Committee on Environmental Protection are well aware of the problems associated with climate change and the decisions of international environmental conventions.

The Republic of Tajikistan seeks to counter the socio-economic impacts of climate change on vulnerable members of society, agricultural productivity and water availability, and other sectors by increasing the resilience of various communities in Tajikistan, as well as reducing the vulnerability of various stakeholders in the country.

Tajikistan has a regulatory and institutional framework for implementing climate change adaptation measures. Many key state bodies and institutions implement programs related to adaptation to climate change and submit reports to the Government of the Republic of Tajikistan.

The Committee on Environmental Protection under the Government of the Republic of Tajikistan provides general management of coordination of the activities of line ministries and departments on adaptation to climate change.

In accordance with the Decree of the Government of the Republic of Tajikistan, the Committee on Environmental Protection is responsible for the implementation of the National Strategy for Adaptation of the Republic of Tajikistan to Climate Change for the period up to 2030. In addition, the Committee on Environmental Protection is the National Designated Authority (NDA) of the Green Climate Fund (GCF).

It should be noted that after the signing of the Paris Agreement and the submission of the first NDC of Tajikistan, the country adopted a number of strategic documents, programs and concepts that directly or indirectly determine measures for adaptation to climate change.

The National Development Strategy (NDS) of the Republic of Tajikistan for the period up to 2030, adopted in 2016, defines general directions for economic development and measures that can help reduce the impact of climate change, including: 1) the use of non-traditional (renewable) energy sources; 2) minimization of the negative impact of transport on the environment and human health; 3) support for employment in the "green" sector, expansion of environmental entrepreneurship and the market for environmental services with the support of the state.

The National Strategy for Adaptation to Climate Change (NSACC) of the Republic of Tajikistan for the period up to 2030, adopted by the Government of the Republic of Tajikistan on October 2, 2019, has become a strategic document for the implementation of the Paris Agreement. This strategy summarizes the information needed to identify risks, threats and adaptation measures to climate change. The Government of Tajikistan has determined four priority sectors that are sensitive to climate change and need development: 1) energy; 2) water resources; 3) transport; 4) agriculture. The strategy presents adaptation measures in key sectors of the economy, and suggests mechanisms and sources of financing.

In the Medium-term Development Program of the Republic of Tajikistan for 2016-2020, the main measures to reduce the impact of climate change include expanding access to natural resources and their rational use, creating legal protection mechanisms, providing financial support and meeting the needs for new technologies that develop a green economy and prevent the risks of climate change; the development of renewable energy sources, modernization of all types of transport, construction of six hydroelectric power plants with a capacity of 700 kWh, reconstruction of 700 km of highways.

In the Medium-term Development Program of the Republic of Tajikistan for 2021-2025, adopted by the Government of the Republic of Tajikistan on April 30, 2021 under No. 168, a special section is devoted to environmental protection, climate change and natural disasters. The NSACC adopted earlier strengthens the mechanisms for the development of capacity-building processes for adaptation to climate change for employees of authorized bodies and civil servants. In addition, the development of gender-sensitive climate change indicators was noted as adaptation measures. Within the framework of this program, sectoral measures for adaptation to climate change are formulated.

Measures for mitigation and adaptation to climate change are also reflected in sectoral programs, strategies and plans.

The Agrarian Reform Programme of the Republic of Tajikistan for the period 2012-2020 provides for the development and introduction of new agricultural technology (for example, the cultivation of drought-resistant crops), research work, the creation of a support system for the development of animal husbandry and meeting the needs of farms in adapted animal breeds, improving the structure of acreage for fodder crops, the use of improved pastures as measures of adaptation to climate change.

Comprehensive program for the development of animal husbandry in the Republic of Tajikistan for the period 2018-2022 as mitigation and adaptation measures to climate change, provides for selection and breeding work, improvement of livestock raising technology and fodder norms, and increase in pasture productivity.

The Pasture Development Program of the Republic of Tajikistan for the period 2016-2020 as mitigation and adaptation measures to climate change, provides for an increase in pasture feed stocks, assistance in increasing the number of highly productive livestock, preparation of land for sowing seeds, improvement of pasture lands, repair and construction of roads and bridges, improvement of the condition of 1,500 hectares of pastures, import and production of meadow grass seeds, improvement of grazing routes.

The Water Sector Reform Program of the Republic of Tajikistan for the period 2016-2025 provides and implements the development of a long-term plan for the use and protection of water resources in five river basins, the development of seasonal and annual plans for the distribution and management of water resources in river basins, the restoration of irrigation infrastructure and improvement of its maintenance and operation conditions, the introduction of new water-saving technologies.

The National Strategy of the Republic of Tajikistan on Disaster Risk Reduction for the period 2019-2030, as mitigation and adaptation measures, provides for ensuring access of all stakeholders to information about the risk of natural disasters, integrating disaster risk management into development processes and improving disaster preparedness and response mechanisms.

The Industrial Development Strategy of the Republic of Tajikistan for the period up to 2030, as mitigation and adaptation measures to climate change, provides for the introduction of new technologies related to reducing emissions of harmful substances into the atmosphere, saving raw materials and energy resources.

According to the State Target Program for the Development of the Transport Complex of the Republic of Tajikistan for the period up to 2025, the life cycle of the transport infrastructure will be increased, which will make it more resilient to climate change. The main goal of this measure is to bring the transport infrastructure in line with international environmental standards. Specific activities include improving road surfaces, increasing traffic capacity, building bypass roads in settlements, applying anti-corrosion paints, plastic and metal, and creating roadside protection strips. These measures are integrated into numerous road construction and reconstruction projects that are planned and implemented in the country.

The draft Forestry Development Strategy for the period 2016-2030 identifies priorities for the development of the national forestry, which include the implementation of institutional, legal and financial reforms; and the development of the forestry management system. The goal of the Forestry Strategy is the sustainable development of the sector by ensuring a balance of

environmental, economic and social functions. Despite the fact that the Action Plan for the Implementation of the Forest Sector Strategy lists detailed activities along with specific goals, due to problems with investment, budget and capacity, most of the activities have not yet begun, and tasks are still pending.

COOPERATION OF TAJIKISTAN ON STRENGTHENING MITIGATION AND ADAPTAION MEASURES TO CLIMATE CHANGE AT THE NATIONAL, INTERNATIONAL AND REGIONAL LEVELS

In recent years, Tajikistan has been actively involved in expanding the range of adaptation measures both at the international and regional levels.

Tajikistan was nominated to participate in the Pilot Program for Climate Resilience (PPCR) in January 2009. The financing of the PPCR was provided by Multilateral Development Banks (MDBs). Within the framework of the MDBs, six PPCR projects totaling more than USD 150 million were approved and implemented. A PPCR Secretariat and a coordination mechanism have been established to coordinate and monitor PPCR projects.

The successful implementation of the PPCR facilitated Tajikistan's cooperation with the Green Climate Fund (GCF). In accordance with the GCF procedures, the Committee on Environmental Protection was appointed as the National Designated Authority (NDA) of the GCF by the Government decree. A coordination mechanism has been established to determine the successful impact of the GCF. Owing to the successful work of the NDA and the technical working group, as well as the active support of organizations accredited by GCF in Tajikistan, the GCF has approved five adaptation projects totaling over USD 100 million. These projects aim to ensure food security, increase the resilience of the energy sector, improve hydrometeorological services, increase climate finance for small businesses, and develop a National Climate Change Adaptation Plan.

Not having much experience working with the Adaptation Fund, Tajikistan, however, with the assistance of UNDP, in 2020 received a grant of almost USD 10 million for the implementation of the project “Integrated landscape approach to enhancing the climate resilience of small-scale farmers and pastoralists in Tajikistan”.

On adaptation to climate change, Tajikistan also cooperates on a bilateral basis with the World Bank (WB), the Asian Development Bank (ADB), the European Bank for Reconstruction and Development (EBRD), the International Bank (IB), the Global Environment Facility (GEF), the International Fund for Agricultural Development (IFAD), United Kingdom Department for International Development (DFID) and GIZ.

In cooperation with Central Asian countries, Tajikistan also participates in the work of such organizations as the International Fund for Saving the Aral Sea (IFAS), the Regional Environmental Center for Central Asia (CAREC, Almaty), the Regional Mountain Center of Central Asia (Bishkek) and the Regional Center for Drought Management (Tashkent).

Tajikistan is also implementing the Climate Adaptation and Mitigation Program for Aral Sea Basin (CAMP4ASB), funded by the GCF and administered by the World Bank.

Tajikistan participates in the World Bank Program “Resilient Landscapes in Central Asia and Afghanistan” (Program RESILAND CA+), which was developed in 2019 to provide a regional framework for landscape restoration to enhance the resilience of regional landscapes in Central Asia. This umbrella program funds analysis and consulting on topics related to landscape restoration and supports investment projects in Central Asian countries, one of which is the

Tajikistan Resilient Landscape Restoration Project (under preparation). The project was developed together with the projects RESILAND CA+ in Uzbekistan, the Kyrgyz Republic and possibly Afghanistan, united by a regional platform for high-level dialogue on landscape restoration.

PROMOTION OF MITIGATION AND ADAPTATION MEASURES TO CLIMATE CHANGE IN COMPLIANCE WITH INTERNATIONAL SYSTEMS AND CONVENTIONS

Sustainable Development Goals (SDGs) for the period up to 2030. The analysis of the multisectoral SDGs goals made it possible to create a profile of Tajikistan based on the consistency of the country's development strategies and programs with the SDGs, including in terms of adaptation measures to climate change.

Sixteen of the seventeen SDGs goals are related to the country's development goals and priorities. However, not all SDGs goals can be met equally by Tajikistan when taking adaptation measures to climate change, and many of them require strengthening priority measures to accelerate implementation. Among the many measures envisaged to accelerate the implementation of the SDGs related to climate change adaptation measures, it is necessary to choose those that correspond to the Sustainable Development Goals of Tajikistan. Thus, of the five strategic programs and strategies, including the NDS-2030, the NSACC, the Water Sector Reform Program of Tajikistan for the period 2016-2025, the Medium-Term Development Program for the period 2021-2025, the Agrarian Reform Program of the Republic of Tajikistan for the period 2012-2020, most of the adaptation measures correspond to the SDGs, especially the Goals 2, 5, 6, 7, 8, 9, 13 and 15.

Sendai Framework for Disaster Risk Reduction 2015-2030. In accordance with the new approaches of the world community to addressing the risk of natural disasters, including aggravated climate change, set out in the Sendai Framework and SDGs for the period up to 2030, on December 29, 2018, Tajikistan adopted the Updated National Strategy for Disaster Risk Reduction for the period 2019-2030. The NDS-2030, NSDRR-2030, NSACC-2030 and the Medium-Term Program for the Development of the Country for the Period 2021-2025 propose specific adaptation measures aimed at reducing natural disasters.

Convention on Biological Diversity. In 2016, as part of the fulfillment of the commitments of the Republic of Tajikistan under the Convention on Biological Diversity (Article 26) and on the basis of the decision of the 10th Conference of the Parties, the National Strategy and Action Plan on Conservation of Biodiversity in the Republic of Tajikistan for the period up to 2020 was developed. In the Medium-term Development Program of the Republic of Tajikistan for the period 2021-2025, in the section «Environment: climate change and disaster risk management», increasing the resilience of ecosystems and existing biodiversity to climate change are identified as key objectives.

United Nations Convention to Combat Desertification - UNCCD. The National Action Program to Combat Desertification takes into account the following factors: 1) the process of desertification, 2) high mountains, 3) natural disasters, 4) degradation of arable land and pastures, 5) soil drainage, 6) the development of erosion processes in the zone of rainfed agriculture and irrigated lands; 7) deterioration and loss of biodiversity.

Astana Resolution. In 2018, Tajikistan, along with five other countries of the Caucasus and Central Asia, signed the Astana Resolution on the restoration of about 2.7 million hectares of

degraded forest landscapes. Tajikistan has made special commitments to restore 66,000 hectares of degraded forest landscapes in the period from 2018 to 2030.

CLIMATE CHANGE IMPACTS, VULNERABILITY AND ADAPTATION

National risks, impacts and vulnerability to climate change. Tajikistan's high dependence on climate-sensitive sectors of the economy is a factor that increases the country's vulnerability to climate change and extreme weather events.

According to preliminary forecasts, by 2030 the average annual temperature in the country will increase by 0.2-0.4°C, and by 2050 the average annual precipitation will decrease by 5%.

The National Strategy for Adaptation to Climate Change of the Republic of Tajikistan (NSACC-2030) for the period up to 2030, after consultations with key ministries and government departments, identified the sectors most vulnerable to climate change: energy, water resources, agriculture and transport.

Based on the analysis of the NDS-2030, the NSACC-2030, the Medium-Term Development Program for the period 2016-2020, the Medium-Term Development Program for the period 2021-2025, sectoral strategies and programs, consultations with representatives of academia, civil society, employees of relevant ministries and departments, development partners, the main risks and impacts of climate change on key sectors of the economy were identified and classified.

The most important goal of Tajikistan's long-term development is to improve the standard of living of the country's population on the basis of ensuring sustainable economic development. To achieve this goal, the NDS-2030 defines such strategic development goals for the next 15 years as: a) ensuring energy security and efficient use of electricity; b) breaking the communication deadlock and turning the country into a transit state; c) ensuring food security and public access to quality food; d) expanding productive employment.

Electricity generation and transmission in Tajikistan is vulnerable to climate change and related extreme weather conditions. Due to the interdependence of energy and water systems, changes in precipitation, an increased risk of drought, a decrease in snow cover and different snowmelt times can negatively affect the production and transmission of electricity.

Agriculture. Another priority sector covering a significant part of the population of Tajikistan and providing livelihoods, income and employment, which is affected by climate change. Drought associated with climate change, the decline of non-irrigated agriculture, reduced yields and production, as well as crop failures and livestock deaths can have harmful consequences for dehkan farms.

Climate change is expected to have a serious impact **on forests**, especially those that are important for the production of non-wood forest products, such as walnuts, pistachios and berries. Changes in precipitation and temperature are likely to reduce forest productivity and increase the risk of natural disasters such as wildfires. These trends also lead to a change in the regional distribution of forests (and a narrowing of production areas for alpine species), as well as an increase in the number of pests and diseases.

Climate change can also directly affect the **transport sector** due to inefficient infrastructure. Highways, which account for more than 90% of passenger and freight traffic, may be affected by more frequent or more intense flooding. Increased precipitation and flooding can accelerate the degradation of road infrastructure.

Taking into account the risk indicators, the impact of climate change and the country's adaptation potential, regions of Tajikistan that are vulnerable to climate change have been identified. The most vulnerable area is the central mountainous regions of Tajikistan, followed by the densely populated southern mountainous and lowland regions of the country (Khatlon region) and the northern slopes of Zeravshan and Turkestan (Sughd region).

For the signing of the SDGs and the Sendai Framework for Disaster Risk Reduction, as well as on the basis of the goals and objectives of the National Disaster Risk Reduction Strategy for the period 2019-2030 and information received from the Committee on Emergency Situations and Civil Defense, risks and losses from natural disasters related to climate change were identified. The main types of natural disaster risks causing the greatest damage are: floods, landslides, mudslides, avalanches and drought. According to the Committee on Emergency Situations and Civil Defense for 1997-2018, the total amount of damage from natural disasters amounted to USD 589 million, or on average more than USD 25 million per year.

NATIONAL ADAPTATION PRIORITIES, STRATEGIES, POLICIES, PLANS, GOALS AND ACTIONS

In order to overcome the current and future serious economic and social consequences of climate change in Tajikistan, it is necessary to encourage the implementation of effective adaptation measures and avoid inadequate adaptation in priority sectors of the economy. To mitigate the effects of climate change, a number of strategic documents, programs and approaches have been adopted aimed at taking measures to adapt to climate change.

NDS-2030 defines the general directions of economic development, which, if implemented, can contribute to reducing the impact of climate change by taking the necessary adaptation measures aimed at using more renewable energy sources, minimizing the impact of the transport sector on the environment and encouraging employment in “green” industries.

NSACC-2030, adopted by the Government of the country in 2019, is a consolidated strategic document reflecting measures aimed at adaptation to climate change in Tajikistan.

During the national consultations on the development of NSACC, four priority adaptation sectors were identified, taking into account their vulnerability to climate change and development priorities. These are sectors such as (1) energy, (2) water resources, (3) transport and (4) agriculture, as well as seven intersectoral areas: (1) health, (2) education, (3) gender, (4) youth, (5) migration, (6) environment and (7) emergencies.

Based on the goals formulated within the framework of the NDS-2030, the NSACC-2030, as well as taking into account the provisions of other key documents, in particular the Medium-Term Development Program for the period 2021-2025, sectoral programs and strategies, research conducted by development partners, as well as consultations with specialists from key ministries and departments, long-term adaptation measures were identified that should be implemented in key sectors of the economy. These sectors include: (1) energy, (2) water resources, (3) agriculture and forestry, (4) transport and infrastructure, (5) industry and construction, as well as intersectoral sectors of the economy, that is: 1) education, 2) health, 3) migration, 4) environmental protection and 5) gender issues.

Based on the general analysis of the information received, the adaptation measures described below were developed in key sectors of the economy.

Key adaptation measures in the **energy sector** include:

- development of short-term forecasting models and effective ways to adapt to extreme weather conditions, such as drought;
- enhancing the skills of specialists in this sector in the application of methods for assessing climate risks and vulnerability;
- taking measures to ensure infrastructure security;
- revision of maintenance procedures and measures to improve the safety of electricity transmission and distribution networks due to weather conditions;
- development of networks of small hydroelectric power plants and the widespread development of other renewable energy sources in remote mountainous and rural areas of the country;
- strengthening the hydropower potential and increasing the reliability factor, taking into account the effects of climate change (an increase in the number of floods or a decrease in surface runoff).

The following steps have been developed as adaptation measures for the **use of water resources**:

- solving the problem of water shortage in the future by improving the efficiency of water use, utilization, recycling and regulation of water demand;
- strengthening the capacity of Water User Associations (WUAs);
- stricter regulation of wastewater treatment and discharge;
- ensuring the operation of ancillary systems for the management of accumulated water resources;
- improvement of groundwater management;
- widespread application of the principles of Integrated Water Resources Management (IWRM);
- rehabilitation of irrigation and drainage systems to improve the reclamation of saline marshes and wetlands;
- use of effective irrigation methods (drip irrigation);
- improvement of the water inflow forecasting system;
- development of national measures for adaptation and resilience to climate change in the water sector.

Tajikistan's agriculture is very vulnerable to climate change. Without significant adaptation measures, this can have a negative impact on food and nutritional security, poverty eradication and sustainable development. Adaptation measures are of priority importance both for crop production (including cereals and legumes, industrial crops, vegetables, horticulture and viticulture) and for subsectors of animal husbandry. Agricultural adaptation measures contribute to the achievement of national policy goals in the fields of agriculture, food and nutrition security, gender issues, disaster risk reduction, industrial development and biodiversity conservation (for example, the National Biodiversity Strategy and Action Plan under the Convention on Biological Diversity (CBD)) and thus contribute to the achievement of many SDGs, that is: the Sendai Framework and commitments under the CBD and the United Nations Convention to Combat Desertification.

The list of adaptation measures in **agriculture** includes:

- introduction of “green” technologies and “green” infrastructure in agro-industrial production;
- development of measures to improve the livestock breeding system (animal husbandry);
- development of agroforestry and conservation farming;
- crop rotation, intercropping and crop diversity (drought and pest resistance);

- seed quality improvement;
- promoting soil protection and integrated pest management;
- improved management of irrigation and drainage systems;
- improved pasture management;
- raising awareness and increasing access to climate change information for rural populations, farmers and agricultural enterprises.

In forestry, adaptation measures (many of which also have strong mitigation benefits) include reforestation/afforestation, natural and active/supported restoration, protection of forests from logging, grazing, fires, pests, etc., improved and sustainable management of existing forests, improved pasture productivity, promotion of integrated actions: integrated land resources management, improvement of the regulatory framework, strengthening of law enforcement, development of a sustainable financing system, inventory and monitoring, as well as investing in science and innovation.

List of adaptation measures in the **transport sector**:

- improved protection and long-term maintenance of transport infrastructure;
- updating national building codes and regulations for the construction of bridges;
- providing support for the improvement of infrastructure and access roads in the country, in particular in dangerous and vulnerable areas;
- adaptation of rail, road, air and other modes of transport, including non-traditional and special modes of transport, to the requirements of international standards;
- promoting the implementation of incentives and regulations for fuel efficient vehicles.

The following adaptation measures are proposed in the **industrial and construction sector**:

- equipping large enterprises with modern energy-saving and digital technologies;
- development of industrial sectors of the national economy, taking into account the implementation of environmental protection measures and the "green" economy;
- introduction of rational consumption and production patterns;
- greening of enterprises;
- development of sustainable infrastructure based on the implementation of «green» investment projects;
- development of early warning systems on the adoption of protective measures and prevention of damage and loss of infrastructure.

Adaptation measures in cross-sectoral areas:

- creating favorable conditions for the introduction of new technologies to mitigate the effects of climate change and manage risks arising from natural disasters;
- development of gender-sensitive measures to improve planning, management and awareness of risks associated with climate change;
- construction of new recreational areas in and around cities during the adjustment of master plans;
- development of curricula for secondary schools, secondary vocational and higher education institutions, including issues of climate change mitigation, adaptation to it and early warning of natural disasters;
- strengthening mechanisms for organizing regular professional development of employees of authorized bodies, government officials on climate change management and adaptation;
- organizing media campaigns on climate change and disaster risk management.

CLIMATE FINANCE AND OPPORTUNITIES FOR COOPERATION

Tajikistan is strongly influenced by the effects of climate change and has a relatively low capacity for adaptation. Unless decisive measures are taken to reduce current and future vulnerability and increase adaptation capacity, the country is likely to suffer significant economic losses, face humanitarian problems and environmental degradation. The Paris Agreement for developing countries, which includes the Republic of Tajikistan, defines measures to provide specific assistance in adaptation to climate change.

When predicting the calculations of possible costs of mitigation and adaptation to climate change on a long-term basis in key sectors of the economy, it is necessary to proceed from the planned measures of the revised NDC, NDS-2030, the Medium-Term Development Program of the Republic of Tajikistan for the period 2021-2025, NSACC-2030, as well as other sectoral strategies and programs. To predict climate finance, the best option, taking into account the impact of COVID-19 on the national economy, is to formulate a scenario of inertial development based on the NDS-2030 and a crisis scenario based on the Medium-Term Development Program for the period 2021-2025. In both scenarios, the average annual growth rate of the country's GDP is envisaged in the range of 4-5%.

Based on predicted calculations of GDP growth rates (on average 5%) it is possible to anticipate the likely costs of the envisaged mitigation and adaptation measures to climate change. Nevertheless, it should be emphasized that an increase in GDP will automatically lead to an increase in GHG emissions. Thus, the growth of investments in mitigation and adaptation measures to climate change should be higher than the expected GDP growth rates. In the worst case, investments in the combat against climate change will remain at the level of GDP growth rates. To finance activities to combat climate change over the decade 2020-2030, investments of at least 7% of Tajikistan's GDP will be required annually. The last implies that the total climate finance needed by 2030 could be over USD 1 billion per year. In addition, Tajikistan expects that the energy and transport sectors will account for 20% of the total costs of climate change, respectively, followed by water supply and sanitation with 10% and water irrigation - 15%, biodiversity and natural disasters - 15% and rural farming - 20%. Thus, Tajikistan is asking for equitable funding for mitigation as well as adaptation measures.

Some financial funds could be an option for creating a climate finance mechanism for Tajikistan, for example, the GCF, the Adaptation Fund, the GEF, funds under multilateral and bilateral agreements, as well as other sources of financing and private foundations.

GENDER PERSPECTIVE OF CLIMATE CHANGE

The Government of Tajikistan has approved a number of strategies and plans to address gender equality and climate change adaptation.

After the ratification of the Convention on the Elimination of All Forms of Discrimination Against Women in 1993, the Government of Tajikistan approved a number of regulatory documents that may indirectly affect the resilience of women and girls to the risks of climate change. In particular, this is the Family Code of the Republic of Tajikistan (dated November 13, 1998); the Decree of the President of the Republic of Tajikistan “On measures to improve the status of women in society” (December 1999); The Fundamental Law of the Republic of Tajikistan “On state guarantees of equality of men and women and equal opportunities for their implementation”, adopted on December 15, 2004; the State Program “Main directions of state policy on ensuring

equal rights and opportunities of women and men in the Republic of Tajikistan for the period 2001-2010".

The National Strategy for Enhancing the Role of Women in the Republic of Tajikistan for the period 2011-2020 identified goals for realizing the potential of women in the economy, including opportunities to train women in new skills and specialties. The plan proposes a number of measures that can reduce the impact of climate change on women and increase their adaptive capacity.

Gender perspectives of climate change are included in the NDS-2030 (2016). The strategy is based on the commitment of the Government of Tajikistan to achieve the SDGs, including SDG 5 (Gender Equality). The Strategy emphasizes the need to address gender equality and climate change, in particular in the context of rural areas, for sustainable development.

NSACC-2030 describes the opportunities for investing in improving resilience to climate change, taking into account the multifaceted challenges associated with gender, youth and other vulnerable groups. The Strategy recognizes the vulnerability of women employed in agriculture.

The Medium-Term Development Program of the Republic of Tajikistan for the period 2021-2025 provides specific goals and indicators related to the gender perspective of climate change. Thus, one of the gender indicators is to increase women's awareness of the risks of climate change from 15% from the baseline to 35% in 2025. In order to improve regulatory documents in accordance with international standards, the task is to develop gender-sensitive indicators on climate change and disaster risk management by 2022. Gender indicators are also included in such sectors of the economy as agriculture, water supply and energy, social protection, education and health.

To promote the relationship between gender and climate change, the overall level of understanding of gender inequality is clearly presented. In Tajikistan, as the survey results showed, there are two key factors that create a context for ongoing efforts to achieve gender equality:

- traditions and gender stereotypes adopted regarding the role of women in the family and in society, on the one hand;
- large number of female-headed households due to large-scale male labor migration, on the other hand.

Taking into account the results of the analysis and in order to improve the process of promoting the relationship between gender and climate change in Tajikistan, it is planned to take the following actions:

- raising awareness of the relationship between gender and climate change in the context of development;
- promotion of the principle of the relationship between gender and climate change in planning, budgeting and implementation of development;
- capacity-building and enabling women's active participation in sustainable socio-economic development taking into account climate change.

TECHNOLOGY TRANSFER

Analysis of available technological solutions in Tajikistan within the framework of cooperation of development partners shows that their scope covers only the energy, agriculture and water sectors and, mainly, irrigation technologies for water saving and processing of agricultural products. Moreover, other technologies are mainly aimed at improving the living conditions of the population. In contrast, the transport sector and disaster risk management technologies are not

included in the list. However, some of the proposed technological solutions, while related to climate change mitigation, are more focused on poverty reduction rather than climate change adaptation policies.

Based on the lessons learned from the implementation of projects in Tajikistan, as well as the experience of other countries, the following mechanism for the introduction of new technologies can be proposed:

- addressing existing gaps in the introduction of new technologies;
- monitoring and evaluation of the introduction of new technologies;
- financing mechanism;
- incentives and technology development;
- sectoral coverage and knowledge sharing.

Specific measures for the introduction of new technologies include:

- assessment of the effectiveness of the implementation of climate change adaptation projects throughout the life cycle of projects;
- quantitative and qualitative indicators of the introduction of new technologies and their effectiveness in the monitoring and evaluation system.

Technologies for adaptation to climate change can and should be financed within the budget by the private sector and development partners through the multilateral development fund, co-financing and / or public-private partnerships. The use of climate change adaptation technologies should be expanded by reducing the interest rate on loans intended for the purchase of these technologies for a longer period, local manufacturers and service providers should be exempted from income tax when using climate-resistant technologies. Best practices for introducing new technologies should be available to all users; it is necessary to create technoparks for the introduction of new technologies for adaptation to climate change; regional experience in the exchange of information on new technologies directly or indirectly affects the mitigation of the impact of climate change; creation of a platform for the exchange of experience on new technologies at the national and regional levels.

CAPACITY BUILDING

Capacity building for the introduction of new technologies should primarily come from human and organizational capacity. Without the interaction of these two important aspects, it is impossible to effectively increase the potential for the introduction of new technologies. In recent years, Tajikistan has accumulated some experience in building both human and organizational capacity to mitigate the effects of climate change through adaptation. PPCR is considered one of the first programs aimed at capacity building.

Public organizations within the framework of the TajCN climate network play an important role in capacity building in Tajikistan. Non-governmental organizations of this network are doing a lot of work to build capacity on climate change issues at the community level and in educational institutions.

Since the signing of the Paris Agreement and the submission of Tajikistan's initial NDC, the issue of capacity building has been reflected in Tajikistan's strategic programs and strategies.

Capacity building issues were reflected in Tajikistan's strategic programs and strategies after the presentation of the first NDC and the signing of the Paris Agreement. NSACC-2030 defines the following measures in response to specific capacity-building requirements at the sectoral level:

- **in the energy sector**: courses for officials of energy companies on the methodology of assessing climate risks and vulnerabilities;
- **in the water sector**: capacity building of Water User Associations;
- **in agriculture**: dissemination of knowledge about the diversity of crops and plant breeding, ensuring farmers' free access to information, best practices and new technologies, encouraging the use of drought-resistant seeds and training in their cultivation methods, as well as dissemination of knowledge about plant protection from frost.

In the Medium-Term Development Program of the Republic of Tajikistan for the period 2021-2025, specific measures are noted to increase the potential in the field of climate change:

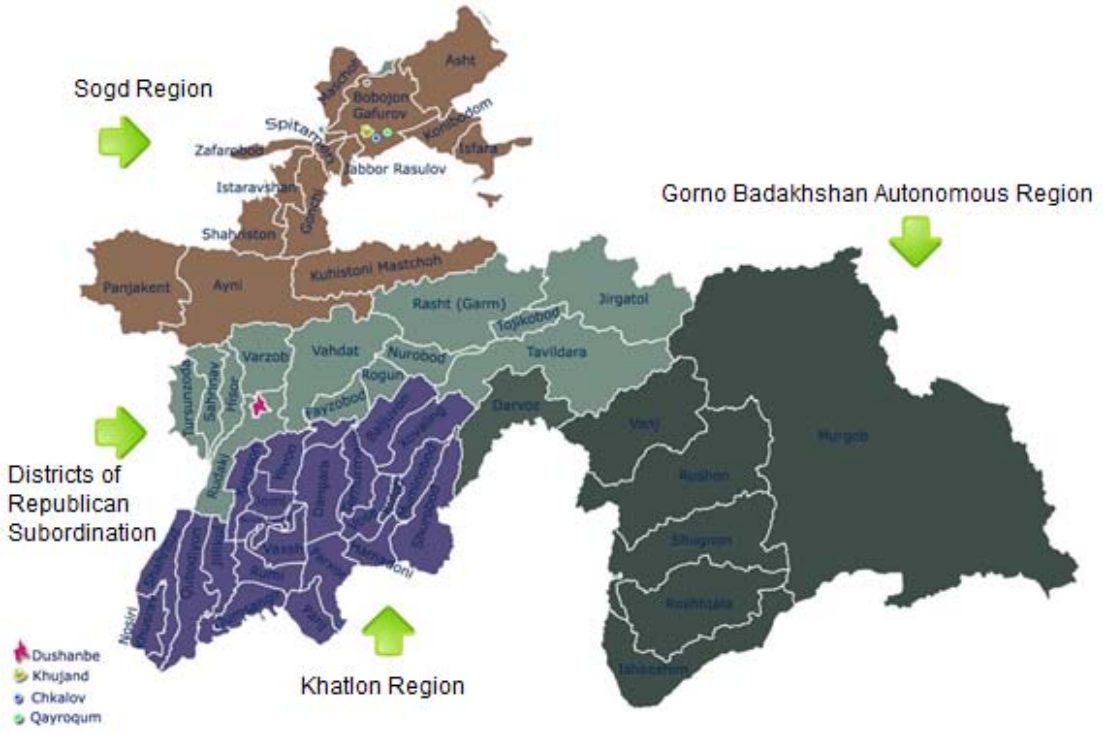
- increased media coverage of climate change and disaster risk management;
- improvement of educational and methodological materials, introduction of innovative training methods in the process of professional development of government officials on adaptation to climate change;
- defining a system of target indicators, including gender-sensitive indicators, to achieve national, sectoral and regional adaptation goals;
- approval of methodological recommendations on climate risk assessment, development of sectoral and regional plans for adaptation to climate change.

Systemic capacity development at national, sectoral, regional and local levels is required to improve knowledge and capacity building on climate change impacts and related mitigation and adaptation measures, in close cooperation with civil society, academia and the private sector.

1 NATIONAL CIRCUMSTANCES

1.1 Geographical location and administrative division

Tajikistan is a landlocked mountainous country located in the southeastern part of Central Asia between 36°40' and 41°05' north latitude, 67°31' and 75°14' east longitude, stretching from west to east for 700 km and from north to south for 350 km. The total area of the country is 142 100 km2. Tajikistan shares a common border in the west and north with Uzbekistan (1332 km), in the south with Afghanistan (1374.2 km), in the north with Kyrgyzstan (987.5 km), in the east with China (495 km). In the southeast, Tajikistan is separated from India and Pakistan by a strip of Afghan territory from 15 to 65 km wide.



Source: *life.ansor.info*

Fig. 1. Administrative division of the Republic of Tajikistan.

The territory of Tajikistan is divided into the following administrative-territorial units: Gorno-Badakhshan Autonomous Region, Sughd Region, Khatlon Region, 62 districts, 18 cities, 57 urban-type settlements and 370 rural administrative units (jamoat dekhot). In the central part of Tajikistan, 13 districts belong to the Districts of Republican Subordination (DRS). The capital, Dushanbe, has a separate administrative status and is divided into four districts.

The relief of the territory is characterized by an alternation of mountain ranges with numerous glaciers and snowfields on the peaks and intermountain depressions, with deep valleys in the floodplains of which agriculture is developed, settlements and cities with industrial enterprises are located. Mountains make up 93% of the country's territory. The country's elevations range from 300 meters to 7495 meters. Almost half of the republic's territory is located at an absolute altitude of more than 3000 m above sea level, which is unsuitable for agriculture due to the inclement climatic and physical-geographical conditions of the predominance of rocks, glaciers and highlands. About 7% of the territory consists of oases (Kulyab-Vakhsh, Hissar, Khodjent).

Climatic conditions and features. The climate of Tajikistan is extremely continental with sharp fluctuations of daily and seasonal temperatures, with highly intensive solar radiation, aridity, low

cloud cover, uneven distribution of precipitation over the seasons. Ruggedness of relief plays an important role in the distribution of heat and moisture. Depending on the hypsometric levels and location of the mountains, the amount of precipitation and air temperature varies sharply. At an altitude of 1500-2000 m in Central Tajikistan, annual precipitation makes 1800 mm, while in the south it makes 200 mm at an altitude of 300-500 m, and in the Eastern Pamir it makes only 80 mm at an altitude of 4000 m. The air temperature also fluctuates with different altitudes and areas. In the south of the Shahritus district air temperature may reach +22°C, at the same time, in the Pamirs, around the Bulunkul Lake, it drops to -63°C. The general annual weather pattern at altitudes below 1000 m is characterized by positive average annual air temperature and relatively low precipitation. Average annual amount of precipitation at the altitudes 1200-3200 m is 560-650 mm, and the average annual temperature is +5,4°C.

The territory of Tajikistan is located at the junction of the influence of several powerful atmospheric circulation processes. One of them is the Siberian anticyclone in winter. Cold waves from the Arctic reach the territory of southwestern Tajikistan, and the mountains bordering the country from the north and east favor the retention of cold air masses. The influx of warm air in winter, as a rule, occurs when tropical air masses penetrate. Another important atmospheric process – thermal depression – prevails in summer. Its formation is facilitated by the proximity of deserts, high mountains and it is characterized by clear, dry and hot weather. Heavy precipitation is often brought by western cyclones in the winter-spring period.

1.2 **State structure**

The Republic of Tajikistan declared independence on September 9, 1991, and is a sovereign democratic secular unitary State governed by the rule of law. The State system of Tajikistan is determined by the Constitution adopted on November 6, 1994.

State power is based on the principle of its division into legislative, executive and judicial. The President of the Republic of Tajikistan is the head of State and executive power (Government). The President is elected by citizens of Tajikistan on the basis of universal, equal and direct suffrage by secret ballot for a period of 7 years. Every citizen of the Republic of Tajikistan at least 35 years old, who speaks the state language and has been permanently residing in Tajikistan for at least the last 10 years, can be nominated as a candidate for the post of President.

The Government of the Republic consists of the Prime Minister, his first Deputy and deputies, ministers, chairmens of state committees.

Majlisi Oli - the Parliament of the Republic of Tajikistan - is the highest representative and legislative body of the Republic of Tajikistan. Majlisi Oli consist: Majlisi Milli and Majlisi Namoyandagon. The term of office of the Majlisi Milli and Majlisi Namoyandagon is 5 years. The Majlisi Namoyandagon is elected on the basis of universal, equal and direct suffrage by secret ballot. Every citizen of the Republic of Tajikistan who is at least 25 years old and has a higher education can be elected a deputy of the Majlisi Namoyandagon.

1.3 **Natural resources**

1.3.1 ***Land resources***

Tajikistan's land resources are the basis of rain-fed and irrigated agriculture, horticulture and pasture farming. The presence of vast mountainous territories on a relatively small area of the republic and high population growth rates (1.5-3%) predetermine a high degree of vulnerability of land resources. More than half of the country's territory is occupied by unproductive rocky and gravelly soils, rocks and glaciers. Only a small part remains suitable for economic use.

The total area of the land fund of the republic is 142 100 sq. km. Of which about 4.58 million hectares are in economic circulation (including 3.3 million hectares of pasture lands - 80.5%), the state forest fund lands amount to 1.7 million hectares (including over 400 thousand hectares of forests), arable land - 750 thousand hectares (16.1%), perennial plantations - over 100 thousand hectares (2.2%). Rocks and scree occupy 17.5% of the republic's area, glaciers and reservoirs - up to 9%, settlements - 40 thousand hectares, transport and industry - over 200 thousand hectares.

The vulnerable soils of Tajikistan are largely susceptible to degradation, especially in the zone of intensive anthropogenic activity. Gray-earth soils are destroyed in the process of water erosion and deflation. Brown soils degrade mainly as a result of vegetation destruction, intensive grazing and plowing of steeply sloping lands. High-altitude meadow-steppe soils are less susceptible to degradation, since they are anchored tightly by turf vegetation, however, even here the impact of cattle grazing is becoming more noticeable.

1.3.2 ***Water resources and glaciers***

Water resources of Tajikistan play an indispensable role in water supply, food supply, production of electric power, employment of population, and are the basis for the development of the Aral Sea basin countries.

At present, the main water users are hydropower and agriculture. Use of water resources for drinking water supply, industrial water supply, fishery and other water use sectors is not significant, and their total volume varies from country to country within 7-10%.

There are 947 rivers with the length of more than 10 km through the territory of the country, which is about 60% of water resources of Central Asia.

There are about 1,300 lakes and reservoirs of different origin in the republic with a total area of about 1,200 sq. km. About 44 cubic km of water are concentrated in these lakes, of which 20 cubic km are fresh waters. The largest lakes (Karakul, Rangkul, Zorkul, Sarez, Yashikul) are located in the Pamirs. Significant water reserves, over 500 cubic km, are concentrated in the glaciers of Central Tajikistan and the Pamirs. Their area is about 8,476 sq. km and occupies more than 5% of the total area of the country. The total runoff of rivers passing through the territory of Tajikistan is 65.11 cubic kilometers. About 51 cubic kilometers of this volume are formed within the country, of which about 11 cubic kilometers are used, and the rest is completely consumed in neighboring countries (Uzbekistan and Turkmenistan). About 50% of the total annual flow of the Aral Sea is formed in the territory of the country. Many high-mountain rivers have a significant indication of decline - up to 40 m per 1 km. Flooding of rivers is observed from May to August, and during this period the rivers have the greatest turbidity. In summer, some rivers are completely disassembled for irrigation of agricultural crops.

1.3.3 ***Biological resources***

Flora and fauna. Tajikistan has a rich gene pool of species that represent a potential resource for the creation of high-performance and resistant cultivars, ornamental plants, medicinal, aromatic and technical raw materials. 0.66% of the world's animal diversity and 1.8% of plants, including wild relatives of domestic animals and cultivated plants are in the mountainous regions of Tajikistan. The richness of biodiversity (Table 1.1) is manifested at the genetic, species, population, biocenotic and eco-system levels. More than 9,000 species of spore and flowering plants grow on the territory of modern Tajikistan and more than 13,000 species of animals live.

Forest resources. In 2020, the total land area of the State Forest Fund of Tajikistan was estimated at 1.9 million hectares. After the collapse of the Soviet Union, Tajikistan experienced an extreme degree of deforestation. Today Tajikistan belongs to the least wooded countries. The area of the

country's forests is about 423,000 hectares, or 3% of the total area of the country. Forests are managed by the Agency on Forestry under the Government of the Republic of Tajikistan. Forests are concentrated in the north of the country at an altitude of 800-2,500 m above sea level.

Table 1.1. The main composition of the biodiversity of Tajikistan.

#	*Composition*	*Quantity*
1	Ecosystems	12 types
2	Vegetation types	20 types
3	Flora	9 771 types
4	Wild relatives of cultivated plants	1000 types
5	Endemic plants	1132 types
6	Plants listed in the Red Book of Tajikistan	226 types
7	Agricultural crops	500 varieties
8	Fauna	13531 types
9	Endemic animals	800 types
10	Animals listed in the Red Book of Tajikistan	162 types
11	Pet animals	30 breeds

Source: *National Strategy and Action Plan for the conservation and sustainable use of biodiversity. Dushanbe, 2003.*

The area of forests has sharply decreased due to the expansion and laying of agricultural land, as well as deforestation. The load on forest resources remains high, and the main factors here are: overexploitation (mainly for the production of fuel wood) and overgrazing. The villagers depend on collecting firewood for heating and cooking. Fuelwood remains the main source of energy for rural households, but the remaining forest resources cannot meet the growing demand.

Photo 1. Forests on Shakhristan.

In addition, grazing of livestock on pastures of the State Forest Fund plays an important role. Overgrazing of livestock leads to a significant load on forests and pasture lands that are in open access. Forests in Tajikistan are an important source of biodiversity and play a key role in providing vital ecosystem services, also in terms of adaptation to climate change. At the same time, forests are affected by climate change, especially droughts, during which the risk of forest fires increases dramatically. The existing trends also lead to a change in the regional distribution of forests (and a narrowing of the zones of growth of alpine species), as well as to an increase in the number of pests and diseases.

Exact data on the mitigation potential in the forest sector are unknown. Forestry is the least studied sector in terms of the impacts of climate change, as well as possible contributions to mitigation and adaptation. Assessing the potential of forests for mitigation and adaptation to climate change and, consequently, mobilizing financial resources for the restoration of forest landscapes and sustainable forest management should be one of the main priorities for the sector.

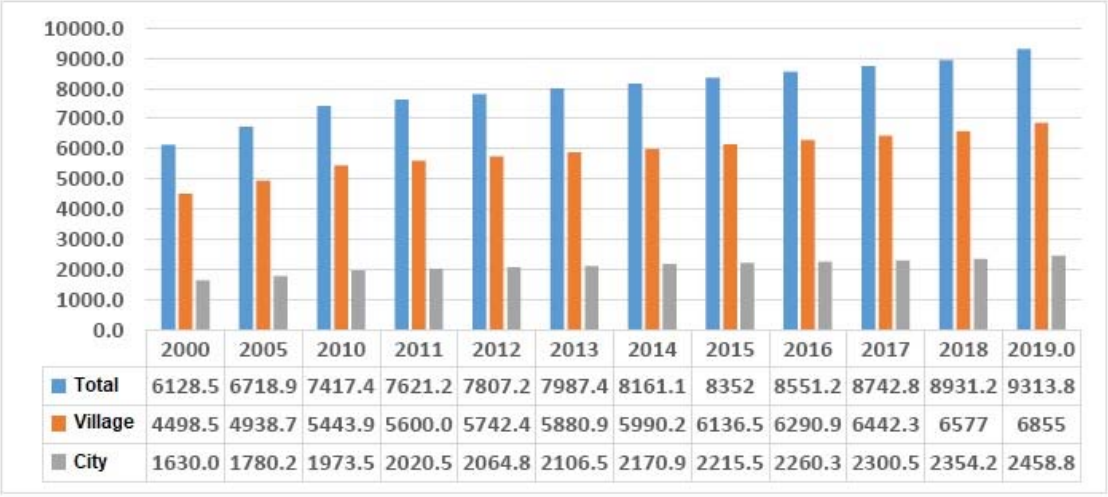
There is no forest industry as such in Tajikistan, despite the fact that demand exceeds supply. According to various estimates, 90-95% of commercial wood in the country is imported from the Russian Federation. The sector's contribution to the country's GDP is extremely small compared to other industries.

1.4 Socio-demographic situation and human capital

Tajikistan is one of the fastest growing countries in terms of population. Between 2000 and 2019, Tajikistan's population increased by 49 percent, that is, from 6,13 million to 9,31 million, respectively. The average annual population growth rate for this period was 2.1%. In the total population structure in 2019, the share of rural population was 73.7% and urban 26.3%.

In Tajikistan, the number of children under the age of 17 is more than 40% of the total population of the country. More than 180 thousand people (2.2% of the total population) have an official disability status. According to the Agency for Statistics of the Republic of Tajikistan in 2019, the total number of elderly people in the country was 700 thousand people (8% of the total population).

The population is divided into four main regions and the city of Dushanbe as follows: Khatlon region - 35.9%; Sughd region-29.1%, GBAO-2.5%, Republican Subordination Districts (RSD) - 23.2% and Dushanbe -9.3%.



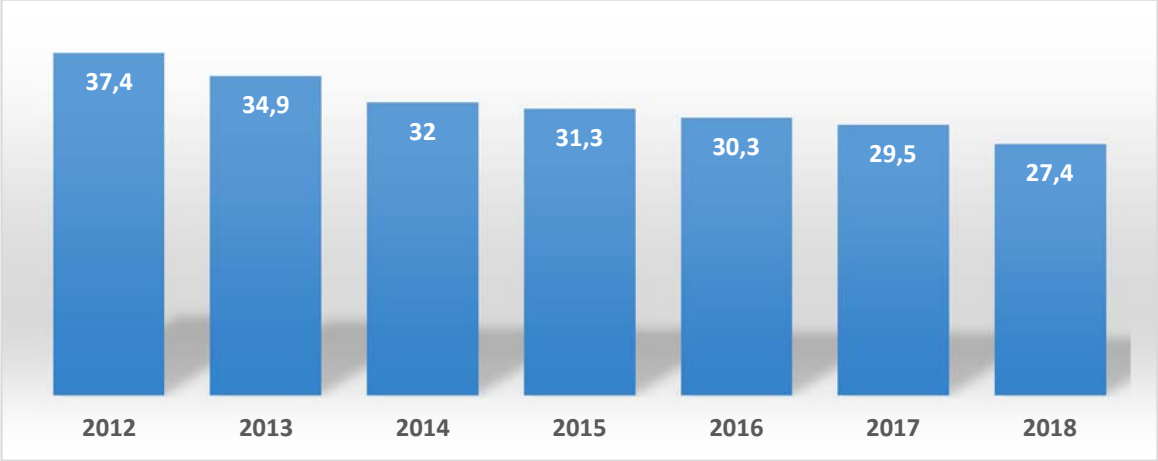
	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019.0
Total	6128.5	6718.9	7417.4	7621.2	7807.2	7987.4	8161.1	8352	8551.2	8742.8	8931.2	9313.8
Village	4498.5	4938.7	5443.9	5600.0	5742.4	5880.9	5990.2	6136.5	6290.9	6442.3	6577	6855
City	1630.0	1780.2	1973.5	2020.5	2064.8	2106.5	2170.9	2215.5	2260.3	2300.5	2354.2	2458.8

Fig. 2. Dynamics of the population of the Republic of Tajikistan for 2000-2019 (thousand people).

The average population density for this period increased from 42.8 per 1 km^2 in 2000 to 64.5 people in 2019[1]. Although the average population density is not very high, it varies significantly due to the geographical features of the mountainous terrain, and the most densely populated areas of the country are the lowlands of Northern and Southwestern Tajikistan.

The lowest population density is observed in mountainous areas, where the density is less than 50 people per square kilometer of territory. In GBAO, the population density is 3.5 people per km^2. The highest population density is observed in the capital – the city of Dushanbe 8,486 people per km^2 and in other major cities of the country. The largest city in the country is its capital, Dushanbe, with a population of 846.4 thousand people. Other major cities include Khujand (180.7 thousand people), Bokhtar (109.9 thousand people) and Kulyab (104.9 thousand people)[2].

According to forecast data, with a growth rate of 2.1%, the population of Tajikistan will reach 11.5 million people by 2030, which is 88% higher than in 2000, 55% higher than in 2010 and 26%[3] higher than in 2019.



Source: Increased vulnerability despite sustained economic growth. Tajikistan. Report on the Economy Autumn Issue 2018 World Bank Group.

Fig. 3. Dynamics of the poverty level (in %) in Tajikistan for 2012-2018.

Tajikistan has made significant progress in reducing poverty before the start of the COVID-19 pandemic. In 2012-2018, the poverty level in Tajikistan decreased by 10%, from 37.4% to 27.4%. Nevertheless, there is a significant difference in poverty levels between the regions of Tajikistan, with poverty being predominantly rural.

The level of poverty is still widely prevalent among women and girls, especially in rural areas, for example, due to more limited access to jobs. One of the reasons for the persistence of poverty is the lack of a well-paid job, which forces many citizens to leave for labor migration. Another reason is that household incomes are mainly used for consumption, while the savings of these households are either insignificant or absent, which reduces resilience to economic and financial difficulties

[1] The population of the Republic of Tajikistan as of January 1, 2019. Agency for Statistics under the President of the Republic of Tajikistan. https://www.stat.tj/ru

[2] The population of the Republic of Tajikistan as of January 1, 2019. Agency for Statistics under the President of the Republic of Tajikistan. https://www.stat.tj/ru

[3] Demographic Yearbook of the Republic of Tajikistan. Agency for Statistics under the President of the Republic of Tajikistan. 2018. https://www.stat.tj/ru

and increases vulnerability. It is very likely that the achievements of the past years in reducing poverty may be lost due to the economic consequences of COVID-19.

Impressive rates of poverty reduction and investments in the provision of public services, such as education, have led to an increase in the Human Development Index (HDI). The HDI indicator of the Republic of Tajikistan improved from 0.642 in 2015 to 0.656 in 2019 (while Tajikistan ranks 125th among 189 countries in the world), which indicates steady progress in improving the quality of life and human development. However, the inequality-adjusted HDI was 0.574, i.e. It is 11% lower than the total HDI indicator, which indicates losses in human development due to inequality. In addition, the average annual HDI growth is slowing down due to rapid population growth and economic difficulties. In addition, the UNDP Human Development Report for 2019 determined that the value of the Gender Development Index (GDI) was 0.799, which is significantly lower than in neighboring Central Asian countries. Although it is too early to assess the dynamics of HDI in 2020, the outbreak of COVID-19 is likely to lead to a further slowdown in the growth of HDI in the Republic of Tajikistan.

1.5 **Macroecomic situation and development**

The economy of Tajikistan is agro-industrial, its basis is agriculture: cotton growing, crop production, animal husbandry, as well as industry, mechanical engineering, aluminum production, mineral fertilizers, textile and light industry, energy and consumer goods production. Relative remoteness and communication isolation from the existing global transport infrastructure, high-altitude terrain, lack of access to the sea determine the unfavorable economic and geographical position.

In 2010-2019, Tajikistan's GDP increased by 43.8%, including in agriculture by 45.2%, industry by 70%, construction by 24.2%, transport and communications by 15%, and services by 51%.

The total GDP of Tajikistan in 2019 amounted to 8.1 billion US dollars, including 840 US dollars per capita. In the structure of GDP, 19.8% is accounted for agricultural products, 17.4% - for industry, 8.8% - for construction, 34.7% - for the service sector, 8.9% - for transport and communications and 10.4% - for net tax on products. Tajikistan's public external debt at the end of 2018 amounted to $2.9 billion (40% of GDP) compared to 24% of GDP in 2014.

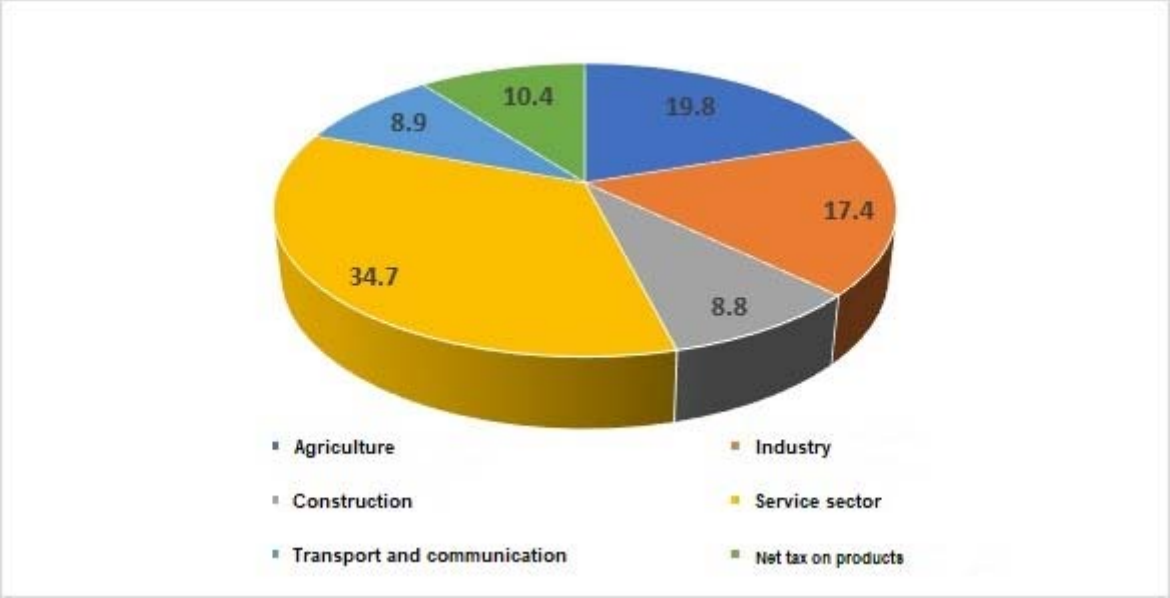
Table 1.2. Dynamics of the main macroeconomic indicators of the Republic of Tajikistan for 2010-2019

Indicators, Mln. dollars, %	Years					
	2010	2015	2016	2017	2018	2019
Total GDP	5642,2	7852,8	6952,8	7157,9	7765	8116,9
Agriculture	1105,1	1722,3	1416,7	1458,5	1535,3	1604,9
% to GDP	19,6	21,9	20,4	20,4	19,8	19,8
Industry	831,8	1042,5	1055,2	1086,3	1642,6	1415,3
% to GDP	14,7	13,3	15,2	15,2	21,2	17,4
Construction	577,3	872,8	838,4	863,2	1028,5	717,0
% to GDP	10,2	11,1	12,1	12,1	13,2	8,8
Transport and communications	629,8	977,5	882,7	908,7	467,4	723,6
% to GDP	11,2	12,4	12,7	12,7	6,0	8,9
Service sector	1863	2243,4	1975	2033,2	2324,2	2812,6
% to GDP	33,0	28,6	28,4	28,4	29,9	34,7

Net tax on products	635,2	994,3	784,8	807,95	767,0	843,4
% to GDP	11,3	12,7	11,3	11,3	9,9	10,4

Source: *Agency for Statistics under President of RT. https://www.stat.tj*

In the Address of the President of the Republic of Tajikistan to the Parliament of the country in 2021 noted that the consequences of the pandemic (COVID - 19) continue to have a negative impact on the economies of the world, including the development of national economy, the state budget, foreign trade, the exchange rate of the national currency, as well as on the activities of industrial enterprises and service institutions. By the end of 2020, GDP amounted to 8.25 billion US dollars with an increase of 4.5%, which is 3% lower compared to 2019 (7.5%). According to preliminary statistics, the inflation rate in 2020 was 9.4%, which is 1.4 percentage points higher than in 2019 (8%).



Source: *Agency for Statistics under President of RT, 2020.*

Fig. 4. The structure of Tajikistan's GDP (in %) in 2019.

According to the World Bank, real GDP growth slowed from 7.3% in 2018 to 6.2% in 2019 and will decrease to 4.5-5.0% in 2020-2021, reflecting the weakening of economic growth in Russia and the decline in world commodity prices associated with the regression due to COVID-19. In the medium term, the inflow of remittances will remain slow. Economic activity will be supported by mining, manufacturing and construction.

Of the total employed population, 46% are employed in agriculture, 6.8% in industry, 8.6% in construction, 12.2% in trade and services, 4.6% in public administration, 4.1% in healthcare, 8.1% in education and 9.3% in other sectors of the economy (finance, communications, science, etc.).

1.6 **Agriculture**

Agriculture, which is another priority sector on which a significant part of the population of Tajikistan depends as a source of livelihood, income and employment, may suffer from climate change. The Government of Tajikistan recognizes the need to reduce the vulnerability of the agricultural sector to climate change, especially given that agriculture contributes significantly to

GDP and employment in the country: it accounts for 19.8% of GDP and employs more than 60% of the population of Tajikistan[4].

In the production of gross agricultural output by the end of 2019, the share of crop production accounted for 69.1% and animal husbandry 30.9% of the output. Of the total agricultural output, 5% was produced in the public sector, 56% in households and 39% in dehkan farms. At the same time, it should be noted that more than 93% of livestock products and 39% of crop[5] production were produced in the subsidiary farms of the population.

Land use. For 2011 -2019, there were no significant changes in the area of agricultural land. As of 2019, the total area of agricultural land was 3669411 hectares. In the total area of agricultural land, the share of arable land is 18%, pastures - 76.8%, perennial plantations - 4.1%, deposits -0.7% and 0.4% of hayfields.

According to the State Committee for Land Management and Geodesy of the Republic of Tajikistan in 2018, about 30% of the total area[6] of agricultural land was used by agricultural enterprises (KDF - 2.7%, state farms - 14.4%, inter-farms - 1.8% and other agricultural enterprises - 10.7%), 70.3% - dehkan farms, including 7.4% of household plots of the population. Of the total area of arable land (659 thousand hectares), agricultural enterprises accounted for 18.6%, dehkan farms - 81.4%, including household plots of the population - 27.4%. Of the total area of arable land in 2018, only 70% belonged to the category of irrigated.

In 2019, there were 182756 dehkan farms in Tajikistan, which is more than twice as high as in 2013. In 2019, on average, one dehkan farm accounted for 15 hectares of agricultural land, including 3.1 hectares of arable land, 0.7 hectares of perennial plantations and 11 hectares of pastures.

Crop production. In the structure of sown areas, the main place is occupied by the production of grain crops – 45.4%, followed by industrial crops - 26% (including 22.5% cotton), potatoes - 6%, vegetables-8.3%, food melons - 2.4% and fodder crops - 12%. In the total volume of grain crops produced in 2019, 33.5% were produced in subsidiary farms of the population and 58% in dehkan farms, rice, respectively, 22% in households of the population and 60% in dehkan farms, potatoes 33% in households of the population and 60% in dehkan farms. In 2018, 300.3 thousand tons of raw cotton were produced, which is 23% lower compared to 2017. In the total volume of raw cotton, more than 80% was produced in dehkan farms.

Animal husbandry. Animal husbandry is an important area of agricultural development in Tajikistan. In the total volume of agricultural production, the share of livestock products is more than 30%. In 2013-2019, the volume of gross livestock production increased by more than 40%. It should be noted that out of the total meat production, the share of households of the population is 94%, milk - 95% and eggs - 40%. In general, the contribution of households in the production of livestock products is more than 93%. In 2011-2019, the number of livestock in the country increased by 18.5%.

[4] Agriculture of Tajikistan. Statistical digest. Agency for Statistics under the President of the Republic of Tajikistan, 2019.
[5] Ibid.
[6] According to the Land Code, the land belongs to the state.

1.7 **Transport and communication tracks**

Tajikistan's transport sector includes road, railway and air subsectors, while more than 90% of freight and passenger traffic within the country is carried out using road transport. In the structure of GDP, the share of the transport and communications sector in 2019 was 8.9%.

The total length of highways in Tajikistan is 26,300 km, and 14,339 km of which are general-purpose roads. The infrastructure of general-purpose roads mainly consists of local roads (62%), international highways (23%) and republican roads (15%).

According to the World Bank Logistics Efficiency Index, Tajikistan's transport infrastructure ranks 147th out of 163 countries[7].

Nevertheless, Tajikistan's road network has undergone significant changes over the years of independence: 53 state investment projects have been implemented and more than 2,200 km of international roads have been built, and another 1,500 km is planned to be built in the future. Thus, Tajikistan has improved its position by 20 points over the past two years in the global road infrastructure quality rating of the World Economic Forum from 70th place in 2017 to 50th place in 2019 out of 141 countries included in the study[8].

There is a steady growth of motor vehicles in Tajikistan. In 2005, there were 250 thousand cars in Tajikistan. By 2013, the total number of vehicles increased up to 400 thousand, and by 2019, the number of vehicles amounted to more than 500 thousand. Despite this, the level of vehicle ownership is still the lowest in Central Asia, with approximately 50 cars per 1,000 residents.

Structure of passenger transportation by means of transport for 2019, %

Automobile - 96,6

Railway - 0,1

Air - 0,1

Electric - 3,2

Structure of cargo transportation by means of transport for 2019, %

Automobile – 92,8

Railway – 7,2

Air – 0,001

Source. Socio-economic situation of the Republic of Tajikistan January - December 2019. Agency of Statistics under the President of the Republic of Tajikistan.

Fig. 5. Structure of transportation in the Republic of Tajikistan.

Currently, there are four international and several domestic airports in Tajikistan. Prior to the start of the COVID-19 pandemic, the annual passenger turnover at international airports averaged 2.2 million passengers, of which 63% accounted for Dushanbe International Airport, 30% for Khujand

[7] https://lpi.worldbank.org/international/aggregated-ranking?sort=asc&order=LPI%20Rank#datatable

[8] The Global Competitiveness Report, 2019. World Economic Forum. ISBN-13: 978-2-940631-02-5. Available at: http://www.weforum.org/gcr

International Airport and 7% for Kulyab International Airport. Dushanbe and Khujand International Airports serve 90% of domestic air traffic. In total, there are 2 domestic and 15 international airlines operating in Tajikistan, of which 80% of flights and more than 65% of passengers are served by international airlines.

The total length of railway tracks in Tajikistan is 987 km, none of which is electrified. It is very small for freight and passenger transportation by railway, which can partly be explained by the current state of the national railway network. According to the Statistics Agency, in 2019, railway transport accounted for only 7% of the total cargo turnover and 0.1% of passenger turnover.

In general, Tajikistan has seen a steady growth trend in both freight and passenger transportation over the past 20 years, with passenger traffic growing by an average of 8%, and freight traffic by 7% per year.

1.8 **Industry and construction**

Industry. The modern development of Tajikistan's industry comes from a large stock of raw materials for the metallurgical, chemical and construction industries. Currently, more than 600 deposits of precious stones, non-ferrous and rare metals have been explored in the country, which in total contain more than 50 types of mineral raw materials. Tajikistan also has large reserves of non-mineral raw materials for the production of building materials. Currently, more than 420 deposits with reserves of 30 different types of raw materials have been discovered and explored. Tajikistan also has great opportunities for the development of light and food industries.

The industry of Tajikistan is currently represented by more than 90 types of production related to the following industries:

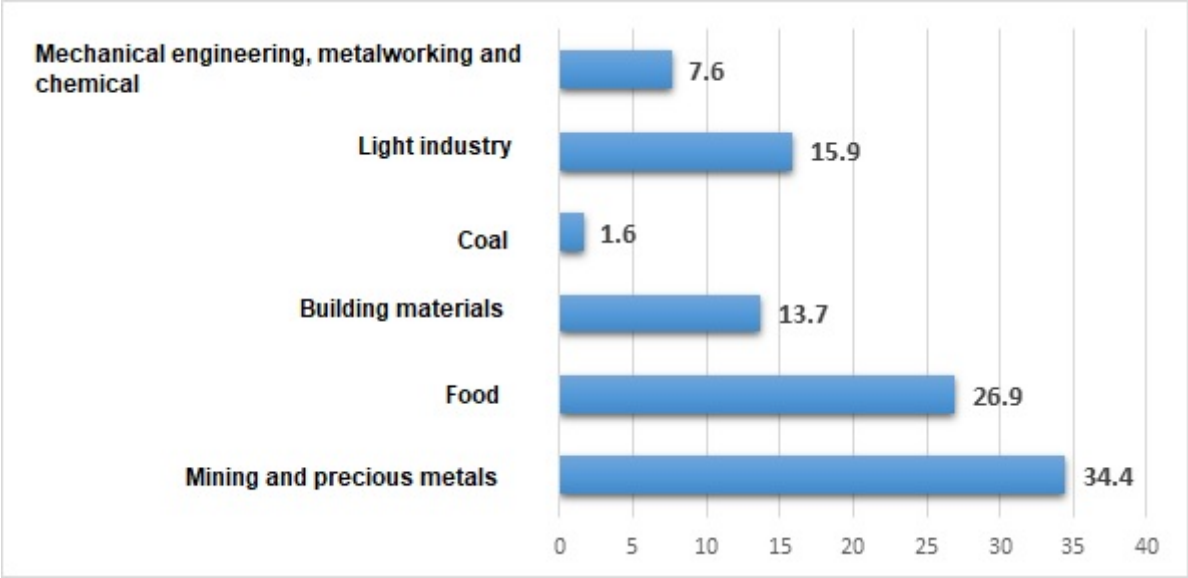
- Mining industry – enterprises for the extraction and processing of mineral and non-mineral raw materials;
- Manufacturing industry - enterprises processing mineral and non-mineral raw materials, agricultural products and semi-finished products

Conducting survey work on the use of local raw materials allowed Tajikistan to develop enterprises in the metallurgical, mining, chemical, machine-building, food and textile industries. In 2019, compared with 1990, the number of enterprises in the industrial sector increased from 300 to 1996 units, enterprises of the construction complex from 30 to 997 units, chemical and petrochemical industry from 10 to 58 units[9]. Despite the COVID-19 pandemic, the industrial sector accounted for 21.9% of GDP in 2020.

Tajik Aluminum Company (TALCO) is the largest export-oriented company in Tajikistan and a major industrial employer. In the period from 2010 to 2016, aluminum production at this plant was about 129.3 thousand tons per year. In 2013-2014, TALCO launched a program to switch to the use of domestic raw materials and create a chemical and metallurgical corporation, which will be joined by enterprises producing caustic soda, cryolite, alum shale, aluminum fluoride, anthracite and cement processing. Since 2016, TALCO has started replacing old electrolysis tanks at its facilities with new electrolysis tanks, 285 units have been replaced to date. TALCO intends to initiate a program of gradual and complete modernization of its aluminum production, transferring its activities to "new modern technologies", which will significantly increase the plant's capacity and aluminum production in the future to about 1 million tons. aluminum per year. The implementation of the project will allow the company to introduce new modern technologies in

[9] Statistical digest "Industry", Agency for Statistics under the President of the Republic of Tajikistan, 2020.

the production of aluminum in Tajikistan, which will almost halve the need for electricity. The new plant will meet the highest environmental safety requirements.



Source: Industrial Development Strategy of Tajikistan for the period up to 2030

Fig. 6. Industrial structure of the Republic of Tajikistan (in %).

1.9 **Housing conditions**

After twenty years of stagnation in the construction sector of Tajikistan, a boom in housing construction has begun. The average level of housing per capita increased from 10.7 square meters in 2015 to 11.6 square meters in 2020, and 98.1% of the country's housing stock is privately owned. The quality of housing construction is steadily improving, energy-saving and energy-efficient technologies are used in the design and construction of high-rise buildings. The volume of affordable housing construction has increased, (according to SDG 11) in the construction of housing and public facilities, specialized corridors and bodices, parking lots for the disabled and other vulnerable groups of the population are observed.

In the housing and communal services, measures have been taken to repair the housing stock, improve the infrastructure of electricity, water supply and sewerage, and update the fleet of municipal equipment.

Heating and hot water supply systems in apartment buildings and social institutions have been repaired in Dushanbe. In 2017-2020, more than 2,555 objects of the city were provided with hot water and heating. Measures have been successfully implemented to modernize the infrastructure of water supply, sewerage and solid waste disposal, and the infrastructure of energy supply and outdoor lighting is being installed and restored in the country. Based on the implementation of the "Concept of Housing and Communal services reform in the Republic of Tajikistan for 2010-2025" and the "Housing and Communal Services Development Program for 2014-2018", SUE "Housing and Communal Services" has started implementing a policy of decentralization of services. Regional water management enterprises have been established, whose independent activities at the regional level have helped to increase the efficiency of urban water management enterprises and urban-type settlements. At the same time, there are issues in the sphere of housing and communal services that need to be addressed.

Photo 2. New buildings in Dushanbe.

The share of the population in rural housing construction is decrease due to lower incomes, rising prices for building materials and energy resources, reduction of new land plots for individual construction, lack of engineering and communication infrastructure in areas of individual construction in rural areas, including drinking water, electricity, schools and other social facilities. Mortgage loans are not yet an effective mechanism for financing affordable housing.

It is expected that housing construction will continue to develop. Energy-efficient building materials are used in the construction of residential buildings in accordance with the Government's decision. From 2014 to 2019, 7350 thousand m2 of housing were commissioned in Tajikistan.

In 2019, 60.3% of the total capital investments in Tajikistan were directed to the construction of industrial facilities and 39.7% to non-industrial residential facilities. In the total volume of non-industrial facilities: 13.2% - educational, 7.0% - healthcare, 11.9% - cultural and sports, 32.6% - other facilities.

1.10 **Energy resources and energy**

Tajikistan has quite large reserves of energy resources. A special place in this context is occupied by hydropower resources with the potential to generate 527 billion kWh per year. According to this indicator, Tajikistan ranks 8th in the world and first in terms of hydropower potential per unit of the country's territory. In technical terms, Tajikistan's hydropower resources have good prospects for development and consist of 317 billion kWh per year, of which only 4-5% have been used so far. Also, in Tajikistan special attention is paid to the issue of the development of renewable energy, including small-scale energy. 54.2% of the potential hydro resources of Central Asia are concentrated in the republic, with a specific weight of the territory of 11.2%. The hydro energy potential of Tajikistan is three times higher than the current electricity consumption throughout Central Asia. With the efficient use of these resources, the region can be provided with inexpensive and environmentally friendly energy. The development of renewable hydropower resources is the highest priority for the development of the economy of Tajikistan. The electricity generated at hydroelectric power plants is the cheapest at cost and environmentally friendly of all existing methods of energy production. Its prime cost, according to industry experts, is 6-8 times

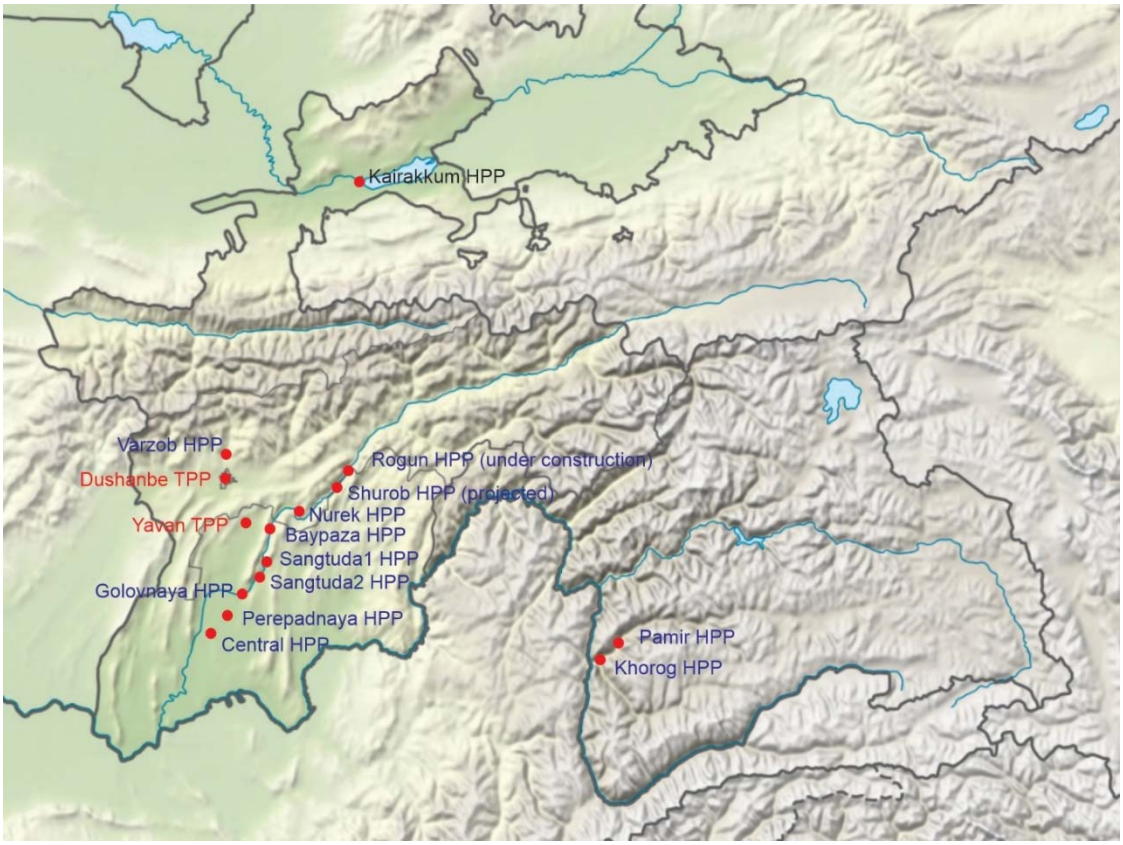
lower than thermal, and this difference in the future, as prices for non—renewable energy carriers - oil, gas, coal, etc., will only increase.

The largest part of the potential and technically possible hydropower resources for operation is concentrated in the Vakhsh and Panj rivers. To date, the cascade of hydroelectric power plants on the Vakhsh river consists: operating — Nurek, Baypaza, Sangtuda-1, Sangtuda-2, Golovnaya, Perepadnaya and Central; under construction - Rogun; projected - Shurob. The total capacity of the Vakhsh cascade is estimated at 9.0 million kW with an annual electricity generation of about 35 billion kWh.

Within the framework of the Energy Sector Development Concept until 2030, in the period 2016-2020, the production capacity of the sector increased from 5,600 MW in 2015-2016 to 6,100 MW in 2019, due to the launch of Thermal power plant 2 (300 MW) and two aggregate of the Rogun HPP (200 MW).

In the last three years, uninterrupted power supply has been provided throughout Tajikistan, including remote areas, during the autumn-winter period. Currently, a number of key hydroelectric power plants of the country are being modernized – Nurek, Golovnaya (in Sarband) and Kairakkum.

The implemented measures to ensure the country's energy independence contributed to the fact that the Republic of Tajikistan took the 2nd place in the international rating of access to electricity.



Source: Ministry of Energy and Water Resources of the Republic of Tajikistan. https://www.mewr.tj

Fig. 7. Map of hydro and thermal power plants of Tajikistan.

It is known that the resources of solar, small and medium-sized hydroelectric power plants prevail in the Republic of Tajikistan. Since there are more than 200 days in the country with a high

intensity of sunshine and a plural number of river flows. At the same time, issues related to the development of other types of renewable energy, such as wind energy, biomass and geothermal energy, are being considered.

Currently, more than 285 operating small hydroelectric power plants with a capacity from 5 to 4300 kW are registered in the republic. In this number, 16 units of small hydroelectric power plants are built and operated by Barki Tojik, i.e. they are State-owned.

Table 1.3. Resources of renewable energy sources of Tajikistan
(million tons of conditional fuel)

Resources	Gross potential	Technical potential	Economic potential
Hydro energy, total	179,2	107,4	107,4
Including small HPP	62,7	20,3	20,3
Solar energy	4790,6	3,92	1,49
Biomass energy	4,25	4,25	1,12
Wind energy	16,3	10,12	5,06
Geothermal energy	0,04	0,04	0,04
Summary (without large HPP)	5020,595	38,63	27,95

Source: Ministry of Energy and Water Resources of the Republic of Tajikistan. https://www.mewr.tj

The CASA-1000 project is the largest energy project of Central Asia - South Asia (CASA). It involves the construction of a cross-border high-voltage power transmission line (LEP), which will connect the energy systems of Kyrgyzstan and Tajikistan with Afghanistan and Pakistan. The implementation of the project will allow the countries to organize a single electricity market and trade all year round. Kyrgyzstan and Tajikistan will be able to supply 1,300 megawatts of excess electricity to southern Asian countries every summer.

The implementation of the CASA project will help transform this region and mark an important step towards the formation of the Regional Electricity Market in Central and South Asia (CASAREM). The CASAREM initiative will benefit not only these four countries, but will also improve power transmission systems and stimulate interregional cooperation between the countries of Central and South Asia.

1.11 **Development of tourism**

Due to the unique climatic conditions, diverse landscape, untouched nature, authentic historical monuments in Tajikistan, there are opportunities for the development of various types of tourism, such as ecological, cultural, historical, wellness, alpinism, hunting and travel, which can be used to create a new world-class tourist product and thus compete with other countries with developed tourism.

The development of tourism in 2016-2020 was facilitated by the adoption in Tajikistan of the "Tourism Development Program in the Republic of Tajikistan for 2018-2020", "Tourism Development Strategy of the Republic of Tajikistan for the period up to 2030" (Action Plan of the Strategy for 2019-2022), which cover various areas of the tourism sector, including improving the quality of services at airports, issuing visas and registration, issuing permits for tourism in the regions of the country and other relevant aspects of the industry. As part of the adopted state programs for the development of tourism, an electronic visa system for foreign citizens has been introduced. According to the results of a sociological study by the Gallup Institute in 2019 Tajikistan have second place in the ranking of the safest countries in the world.

Photo 3. Ecotourism.

According to the World Tourism Organization, in January-December 2019, the share of Tajikistan's tourism services in the total gross domestic product (GDP) averaged 10.4%, and the direct share of tourism in GDP was 2.2 percent. During the period 2015-2019, the number of foreigners entering the country tripled and amounted to 1.26 million people.

In the process of developing the tourism system, equal attention is paid to attracting foreign tourists and developing domestic tourism. In order to develop the tourism sector, in particular the infrastructure of this sector, cooperation with international financial institutions has been established. Tourism is one of the sectors most affected by the COVID-19 crisis, which has a serious impact on the economy. Accordingly, the priorities of the development of this sector, along with other operations, will be related to labor protection measures.

Taking into account the current trends in tourism development and the declaration of 2019-2021 as the years of rural development, tourism and folk crafts in the context of a pandemic, special attention should be paid to the development of domestic tourism in the country based on extensive medical and recreational opportunities, alpinism, hunting, ecotourism, gastronomy and national cuisine, historical and cultural.

Tajikistan has a simplified visa system for citizens of more than 114 foreign countries. A visa-free regime has been introduced with more than 10 countries. The registration period for foreign passports of foreign citizens arriving in Tajikistan from June 1, 2018 has been increased from 3 to 10 days, and the validity period of a tourist visa is no more than 45 days.

Currently, there are 4 international airports operating in the republic. Passengers are transported by two national airlines. Global hotel chains have coming in the market of hotel services. Services to vacationers are provided by more than 70 health sanatorium and resorts, as well as more than 170 hotels.

In order to develop tourism in Tajikistan, travel companies are exempt from income tax for five years of their activities. Equipment and construction materials imported for the purpose of construction and reconstruction of tourist infrastructure are exempt from VAT and customs duties.

1.12 **Waste management**

The problem of formation, accumulation, burial and recycling of waste in Tajikistan in recent years has become increasingly relevant, especially solid household waste (SHW). Without constant monitoring and taking measures to reduce the amount of waste generated and disposed on the territory of the country, problems may arise leading to environmental disasters. The main document defining the legal framework in the field of waste management in order to prevent the

harmful effects of waste on human health and the environment, as well as the involvement of waste in economic circulation as additional sources of raw materials, is the Law of the Republic of Tajikistan "On Production and Consumption Waste", No. 736 of 28.06.2011.

Tajikistan has not established system of organized selective collection of SHW, there are no waste recycling and garbage incineration plants. Disposal, reuse and recycling of these wastes are also not carried out. Burial of SHW by elementary placement "in bulk", is today the main method of SHW handling. As of today, the infrastructure for the collection and processing of 236 secondary resources in Tajikistan is poorly developed. Statistics on the accounting of volumes and types of secondary raw materials and its further movement are not kept at a sufficient level.

1.13 **COVID-19 pandemic**

For Tajikistan, the socio-economic consequences of the COVID-19 outbreak are likely to be serious. At the same time, the extent to which each sector is affected by the COVID-19 outbreak seems to be lagging behind and will become more measurable later as the situation gradually develops.

After the outbreak of COVID-19, net inflows of foreign direct investment (FDI) have declined significantly and are unlikely to recover to the level before 2020 in the near future.

The tourism sector is perhaps the most sensitive to the COVID-19 outbreak and related restrictions on the movement of people and goods, with the exception of civil aviation and cross-border trade. Restrictions imposed due to the COVID-19 outbreak resulted in the tourism sector producing only 34.9 million somoni, equivalent to only 0.11% of GDP.

The COVID-19 situation had a negative impact on Tajikistan's total international trade. In January-June 2020, exports to other CIS countries fell by 30.6% compared to the same period last year. In the first six months of 2020, Tajikistan's exports were $654.4 million and imports were $1,504.3 million, resulting in a trade deficit of $849.9 million. Imports from non-CIS countries also declined, down 20.6 percent from the same period last year. Total imports were also down 4 percent from January-June 2019.

The situation with COVID-19 required amendments to the budget legislation. In accordance with the IMF recommendations, amendments and additions were made to the Law of the Republic of Tajikistan "On the State Budget of the Republic of Tajikistan for 2020" (№ 1692 dated July 4, 2020), in particular the figures on revenues, expenditures and expenditures. To this end, the total estimate of expenditures for 2020 was revised downward by 9.6% from TJS 26.1 billion to TJS 23.6 billion. This demonstrates a concerted effort by the government and development partners to increase fiscal consolidation and discipline in resource allocation in the face of health and economic risks.

Public spending on social sectors accounted for 46.8% of the state budget, corresponding to the expenditures of the public administration sector, in the first six months of 2020 and gradually increased until 2020. However, nominal growth rates mask problems of efficiency and equity in the allocation of resources across the board, sectors and institutions. Revenue shortfalls and further expected fiscal consolidation measures led to lower spending across all sectors in January-June 2020. The largest reductions in public spending compared to the original plan were in public administration (41.7%), education (21.8%), culture, sports (18.6%), industry and construction (15.8%), and social insurance and social protection (15.3%). Urgent health and social spending needs due to the outbreak of disease will inevitably lead to an increase in the budget deficit, at least in the medium term.

In order to mitigate the negative impact of the COVID-19 outbreak on life, livelihoods and the economy, the Government of Tajikistan has taken a number of important measures that have rationalized and strengthened the coronavirus monitoring system, created vital coordination and communication structures, and implemented concrete actions to support vulnerable populations and businesses.

In March 2020, by Presidential Decree, a National IWG on Strengthening Activities to Counter COVID-19 was established. This new body replaced the previous IWG, which operated from January to March 2020 and is chaired by the Prime Minister. The National IWG coordinates the government's response, assesses the situation, and liaises with development partners. The National IWG reports daily to the President of the Republic of Tajikistan and includes high-level representatives from each ministry and other government agencies, the Secretary of the National Security Council of the Republic of Tajikistan, the Prosecutor General, heads of relevant agencies/departments, the Presidential Administration, and the heads of several large state-owned enterprises.

The National IWG subsequently developed an Action Plan to Prevent and Reduce National Economic Exposure to Potential COVID-19 Risks (i.e., the "Country Preparedness and Response Plan for COVID-19"), which was approved by the Prime Minister on March 19, 2020. The COVID-19 Preparedness and Response Plan consists of 23 broadly defined measures to be implemented between March and December 2020, including:

- a health and social protection sector package to help the poor and vulnerable;
- a package of economic measures to ensure food security; and
- a package of economic measures to protect severely impacted MSMEs.

The total estimated cost of the proposed measures is $364 million. These measures were prepared in close consultation with key international development partners, including the Asian Development Bank, World Bank, World Health Organization, European Union Delegation, UNDP, and UNICEF.

2 INVENTORY OF GREENHOUSE GASES

According to Articles 4.1 and 12.1a of the UN Framework Convention on Climate Change, reporting on greenhouse gas emissions is a mandatory component of the activities of the countries Parties to the Convention, therefore, the inventory of greenhouse gases is considered one of the main parts of the national report.

In the greenhouse gas inventory for the preparation of the 4th National Communication of the Republic of Tajikistan on Climate Change, all calculations were based on the methodology of the 2006 IPCC Guidelines. Initially, the GHG inventory covered the period 2004 - 2016, but taking into account the update of the Nationally Determined Contribution (NDC), the period 1990-2016 was determined. This is because the previous set of greenhouse gas inventory data from 1990 to 2003 was calculated using the methodology of the 1996 IPCC Guidelines, and the inventory from 2004 to 2016 was calculated using the methodology of the 2006 IPCC Guidelines.

In accordance with the 2006 IPCC Guidelines, the following sectors were considered:

- Energy
- Industrial Processes and Product Use (IPPU)
- Agriculture, forestry and other land uses (AFOLU)
- Waste

The GHG Inventory of Tajikistan is compiled in accordance with the Guidelines of the IPCC 2006 National Greenhouse Gas Inventories, unregulated by the Montreal Protocol, including emissions and removals of four direct greenhouse gases:

- Carbon dioxide (CO2),
- Methane (CH4),
- Nitrous oxide (N2O);
- Perfluorocarbons: CF4 (tetrafluorocarbon) and C2F6 (hexafluorocarbon)

Emissions of CH4, N2O, PFCs were recalculated in CO2 equivalent (CO2eq.) using the Global Warming Potential (GWP) values provided by the IPCC in the Fourth Assessment Report[10] based on Greenhouse Gas Exposure over a 100-year period.

GHG	GWP
CO2	1
CH4	25
N2O	298
CF4	7 390
C2F6	12 200

The main sources of data for calculating GHG emissions were the Agency for Statistics under the President of the Republic of Tajikistan, the Forestry Agency under the Government of the Republic of Tajikistan, the Ministry of Industry and New Technologies, the Ministry of Energy and Water Resources, the Ministry of Agriculture, the Ministry of Economic Development and Trade, the Committee for Environmental Protection under the Government of the Republic of Tajikistan, the State Committee for Land Management, the Customs Committee, as well as specialized companies

[10] https://unfccc.int/process-and-meetings/transparency-and-reporting/greenhouse-gas-data/frequently-asked-questions/global-warming-potentials-ipcc-fourth-assessment-report

and enterprises (for energy - OSHC "Barki Tojik", for transport - SUE airline "Tojikiston" and SUE railway company "Rohi Ohani Tojikiston", for fuel - OJSC "Naftrason", SUE "Tajikgas", for waste - the Committee for Environmental Protection of the Republic of Tajikistan under the Government of the Republic of Tajikistan). For data in certain categories of the agriculture and forestry sector and waste, data from FAO, GIZ were used.

2.1 **Methodology**

The National Greenhouse Gas Inventory was prepared in accordance with the IPCC 2006 Guidelines for National Greenhouse Gas Inventories. IPCC 2006 Inventory Software - IPCC 2006 V2.54[11], developed for these Guidelines, was used for data entry, emission calculation, analysis of results and conclusions.

Good Practice Guidelines and Uncertainty Management in National Greenhouse Gas Inventories (IPCC 2006), Good Practice Guidelines for Land Use, Land-use Change and Forestry (IPCC 2003) and the IPCC 1996 Guidelines for National Greenhouse Gas Inventories were also used.

Greenhouse gas inventories have been prepared in accordance with the principles described below:

- Clear adherence to the logic and structure of the 2006 IPCC Guidelines.
- Priority is given to the use of national data and indicators.
- Use of all possible sources of information.

The highest priority was given to the assessment of emissions of gases with a direct greenhouse effect - CO2, CH4 and N2O from key categories, as well as for emissions of PFCs compounds in the preparing the greenhouse gas inventory.

The emission estimates were based on a sectoral approach, using Tier 1 and Tier 2 methods. The Tier 2 method was used to estimate emissions in one of the key categories: In the waste sector, methane emissions from solid waste disposal. Other emissions were estimated using the Tier 1 method with default estimation parameters from the 2006 IPCC Guidelines and country data.

2.2 **Analysis of the key sources of greenhouse gases**

According to the requirements of the IPCC Guidelines (IPCC, 2006), the key sources of greenhouse gases are those sources that make the main contribution in CO2-equivalent in the amount of at least 95% in relation to all emissions in a certain period (usually a year). Identification of key emission sources and their analysis allows to prioritize to improve the quality of the inventory and to develop a strategy of measures to reduce the largest emissions.

Table 2.1. Key Categories of the Emission Sources by their Contribution in the Aggregate Emission of Greenhouse Gases in 2016 (including the "Land Use, Change in Land Use and Forestry" Sector*)*

IPCC Category code	IPCC Category	Greenhouse gas	2016 Ex,t (Gg CO2 Eq)	Lx,t	Cumulative Total
3.A.1	Enteric Fermentation	CH4	4600,33	0,31	0,31
1.A.2	Manufacturing Industries and Construction - Solid Fuels	CO2	1651,14	0,11	0,42
3.B.1.a	Forest land Remaining Forest land	CO2	-1598,19	0,11	0,52
1.A.1	Energy Industries - Solid Fuels	CO2	1014,19	0,07	0,59
2.A.1	Cement production	CO2	978,46	0,07	0,66

[11] https://www.ipcc-nggip.iges.or.jp/software/index.html

IPCC Category code	IPCC Category	Greenhouse gas	2016 Ex,t (Gg CO2 Eq)	Lx,t	Cumulative Total
1.A.1	Energy Industries - Liquid Fuels	CO2	711,08	0,05	1,00
3.A.2	Manure Management	CH4	689,98	0,05	0,70
3.A.2	Manure Management	N2O	683,53	0,05	0,75
3.C.4	Direct N2O Emissions from managed soils	N2O	487,27	0,03	0,78
2.C.3	Aluminium production	PFCs	383,76	0,03	0,81
1.A.4	Other Sectors - Liquid Fuels	CO2	351,04	0,02	0,83
1.A.2	Manufacturing Industries and Construction - Liquid Fuels	CO2	287,16	0,02	0,85
4.A	Solid Waste Disposal	CH4	226,95	0,02	0,86
3.C.7	Rice cultivations	CH4	216,09	0,01	0,88
2.C.3	Aluminium production	CO2	206,88	0,01	0,89
3.C.5	Indirect N2O Emissions from managed soils	N2O	182,29	0,01	0,91
1.A.3.b	Road Transportation	CO2	121,09	0,01	0,91
4.D	Wastewater Treatment and Discharge	N2O	99,79	0,01	0,92
4.D	Wastewater Treatment and Discharge	CH4	97,26	0,01	0,93
1.A.4	Other Sectors - Solid Fuels	CO2	87,41	0,01	0,93
3.C.6	Indirect N2O Emissions from manure management	N2O	68,35	0,00	0,94
3.C.3	Urea application	CO2	46,48	0,00	0,94
2.A.4	Other Process Uses of Carbonates	CO2	40,70	0,00	0,94
1.B.2.a	Oil	CH4	31,50	0,00	0,94
1.B.1	Solid Fuels	CH4	24,90	0,00	0,95

Table 2.2. Key Categories of Emission Sources by Contribution in the Trend of the Aggregate Emission of Greenhouse Gases in 2004 and 2016 (the last year) Covered by the Cadastre (Including the "Land Use, Change in Land Use, Forestry" Sector)

IPCC Category code	IPCC Category	GP gas	2004 Year Estimate Ex0 (Gg CO2 Eq)	2016 Year Estimate Ext (Gg CO2 Eq)	Trend Assessment (Txt)	% Contribution to Trend	Cumulative Total of Column G
1.A.1	Energy Industries - Solid Fuels	CO2	0,000	1014,191	0,091	0,076	0,692
1.A.1	Energy Industries - Liquid Fuels	CO2	279,926	711,078	0,028	0,023	0,912
1.A.1	Energy Industries - Solid Fuels	N2O	0,000	4,798	0,000	0,000	0,997
1.A.2	Manufacturing Industries and Construction - Solid Fuels	CO2	45,406	1651,142	0,143	0,119	0,439
1.A.2	Manufacturing Industries and Construction - Liquid Fuels	CO2	411,690	287,160	0,027	0,023	0,935
1.A.2	Manufacturing Industries and Construction - Gaseous Fuels	CO2	29,352	18,311	0,002	0,002	0,990
1.A.3.b	Road Transportation	CO2	349,858	121,086	0,034	0,029	0,889
1.A.3.b	Road Transportation	N2O	5,473	1,774	0,001	0,000	0,997
2.C.3	Aluminium production	PFCs	1062,787	383,762	0,103	0,086	0,616
2.C.3	Aluminium production	CO2	572,931	206,880	0,056	0,046	0,860
2.C.4	Magnesium production	CO2	0,000	0,000	0,000	0,000	1,000
3.A.1	Enteric Fermentation	CH4	1991,156	4600,330	0,156	0,131	0,320
3.A.2	Manure Management	CH4	400,103	689,978	0,010	0,009	0,944
3.A.2	Manure Management	N2O	397,619	683,532	0,010	0,008	0,952
3.B.1.a	Forest land Remaining Forest land	CO2	-1460,54	-1598,19	0,070	0,059	0,814

2.3 **Uncertainty assessment**

"Uncertainty" characterizes the degree of dispersion and possible deviations of the data compared to the true value. Information on uncertainty allows us to prioritize measures to better estimate emissions in subsequent inventories and take this into account in the planning of measures to reduce GHG emissions. The overall uncertainty is a combination of GHG emission factor uncertainties and activity data uncertainties.

According to the IPCC methodology, uncertainties are categorized into 3 degrees. Low uncertainty (high enough reliability) if the uncertainty is less than 10 percent, medium uncertainty if the uncertainty is between 10 and 50 percent, high uncertainty (low reliability) - uncertainty over 50 percent.

The overall uncertainty of the current inventory, according to expert evaluation, is medium, with low uncertainty for some industries in the category (Industrial Processes) and high uncertainty for others (Agriculture, IPFH, Waste). Due to the lack of energy balance, taking into account the best available data on fuel consumption, the uncertainty of the estimate of GHG emissions in the category "Energy" is medium.

2.4 **Trends of greenhouse gas emissions and absorbers during 2004-2016**

Total CO2-equivalent greenhouse gas emissions excluding the Land Use, Land Use Change and Forestry sector in 2016 were 15,573 Gg CO2-equivalent, and taking into account the sector "LULUCF" - 13974.56 Gg CO2-eq. The table below (Table 2.3.) provides estimates of greenhouse gas emissions in Tajikistan for the period 2004-2016.

Table 2.3. Dynamics of Greenhouse Gas Emission in 2004-2016, Gg, CO2 Equivalent

	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
GHG taking into account LULUCF	8432	8070	8656	9120	9295	8536	7984	8308	7826	8255	8602	11367	13975
GHG excluding LULUCF	9892	9531	10148	10617	10797	10034	9496	9844	9377	9819	10179	12957	15573
Energy	4022	3166	3833	3175	2947	2214	1422	2121	1571	2052	2352	4615	6537
IPPU	1798	1926	2073	2107	1958	1763	1771	1442	1393	1214	1159	1380	1622
Agriculture	2226	2586	2380	3446	4009	4185	4395	4339	4447	4564	4657	4927	6960
LULUCF	-1460	-1461	-1492	-1497	-1502	-1498	-1512	-1536	-1551	-1564	-1577	-1591	-1598
Waste	386	392	370	392	381	374	396	406	415	425	434	445	454

Table 2.4. Emission of Greenhouse Gases by Sectors and Gases in 2016, Gg, CO2 Equivalent

	CO2	**CH4**	**N2O**	**PFCs**	**CO2 eq**
Energy	6415,84	80,74	40,25	NA	6536,83
IPPU	1238,59	NA	NA	383,76	1622,35
Agriculture	37,33	4414,34	2507,90	NA	6959,57
Waste	NO	354,44	99,79	NA	454,23
LULUCF	-1598,42	NA	NO	NA	-1598,42
Total emissions	6093,34	4849,52	2647,94	383,76	13974,56
Total emissions (excluding LULUCF)	7691,76	4849,52	2647,94	383,76	15572,98

The agriculture sector is the key source of greenhouse gas emissions in the Republic of Tajikistan. In 2016, greenhouse gas emissions in CO2 equivalent in this sector amounted to 44.7% of all greenhouse gas emissions in the country. The main sources of emissions in the sector are: 3.A.1 -

enteric fermentation of animals, CH4 gas, 3.A.2 - manure management, CH4 gas and N2O, 3.C.4 - application of nitrogen fertilizers, N2O gas.

The second most important key sector of greenhouse gas emissions is Energy, in 2016, CO2 equivalent emissions from this sector accounted for 42% of all national emissions. The sector includes 1.A.1 - Energy industries (electricity and heat production), all major gases are emitted, the main greenhouse gas is carbon dioxide, 1.A.2 - Manufacturing industries and construction, 1.A.3 - Transportation, 1.A.4 - Other sectors.

Carbon dioxide CO2 emissions account for 49.3 percent of all greenhouse gas emissions. The main carbon dioxide emissions occurred in the Energy sector - about 83.4% of all carbon dioxide emissions in 2016. The largest emissions of this gas were observed in subsectors 1.A.1 - Energy Industry, 1.A.2 - Manufacturing and Construction, 1.A.3 - Transportation.

The second sector in terms of carbon dioxide emissions - Industrial Processes and Product Use (IPPU). CO2 emissions in the sector accounted for 16.1% of total emissions of this gas in 2016. The most important subsectors are 2.A.1 - Cement Manufacturing, 2.C.3 - Aluminum Manufacturing.

The most significant greenhouse gas is methane. CH4 methane emissions account for 31.1 percent of total emissions of all gases. Methane emissions were highest in the Agriculture sector, about 91 percent of all emissions of this gas in 2016 due to high emissions in subsectors 3.A.1 - Enteric Fermentation and 3.A.2 - Manure Management.

The second largest sector of CH4 emissions is Waste, with emissions accounting for about 7.3% of all emissions of this gas in 2016.

Nitrous oxide N2O emissions account for nearly 17 percent of all greenhouse gas emissions. Most of the nitrous oxide emissions (94.7%) come from the Agriculture sector. The most significant subsectors are 3.A.2 – Manure Management and 3.C.4 – Direct N2O emissions from managed soils. The next highest N2O emitting sector is Waste (about 4%), the most important subsectors are 4.A - Solid Waste Disposal and 4.D - Wastewater Treatment and Discharges.

Greenhouse gas inventory and precursor emissions by key sectors for the period 1990-2016 are presented in the Annex.

2.5 **Greenhouse gas emissions by sectors**

2.5.1 **Energy**

According to the revised UNFCCC/12 guidelines, greenhouse gas - CO2, CH4, N2O - emissions are reported in the energy sector.

Table 2.5. Dynamics of Greenhouse Gas Emissions in CO2 Equivalent in Gg in Energy Sector Subsectors

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
1 - Energy	4022	3166	3833	3175	2947	2214	1422	2122	1571	2052	2352	4615	6537
1.A - Fuel Combustion Activities	3996	3136	3800	3139	2910	2177	1383	2080	1525	2006	2303	4562	6477
1.A.1 - Energy Industries	283	91	400	251	300	300	251	584	509	774	759	2157	2714
1.A.2 - Manufacturing Industries and Construction	488	252	696	391	551	399	392	554	361	435	884	1724	1967

1.A.3 - Transport	408	460	514	274	213	263	256	436	183	370	212	255	1371
1.A.4 - Other Sectors	2816	2334	2190	2224	1846	1214	484	507	471	427	448	426	424
1.B - Fugitive emissions from fuels	27	30	33	37	37	37	39	41	47	45	49	53	60
1.B.1 - Solid Fuels	2	2	2	3	4	4	4	5	9	11	18	22	28
1.B.2 - Oil and Natural Gas	25	28	30	33	33	34	35	36	38	35	31	31	32

Table 2.6. Dynamics of the Greenhouse Gas Emissions in CO2 Equivalent in the Energy Secto by Gases

	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
CO2	3 970	3 106	3 775	3 119	2 892	2 157	1 368	2 060	1 511	1 988	2 285	4530	6416
CH4	36	45	46	45	43	45	44	47	50	53	55	61	81
N2O	16	15	12	12	12	12	10	15	10	11	12	24	40
Total GHG emis-sions	4 022	3 166	3 833	3 175	2 947	2 214	1 422	2 122	1 571	2 052	2 352	4615	6537

In 2016, there was an increase in emissions of all major greenhouse gases compared to 2004: CO2 emissions increased by 61.6%, CH4 by 2,25 times, and nitrous oxide by 2,5 times.

According to the results of the present inventory of greenhouse gases and the results of the previous Third National Communication in the Energy sector, the most significant gas is carbon dioxide CO2.

Until 2010, the largest emissions were observed in the Commercial and Residential sectors, then, gradually the largest CO2 emissions by the end of 2016 became in the sector of Industry and Construction, taking into account the transition of industries to solid fuels.

1.A.1 - Energy Industry (taking into account the operation of coal-fired thermal plants after 2011) follows in second place in terms of CO2 emissions. And then, with slight fluctuations sections 1.A.3 - Transport and 1.A.4a - Commercial.

Before 2010-2011, the largest emissions of CH4 belonged to the Transport, Commercial and Utilities sectors. After 2011, the priority in emissions went to the Industry and Construction sector; the Commercial and Residential sectors were second.

For the entire observed period 2004-2016, the priority source of N2O emissions was the Transport sector, and by the end of 2016, the role of emissions is also increasing in the Industry and Energy sector.

Rechecking the data of the 3rd Inventory according to the updated version of the IPCC 2.54 program and their refinement for the period 2004-2010 showed more accurate indicators in various branches of the Energy industry. It is worth saying that in general, GHG emissions correspond to the initial calculations of the 3rd Inventory. However, there are discrepancies in the fugitive emissions of CH4, which is associated with a more correct approach to calculating emissions from the extraction of solid fuels, and the use of other coefficients for onshore coal mining. In this connection, the results in the new calculations that differ from the 3rd Inventory were obtained.

2.5.2 **Industrial processes**

Inventory of greenhouse gas emissions in the sector "Industrial Processes and Product Use" includes an assessment of direct greenhouse gases: CO2, CF4 (tetrafluorocarbon) and C2F6 (hexafluorocarbon), as well as indirect greenhouse gases: CO, NOx, SO2, NMVOC.

Table 2.7. Dynamics of Greenhouse Gas Emissions in CO2 Equivalent in Gg in the "Industrial Processes and Use of Products" Sector

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
2 - Industrial Processes and Product Use	**1798**	**1926**	**2073**	**2107**	**1958**	**1763**	**1771**	**1442**	**1393**	**1214**	**1158**	**1379**	**1622**
2.A - Mineral Industry	123	154	162	179	122	121	177	171	148	226	605	744	1032
2.A.1 - Cement production	94,62	124	138	153	93,06	95,35	144	146	123	188	562	693	978
2.A.2 - Lime production	7,05	2,4	3,75	3,08	4,28	3,30	5,93	1,50	4,13	8,18	9,15	10,6	11,5
2.A.3 – Glass Production	3,0	3,6	1,75	1,78	1,74	1,75	0,34	0,75	0,50	0,93	0,34	0,33	1,07
2.A.4 - Other Process Uses of Carbonates	18,01	24,42	18,66	20,94	22,46	21,07	27,02	22,13	20,82	29,18	32,91	39,9	40,7
2.B - Chemical Industry	27,10	24,77	21,42	14,30	12,51	0,00	0,00	0,00	0,00	0,00	0,00	0	0
2.B.1 - Ammonia Production	27,10	24,77	21,42	14,30	12,51	0,00	0,00	0,00	0,00	0,00	0,00	0	0
2.C - Metal Industry	1648	1747	1890	1914	1824	1642	1594	1272	1245	988	554	635	591
2.C.3 – Aluminium production	1636	1734	1890	1914	1824	1642	1594	1272	1245	988	554	635	591

CO2-equivalent greenhouse gas emissions in the IPPU sector in 2016 were 90% of 2004 levels and increased 17% over 2015 (Table 2.7.).

The major contributor to CO2 eq. for 2004-2013 was PFCs emissions from primary aluminum production, which has a large global warming potential with actually negligible PFCs emissions between 0.0534 Gg and 0.1225 Gg per year. PFCs emissions in 2016 were down 64% (383.76 Gg) from 2004 and 7% from 2015. Since 2014, the major share of CO2 equivalent emissions has been CO2: 69-76% (2016 yr.) from cement and other industrial production.

CO2 emissions, in the IPPU sector in 2016 increased 68% (1238.59 Gg) compared to 2004 and 28% compared to 2015 (Table 2.8.).

Table 2.8. Dynamics of Greenhouse Gas Emissions in CO2 Equivalent in Gg in the "Industrial Processes and Use of Products" Sector Broken Down by Gases

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
CO2	735	799	845	864	773	696	735	616	584	572	798	966	1238
PFC	1 063	1 127	1 228	1 244	1 185	1 067	1 036	826	809	642	360	413	384
Total GHG Emis-sions	1 798	1 926	2 073	2 107	1 958	1 763	1 771	1 442	1 393	1 214	1 158	1379	1622

Separate items were recalculated for the subsector "industrial wastewater" - oil refining, and the latest FAO data on annual protein consumption were taken into account when determining the volume of nitrous oxide (N2O) emissions.

Emission of Indicrect Greenhouse Gases in the IPUP Sector. Between 2004 and 2016, the largest emissions in this sector were carbon monoxide (CO), followed by volatile inorganic compounds

(VOC) and sulfur dioxide (SO2). Nitrogen oxide (NOx) emissions in the Industrial Processes and Product Use Sector are negligible at less than 1 Gg. Since 2014, NMVOC emissions have increased by a factor of 2.2, while in contrast, CO emissions decreased by more than 3 times. SO2 and NOx emissions have not changed significantly.

Non-methane hydrocarbon emissions (NMVOC) in 2004 were 35 Gg, in 2016 increased 2.7 times and amounted to 96 Gg. When estimating emissions of non-methane hydrocarbons for the first time emissions from the use of dyes were estimated.

Emissions of sulfur dioxide SO2 ranged from 5 Gg in 2004 and decreased by 40% in 2016, reaching 3 Gg.

Emissions of nitrogen oxides (NOx) in the Industrial Processes and Product Use sector are insignificant - less than 1 Gg (Table 2.9).

Table 2.9. Dynamics of Indirect Greenhouse Gases in Gg in the "Industrial Processes and Use of Products" Sector by Gases

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
CO	192	204	222	224	214	193	192	149	146	116	65	74	69
SO_2	5	6	6	6	6	5	5	4	4	3	2	3	3
НМЛОС	35	37	39	41	51	51	50	62	72	92	76	93	96
NO_x	0,77	0,82	0,89	0,9	0,86	0,77	0,77	0,6	0,59	0,47	0,26	0,3	0,28

2.5.3 **Agriculture**

Inventory of greenhouse gas emissions in the "Agriculture" sector includes an assessment of emissions for all three major gases: CO2, CH4, N2O.

The main sources in the sector:

- livestock production: intestinal fermentation (CH4) and manure, depending on how it is used and stored (CH4, N2O);
- rice cultivation: flooded rice fields (CH4);
- burning of agricultural waste in the fields (CH4, N2O, NOx, CO);
- direct N2O emissions from agricultural soils;
- direct N2O emissions associated with livestock production;
- indirect N2O emissions from the use of nitrogen-containing substances in agriculture.

Table 2.10. Dynamics of Indirect Greenhouse Gases in CO2 Equivalent in Gg in the "Agriculture" Sector

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
3.A - Livestock	3623	3842	3997	4600	5031	5111	5307	5587	5690	5858	5955	6180	6707
3.A.1 - Enteric Fermentation	1943	2055	2139	2489	2689	2732	2835	2990	3042	3129	3177	3297	3508
3.A.2 - Manure Management	1680	1787	1858	2111	2342	2379	2473	2597	2647	2729	2779	2883	3199
3.C - Aggregate sources and non-CO2 emissions sources on land	1525	1666	1367	1839	1982	2071	2112	1824	1858	1834	1855	1928	2356
3.C.3 - Urea application	48	49	22	38	42	43	39	36	38	38	42	43	37
3.C.4 - Direct N2O Emissions from	854	945	738	1051	1165	1194	1205	994	1015	1048	1068	1109	1400

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
managed soils													
3.C.5 - Indirect N2O Emissions from managed soils	331	369	299	422	468	479	486	423	431	445	454	471	570
3.C.6 - Indirect N2O Emissions from manure management	76	80	83	99	105	106	110	117	119	122	124	129	133
3.C.7 - Rice cultivations	216	223	225	229	203	248	271	254	255	182	169	177	216

In the category "Agriculture", the main greenhouse gases are CH4 and NO2. The main share of methane emissions comes from intestinal fermentation of livestock, to a lesser extent from manure-related activities. Methane emissions from rice fields do not exceed 3.9% of total methane emissions in the sector.

Table 2.11. Dynamics of GHG Emissions in CO2 Equivalent in Gg in the "Agriculture" Sector by Gases

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
CO2	48,4	49,1	22,46	37,69	41,60	42,81	38,95	36,15	37,91	37,62	41,58	42,75	37,34
CH4	2343	2479	2583	2998	3238	3292	3414	3598	3660	3763	3820	3963	4198
N2O	1280	1363	1414	1602	1793	1819	1893	1989	2030	2095	2135	2217	2509
Total GHG Emissions	3671	3891	4019	4638	5073	5154	5346	5623	5728	5896	5997	6223	6744

In 2004, methane emissions were 2,343 Gg and in 2016 they were 4,198 Gg. During the considered period 2004-2016, the highest methane emissions in the category "Agriculture" occurred in 2016, which corresponds to the dynamics of the number of agricultural animals. Thus, in the Republic of Tajikistan, the contribution of GHGs in the category "Agriculture" in different years ranged from 20% to 50% of total emissions in CO2 equivalent. From 2004 to 2016 this sector was among the key sources of GHG emissions.

2.5.4 **Changes in land use and forestry**

This section presents the initial data and results of calculations of greenhouse gas emissions and sinks from anthropogenic land use, land use change, and forestry (LULUCF) activities.

Table 2.12. Dynamics of greenhouse gas emissions in CO2 equivalent in Gg in the "Land use, land use change, and forest management" sector

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
3.B – Land	-1460,77	-1460,81	-1491,91	-1496,48	-1501,96	-1498,25	-1512,12	-1536,27	-1550,79	-1564,28	-1576,90	-1590,75	-1598,32
3.B.1 – Forest	-1460,54	-1460,58	-1491,78	-1496,35	-1501,83	-1498,12	-1511,99	-1536,14	-1550,66	-1564,15	-1576,77	-1590,62	-1598,19
3.B.2 – Tilled land	-0,20	-0,20	-0,10	-0,10	-0,10	-0,10	-0,10	-0,10	-0,10	-0,10	-0,10	-0,10	-0,10
3.B.3 – pasture land	-0,03	-0,03	-0,03	-0,03	-0,03	-0,03	-0,03	-0,03	-0,03	-0,03	-0,03	-0,03	-0,03

When comparing the data obtained by the inventory of CO2 emissions and removals for 2004-2010, when recalculating them using the computer program IPCC2006 V2.54 with the final GHG

inventory data for the Third National Communication, we see a noticeable reduction in the final data on carbon dioxide accumulation for the sector IPLCH in general for all years by 30%.

It should be considered that the more accurate is the calculation of GHG, carried out with the new computer program, which more fully takes into account the specifics of the sector and depending on this, recommends in each case different default factors (for example - on pasture management, on the degree of their degradation, etc.).

2.5.5 **Waste**

The Waste Sector contains estimates of methane (CH4) and nitrous oxide (N2O) emissions in the following categories:

- removal and disposal of municipal solid waste (MSW) in landfills/landfills (4.A)
- treatment and discharge of municipal and industrial wastewater to centralized sewage treatment plants (STPs) - (4.D).

CO2-equivalent greenhouse gas emissions in the Waste sector in 2016 increased by 18% from 2004 levels and increased by 2% compared to 2015. The main contribution to CO2 eq. for 2004-2016 is methane emissions 81.6% (2004) to 78% (2016).

Table 2.13. Dynamics of GHG Emissions in CO2 Equivalent in Gg by Subsectors of the "Waste" Sector

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
4 - Waste	**386**	**392**	**370**	**392**	**381**	**374**	**396**	**405**	**415**	**424**	**434**	**445**	**454**
4.A - Solid Waste Disposal	193	199	204	210	215	220	226	231	236	242	247	252	257
4.D - Wastewater Treatment and Discharge	193	193	166	182	166	154	170	174	179	182	187	192	197

Table 2.14. Dynamics of GHG Emissions in CO2 Equivalent in Gg in the "Waste" Secto by Gases

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
CH4	237	248	251	274	264	258	268	278	287	296	305	316	324
N2O	65	66	69	70	72	73	87	89	91	93	95	98	100
Total GHG Emissions	**302**	**314**	**320**	**344**	**335**	**331**	**355**	**367**	**378**	**389**	**400**	**413**	**424**

Methane emissions in the Waste sector increased by 12.4% in 2016 compared to 2004 and by 2% compared to 2015. The main share (up to 70%) of methane emissions in the Waste sector comes from municipal solid waste (MSW). Methane emissions from the Waste Management Facility are respectively up to 30% for 2004-2016.

Re-checking the data of the previous 4th national inventory of greenhouse gas emissions in the "Waste" sector for 2004-2014 showed that the IPCC2006 V2.54 program for Section 4A erroneously included data on the total population of the country, whereas according to the IPCC methodology in calculating methane emissions from MSW (solid municipal waste) urban dumps and urban population, whose share in the total population is about 26% are considered. Accordingly, changes were made for the entire time series for 1960-2014 and further for 2015-2016. As a result of the recalculation, methane emissions from the Solid Waste Sub-sector decreased by a factor of two.

3 INFORMATION ON MITIGATION MEASURES AND THEIR CONSEQUENCES

The Republic of Tajikistan has adopted a number of sectoral and environmental regulations, programs and action plans that directly or indirectly address climate change. Since the adoption of the Paris Agreement in order to develop a new global mechanism to implement the objectives of the Convention, Tajikistan is actively discussing opportunities and needs and will seek to make a feasible and proportional contribution to the reduction of anthropogenic impact on the climate system of the planet. Tajikistan sees as the main tool for reducing greenhouse gas emissions the development of renewable energy potential, primarily hydropower, as well as strive to increase the amount of forest plantations, implementation of measures to protect and restore forests and soils.

Tajikistan's relatively low level of socio-economic development, inadequate infrastructure, and high dependence on climate-sensitive sectors make the country extremely vulnerable to climate change and extreme weather events. The lack of human, technological and institutional capacity to effectively reduce and manage the risks and impacts of climate change makes efforts to reduce vulnerability to climate change and build the levels of resilience needed to cope with impending climate challenges extremely difficult.

3.1 Nationally determined contribution

In the Intended Nationally Determined Contribution (INDC) submitted in 2015, the Republic of Tajikistan defines its climate change (CC) mitigation and adaptation goals - both unconditional and conditional on the provision of international assistance. Tajikistan's unconditional commitment to mitigate CC by 2030 - greenhouse gas (GHG) emissions no higher than 80-90% of 1990 levels; with the provision of international assistance - no higher than 65-75% of 1990 levels.

The estimated nationally determined contribution of the Republic of Tajikistan in terms of GHG emissions reduction and impact on climate system states:

- without attracting new substantial amounts of international funding: "The long-term goal of limiting anthropogenic greenhouse gas emissions is defined as a flexible indicator not exceeding 80-90% of 1990 levels by 2030, which is 1.7-2.2 tons in CO2 equivalent per capita, which is the country's contribution to reducing greenhouse gases. A significant contribution of the country to reducing the negative impact on the climate system is the systematic restoration of forests in accordance with the adopted State Programs".
- Subject to substantial international financing and technology transfer: "The potential to reduce greenhouse gas emissions in the Republic of Tajikistan allows to provide 65-75% of the 1990 level by 2030, which is 1.2-1.7 tons in CO2-equivalent per capita. This will be possible with the implementation of investment projects and national programs in energy, transport, agriculture, forestry and water management, reduction of natural disaster risks, increase and diversification of renewable energy sources, and reduction of energy losses; modernization, introduction of new technologies and development of economic sectors."

The targets specified in the INDC relate to 1990 emission levels. In 2021, the achievement of the INDC goals was revised through the analysis and forecast until 2030 of the results of the updated inventory of greenhouse gas emissions given in this document.

After a thorough analysis of the results of the three scenarios (base, unconditional and conditional) emissions, and updated at the national level, the contribution (NDC) can be represented as follows:

- The Republic of Tajikistan is planning to keep the unconditional target, namely 60 to 70% of GHG emissions from 1990 levels by 2030, which will account for one - 21.32–24,87 million tons of CO2 equivalent by 2030, or from 1.9 to 2.2 tons of CO2 equivalent per capita.
- The conditional goal to reduce greenhouse gas emissions in the Republic of Tajikistan will have an upper limit of emissions from 50 to 60% of the 1990 level, which by 2030 will be from 17.76 to 21.32 million tons of CO2 equivalent or 1.5-1.9 tons of CO2 equivalent per capita, if international financial support, technology transfer and technical cooperation are provided.

3.2 Current policy and measures to reduce greenhouse gas emissions

3.2.1 Legal and regulatory framework

The Majlisi Oli (Parliament) plays a key role in developing and improving legislation and bringing it into line with international agreements. The members of the Parliamentary Environment Committee are well aware of the problems related to climate change and the decisions of international environmental conventions.

The legal framework of national and sectoral programs and strategies of the Republic of Tajikistan reflects the principles of sustainable development in the area of energy saving, energy efficiency and, consequently, reduction of greenhouse gas emissions.

The National Development Strategy of Tajikistan for the period up to 2030, adopted in 2016, does not contain specific measures to reduce GHG emissions at the national, sectoral and local levels. The Strategy notes the general directions of economic development, which, if implemented, can contribute to the reduction of GHG emissions, which can include:

- ✓ use of unconventional (renewable) energy sources;
- ✓ minimizing the negative impact of the transport complex on the environment and human health;
- ✓ stimulating the development of "green employment", expansion and state support of ecological entrepreneurship and ecological services market.

The NDS recognizes that there are general and specific problems for the development of the real economy, which can include problems related to GHG emissions:

- ✓ increasing negative impact on the environment of mining enterprises;
- ✓ the tendency of growth of accumulated industrial emissions and pollution of land and water resources in industrial regions, the negative environmental impact of mining enterprises;
- ✓ growth of air pollution in cities (and industrial zones) is accompanied by insufficient control by the relevant authorities over emissions from vehicles and the quality of inspections of vehicles for compliance with environmental norms and standards.

In order to reduce GHG emissions in general, it is envisaged to introduce rational production models by introducing new energy- and resource-saving technologies, reducing waste and reducing CO2 emissions, thus forming opportunities for "green employment" (i.e. combining decent work with the use of clean technologies).

The Medium-term development program of Tajikistan for 2016-2020 is based on the strategic directions of the NDS up to 2030. The MTP 2016-2020 notes that its implementation is based on international commitments of the Republic of Tajikistan, including the Intended nationally determined contribution of the Republic of Tajikistan in terms of reducing GHG emissions. It is noted in the program that development of legal protection mechanisms, provision of financial support and meeting the needs for provision of new technology will be carried out taking into account the risk of climate change.

Of the 10 projected indicators that are identified in the MTP, the seventh indicator is aimed at the efficient use of natural resources and environmental sustainability, which partially affects the reduction of GHG emissions.

The optimistic version of the country's economic development provides for the development of organic farming, renewable and clean energy sources as the basis of a "green economy", which will eventually contribute to the reduction of GHG emissions.

When considering the goals and priorities of the MTP 2016-2020, the main issues related to climate change include:

- protecting the environment and forming the basis of a national system of strategic environmental assessment (SEA), as well as adaptation to climate change;
- implementation of preventive measures to mitigate climate change.

Although these goals do not fully cover the issues of GHG reductions, but to some extent are aimed at mitigation in this direction.

With regard to the development of the real sector of the economy, including agriculture, where the highest level of GHG emissions and, above all, livestock products, it is noted about the reduction of livestock through the development of breeding livestock.

To improve the structure of the fuel and energy balance of the country it is envisaged to increase the share of non-fuel energy by increasing the technical possibilities of using RES (solar, wind, biological, geothermal), development of hydropower potential of the country and improving the energy efficiency of the national economy.

In the matrix of actions related to reduction of GHG emissions, amendments to the Law of RT "On breeding cattle breeding" are envisaged. In the energy sector it is envisaged to encourage the involvement of RES (solar, biogas, wind) in the economic turnover on the basis of preferential crediting of entrepreneurship in the field of design, production and use of installations based on RES, creation of training and service centers to promote the use of RES.

The section "Environment and Life" includes:

- ✓ Development and implementation of a regulatory framework and new standards on emissions and environmental certification;
- ✓ Development of a set of measures for the development and monitoring of environmental requirements for the use of personal transport, production and import of food, waste management;
- ✓ Formation of conceptual schemes to create prerequisites for the development of green economy.

On October 2, 2019 Decree № 482 of the Government of the Republic of Tajikistan was adopted the National Strategy for Adaptation to Climate Change in Tajikistan for the period up to 2030. In the Strategy, agriculture is selected as one of the priority sectors at risk of climate change. The following main risks are defined in agriculture: increase of average temperature, more frequent extreme temperatures, extreme precipitation, droughts, seasonal changes in river flows, possible

disappearance of glaciers and reduction of water flows, increased weather variability, changes in time, scale, distribution of rainfall and rainfall, cycles of frost and thaw, dust storms, lack of water, changes in population of agricultural insect pests and vectors of dangerous plant diseases, shift in seasons of temperature changes in the hills.

The main adaptation activities related to climate change in agriculture are defined as: Promoting soil improvement and erosion protection as well as water and drainage management, promoting pasture management schemes, Introducing crop diversity and knowledge on plant breeding, Establishing seed banks in communities, especially for drought and disease resistant crops, Improving storage systems in communities to store crops and food to reduce losses, Disseminate drought resistant seeds and practices as well as knowledge on protection of plants from cold, develop options of insuring harvest against drought.

On December 28, 2018, pursuant to the Decree No. 602 of the Government of the Republic of Tajikistan the National Strategy of the Republic of Tajikistan for Disaster Risk Reduction 2019-2030 was adopted. The Strategy notes that threats associated with climatic conditions, in particular mudflows and avalanches, are among the most significant causes of natural disasters in 1997-2018. Specifically, it notes that the damage from climate change, particularly drought, is more than $5.4 million annually in the country.

Droughts are expected to become more frequent due to rising temperatures, leading to increased water loss through evaporation and reduced snow cover. In the past, the impact of droughts has been mitigated by the availability of irrigation water. However, in the future, drought will periodically affect rainfed crops, including staple food crops and sources of rural income.

Projected changes in climate and weather patterns are expected to lead to more frequent mudslides and, paradoxically, droughts, as well as periods of extreme heat and adverse weather conditions (e.g., heavy hail that can destroy crops). To successfully cope with such climate change, early warning systems and existing risk management practices (e.g., for mudslides and droughts) need to be improved, and new mitigation and adaptation approaches developed, especially for heat waves and droughts.

The State Environmental Program for 2009-2019 (Government Decree No. 123 of 2009) includes a section on air protection, which emphasizes the need to improve data collection and analysis, as well as to strengthen control over emissions from stationary and mobile sources, as well as the development of regional air quality norms and standards. The Action Plan for the implementation of this program (Government Decree No. 602 of 2009) provides for such activities as the organization of transport environmental posts and vehicle maintenance stations at customs posts and highways; restoration and reconstruction of dust collection units and devices for neutralization of industrial waste; organization of mobile environmental diagnostic laboratories; organization of environmental monitoring in the area of influence of TALCO; and the restoration of aero-meteorological stations in Dushanbe and Khorog. As part of this program, an environmental management system in accordance with ISO 14000 was introduced at TALCO facilities. Environmental monitoring is conducted in the vicinity of TALCO.

The Program for rehabilitation of hydrometeorological stations and hydrological posts for 2007-2016. (Government Decree No. 408 of 2006) has as its main objective the rehabilitation and improvement of TajikHydromet networks. The World Bank's Central Asia Hydrometeorological Service Modernization Project (2011-2018) makes a significant contribution to achieving this objective.

The Forestry Development Strategy for 2016-2030 and the corresponding draft Action Plan for 2016-2020 have been submitted to the Government for approval. Reforestation is one of the main components of the draft Strategy, which assumes planting of new forests on an area of 10,000 ha

over the next 15 years, which is much less than the current volume of creation of forest plantations. Expenditures for reforestation activities represent about 25% of the total planned budget funding that will be required over the first five years (2016-2020). The action plan provides for planting of at least 1,000 hectares of forest per year, implementing measures to restore degraded forests on an area of at least 2,000 hectares each year, and ensuring natural reforestation on an area of at least 8,000 hectares per year. The documents do not include measures to grow fuel wood and create energy plantations around rural settlements. The draft Strategy assumes an increase in the number of households that will be contracted for joint forest management (from 721 as of today to 3,500). The draft Action Plan includes activities to involve local communities in joint forest management schemes, with an allocated budget of 2% of the total. According to the draft Action Plan, the state budget and other sources are currently able to provide up to 14.81% of the required funds, while sources of funding for the remaining 85.19% of the required budget have not been identified.

3.2.2 Implementation of policies and measures at the subnational level

Agriculture

Based on the fact that a significant share of GHG emissions comes from soil cultivation. The main sources of nitrous oxide (N2O) emissions are manure left on pastures, manure spreading in soil, synthetic fertilizers, and manure storage and management. Agriculture's share of total N2O emissions is about 88%, including emissions from fertilizers (inorganic and manure), animal waste management and agricultural residue burning (not for energy purposes, on-site).

The 2013 Law on Pastures defines the basic principles of pasture use, including the protection of pastures and the environment, as well as the attraction of investments for more effective use and protection of pastures. The law defines the authority of local administrations to control the environmental safety and use of pastures in accordance with state regulations and standards. The law prohibits a number of activities in pastures, such as cutting down trees or bushes, road construction, misuse of pasture land, pollution with waste, and grazing livestock in excess of the established norm. The law requires users to ensure effective use of pastures, including the protection of pastures from degradation and pollution. It provides for geobotanical studies on pastures to assess the potential productivity of natural forage lands.

The Pasture Development Program for 2016-2020 (Government Resolution No. 724 of 2015) was adopted following the Program for Improvement and Rational Use of Pastures for 2009-2015 (Government Resolution No. 481 of 2008). These Programs contain similar descriptions of the current situation with respect to pasture degradation and related impacts on the agricultural industry, thus the effect of the 2009-2015 Program is not clear. Both Programs aim to increase pasture forage, assist in increasing livestock numbers and dairy and meat production. The 2009-2015 program included activities such as clearing pasture areas of rocks and shrubs; purchasing grass seed; using machinery and equipment to conduct seeding operations; purchasing fuel and lubricants; guarding pasture areas; and building bridges and repairing roads to use pastures not previously used. The program for 2016-2020 additionally provides for the purchase of mineral fertilizers and improvement of pastures by root and surface treatment methods.

Transport Sector

In recent years, the influence of the transport sector on air pollution has stabilized in absolute terms. Compared to 2009, emissions of air pollutants from transportation increased by only 14% in 2014 (from 249,000 tons to 284,000 tons), while the vehicle fleet increased by 26% over the same period (from 337,425 to 423,303 vehicles). However, in relative terms, motor transport today

undoubtedly remains the main source of air pollution. In 2014, its contribution was more than 13 times higher than the total emissions from industry and energy.

The law "On Ensuring Environmental Safety of Road Transport" 2015 provides for measures aimed at preventing and reducing the negative impact of vehicles on air quality. The measures include environmental classification of imported vehicles, environmental inspections of motor vehicles, introduction of technical specifications for motor fuel, organization of production of environmentally friendly motor fuel, systematic quality control of motor fuel and introduction of battery recycling or decontamination technology. The law also stipulates the responsibility of owners to equip vehicles with devices to reduce the toxicity of exhaust gases.

If properly implemented, this Law could be a milestone in environmental protection activities in the transportation sector. However, a set of bylaws explicitly provided for in the Law (e.g., regarding classification of vehicles) is lacking. The country has not yet carried out activities aimed at the soonest application of the Law in practice. The country has not yet adopted international standards for motor vehicles, which could facilitate the implementation of the Law. Given the complexity and cross-cutting nature of these issues, there is reason to adopt a roadmap for the implementation of the Law at the state level.

The Government Resolution № 517 of 2005 introduces a complete ban on the import and export of all ozone-depleting substances listed in Annex A and B of the Montreal Protocol, as well as products containing such substances. This Resolution is strictly enforced.

Industry

In emissions of the main pollutants into the atmosphere from industrial enterprises in 2004-2016, a gradual decline was observed until 2014. Carbon monoxide emissions sharply decreased from 2004 to 2014 and in 2015-2016, the downward trend was reversed. The share of GHG emissions in the Industrial Processes sector in the period 2005-2010 averaged 9.25%, and in 2016 amounted to 11.6% of the total national emissions.

Strategy for Innovative Development for the period up to 2020. The Strategy for Innovative Development for the period up to 2020 (Government Decree No. 354 of 2015) notes that Tajik industry is in a difficult situation and requires innovative reform. Two of the six indicators of the Strategy focus directly on the Industrial sector:

- ✓ increasing the share of industrial production enterprises implementing technological innovation in the total number of industrial production enterprises to 5-8% by 2020.
- ✓ increase in the share of innovative products in the total volume of industrial production by 2020.

The strategy provides for the use of appropriate tools to stimulate enterprises to improve production technologies and innovations, as well as the formation of a system of incentives for the development of priority technologies and sectors of the economy based on the tightening of environmental legislation and the requirements of technical regulations.

Energy

The main sources of GHG emissions in Tajikistan are the energy sector and industrial processes. According to the Ministry of Energy and Water Resources, by 2012 CO2 emissions from the energy sector were about 2 million tons; in terms of carbon equivalent this represents 12-15% of the 1990 level. GHG emissions associated with international transit and energy production for the population by burning biomass are not taken into account. Over the period 2015-2016, emissions in the Energy sector increased significantly and amounted to 47% of total emissions in the country.

The 2010 Law on the Use of Renewable Energy Sources establishes the principles and objectives of state policy in the field of RES development, defines the ways of integrating renewable energy into the national energy system; regulates activities aimed at expanding the use of renewable energy; and defines economic and organizational measures aimed at stimulating the production and use of RES. The law defines some practical measures for the organization of legal, financial, scientific and technical support, as prescribed in its provisions. However, weak institutional capacity at the national and local level makes it difficult to implement RES policies.

Waste

The basis for the regulation of waste management activities is established by the ***2011 Law on Environmental Protection***. The Law prohibits the import of radioactive waste and materials, as well as their transit through the territory of Tajikistan. The Law also prohibits the discharge of industrial waste and untreated sewage into water, irrigation canals and aquifers, or into residential areas, forests and agricultural land. Places of waste storage and disposal shall be determined by local executive authorities in coordination with the authorized state bodies in the field of environmental protection, sanitary and epidemiological supervision, and geology. The law prohibits the disposal of hazardous waste, including radioactive waste, in and near populated areas, as well as in regions with a high population density.

The Law "On Consumption and Production Waste" of 2002 defines the basic terms used in the field of waste management, the principles of national policy in the field of waste management and the powers of the state authorities in the field of waste management. The Law also defines the financial instruments for the regulation of waste management activities, including the collection of fees for waste disposal taking into account their class of hazard. In 2011, the concept of orphan waste was included in the Law.

Government Resolution No. 279 "On Approval of the Procedure, Conditions and Methods of Collection, Use, Disinfection, Transportation, Storage and Burial of Industrial and Domestic Waste in the Republic of Tajikistan" 2011 establishes the rules, conditions and methods of collection, use, decontamination, transportation, storage and disposal of industrial and domestic waste. This document defines the rules for placement of containers for household waste, prohibits burning of waste in containers, requires written contracts for waste removal and defines the rights of consumers of waste collection and removal services. In addition, the document prescribes the procedure for selecting locations for waste disposal facilities and establishes a ban on dumping waste in cities and other settlements. It also describes the rules of waste collection and disposal in cities, towns and rural areas, and establishes the responsibility of owners to keep territories clean. The document establishes the rules for keeping livestock on the territory of settlements and the rules for disinfection and deratization of settlements. This document also makes the Ministry of Health and Social Protection and the Environmental Protection Committee responsible for supervising the implementation of the rules.

Table 3.1. National and Sectoral Strategies and Programs

Tiles of Strategies and Programs	Description	Implementation Period		Sector Affected by the Mitigation
Agrarian Reform Program of the Republic of Tajikistan	The overall goal of the Program is to achieve two major national goals: - To develop productive and profitable agriculture based on the sustainable use and management of natural resources. - Undertake overall agricultural reform, including structural and institutional reforms at national and sub-national levels.	2012	2020	Agriculture
Program for the Development of Cattle Biotechnology in the Republic of Tajikistan	The goal of this program is the development of livestock biotechnology, research in this area in order to preserve the genetic resources of breeding stock and rare animal species. The goal is to improve animal breeding methods. To implement the Program the following measures should be taken: (a) acquisition of highly productive breeding stock from abroad and its import; (b) breeding young animals with high reproduction rate; (c) acquisition of laboratory equipment; (d) personnel training.	2013	2017	Agriculture
Pasture Development Program of the Republic of Tajikistan	The program is aimed at increasing the stock of pasture vegetation using modern technologies by sowing seeds of natural vegetation of pastures and increasing their productivity. This program is designed to increase the production of livestock, meat, milk, leather and wool in all types of households, to meet the needs of the population in ecologically clean food, industry - raw materials, to organize new jobs and improve the living standards of rural residents.	2016	2020	Agriculture
Horticulture and vineyard development program	Taking specific measures for the development of new lands and the introduction of free land into agricultural turnover to create orchards and vineyards, the development and publication of recommendations on modern methods of growing and cultivation of fruit trees and grapes.	2016	2020	Agriculture
Water Sector Reform Program of the Republic of Tajikistan	Creating the principle of integrated water resources management based on the basin approach, taking into account climate change	2016	2025	Water Resources
Clean drinking water program	Rehabilitation of the existing water supply system, introduction of new technologies, construction of local water supply systems, purchase of meters and control, and disinfection. (SDG 6)	2017	2020	Water Resources

Tiles of Strategies and Programs	Description	Implementation Period		Sector Affected by the Mitigation
Program for the Development of Housing and Communal Services of the Republic of Tajikistan	Disclosure of the development of municipal engineering infrastructure, the introduction of modern cost-effective technologies.	2014	2018	Waste
Long-term program for the construction of small hydropower plants	Development of hydropower resources of small rivers and creation of an appropriate structure, determination of needs and generation of electricity in hard-to-reach settlements.	2009	2020	Energy
State Target Program for the Development of the Transport Complex of the Republic of Tajikistan	Conversion of vehicles to the use of environmentally friendly fuel (gas),	2012	2025	Transport/Energy
	Creation of protective forest belts along roads	2012	2025	Agriculture
	Electrification of railroads	2012	2025	Energy
Strategy for Industrial Development in the Republic of Tajikistan	Production based on modern innovative technologies with energy-saving functions, raw materials and environmental safety	2018	2030	Industry
	Conducting scientific research, stimulating scientific, technical and innovative activities.			
	Intensification of innovation processes, introduction of new technologies, development of national scientific and technical potential			
	Provisions of norms and regulations stipulated in the laws of the Republic of Tajikistan "On Environmental Protection" and "On Subsoil"			
Seed Production Development Program of the Republic of Tajikistan	The main objective of the Program is to promote breeding and seed production in order to form this sector of the national economy able to function in accordance with international norms and standards. Breeding and seed production should be aimed at the promotion of plant varieties, the introduction, testing and registration of plant varieties, the use of various methods of seed production to expand the cultivation of crops through the use of new technologies, and for the commercial production, multiplication, processing, certification and marketing of high quality seeds for the domestic market	2016	2020	Agriculture

Tiles of Strategies and Programs	Description	Implementation Period		Sector Affected by the Mitigation
	and export. In particular, this Program focuses on the introduction of new high-yielding varieties.			
State program for development of new irrigated lands and rehabilitation of lands withdrawn from agricultural circulation in the Republic of Tajikistan	The main goal of this Program is to restore abandoned land in agricultural turnover and expand the area of irrigated land in the country in 2012-2020. This Program is consistent with the objectives of other programs of the Government of the Republic of Tajikistan to improve the living standards of people and is designed to contribute to the socio-economic development of the country.	2012	2020	Agriculture
Comprehensive livestock development program	The program is aimed at developing livestock breeding in Tajikistan, improving the quality of breeds and livestock productivity, importing pedigree animals, increasing the number of bull producers, developing horse breeding, poultry farming, improving pastures. Animal biotechnology.	2018	2022	Agriculture
State Environmental Program	Widespread, efficient use of natural resources, introduction and use of environmentally friendly technologies, expansion of the area of forests and gardens. Organization of expansion of specially protected areas, ensuring clean air, strengthening control of emissions	2009	2019	Cross-Sectoral
Forest sector development strategy	The main objectives of the Strategy are: - conservation of forest biodiversity, restoration and conservation of forests, increasing their area and productivity; - improving the quality and quantity of ecosystem services provided under conditions of climate change; - promoting economic development by attracting entrepreneurs to the forest sector and improving the efficiency of forestry; - Improving livelihoods of local people by involving them in forestry and providing them with forest products based on sustainable forest management. - strengthening the participation of civil society, in particular women, in forest policy issues at national and local levels; - strengthening the role of the forests of the Republic of Tajikistan in the implementation of international commitments and global programs on sustainable forest development and climate change mitigation and adaptation.	2016	2030	Land Use, Land Use Changes, Forestry

3.3 **Organizational structure**

The Committee on Environmental Protection is responsible for state air protection policy, regulation, coordination of other state agencies, hydrometeorological activities, national environmental monitoring system, information on air pollution and air protection, reduction of GHG emissions, ozone layer protection policy and international cooperation.

The Agency for Hydrometeorology (TajikHydromet), which is part of the Committee for Environmental Protection, monitors air conditions and posts this information daily on the Internet. Since 2014 the Agency for Hydrometeorology is responsible for data collection and preparation of the national GHG cadaster, conducts climate change vulnerability assessments, disseminates information on implementation of the provisions of the UNFCCC and is responsible for international cooperation (with the International Panel on Climate Change and the UNFCCC Secretariat). The Director of the Agency for Hydrometeorology is the National coordinator of the UNFCCC.

The Committee on Environmental Protection, which has a Division of State Control of Use and Protection of Atmospheric Air, is responsible for issuing permits and conducting inspections of enterprises in the field of air protection. Permits are issued for a period of three to five years (Chapter 2).

The Analytical Control Center measures pollution from stationary sources (Chapter 2). The Center has its own mobile equipment for measuring ambient air pollution near industrial enterprises. Measurements are taken at about 60 enterprises, most of them twice a year, with the exception of TALCO, where measurements are taken every two weeks. The data is then transmitted to the Department of State Control over the Use and Protection of Atmospheric Air of the Committee for Environmental Protection and is used for inspections as well as for gathering information on atmospheric air pollution.

Licensing in the field of ODS is carried out by the Centre for Standardization and Environmental Regulation of the Committee for Environmental Protection.

Since 2013 ***the Ministry of Energy and Water Resources*** is responsible for energy policy and regulation, including development of renewable energy sources (in particular hydropower) and energy efficiency. The Ministry is the designated national authority for the Clean Development Mechanism of the UNFCCC. Among other tasks, the Ministry is responsible for formulating strategies for the development and management of the fuel and energy complex.

The Ministry of Transport develops the country's road and other infrastructure, taking into account aspects related to air pollution.

The Ministry of Agriculture develops and coordinates the state policy in the agricultural sector and develops programmes and forecasts of agricultural production. Crop and livestock production plays an important role in GHG and ammonia emissions.

The Ministry of Industry and New Technologies develops and implements government policy in the industrial sector. The Ministry is responsible for the establishment and implementation of research and development programmes and innovative projects focusing on energy-saving technologies and green products in order to reduce air pollution and prevent climate change.

The Ministry of Health and Social Protection deals with the risks of climate change and the impact of air pollution on human health.

The Statistical Agency publishes aggregated data on emissions to atmospheric air from stationary and mobile sources.

The National Academy of Sciences provides scientific support for the implementation of policies in the field of atmospheric air protection.

Local government agencies are responsible for planning, financing, and implementing local programs to protect the atmospheric air, as well as maintaining records of facilities affecting atmospheric air quality.

In 2014, ***the National Ozone Center*** was established, a non-profit organization operating with the financial support of UNEP. The main objective of the Center is to facilitate the implementation of Tajikistan's commitments under the Montreal Protocol and the provisions of the state strategic documents on ODS. The Center's activities include monitoring the application of ODS, information exchange, preparation of reports for UNEP, as well as training and providing information to consumers of refrigerants.

3.4 Global and regional agreements on the protection of atmospheric air

The United Nations Framework Convention on Climate Change, the Kyoto Protocol, and the Paris Agreement

Tajikistan joined the United Nations Framework Convention on Climate Change (UNFCCC) in 1998 and the Kyoto Protocol in 2008. As a non-Annex I country, Tajikistan has only general obligations, such as collecting relevant information, providing national GHG inventory reports to the UNFCCC and conducting research on climate change vulnerability and mitigation. The third national communication was prepared in 2014.

In 2015, at the 21st Conference of the Parties to the UNFCCC, Tajikistan submitted a report on its Intended Nationally Determined Contribution. Tajikistan's current contribution to global GHG emissions is estimated at less than 0.02%.

In April 2016 Tajikistan signed Paris Agreement. Although currently Tajikistan's contribution to global GHG emissions is very small, Tajikistan is highly vulnerable to the impacts of climate change.

Convention for the Protection of the Ozone Layer and Protocol on Substances that Deplete the Ozone Layer

Tajikistan acceded to the Vienna Convention for the Protection of the Ozone Layer in 1996, the Montreal Protocol on Substances that Deplete the Ozone Layer in 1998 and the Copenhagen, Montreal and Beijing Amendments in 2009. The National Program to Eliminate the Use of Ozone Depleting Substances (2002) and the National Strategy to Reduce the Consumption of Ozone Depleting Substances for 2015-2020 (2015) were adopted to enforce the terms of the Convention and the Protocol. In 2014, the National Ozone Center was established to support activities under these agreements.

Tajikistan supports the 2016 Kigali amendment to the Protocol regarding restrictions on the use of CFCs that do not have ozone-depleting properties, but in some cases have enhanced global warming characteristics, and the use of other substances such as propane, butane, ammonia and pentane instead. This means taking action in the manufacturing sector, where HCFCs are used as cleaning fluids, foaming agents and in refrigerants.

Convention on Persistent Organic Pollutants

Tajikistan ratified the Stockholm Convention on Persistent Organic Pollutants in 2007. The National Implementation Plan (NIP) was adopted in 2007. The National Center, which is part of the Committee on Environmental Protection, is responsible for fulfilling the obligations of the Stockholm Convention.

3.5 **Access to climate finance**

Analysis of adopted documents, both at the national and sectoral levels, shows that not all of the adopted strategies and programs are supported by the necessary financial resources aimed at reducing the impact of climate change.

Various sources of financing are needed to address climate change, including national and international, as well as public and private funds.

In addition to international climate funds, there are important adaptation projects supported through official bilateral development assistance.

In addition to these projects, the Government of Tajikistan has also received funding for adaptation and mitigation projects from international climate funds: the Global Environment Facility (GEF), the Climate Investment Fund (CIF) and the Green Climate Fund.

PPCR stands out among all the others as one of the large sources of funding, which receives a significant share of its co-financing from the state budget of the Government of Tajikistan. This is a very important element that can be used to convince donors to finance investment projects included in the GCF.

Pilot program on climate resilience

Since 2010, Tajikistan participates in the Pilot Program on Adaptation to Climate Change (PPCR) funded under the Climate Investment Funds. The program assists developing countries to integrate climate change adaptation and mitigation into national development plans. A number of projects are currently being implemented to finance climate change adaptation initiatives (such as "Environmentally Sustainable Land Use and Livelihoods in Rural Areas", "Crop Loss Reduction and Agricultural Diversification" and "Improving Drinking Water Supply in Urban Areas"). The PPCR in Tajikistan covers six priority investment areas, of which four are air-related: i) capacity building for climate resilience and adaptation; ii) improved delivery of meteorological, climate and hydrological services; iii) development of a climate science and modeling program; and iv) strengthening climate resilience in the energy sector.

Interaction with the Green Climate Fund

In order to implement National Plans with regard to sustainable development, the Government has appointed the Committee on Environmental Protection as the Designated National Authority (DNA) for the Green Climate Fund (GCF). A working group of representatives of key ministries was established to review and approve national project proposals to the GCF through the DNA. Tajikistan has initiated a program to prepare for climate finance, this initiative has allowed a positive interaction with the Secretariat of the GCF and established mechanisms for review and development of integrated investment projects that take into account the priorities of existing national strategies and programs, and assess their suitability for financing through the GCF. The DNA of the Republic of Tajikistan together with the accredited agencies under the GCF reviewed and approved five investment projects, which in turn received approval from the GCF.

Projects approved by the GCF:

- ✓ Institutional Development of the State Agency on Hydrometeorology of Tajikistan – ADB
- ✓ Enhancing Climate Resilience in Hydropower (Kairokum HPP) – EBRD
- ✓ Building climate resilience of vulnerable and food insecure communities through capacity building and livelihood diversification in mountainous regions of Tajikistan – WFP
- ✓ Aral Sea Basin Adaptation and Mitigation Program (CAMP4ASB), in Tajikistan and Uzbekistan – WB
- ✓ Enhancing Private Sector Climate Finance through Local Financial Institutions – EBRD.

4 FORECAST OF GREENHOUSE GAS EMISSIONS

Several scenarios were used to predict future greenhouse gas emissions. The first step was to identify macroeconomic and other general parameters that were used to determine the baseline scenario and mitigation scenario.

The second step was to formulate bottom-up models for each sector. The following industries are considered: 1) Energy; 2) Agriculture; 3) Forestry (LULUCF); 4) Transport; 5) Industry and construction. Estimates of greenhouse gas emissions have been integrated into common country scenarios, following a sectoral assessment.

To make forecasts of greenhouse gas emissions in the Republic of Tajikistan until 2030, three scenarios were formulated: basic, unconditional and conditional.

4.1 Baseline scenario

The average annual growth of GHG emissions in the baseline scenario is 3.90% for years 2017-2030. In the first part of the historical period (1990-2000), the average annual GHG emissions growth was -12.69%, motivated by the drastic structural changes of the collapse of the soviet era. In the second part of the historical period (2000-2016), the average annual growth of emissions was 4.29% according to the overall economic growth experienced in this time span. From 2017 to 2030 the annual GHG emission growth will stabilize at about 3%, without considering the impact of policies into the decoupling of GHG emissions and economic growth.

The assessment of the baseline scenario is a key methodological step for obtaining forecasts of the total volume of national greenhouse gas emissions. Other scenarios that take into account different degrees of policy implementation (Unconditional and Conditional scenarios) are calculated on the basis of the baseline scenario, taking into account the impact of climate change mitigation assessed for various climate change mitigation actions and identified mitigation options.

The baseline scenario is predicted based on available projections that explain the country's future context, such as GDP, population, or electricity demand.

The GHG emissions profile in the country remains relatively stable in the baseline scenario. According to the GDP forecast under the industrial scenario of the National Development Strategy, the contribution of agriculture to the total national emissions is decreasing, while emissions from energy and Industrial Processes are increasing their contribution. The contribution of the waste and LULUCF sectors is also somewhat reduced.

Emissions from the National GHG Emission Inventory (time series 2004-2016) are usually projected taking into account differences between activity data and emission factors in accordance with the 2006 IPCC baseline equation for calculating GHG emissions.

4.2 Unconditional scenario

The conditional scenario is estimated from the baseline scenario by considering the impact of unconditional mitigation actions. Unconditional mitigation actions impact future activity levels and future emission factors, as climate policies can derive in behavioral, technological, or socio-economic changes impacting future GHG emission trends.

The criteria for selecting mitigation actions to be considered under the unconditional scenario are the following:

- There are no overlaps between mitigation actions, avoiding double counting of emission reductions.
- The mitigation action has been assessed, and a likely mitigation reduction is available.
- As far as possible, the assessment of mitigation actions is consistent with the baseline scenario estimated and the GHG emission inventory used. This means that the same global warming potential and equivalent 2006 IPCC methodologies are used for assessing the impact of the actions.
- There might be unconditional mitigation actions identified in the sectoral assessments that have not been assessed in terms of potential GHG emission reductions. It is noted that not all mitigation actions can be estimated and considered in projections. The main reasons for this are the following:
    a. due to the nature of the mitigation action, it does not lead to direct GHG emission reductions (for instance, awareness campaigns, adaptation actions, or other mitigation actions which do not imply GHG emission reductions in inventory categories);
    b. lack of availability of data for assessing the impact of the action. It is common in the climate policy area to have aspirational policies which do not contain clear objectives or activities to be implemented. It is also common that such policies need time for developing an implementation strategy or action plan. For the purpose of this study, aspirational policies or mitigation actions which cannot be translated into real GHG emission reductions have not been considered;
    c. There might be scope issues hampering the assessment of impact (i.e. impact of mitigation actions is very small, well below the uncertainty threshold of projections). National policies and actions, as well as the interventions targeting big cities are covered. Nevertheless, there might be actions implemented in small towns or small-scale actions which are not considered under this study.

The implementation of unconditional mitigation actions reduces 1 672.39 Gg CO2-eq by 2030. Mitigation actions reduce mostly GHG emissions in category 3B - Land, 1A1 - energy industries, categories and 1A3 - Transport.

4.3 **Conditional scenario**

The conditional scenario is estimated from the unconditional scenario by considering the impact of additional mitigation actions that could be implemented if further international support is provided. Conditional mitigation actions have been identified by implementing partners in the NDC revision process and are reflected in the sectoral assessments developed for the NDC revision.

The criteria for selecting mitigation actions to be considered under the conditional scenario are the following:

- The mitigation actions are additional to those actions implemented under the conditional scenario. They are based in an analysis of the historical trends and likely impacts of current policies. Conditional interventions affect the areas with wider mitigation potential up to 2030 in Tajikistan.
- Conditional mitigation actions are mitigation options that could be implemented in future years. The scope of those options can differ, and the final impact will depend on the extent to which each action is implemented. For this study, the scope of the conditional

mitigation actions represents a likely mitigation impact of interventions, making assumption on their scope and objectives.

The implementation of conditional mitigation actions reduces 4 069.66 Gg CO2-eq by 2030, in addition to the 1 672.39 Gg CO2-eq reductions of unconditional mitigation actions.

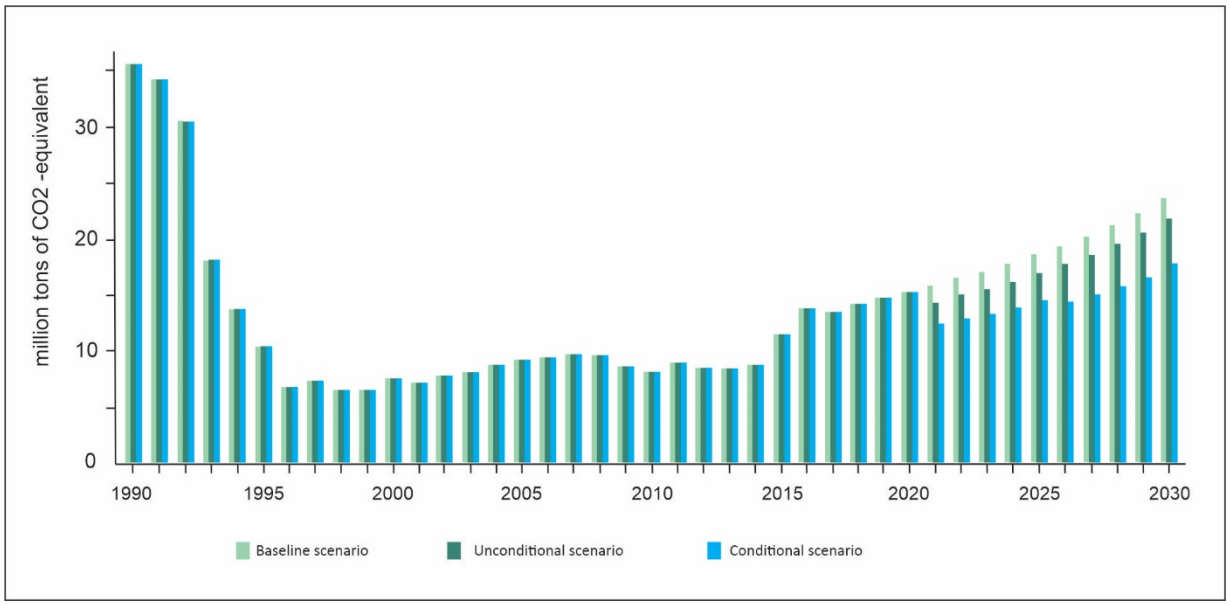


Fig. 4.1. Forecast of greenhouse gas emissions on different scenarios.

Mitigation actions reduce mostly GHG emissions in category 3B Land, 1A1 energy industries, categories 3A, 3B and 3C agriculture, and 1A4 Commercial/residential and institutional emissions.

Given the modest impact of climate change mitigation, Tajikistan will need to implement **additional climate change mitigation actions** to achieve its conditional NDC target.

Tajikistan is already making efforts to further reduce its GHG emissions in the future and plans to implement significant mitigation initiatives in the future. This refers to the Forest Sector Development Strategy, which has not yet been adopted, but has an estimated mitigation impact of 353 Gg CO2-eq. by 2030. This also applies to the commissioning of the Rogun HPP, which is under construction and is expected to be completed by 2026. The effect of this strategy and the commissioning of the Rogun HPP are included in the **unconditional scenario**, together with **additional actions to mitigate of climate change** with the potential to reduce greenhouse gas emissions. The implementation of all actions included in the **conditional scenario** will require significant international support, which will allow Tajikistan to significantly reduce its emissions by 2030, reaching its conditional target for NDC.

4.4 Analysis of factors and measures contributing to the reduction of greenhouse gas emissions in key sectors

According to the results of the assessments, the greatest potential for CC mitigation is in the **energy, residential, commercial, and industrial sectors** that produce the largest GHG emissions. Installed hydroelectric capacity limits current GHG emissions. Reduction of future GHG emissions in the energy sector depends on the reconstruction of existing HPPs and completion of the Rogun HPP with the added capacity of 3,600 MW, while limiting the need for fossil fuel production to meet the national electricity demand. The use of coal (anthracite) in these sectors is one of the largest sources of inventory emissions. Replacing coal-fired boilers, kitchens, and

furnaces with equivalent electrical appliances would significantly reduce emissions from these emission sources. In addition, energy efficiency measures could also be considered to reduce energy consumption in order to reduce this sector's contribution to national greenhouse gas emissions.

The transport sector makes a limited contribution to greenhouse gas emissions from the energy sector. However, the transport sector is an important sector for the country's development and should be considered as a key element of the CC mitigation strategy for the country. Continuing to upgrade public transportation infrastructure and creating incentives to encourage its use should be a priority for the country's climate change actions in the future.

In **the industrial sector**, aluminum production is one of Tajikistan's key industries and is highly energy intensive. Reducing the energy intensity of aluminum production by encouraging the practice of secondary aluminum production is another opportunity to significantly reduce greenhouse gas emissions in the energy sector. Promoting the best available technologies in the industry will reduce the energy consumption requirements of the industry, limiting its greenhouse gas emissions.

Emissions from **industrial processes and product use** are dominated by the contribution of the **cement industry**, where recent commissioning of cement plants has dramatically increased emissions. Measures to promote clinker reduction in cement would greatly reduce emissions as a key potential alternative to climate change mitigating for the country.

In **the waste sector**, Tajikistan is making significant efforts to improve its solid waste and wastewater management practices in line with the national policy framework. Expansion of solid waste management practices and reduction of open burning of waste in rural areas are identified as a key opportunity to reduce GHG emissions with significant co-benefits in terms of health and air quality. In addition, continued reconstruction of wastewater treatment facilities has also been identified as an appropriate climate change mitigation opportunity for the country.

The contribution of the **agriculture, forestry and other land use sectors** to the profile of greenhouse gas emissions is determined by more than 40% of total national emissions. Given its impact on the country's total greenhouse gas emissions and its prospects, this sector should be a priority in the country's efforts to climate change mitigate. In particular, the implementation of the Forest Sector Development Strategy for 2016-2030 and continuation of the Comprehensive Livestock Development Program, Pasture Development Program after 2020 and Seed Production Development Program of the Republic of Tajikistan are key to low-carbon development of the country.

The assignment identified climate change mitigation options with the greatest potential to reduce future GHG emissions, which include:

- ✓ Reduction of anthracite consumption in the residential, commercial, and institutional sectors with substitution for the use of hydropower energy. This action has a higher estimated IR mitigation potential of 1,929 Gg CO2-eq. by 2030.
- ✓ Encouraging a reduction in the clinker content of cement produced domestically. Reducing clinker production at national cement plants has an estimated climate change mitigation potential of 510 Gg CO2-eq. by 2030.
- ✓ Improved solid waste management practices. Consistent with national efforts to improve solid waste management practices, the waste management system could be extended to rural areas by reducing GHG emissions from open burning of waste. This mitigation action has an estimated climate change mitigation potential of 328 Gg CO2-eq. by 2030.
- ✓ Reduction of anthracite consumption in the residential, commercial and institutional sectors with replacement by the use of hydropower energy. This action has a higher

estimated climate change mitigation potential of 1,929 Gg CO2-eq. by 2030.

- ✓ Encouraging a reduction in the clinker content of cement produced domestically. Reducing clinker production at national cement plants has an estimated climate change mitigation potential of 510 Gg CO2-eq. by 2030.
- ✓ Improved solid waste management practices. Consistent with national efforts to improve solid waste management practices, the waste management system could be extended to rural areas by reducing GHG emissions from open burning of waste. This mitigation action has an estimated climate change mitigation potential of 328 Gg CO2-eq. by 2030.
- ✓ Increase removals by establishing new fruit orchards and vineyards in addition to those in the "Horticulture and Viticulture Development Program in the Republic of Tajikistan 2016-2020". This mitigation action has an estimated climate change mitigation potential of 125 Gg CO2-eq. by 2030.
- ✓ Agroforestry and/or grassland systems. This mitigation option relates to improving agroforestry and/or grassland systems by planting shrubs and trees on rangelands and agricultural lands. This mitigation action has an estimated climate change mitigation potential of 125 Gg CO2-eq. by 2030.

The implementation of identified key climate change mitigation options will allow Tajikistan to reduce its greenhouse gas emissions well below the conditional NDC target, contributing to achieving the goals of the Paris agreements and the UN Convention on Climate Change.

5 IMPACT OF CLIMATE CHANGE, VULNERABILITY AND ADAPTATION

5.1 Meteorological indicators of climate change in Tajikistan

Tajikistan ranks first among the countries of Europe and Central Asia in the calculated simplified index of vulnerability to climate change, being a particularly vulnerable country by this criterion due to its low adaptive capacity[12].

The high dependence of Tajikistan's climate-sensitive economic sectors is a factor that increases the country's vulnerability to climate change and extreme weather events. The low human, technical and institutional capacity to effectively mitigate and manage the risks and consequences of climate change makes it extremely difficult to implement measures to reduce vulnerability and increase the level of adaptability necessary to solve the climate problems hanging over the country. Projected climate change could not only reverse past development gains, but also plunge more people into extreme poverty as a result of declining crop yields, increased food costs and the spread of infectious diseases. Understanding at the state level the consequences and shocks caused by climate change is extremely important from the point of view of preparedness for climate change, but, more importantly, from the perspective of a deeper understanding of climate change and its impact on priority climate-dependent sectors of the economy that are crucial in the overall development of the country.

5.1.1 Temperature regime

Between 1940 and 2020, Tajikistan experienced a temperature increase of 0.1ºC-0.2ºC for each decade of that period. The number of days with temperatures of 40ºC and above is increasing The mountainous areas experienced an increase of 0.3ºC-0.5ºC, while the alpine zones experienced an increase of 0.2ºC-0.4ºC. Temperatures were 0.1ºC-1.1ºC higher on average in winter and 0.1ºC-1.3ºC higher in spring. Autumn temperatures in all mountainous areas exceeded the average by 0.6ºC-1.1ºC.

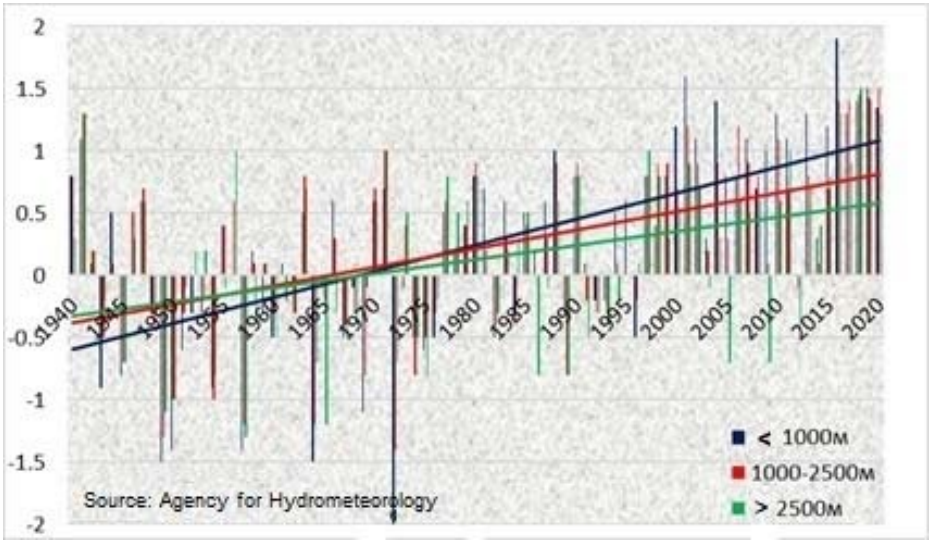


Fig. 5.1. Dynamics of changes in the average annual air temperature from the norm.

[12] Marianne Fay, Rachel Block and Jan Ebinger, Climate Change Adaptation in Eastern Europe and Central Asia, 2009. (Washington, World Bank, 2009).

Tajikistan has the highest percentage of mountainous areas in the region, occupying 93% of the country. More than half of Tajikistan's mountains are at elevations of 3,000 meters or higher. Data from 1940 to 2020 show that temperatures have increased in most areas of the country, including low-altitude (up to 1,000 m.a.s.l.) mountainous (1,000-2,500 m.a.s.l.) and high-altitude (above 2,500 m.a.s.l.) areas, but the extent of warming varies with geographic location and climatic factors. In the flat territory of Tajikistan, the average annual temperature increased by 0.1-0.2°C over the decade, with the largest increase of 0.5-0.8°C.

Below are the deviations of the average annual air temperature from the norm, where fluctuations and a continuing trend of an increase in the average temperature are clearly traced.

5.1.2 **Precipitation**

Annual precipitation varies by regions of the Republic of Tajikistan. Most of the plains and foothills, as well as areas of western Tajikistan are characterized by a course of annual precipitation with a minimum in the summer months. Maximum precipitation is in March-April in valleys and foothills and in April-May in highlands. This is explained by the fact that in spring the planetary altitude frontal zone is located over the territory of Central Asian plains, and later it shifts to the north-east. Annual precipitation fluctuations are largely related to changes in general atmospheric circulation and can be significant (Fig. 5.2.).

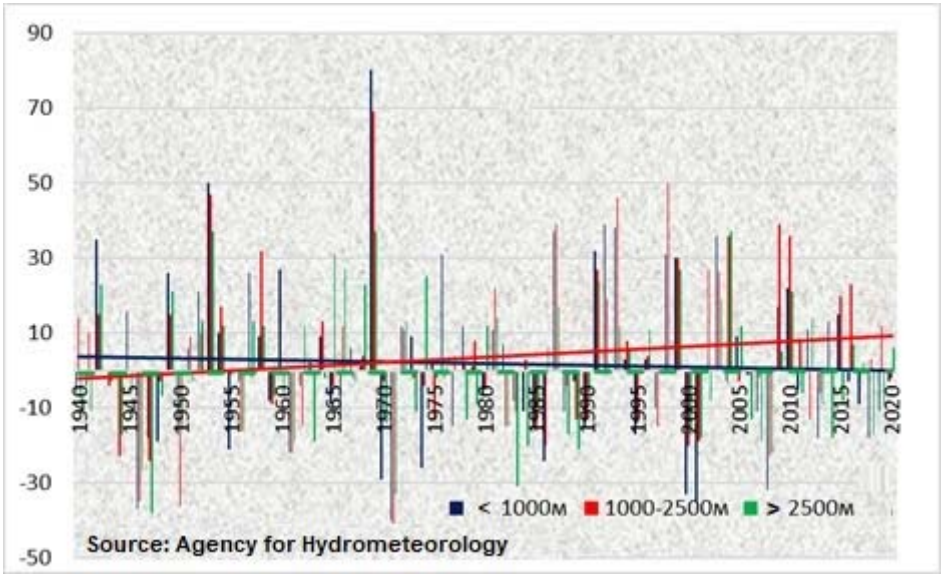


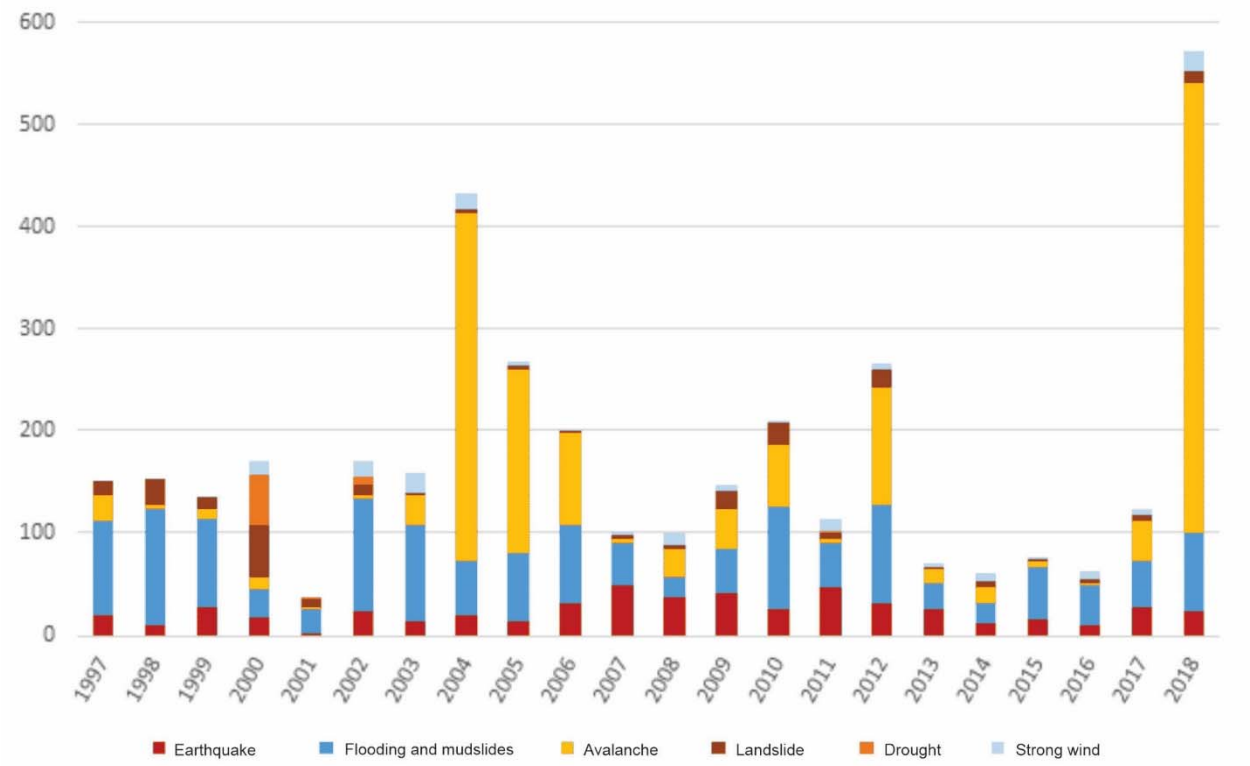
Fig. 5.2. Deviation of the accumulation of annual precipitation amounts in % from the norm.

In summer Tajikistan is located on the northern edge of the fore-Asian depression, at a significant distance from the planetary high-altitude frontal zone. The vast majority of fronts passing over the plain do not produce precipitation. In the mountainous areas, the rugged terrain activates the fronts, and cyclonic activity is also evident here in summer.

Dry climate zone covers valley areas of south-western and northern Tajikistan and high-mountain area of Eastern Pamir (75-300 mm of precipitation per year). In the territory located on the southern windward slopes of the Gissar range the wet climate zone (more than 1200 mm per year) is marked by spots. The rest of the territory belongs to the zone of insufficient moisture.

5.2 Climate change and extreme natural disasters in Tajikistan

Tajikistan is prone to natural disasters such as floods, avalanches, landslides, extreme temperatures and droughts, which are exacerbated by climate change. Such events damage and destroy land, crops, infrastructure, reducing sources of income and affecting the livelihoods of people, especially those living in rural areas. During the period 1997-2018, about 4,194 natural disasters occurred in Tajikistan. In particular, on average, one natural disaster occurred every two days. Mudflows are the most common (on average 70 situations per year) and the most dangerous (on average 35 deaths per year) type of disasters in Tajikistan. Avalanches rank second in these indicators (an average of 27 situations and 6 deaths per year) (Fig. 5.3). Total losses from natural disasters for the period 1997-2018 amounted to 589 million US dollars, or an average of more than 25 million US dollars per year. The largest financial losses - on average about $15 million per year - are associated with mudflows. The second most important source of financial losses are droughts ($5.4 million). Earthquakes should be noted in the third place in terms of financial damage (3.3 million US dollars).



Source: Committee on Emergency Situations and Civil Defense of the Republic of Tajikistan

Fig. 5.3. Dynamics of the spread of the most dangerous natural disasters in Tajikistan for 1997-2018

One of the priorities of the Sendai Framework Program for Disaster Risk Reduction for 2015-2030 is the preparation of national disaster risk reduction programs and strategies. On December 29, 2018, Tajikistan, in accordance with the new approaches of the world community to disaster risk issues, including climate change, set out in the Sendai Framework Program and the 2030 Sustainable Development Goals, adopted an updated National Strategy for Disaster Risk Reduction for 2019-2030, which is based on the experience gained during the implementation of the National Strategy for Disaster Risk Reduction for 2010-2015. One of the objectives of the updated Strategy is to conduct a risk assessment with an emphasis not only on hazards, but also on determining the level of vulnerability of the population to risks, determining the potential taking into account gender and age factors and available resources for management. In addition, in order

to reduce the level of vulnerability, the Strategy indicates the need to identify priority threats, risk factors, high-risk regions and the most vulnerable groups of the population.

The Strategy notes that the predicted changes in climate and weather conditions will cause more frequent mudslides and, paradoxically, droughts, as well as periods of abnormally hot weather and adverse weather conditions (for example, heavy hail that can destroy crops). To successfully respond to such impacts of climate change, it is necessary to improve early warning systems, existing risk management and reduction practices (for example, with regard to mudslides and droughts), as well as to develop new mitigation and adaptation methods, especially with regard to hot weather conditions and droughts.

5.3 **Review of the forecast of dynamics of the key indicators of climate to 2050 and 2100**

According to climate models, global temperatures will rise by an average of 5-5.8°C by 2100. This change will be the most extensive climate change that has ever occurred on our planet in at least the last 10,000 years. The magnitude and impacts of climate change, particularly at the regional level, have many uncertainties. Due to the lagging effect of the oceans, surface temperatures will not immediately respond to greenhouse gas emissions, so climate change will continue for many hundreds of years after atmospheric gas concentrations stabilize. Average sea levels are expected to rise by 2100, causing flooding of low-lying areas and other devastation. Other impacts include global increases in precipitation and changes in the severity and frequency of extreme events. Climate zones are likely to shift toward the poles and vertically, causing disruption to all kinds of ecosystems.

5.3.1 **Future Changes in Annual Precipitation and Air Temperature**

Figure 5.4. shows the change in mean annual precipitation and air temperature for the previous (1980-2010) and future (2010-2040, 2040-2070 and 2070-2100) periods for each sub-basin in the Vakhsh and Panj basins.

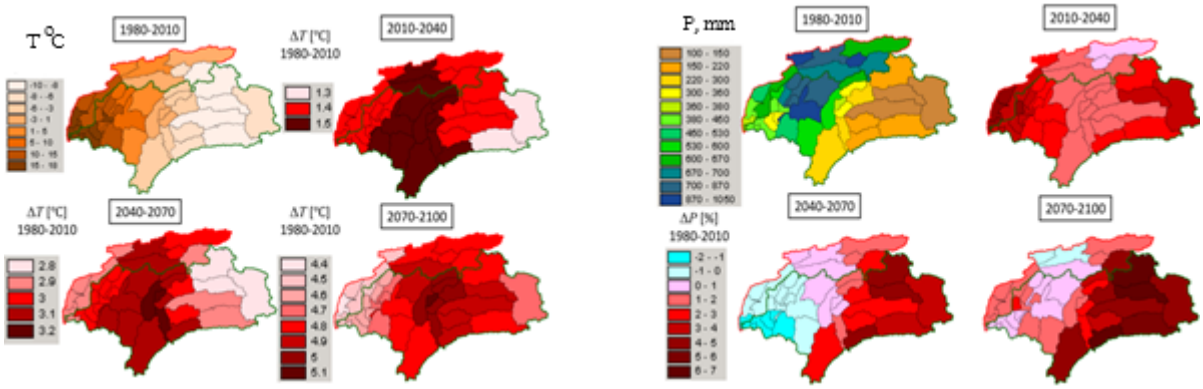


Fig.5.4. Changes in the Mean Annual Temperature (on the left) and Mean Annual Precipitation (on the right) between 1980-2010 and Future Decades in the Model Sub-Basins to 2100.

The average annual air temperature will increase in all sub-basins, especially in the central part of the basins of the Vakhsh and Panj rivers. It can be seen that the average annual precipitation will gradually increase, although some decrease is still noticeable in the lower part of the Vakhsh and Panj basins over the period 2010-2040. However, it should be noted that such changes in precipitation over the past and future periods are in the range from -2% to +7% and are very insignificant.

5.3.2 Scenarios of Temperature and Precipitation Changes in Tajikistan

Since the projections of GCMs in the modified scale have a daily resolution, it is possible to conduct a risk assessment of heat and cold waves for the future period.

In general, the maximum daily temperature (Fig. 5.5.) within each decade (heat wave magnitude) increases toward the end of the century, although there is also a simultaneous decrease between 2030 and 2040 in the Pamirs (GBAO). Particularly, the maximum daily air temperature in the lower reaches of the Vakhsh and Pyandj basins, Khatlon province, may increase by 6.3% by 2090-2100. Consequently, the risk of heat waves is likely to increase in the study area. In the future, the minimum daily air temperature may increase in many sub-basins along the Pyandj and Vakhsh river basins.

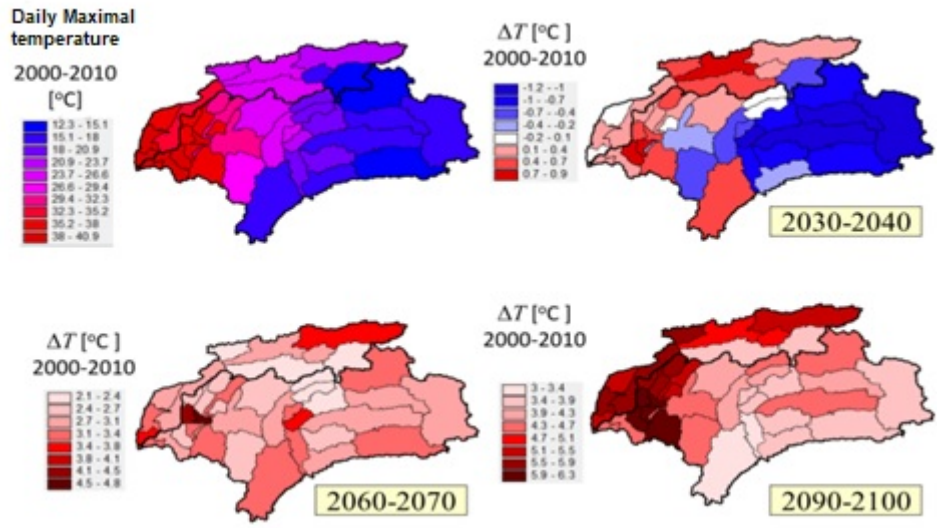


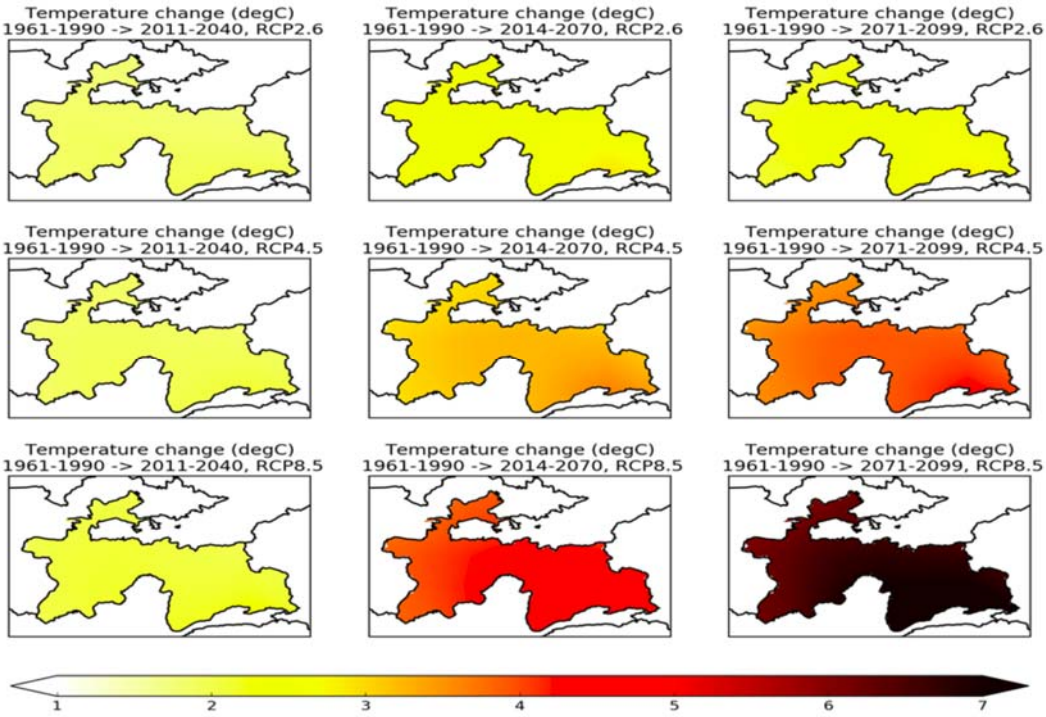
Fig. 5.5. Maximum daily air temperature changes between 2000-2010 and future decades.

According to preliminary forecasts, by 2050 the average annual precipitation will decrease by 5%. In general, winters will be drier and summers will be wetter, which can lead to both increased floods and droughts. In the period from December to February and from March to May, by 2050, precipitation is projected to decrease by 2% and 5%, respectively. In the period from June to August and from September to November, an increase in precipitation is predicted by 1% and 4%, respectively. The number of dry days by 2050 is expected to increase by about 3 days.

Thus, based on the analysis of global climate models, subjected to statistical scaling regarding the future state of the climate by 2100, we can conclude:

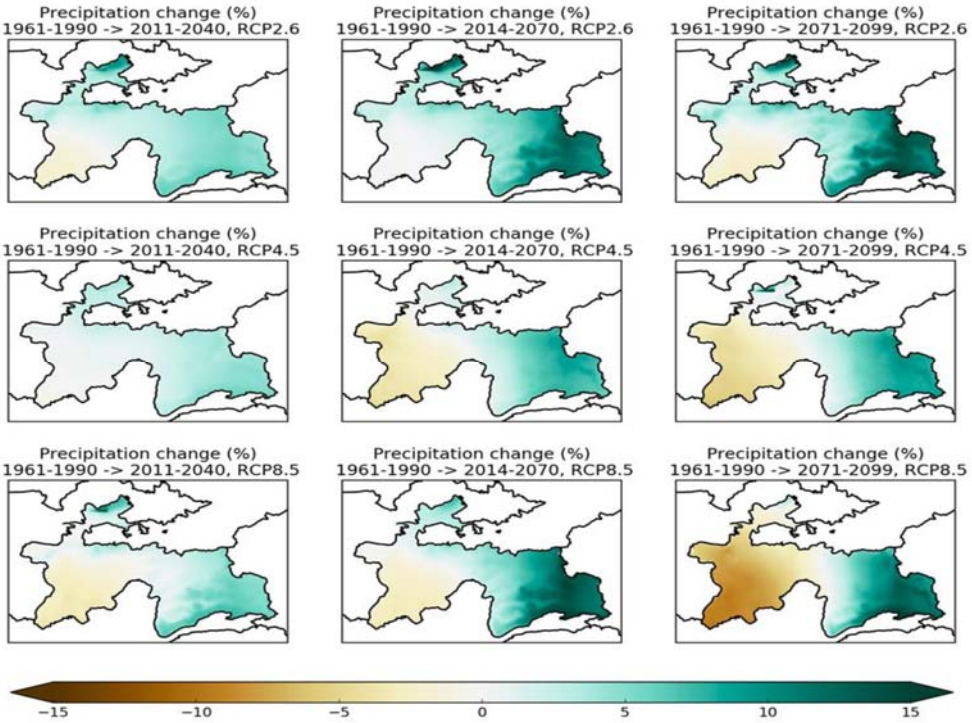
- Mean annual air temperatures are likely to increase from -0.6°C (2010) to 1.1°C (2050) in the Pyanj River Basin, from 3.5°C (2010) to 5.0°C (2050) in the Vakhsh River Basin, from -2.6°C (2010) to -0.9°C (2050) in the Pamir Glaciation Zone;
- Maximum and minimum daily air temperatures will increase;
- Average annual potential evapotranspiration is likely to increase as a result of higher air temperatures;
- Annual rainfall will increase and snowfall will decrease as a result of increased air temperature;
- Significant changes in mean monthly precipitation of rain and snow during winter and spring are probable;
- The frequency of days with some intense precipitation may increase slightly;
- The number of days with intense precipitation (e.g., 50-year storms) is likely to increase in many sub-basins along the Panj and Vakhsh river basins.

Averaged multi-model forecast of average annual temperature and precipitation changes in Tajikistan (in °C) for different future periods under different scenarios of global CO2 emissions are shown in Figures 5.6 and 5.7.



Source: *National Strategy for Adaptation to Climate Change of the Republic of Tajikistan for the period up to 2030*

Fig. 5.6. Climate change scenarios in Tajikistan: Temperature change.



Source: *National Strategy for Adaptation to Climate Change of the Republic of Tajikistan for the period up to 2030*

Fig. 5.7. Climate change scenarios in Tajikistan: Changes in precipitation.

5.3.3 **Glaciation forecasts in the Zeravshan, Vakhsh and Panj basins by 2050**

The Pamir-Alai Mountains are distinguished by an extensive glacial zone. The average contribution of runoff from glaciated areas in the main basins of the Pamirs and Gissaro-Alai to the total runoff for June-September in the basins of the Panj, Vakhsh and Zeravshan Rivers was found to be 41% (7.7 km^3), 44% (5.7 km^3), 43% (1.5 km^3) respectively during 1935-1989.

In 1957-1959, there were 4,287 glaciers in the river basins of the Hissar-Alai Mountains with a total area of 2,183.5 km^2. Between 1957 and 1980, 19% of the glaciers remained static, 4% advanced and 69% retreated in the Hissaro-Alai Mountains area.

In the Pamir, between 1957 and 1980, the glaciation area decreased by 10%. The ratio of advancing, static and retreating glaciers was 1.0: 0.7: 4.1.

There are 287 glaciers in the Fedchenko basin, of which those with an area of less than 1 km2 account for 90.6% of the total and occupy 4.1% of the basin area. In contrast, glaciers with an area of more than 5 km2 account for 2.1% of the total and occupy 90.7% of the basin glaciation area.

Assuming a temperature forecast of 2°C by 2050 using 60 m resolution digital elevation models (SRTM and ASTER), was predicts a 75.5% reduction in glacier volume in the Panj sub-basin and a 53% reduction in the Vakhsh sub-basin (Table 5.1).

Table 5.1. Estimated values of glaciation area and volume of glaciers in 2003 and 2050 and their variation for Panj and Vakhsh river basins (Wagner, S., Hoelzle M., 2010)

	Panj Basin	Vakhsh Basin
Area, 2003 (km^2)	3592	3399
Area, 2050 (km^2)	1160	1887
Contrast, 2003-2050 (km^2)	2432(67.7%)	1513(44.5%)
Volume, 2003 (km^3)	152-179	192-230
Volume, 2050 (km^3)	37-44	90-108
Contrast, 2003-2050 (km^3)	115-135 (75.5%)	102-122 (53%)

Table 5.2. shows the forecast attributes of glaciation in the Zeravshan and Fondarya basins resulting from climatic models of the MAGICC package that show a significant decrease in glaciation.

Table 5.2. Forecast of glaciation change by 2050 in the Zeravshan basin (Glazyrin, G., Finayev, A., 2003).

Model	ΔT, °C	ΔP, %	$Z_{ф.л}$, км	$F_{леди}$, $км^2$	N	$W_{лед}$, $км^3$/год	$W_{лед}$ / $W_б$, %
CCC-EQ	2,3	-5	4,38	220,1	361	0,3274	10,6
UK-TR	2,7	5	4,36	228,5	373	0,3477	10,9
GFDL-TR	2,0	1	4,32	254,7	408	0,4152	11,8
HadCM2	2,3	14	4,27	284,7	446	0,5020	12,7

dT - temperature change (°C); ΔP - relative change in precipitation (%); ZfL - firn line height (km); Fgln - glaciation area (km2); N - number of glaciers; W ice - glacial runoff volume (km3/year); W ice/Wb - glacial runoff share in total runoff (%)

Maximum reduction of glaciation is predicted by the CCC-EQ model whereby the height of the firm line increases by 260-330 m and the area of glaciation decreases from 50% in the Zeravshan basin.

Summarizing the above, it can be noted that:

- The predicted increase in temperature will lead to an increased risk of drought due to higher levels of evaporation and early melting of snow. For example, by the middle of the XXI century, in the densely populated Fergana Valley, precipitation is projected to increase by 10 mm, and evaporation by at least 70 mm.
- Glacial zones are projected to shrink by 15%-20% compared to the current level, while according to forecasts based on the current rate of glacier retreat, most of the small glaciers in Tajikistan may disappear completely in 30-40 years. The reduction in the number of glacial zones will have a significant impact on freshwater reserves in the Panj, Vakhsh and Zeravshan basins, which will further exacerbate tensions over the rights to use water resources, both inside and outside the state borders.
- The recently observed increases in river flows are unlikely to continue until the middle of the XXI century in the rivers of the Western and Eastern Pamirs (Panj River basin). In the absence of adequate preventive measures, as a result of climate change, the average temperature of the basin may rise from 0.7°C to 1.40°C - 3.0°C by the middle of the XXI century and the volume of glaciers may decrease by 50%-70%;
- Runoff in the Vakhsh River basin is projected to increase by the middle or at the end of the XXI century. The models also predict a 10%-20% decrease in the surface runoff of rivers. Moderate scenarios predict an increase in surface runoff by 5%-10% by the middle of the XXI century. In the Vakhsh River basin, the average annual temperature is projected to increase from 3.3°C in the middle to 6.9°C at the end of the XXI century.

5.4 **Vulnerable sectors to climate change in Tajikistan**

In the National Strategy of Adaptation to Climate Change of the Republic of Tajikistan for the period up to 2030, the following sectors were identified as the most susceptible to climate change: energy, water resources, agriculture and transport.

Energy. Tajikistan's energy sector is highly vulnerable to climate change and related extreme weather events. The vulnerability of this sector is of particular concern due to the high dependence on hydropower: more than 98% of electricity in Tajikistan is generated by hydroelectric power plants. Hydroelectric power plants account for 93.9% of the total installed capacity, while electricity generation is 16.5 billion. kilowatt-hours (kWh). Since most hydroelectric power plants were built decades ago, their actual capacity may decrease with increasing risks and impacts of climate change if their climate safety is not ensured. Climate-induced reduction in energy production at hydroelectric power plants can negatively affect both access to energy and its use, given the already existing restrictions.

Agricultural sector. Climate change is expected to have a serious impact on Tajikistan's agricultural sector. The changes in precipitation, temperature and risk described above are likely to lead to problems that can be divided into two broad categories: a decrease in agricultural productivity and an increase in the risk of natural disasters.

The decline in productivity associated with climate change will primarily be caused by a reduction

in water availability. Direct temperature stress for crops and livestock, as well as the associated increase in pest numbers, are also likely to play a role. Reducing water supply in the driest regions of the country can cause serious economic losses, especially for small farmers who are already experiencing the effects of climate change and related extreme weather events. The first factor in reducing water availability will be a decrease in precipitation in many parts of the country, which will lead to drought and a related decrease in yields and livestock production. Secondly, earlier and more intense melting of glaciers will affect the water cycle, which is likely to lead to increased flooding in the rainy season and longer droughts in the dry season. Finally, an expected temperature increase of 1.8-2.9°C by 2050, with a corresponding increase in evaporation rate, is expected to increase water demand by 20-30% during this time. Overall temperature increases in some parts of the country, combined with more frequent extreme temperatures, will also have a direct impact on agricultural systems in Tajikistan. As for animal husbandry systems, increased heat stress and heat-related mortality can dramatically reduce animal productivity. Heat stress can also affect pastures and crop production, potentially leading to pasture degradation and an increased risk of rapid crop failure caused by heat. Elevated temperatures can also lead to deterioration of crop quality and increased exposure to pests and diseases. Although a longer growing season and a decrease in the number of frosty days partially compensate for this decrease in productivity associated with temperature, the economic consequences are likely to remain negative for most farmers.

In May 2021, GIZ, in order to update the NDC, prepared the report "Analysis of the agricultural sector for the revision of the NDC", in which a brief overview of the main risks and consequences of climate change for the agricultural sector was compiled.

Table 5.3. Summary of the main risks and impacts of climate change for the agricultural sector

Trends and phenomena related to climate change	**Impact on agriculture**
Temperature rise above the norm	▪ Reduced productivity of agriculture and pastures; ▪ Invasive and harmful organisms; ▪ Crop losses due to insects, diseases, weeds; ▪ Heat stroke and related livestock mortality; ▪ An increase in the duration of the growing season (at the same time there is a danger of more frequent and intense heat waves); ▪ Reducing the number of days with frost will reduce the risk of damage to crops from frost (however, any resulting benefit may be negated by the risk caused by pests and diseases).
More frequent extreme temperatures	▪ More frequent and intense heat waves that dramatically damage crops and cause soil erosion; ▪ Loss of livelihood and income for the rural population; ▪ Food price increases at local and national levels.
Changes in precipitation, including extreme precipitation	▪ Reduction of crop yields and production, cultivation of perennial fruit trees and cattle breeding; ▪ Rapid damage to crops, soil erosion; ▪ Loss of livelihood and income in rural areas; ▪ Possible relocation from the lands; ▪ Increase in local and national food prices.
Droughts	▪ Rapid rates of crop damage, soil erosion; ▪ Growing demand for irrigation; ▪ Reduced yields of non-irrigated or irrigated crops; ▪ Loss of livelihood and income in rural areas; ▪ Possible relocation from the lands;

Trends and phenomena related to climate change	Impact on agriculture
	▪ Increase in local and national food prices.
The disappearance of glaciers and the reduction of water runoff	▪ Reduction of water availability and reserves; ▪ Reduced yields and production of agricultural crops, perennial fruit trees and livestock; ▪ Loss of livelihood and income in rural areas; ▪ Increase in local and national food prices.
Early or late frosts	▪ Reduction of yield and production of agricultural crops, perennial fruit trees and livestock; ▪ Loss of livelihood and income in rural areas; ▪ Increase in local and national food prices.
Dust storms	▪ Reduced yields and production of agricultural crops, perennial fruit trees and livestock; ▪ Loss of livelihood and income in rural areas; ▪ Increase in local and national food prices.

Source: *GIZ. 2021. Analysis of the agricultural sector for the revision of the NDC of Tajikistan"*

Water resources. The water sector is located at the junction of several key sectors, such as agriculture, healthcare, energy and infrastructure. Despite this, climate change adaptation planning in Tajikistan's water sector does not have an integrated and intersectoral nature. There is no consistency in sectoral plans regarding the rational use of water resources. There are serious gaps at many levels: systemic, organizational and individual, which need to be filled in order to ensure the sector's resilience to climate change. There are several adaptation options for the water sector that can, a) address existing gaps and meet adaptation needs, b) reduce the vulnerability of the water sector to climate change and extreme climate events, and c) strengthen the sector's adaptation to future climate change.

Transport. The transport sector may also be directly affected by the impacts of climate change due to infrastructure problems. Roads and railways will be subject to more frequent or severe flooding. Increased rainfall and flooding can accelerate the deterioration of road infrastructure (for example, wells due to the loss of hydraulic locks). In the highlands, melting permafrost can damage roads and bridges. Due to the increased temperature and solar radiation, asphalt can become brittle and crack, which will lead to temporary or permanent road closures.

Industry and construction. Tajikistan's industrial sector and especially mining activities are vulnerable to geological phenomena such as landslides, earthquakes and rockfalls, as well as hydrometeorological phenomena such as floods and mudslides. This also significantly affects the construction of housing in Tajikistan, which is often built independently. Therefore, it is important to strengthen the country's adaptation to natural disasters related to climate change.

Healthcare. Climate change can adversely affect human health by affecting social and environmental factors that determine the state of health - clean air, drinking water, adequate nutrition and safe housing. And even if the effects of climate change affect the entire population as a whole, some will suffer more from them than others. In particular, children, the elderly and people with pre-existing health problems and, consequently, less mobile, will be more exposed to climate change for a longer period of time. Climate change may lead to an increase in the number of malaria cases in the country, as the area of potential transmission of malaria may increase.

Education. The education sector is directly and indirectly affected by climate change. The damage caused to the educational infrastructure is one example of a direct impact. The destruction of schools and related infrastructure can lead to low attendance or the departure of children from

schools. Poor access to drinking water and heat, which is especially typical for rural areas, in extreme weather conditions can force children, especially girls, to search for these resources. The low level of education of girls in the long term will have an adverse impact on the vulnerability of the local population to climate change. The more people do not have access to early warning systems and opportunities in the labor market, the less likely the local population is to be prepared to respond to climate risks and impacts. According to the Agency for Statistics under the President of the Republic of Tajikistan, in 2018 there were 3,874 secondary schools in the country, of which 85% are in rural areas. The total number of secondary school students in Tajikistan is 1.9 million people, which exceeds 20% of the total population of the country, of which 74% are in rural areas most affected by climate change.

5.5 Prerequisites and aspects of the cross-sectoral climate change to adaptation ratio

Adaptation to climate change is essentially a local problem that requires strategies and mechanisms tailored to different contexts and initial adaptive capacity. There is no one-size-fits-all strategy for dealing with adaptation. However, in general terms, economic development is the best insurance against the negative impacts of climate change.

Overall, populations with adequate access to food, clean water, health care, and education are better equipped to withstand a variety of shocks, including those associated with climate change. Access to adequate resources that can be invested in adaptive capacity topped up with human and social capital defines how resilient countries and communities are in the face of changing and volatile climate conditions. In addition, access to technology and know-how plays an important role in building adaptive capacity.

"The "feasibility" of adaptation and mitigation options or actions within each system that together can curb 1.5°C warming in the context of sustainable development and poverty eradication efforts requires a rigorous scrutiny of many different factors. These factors include (i) the availability of sufficient natural systems and resources to support various transition options (a factor known as environmental feasibility); (ii) the degree of development and availability of required technologies (known as technological feasibility); (iii) economic conditions and impacts (known as economic feasibility); and (iv) to what effect on human behavior and health (known as social/cultural feasibility); and (v) types of institutional support needed, such as governance, institutional capacity and political support. Another factor (vi - known as geophysical feasibility) relates to the ability of physical systems to implement the option, such as whether it is geophysically feasible to implement large-scale afforestation consistent with 1.5°C. Promoting an enabling environment, such as finance, innovation, and behavioral change would reduce the barriers to choice, increase the likelihood of the required pace and scale of systemic change and hence increase the overall feasibility of curbing 1.5°C warming.

5.5.1 Agriculture

Tajikistan's bioclimatic potential is characterized by long warm spells, abundant water resources and fertile land. Land resources are limited, accounting for only 7 percent of the country's territory. Suitable areas for irrigation in the country are estimated at 1,570,000 hectares, of which 743,700 hectares had been reclaimed by 2011. With a population of 7.6 million, the per capita availability is 0.09 hectares, which is times less than in neighboring countries of the region. The country with abundant water resources faces a drastic shortage of irrigable land. Scarcity of irrigated area is caused by harsh terrain and geographical conditions. The shortage of irrigated land is due to difficult topographic and geographic conditions. Agricultural land accounts for 32.1 percent of the country's area (*Decree on the State Program for development of new and rehabilitation of*

previously abandoned agricultural areas in the Republic of Tajikistan for 2012-2020).

Comparative analysis of long-term development, population size and contemporary reclamation pace of new areas suggests that by 2025 a share of irrigated land will decrease to 0.08 hectares per capita. Given the salinization of parts of irrigated areas, inadmissible groundwater level, water scarcity in pumped irrigation areas, construction of urban, rural and industrial facilities at the expense of irrigated lands, per unit availability of irrigated area by 2025 can decrease to 0,06 hectare per capita. Food security relies not only on the total area of irrigated land, but also on its fertility. However, a share of necessary irrigated land in the country as a whole is not sufficient.

The Program will allow to attract 26690 hectares from which a new irrigated areas through development of 18890 hectares, including 3890 hectares of state-funded areas, 15000 hectares under state investment projects and 7800 hectares of returned to production areas. Notably, each hectare of new irrigated land, based on crops and zones will provide jobs for 4 to 8 people. On average, more than 160 thousand new jobs in rural areas of the country will be created as a result of the Program.

As follows from the speech of the Founder of Peace and National Unity, Leader of the Nation, President of Tajikistan, distinguished Emomali Rahmon at the Government meeting on socio-economic development of the country in the first quarter of 2021 in order to ensure sustainable development of the agricultural sector to date the Government has adopted a number of policies to support and stimulate dehkan farms, in place are also several sector-level programs, including the Horticulture and Viticulture Development Program of Tajikistan (2016-2020) and Comprehensive Livestock Development Program for 2018-2022, which allowed a significant surge in production, enhanced the consumption market and increased the export.

Planned adaptation actions to respond to climate change related risks should simultaneously meet other needs and comply with the development goals; such measures should not entail any conditions to increase vulnerability associated with climate change.

Over the last decade drought has become one of the pressing problems of the countries of the region. Drought is more prevalent in the southern regions of Tajikistan, which mainly related to the climatic properties of the area with low precipitation, relatively high temperatures and a significant number of days with air temperatures above +40°C, lack of dense irrigation networks, large reservoirs, forests and desert and semi-desert landscapes.

The most arid areas of the country include the Eastern Pamir, lowland areas of Sughd Region and southern Tajikistan. Annual precipitation is less than 100-200 mm here. Arid conditions prevail in summer in almost entire territory of the republic. Typically, mild droughts are recorded in isolated pockets, while severe and very severe droughts cover extensive areas. The UNDP assessment (2012) found that from the perspective of the population living in different regions and areas of the country, drought seems to have been the most devastating consequence of climate change in the present and future. As the climate warms, droughts in Tajikistan are likely to become more intense and frequent. (Fig. 5.8).

At present, to develop drought monitoring and early warning systems, the Agency for Hydrometeorology of the Committee for Environmental Protection under the Government of the Republic of Tajikistan is launching actions to implement automated control systems for meteorological and agrometeorological parameters of farmland and thereby set up a database for drought scenarios and forecasts in the agricultural areas of the country.

Fig. 5.8. Changes in the aridity index in Tajikistan by 2050 based on global circulation models.

Adaptation of agriculture to climate change should be an integral part of broader agricultural policy efforts to increase productivity and reduce the sector's vulnerability to external shocks. Similarly, policies for forest conservation and rehabilitation should be an essential part of broader development and poverty reduction strategies that include investments in economic diversification and human capital, job creation, as well as land reclamation, improved soil quality, and water management. That said, however, the role of "win-win" solutions should not be overestimated.

5.5.2 **Health and water security**

Adapting to the potential health impacts of climate change requires a broader cross-sectoral approach, since the health risks posed by climate change lie largely within the broader challenge of achieving actual sustainable development. In particular, the links between poverty and vulnerability to climate change are perhaps more evident in the health sector than anywhere else, underscoring the need to pursue development as a master strategy for climate change adaptation. Indeed, the most powerful determinant of vulnerability to health risks associated with climate change appears to be poverty. Thus, there is a common need for the health sector to engage more actively with other sectors in climate change adaptation as health is a complex issue. As malnutrition, for example, is already the strongest contributor to disease burden with the highest risks in this area, adaptation to climate-related health threats must encompass mitigating climate change impacts on crop productivity. Improved water management can have a direct impact on development opportunities, as it is not physical water scarcity but rather poor water management and lack of water rights that cause water-related tension and poverty. An even greater threat to existing unreliable water management systems is the increasingly volatile nature of water supplies stemming from both population growth and climate change, which calls for increased resilience in water management systems. Despite measures already in place to strengthen these systems in a number of developing countries, substantial public investments will be needed to achieve sustainable results.

5.5.3 **Urban environment**

Adaptation in cities requires long-term, forward-looking strategies that address the vulnerabilities associated with increased urbanization. Cities in developing countries are already under tremendous stress, and exacerbated climate change problems will likely require changes in the urban planning model. Short of any planning strategy or study of possible impacts, settlements often emerge in high-risk areas, such as riverbanks or unstable hillsides. While national policies

to guide and influence the development of the formal and informal sectors in these areas are vital, it is equally important to identify alternative areas of development in order to anticipate and shape the concept of the city, ensuring a sustained expansion of land for affordable housing. To prevent the emergence of informal settlements in areas that are not to be developed, certain governance structures and a strong institutional framework are needed with prospective and master plans for urban development supported by an appropriate organizational network. In many developing countries, this network is often weak or lacking.

Climate change adaptation should aim to reduce vulnerability to those factors that can exacerbate the most extreme weather events, thereby stressing the importance of increasing resilience to various hazards. Taking a long-term view of the problem implies that interventions should address climate change vulnerabilities in the context of accelerated urbanization. It involves, for example, changing urban legislation that deters land in urban ownership.

5.5.4 **Energy**

Hydropower production in Tajikistan is quite precarious due to the projected decline in water resources between 2025-2030 owing to rising temperatures and intensive glacier melting. All countries in the region have recognized the importance of improving energy efficiency and conservation and in 2015 signed the International Energy Charter, an international initiative to improve energy efficiency and compliance with environmental standards and other principles of sustainable energy development, which requires participating states to formulate national energy efficiency policy goals and strategies.

The countries' energy policies are already aimed at finding opportunities for technical modernization of energy supply systems, increasing energy efficiency and implementing renewable energy systems, and improving the energy efficiency of residential buildings in remote and sparsely populated areas.

In the context of Tajikistan, to ensure energy independence, reduce the vulnerability of hydropower to extreme events and long-term consequences, reduce the carbon footprint and optimize the use of fuel-energy resources following steps can be taken:

- Building hydropower capacity and increasing the reliability factor given the climate change impacts (increased maximum floods or reduced runoff);
- Constructing new generating facilities and upgrading existing equipment to cover shortages of electricity
- Constructing small HPPs and scaling-up development of other renewable energy sources in high mountainous, hard-to-reach and rural areas;
- Securing a reliable power supply in rural areas, including for water supply;
- Constructing new transmission lines both within the country to increase access to energy, and outside to export hydroelectric power, diversify the fuel and energy balance through the use of local fuels and renewable energy sources
- Modernization of the energy capacities and restoration of the centralized heating system
- Extending the life of existing reservoirs, construction and renovation of hydropower plants and dams given the climate change impact on water resources and peak flow rates in rivers;
- Reducing energy intensity of the economy; improving energy efficiency and energy saving in the energy sector, industry, construction sector, agriculture and residential sector;
- Encouraging the use of gas fuel (liquefied) in transportation;
- Improving the heat and electricity control and metering system.

5.5.5 **Water resources**

Drought or water scarcity can affect water quality as reduced river flows during drought lead to a shortage to dilute wastewater and sewage loads. This increases the risk of concentrations of pathogens, which can cause more infections to spread. Rising summer temperatures lead to increased demand for drinking water, greater pressure on groundwater, and a reduced groundwater recharge.

Ongoing and planned water projects amount to about $258 million. The projects focus mainly on water supply and irrigation (81 percent, or $210 million) and irrigation and water governance (19 percent, or $49 million) (Figure 5-46). High-impact investments include climate change resilience projects, such as flood and mudflow control infrastructure to address climate change, as well as irrigation and drainage infrastructure. For example, the World Bank-funded Zarafshan River Basin Irrigation Modernization and Drainage Management Project aims to improve water management and irrigation in the northern part of the country. These projects are expected to raise crop yields and improve food security for local residents.

Significant amounts of water resources in the region are replenished by melting glaciers and snow pack. The Syr Darya River, for example, is 46% replenished by melted snow and glacier runoff from the Pamir and Tien Shan mountain zones, and the Amu Darya River is 65%[13] replenished by glacier runoff. Such drastic changes in the glaciers are likely to have a significant impact on the availability and distribution of water resources in the region. Compared to 1980-1999, annual runoff in Central Asia could decrease by 12%[14] in 2030-2049. The Amu Darya River flow is predicted to decrease from 5% to 15% by 2050 and to 20% in 2100[15]. However, according to ADB studies, the annual flow of the Amu darya River in the areas of downstream countries may decrease by as much as 26-35% and the Syr darya River by 22-28%[16] by 2050. However, in some rivers formed by melting glaciers, the water flow will increase briefly before decreasing.

As the countries continue to grow economically and their populations continue to increase, Central Asia is closing in on a dwindling water supply and demand. Between 1960-2011, Central Asia's population grew from 24.4 million to over 60 million[17]. Increasing populations will require additional water resources and put more pressure on water supply systems. It is also expected that by 2050 the unmet demand for water from the Syr Darya and Amu Darya basins will reach 13,700 Mm3 and 29,400 Mm3, respectively, which is approximately 35-50% of total water demand. It would all happen due to the impact of high water demand, rising temperatures, increased evaporation and lower inflow[18].

Key adaptation actions envisaged in Tajikistan:

- Water resource management in the irrigation system, including drip irrigation and irrigation by spraying is improved;
- Actions to improve efficiency of water resources are developed and implemented;

[13] ADB, 2014. Climate Change and Sustainable Water Management in Central Asia. ADB Central and West Asia Working Paper Series. No. 5. May 2014. Asian Development Bank, Manila. https://www.adb.org/publications/climate-changeand-sustainable-water-management-central-asia

[14] Westphal, M. (2008). Summary of the Climate Science in the Europe and Central Asia Region: Historical Trends and Future Projections. The World Bank.

[15] http://www.meteo.tj/files/doc/SNC_rus.pdf

[16] ADB, 2014. Climate Change and Sustainable Water Management in Central Asia. ADB Central and West Asia Working Paper Series. No. 5. May 2014. Asian Development Bank, Manila. https://www.adb.org/publications/climate-changeand-sustainable-water-management-central-asia

[17] http://www.zoinet.org/web/sites/default/files/publications/Central-Asia-Mountains-onepager-zoi-RU.pdf

[18] ADB, 2014.

- Drought and soil resistant crops cultivation is available (Tajikistan WNO, ref. in Oxfam, 2010);
- Water scarcity through improved water use efficiency, reuse, recycling, and demand management is eliminated;
- Capacity of the water users association (WUA) is improved and recommendations on effective water use practices are provided;
- Adaptation and planning tools for long-term hydropower generation to cope with constant changes in the availability of water and energy is increased;
- Rollout of a regional water distribution system or use of transboundary water resources for economic and environmental benefits is addressed;
- Water supply systems via a market-based framework are provided;
- -Water storage reservation systems and a pumping storage systems are in place.

5.5.6 **Biodiversity**

Climate change is increasingly becoming a factor that determines the future conditions of the region's ecosystems and increases environmental stress on sensitive flora and fauna. The mountains that tended to be covered by ice and permafrost until recently are experiencing ecosystem change. Drought and reduced flow in rivers significantly affect aquatic ecosystems and riparian areas. The areas exposed to locust invasions each year have expanded significantly. The probability of forest fires and the spread of forest plant diseases is growing. Certain crops fall short to adapt to the drier climate.

In the context of Tajikistan, a significant part of the population relies on the products and services of natural ecosystems. To increase the potential of adaptation in this area it is advisable to: encourage development of sustainable tourism, including ecotourism and agrotourism; build collections and database of genetic resources of rare and endangered forms and varieties of fruit and berry and melon crops, as well as local animal breeds; raise public awareness on conservation of agrobiodiversity and vulnerable ecosystems, including through thematic workshops, fairs and lectures.

5.6 **Climate finance and opportunities for cooperation**

Climate finance in Central Asia has increased markedly in recent years. The London-based Overseas Development Institute (ODI) and the Heinrich Böll Foundation Institute estimate that investments in climate change projects in the region amounted to over $278 million as of late June 2015 (Climate Funds Update 2015). The largest recipient by country in the region is Kazakhstan, with more than $164 million (Climate Funds Update 2015). Between 2009 and 2014, Kazakhstan benefited in excess of $160 million from multilateral funding. Kazakhstan received more than $160 million in multilateral funding between 2009 and 2014. Bilateral contracts brought in a total of $4.24 million. Multilateral projects were financed mainly by the Clean Technology Fund and GEF and aimed at mitigating climate change and reducing greenhouse gas emissions. Tajikistan is second in terms of financial indicators. Over the last five years, the country has been allocated about $80 million for climate change adaptation and mitigation. The largest investor in the $78 million grant was the PPACP, one of the Climate Investment Fund's (CIF) programs.

5.6.1 **Financing of adaptation and mitigation activities**

Tajikistan has been actively involved in strengthening adaptation measures in recent years, both at the international and regional levels.

Cooperation within the framework of the PPCR. Tajikistan was nominated by the PPCR expert group to participate in the Pilot Program on Adaptation to Climate Change (PPCR) in January 2009, and on the basis of this invitation, the Government of the Republic of Tajikistan confirmed its interest and readiness to participate in the PPCR in May 2009. Financing of the PPCR in Tajikistan was carried out through the following multilateral development banks (MDB): WB, ADB and EBRD. The World Bank was responsible for coordination between the MDB and the Government of Tajikistan. The implementation of the PPCR in Tajikistan consisted of two phases.

In the First Phase (I), a Country Climate Change Adaptation Program (CCCAP) was developed to support the country, including technical assistance for the preparation of the main investment program. The implementation of the Phase I of the PPCR lasted 12 months and ended in 2010. The grant proposal for Phase I of the PPCR includes 6 recommended activities with a total funding request of $1.5 million:

- Institutional analysis and assessment of needs for strengthening capacity to adapt to climate change;
- Strengthening Tajikistan's partnership on climate science and climate change impact modeling;
- Raising awareness on climate change in Tajikistan;
- Strengthening climate change adaptation measures in Tajikistan's energy sector;
- Analysis of approaches to sustainable land management in the context of climate change in Tajikistan;
- Analysis of the climate-sustainable river basin management approach.

In 2010, the Second Phase (II) of the implementation of the PPCR began. The goal of Phase II of the PPCR was based on the CCCAP analysis to implement specific projects in the field of adaptation to climate change within the framework of Climate Investment Funds (CIF). The following projects on adaptation to climate change were approved within the framework of Multilateral Development Banks:

- Improvement of hydrometeorological services in the Republic of Tajikistan (WB – US$13 million);
- Capacity-building for climate change adaptation (ADB – US$ 6 million);
- Improving the resilience of the Kairakkum HPP to climate change (EBRD – US$ 59 million);
- Project on Environmentally Sustainable Land use and Life Support in Rural Areas - ELMARL (WB, GEF – US$ 19 million);
- Climate finance for small businesses (EBRD – US$ 13 million);
- Adaptation to climate change in the Panj River Basin (ADB – US$ 21.5 million).

The PPCR Secretariat and Coordination Mechanism were established to coordinate and monitor the PPCR projects.

Cooperation with the Green Climate Fund (GCF). The experience of successful implementation of the PPCR has contributed to Tajikistan in cooperation with the GCF. Based on the procedures of the GCF, the Committee on Environmental Protection was appointed by a Government decree as the National Authorized Body (NAB) in the GCF. A coordination mechanism has been created for successful impact with the GCF. The coordination mechanism ensures the systematization of coordination in the country and the involvement of various stakeholders in the implementation of activities in Tajikistan funded by the GCF. The coordination mechanism includes three main bodies: the Government of the Republic of Tajikistan, NAB, and a Technical Group of Experts. The mechanism also provides for the possibility of attracting additional technical experts if necessary. One of their main functions of the coordination mechanism is to ensure that project

proposals comply with Tajikistan's national strategies in the field of adaptation to climate change. Due to the successful work of the NAB and the technical working group with development partners accredited in Tajikistan, five projects aimed at adaptation measures totaling more than $100 million have been approved, aimed at ensuring food security, increasing the sustainability of the energy sector, improving the services of the hydrometeorology system, climate financing of small businesses and the development of a National Adaptation Plan. In 2019, Tajikistan provided the Country Program for the Green Climate Fund.

Cooperation with the Adaptation Fund (AF). Tajikistan does not have much experience of cooperation with the AF, despite this, in 2020, with the assistance of UNDP, a grant was allocated for the implementation of the project "Integrated landscape approach to improving the climate resilience of small farmers and pastoralists".

Bilateral cooperation. Tajikistan also cooperates on climate change adaptation on a bilateral basis with the World Bank, ADB, EBRD, IB, GEF, IFAD, DFID, GIZ. Although this cooperation within the framework of investment projects as a whole does not fully cover the issues of adaptation to change, but many components have an adaptation direction. For example, the German Development Bank, with the cooperation of GIZ, implemented a $9 million project "Adaptation to climate change through sustainable forestry in the main waters of Tajikistan". IFAD implemented three projects in Tajikistan aimed at the development of animal husbandry and pastures, as well as support for rural communities totaling more than $45 million, of which more than 50% of financial resources were directed to adaptation measures to climate change. The components of the World Bank and ADB projects aimed at improving the irrigation system based on basin management are also adaptation measures.

Regional cooperation. Tajikistan participates in cooperation between the Central Asian countries within the framework of the *International Fund for Saving the Aral Sea (IFAS) and its two commissions: the Interstate Coordinating Water Management Commission (ICWC) and the Interstate Commission for Sustainable Development (ICSD)*.

The International Fund for Saving the Aral Sea (IFAS) serves as a political basis for discussing and solving regional environmental problems and is the only regional organization whose members are all five Central Asian countries. The IFAS Executive Committee works alternately in the capitals of the participating countries. Since 2020, the IFAS Executive Committee has started its activities in Dushanbe. The IFAS Program for the Aral Sea Basin reviewed and approved by the countries is a long-term action program for the sustainable development of the region and takes into account the problem of climate change. The organization has launched a regional climate assessment and funded research on glaciers, but until recently its efforts to secure financial support from international donors in the field of climate change have been passive rather than active.

In 2015, the World Bank and IFAS reached an agreement on the joint implementation of regional climate change program for the Aral Sea basin. Currently, the regional project "Program for Adaptation to Climate Change and mitigation of its consequences for the Aral Sea Basin - CAMP4ASB" is being implemented within the framework of the CEP of Tajikistan.

All Central Asian countries have appropriate institutions and focal points to fulfill their obligations under the UNFCC Convention. Kazakhstan, Kyrgyzstan and Tajikistan have specialized departments and centers on climate change issues working with national and international partners.

Several regional centers have been established in Central Asia to promote cooperation in the field of environmental protection, water resources and climate. The Regional Environmental Center for Central Asia (CAREC) in Almaty (Kazakhstan) works with governmental and non-governmental partners, maintains national offices in each country and implements climate change projects throughout the region. There is a CAREC branch in Tajikistan. Other regional centers located in

Kazakhstan - on hydrology (within the framework of IFAS) and glaciers (within the framework of the UNESCO) - should collect and disseminate data and knowledge of regional scale and importance, but currently limit their activities to the subregional level.

The Regional Mountain Center for Central Asia (Bishkek, Kyrgyzstan) promotes cooperation in the field of protection of mountain ecosystems and currently pays special attention to the impact of climate change in mountainous areas and the exchange of experience on adaptation measures. The Central Asian Institute of Applied Earth Sciences (CAIAES), also located in Bishkek, actively cooperates with scientists from the region and foreign countries in assessing the risk of flooding due to the breakthrough of glacial lakes, monitoring global environmental changes in mountainous areas and other remote assessments. Other regional centers that are planned to be created are the Central Asian Disaster Response and Risk Reduction Center (Almaty), the Regional Drought Control Center (Tashkent) and the Regional Centers for Climate Change and Green Technologies (Ashgabat and Astana, respectively).

5.6.2 **The main priorities for adaptation to climate change**

Based on the targets formulated within the framework of the National Development Strategy 2030, the National Strategy on Adaptation to Climate Change, as well as taking into account the provisions of other fundamental documents, in particular, the Medium-term Development Program of the Republic of Tajikistan for the period 2021-2025, sectoral programs and strategies, research conducted by development partners, as well as consultations with specialists from key ministries and departments, long-term adaptation priorities were identified in order to implement them in the main sectors of the economy.

Table 5.4. Climate change adaptation priorities for key sectors

Sector	***Basic adaptation measures***
Energy	Develop short-term models to respond to the effects of extreme weather events. Development of cost-effective adaptation options to mitigate the effects of drought and energy impacts on GDP.
	Measures to ensure the safety of infrastructure: Raising the height of the dam, introducing additional bypass channels, regulating water discharge.
	Training of energy planning specialists in tools and methods for assessing climate risks and vulnerability.
	Revision of maintenance procedures and measures to improve the safety of transmission and distribution networks from extreme weather events.
	Promoting energy efficiency through demand management and promoting energy efficiency.
	Improving access to energy supply and energy security in rural areas (for example, through the expansion of the rural electrification program, energy-saving furnaces and the production of ethanol-based furnaces).
	Improvement of adaptation and planning tools for long-term hydroelectric power production, allowing to respond to constant changes in the reserves of water and energy resources.
	Promotion of energy-efficient industries.

	Construction of small hydroelectric power plants and extensive development of other renewable energy sources in remote mountainous and rural regions of the country.
	Strengthening the potential of hydropower and increasing the reliability factor taking into account the effects of climate change (increase in maximum floods or decrease in runoff)
	Commissioning of new generating capacities and modernization of existing equipment to fill the energy deficit;
	Extending the service life of existing reservoirs, construction and reconstruction of hydroelectric power plants and dams, taking into account the impact of climate change on water resources and peak water flow in rivers.
	Improving energy efficiency and energy conservation in the energy sector, industry, construction, agriculture and household sector
	Measures have been taken to stimulate the attractiveness of investment projects and initiatives of individuals and legal entities in the field of energy conservation, energy efficiency and the use of renewable energy sources;
	Production of electricity from other renewable energy sources (solar and wind) in mountainous and favorable areas;
	Development of an updated program for the development of renewable energy sources and the construction of small hydroelectric power plants for 2021-2025 (MDG Goal 7.2).
Water resources	Solving the problem of water scarcity in the future by improving the efficiency of water use, recycling, and demand management.
	Strengthening the capacity of the Water Use Association (WUAs) and developing guidelines for effective water use practices.
	Consideration of the possibility of creating a regional system for the allocation of water resources or the use of transboundary water resources to achieve economic and environmental results.
	Stricter regulation of wastewater treatment and discharge in order to preserve water quality and maintain its level
	Provision of backup systems for water storage and pumping storage generators.
	Improving the management of groundwater reserves
	Water distribution through market systems
	On the basis of vulnerability maps to dangerous climatic phenomena, notify vulnerable communities about floods and landslides, involve local communities in the creation of climate-safe facilities and zones, as well as provide technical and financial assistance.
	Wide application of the principles of integrated water resources management (IWRM)
	Introduction of water-saving technologies (drip irrigation, rain irrigation)
	Rehabilitation of irrigation systems and drains to improve the reclamation of saline lands and wetlands

	Improving the system of forecasting the flow of water resources and developing national measures for adaptation and resilience to climate change in the field of water management.
Agriculture and forestry	Promoting more effective soil protection, as well as the management of water and drainage systems.
	Improvement of pasture management system
	Introduction of knowledge about the diversity of crops and plant breeding, the transition to other crops, models and planting of plants.
	Creation of community-based seed banks, in particular for drought-resistant and disease-resistant crops
	Improvement of public and other storage systems for agricultural crops and food in order to reduce waste.
	Improving research and knowledge dissemination services by creating small mobile groups at the farm level to provide farmers with high-quality access to information, practical methods and technologies.
	Development of a crop insurance system against risks associated with climate change
	Development of forest plantations aimed at reducing the impact of winds, dust drilling rigs
	Creation of a reserve fund for insurance of the agricultural sector in case of emergencies and during climate change, improvement of existing and construction of new reserves for the storage of crop and livestock products
	Raising awareness and expanding access of rural populations, farmers and other agricultural organizations to information about climate change.
	Strengthening forestry, Agro-forestry, joint forestry management, conservation of natural resources and management skills
	Development of programs for interdepartmental joint activities aimed at reducing the vulnerability of the agricultural sector to the effects of climate change
	Improving the structure of seed farms and increasing their capacity and efficiency through consolidation in order to provide farms with high-quality reproductive seeds, plant and animal breeding;
	Increase the area of greenhouses, orchards and vineyards and increase the yield of agricultural products;
	Strengthening the implementation of forecasting policy taking into account climate change and the structure of the consumer market while preventing crop losses

	Development of action plans for adaptation to climate change in the agricultural sector at all levels, taking into account various agroecological conditions in Tajikistan
	Development of measures to improve the breeding structure of livestock
	Introduction of "green" technologies and "green" infrastructure in agro-industrial production.
Transport	Improving the protection and long-term maintenance of transport infrastructure
	Development of civil engineering and natural landscaping in order to prevent landslides on mountain slopes, roads and river banks.
	Implementation of best practices in the field of engineering standards and construction principles that ensure the stability of infrastructure to extreme temperature conditions, heavy rains and collapse.
	To carry out structural modernization of the existing transport infrastructure
	Protection of mountain road infrastructure from landslides that lead to road damage.
	Support in improving infrastructure and access roads in the country, in particular in dangerous and vulnerable areas.
	Adaptation of rail, road, air and all types of transport, including non-traditional and special modes of transport, to the requirements of international standards;
	Promoting incentives and regulations for fuel-efficient vehicles
	Consideration of climate impacts on bridge design or reinforcement
	Updating national building codes for bridge construction
	Improving the quality of pavement and design
	Capacity building and monitoring systems
	Creation of enterprises for the production and installation of electric vehicles (electric vehicles, electric vehicles, trolleybuses and electric locomotives);
	Placement of warning signs in high-risk areas on the roads
Industry and construction	Launch industrial production of solar panels and equipment at manufacturing plants using domestic raw materials (silicon raw materials) and thereby reduce the cost of electricity production from this source
	Create quality monitoring systems and collect current hydrometeorological and geotechnical data to track the evolution of water basins and assess the stability of slopes of critical mountain passes
	Introduction of rational models of consumption and production, "greening" of enterprises, development of sustainable infrastructure based on the implementation of "green" investment projects, tax and budget "green" reforms, financing of natural capital
	Equipping large enterprises with modern energy-saving and digital technologies;

	Creation of early warning systems to take protective measures and prevent damage and loss of infrastructure
	Development of industrial sectors of the national economy, taking into account the implementation of environmental protection and "green economy" measures,
	Development of a disaster risk management plan for industrial and construction facilities
	Development of a plan to improve rural housing construction
	Improvement of administrative procedures for obtaining construction permits
Intersectoral sphere	Raising awareness of climate change at all levels
	Development and implementation of an awareness-raising program on adaptation to the potential impacts of climate change on vulnerable sectors
	Improving the early warning system
	Strengthening the health of the cardiovascular and respiratory systems in people vulnerable to climate change and extreme weather events caused by it.
	Development of microfinance institutions aimed at the most vulnerable segments of the population
	Creating favorable conditions for the introduction of new technologies for climate change mitigation and disaster risk management
	Encouraging the appropriate use of meteorological information at all levels
	Preservation and expansion of green spaces in existing urban areas, as well as meeting the requirements for the creation of green spaces in new residential areas (SDG Goal 11)
	Develop gender-sensitive measures to enhance capacity in planning, management and awareness of the risks associated with climate change.
	Creation of new recreational areas within and around cities when adjusting master plans
	Integration of climate change response measures for mitigation, adaptation and early warning into regional development programmes.
	Development of curricula for secondary schools, secondary vocational and higher education institutions, including issues of climate change mitigation, adaptation and early warning of natural disasters.
	Development of a plan of measures to adapt and mitigate the effects of climate change and natural disaster risks in key sectors of the economy to attract investment from development partners and the private sector.
	Creation of a working group to make additions to strategies, programs, resolutions and programs of socio-economic development of cities and districts of the country on climate change and disaster risk management
	Appointment of persons responsible for coordinating issues related to climate change and disaster risk management in the relevant ministries and departments and increasing their capacity.

	Strengthening mechanisms for organizing regular professional development of employees of authorized bodies, civil servants on climate change adaptation and management;
	Organizing media campaigns on climate change and disaster risk management.
	Improving ecosystems and ecosystem services for rural communities in order to adapt to climate change.
	Improving the preparedness of the population to overcome the risks of natural disasters with a special focus on women, children and the most vulnerable (disabled and elderly) persons.

6 OTHER INFORMATION ON ACHIEVING THE GOALS OF THE CONVENTION

6.1 Gender issues in the context of climate change

Climate change affects everyone, however, this does not imply that everyone shares the same vulnerability to it. Some groups are more vulnerable than others. In fact, the impacts of climate change and adaptive capacity, for example, are not gender-neutral.

According to the annual report of the World Economic Forum, in 2017 Tajikistan ranked 95th out of 144 countries in the Global Gender Inequality Index with a score of 0.678, indicating limited progress since 2007, when the country's score was 0.658. While Tajikistan's estimates for the level of education (115th among 144 countries), as well as for health and life expectancy are relatively high (67th among 144 countries), the country ranks 52nd in the ranking of economic participation and opportunities (labor force participation, wage equality and the number of leading, professional and technical workers)[19].

6.2 Climate change in Tajikistan and its gender impacts

Tajikistan has adopted a number of normative legal documents on gender issues. Among them, the Law of the Republic of Tajikistan "On State guarantees of equality of men and women and equal opportunities for their implementation" adopted on December 15, 2004, the Family Code of the Republic of Tajikistan dated November 13, 1998, the Decree of the President of the Republic of Tajikistan "On measures to improve the status of women in society" dated December 3, 1999, the State Program "The main directions of state policy to ensure equal rights and opportunities for women and men in the Republic of Tajikistan for 2001-2010", the National Strategy to enhance the role of women in the Republic of Tajikistan for 2011-2020. Although the adopted regulatory documents do not mention the gender aspects of climate change, but they address the issues of adaptation measures aimed at reducing the impact of climate change.

The National Strategy for Enhancing the Role of Women in the Republic of Tajikistan for 2011-2020 proposes a number of adaptation measures that are also aimed at reducing the impact of climate change on women. When considering the issues of enhancing the employment of women and their role in the labor market, it is proposed to create and develop women's organizations engaged in the economic promotion of women, consider opportunities to train women with new skills and specialties.

Based on the fact that the majority of women, due to the high level of labor migration, are engaged in agriculture, which is most exposed to the risks of climate change, it is proposed to improve women's access to land resources, simplify women's access to loans, and teach new skills in agricultural production, including taking into account climate change. The strategy proposes to work to improve the educational level of women, especially those living in rural and remote areas, as well as in low-income families.

In the National Strategy of Adaptation to Climate Change in the Republic of Tajikistan for the period up to 2030, a special section is devoted to the issues of risks, impacts and adaptation measures related to climate change from a gender perspective. The Strategy lists some gaps that need to be overcome in order for the risks and impacts of climate change to be gender neutral in Tajikistan. The main problems of climate change from a gender perspective are considered at the systemic, organizational and individual level.

[19] National report on the implementation of the country's strategic documents in the context of the Sustainable Development Goals. Dushanbe 2018. https://www.medt.tj/

The issues of gender equality and climate change in ***the National Development Strategy of the Republic of Tajikistan for the period up to 2030*** are discussed in Chapter 4 "Human capital development". In this section, in particular, it is noted that Tajikistan has reached the position of middle-income countries in matters of gender equality. The section "Environment and life" notes that habitat pollution and the low level of ecosystem management, biodiversity conservation, land degradation, vulnerability to the effects of climate change, access to clean water and sanitation have become the main challenges facing the country. The strategy notes that the main problems for Tajikistan in recent years are the high risk of natural disasters, including due to climate change, from which, first of all, women and children suffer. In the field of providing incentives for environmental protection, reducing the impact of climate change, taking into account gender aspects, it is proposed to form and disseminate a code of nature protection, mechanisms for adaptation to climate change with the expansion of international cooperation in this direction.

Gender aspects of reducing vulnerability to risks of change in accordance with the Sendai Framework Program for Disaster Risk Reduction for 2015-2030 are considered in the goals, objectives and priorities in the updated ***National Strategy of the Republic of Tajikistan for Disaster Risk Reduction for 2019-2030***. Based on the new vision of the Sendai Program and its guiding principles, the Strategy defines new approaches to the role of women in disaster risk reduction, the importance of overcoming gender inequality along with disaster risk reduction, climate change and sustainable development. The Strategy notes that one of the problems of disaster risk reduction is the weak consideration of the gender factor, ignoring the fact that disasters have different impacts on men and women and, consequently, women and men have specific needs and vulnerability. At the same time, women are not only a vulnerable group, but also a valuable resource for reducing the risk of natural disasters. A gender approach should be implemented at all stages of disaster risk reduction, taking into account two mandatory areas.

The Medium-term Development Program of the Republic of Tajikistan for 2021-2025 includes specific tasks and indicators related to the gender aspects of climate change in Section 5.8. and the Matrix of Actions "Environment: Climate change and disaster Risk management". Thus, one of the gender indicators is to increase women's awareness of the risks of climate change from the base 15% to 35% in 2025. As an improvement of regulatory and legal documents that comply with international standards, the task has been set to develop gender-sensitive indicators for climate change and disaster risk management by 2022. Gender-sensitive indicators are also included in such sectors of the economy as agriculture, water resources and energy, social protection, education and health.

6.3 Review of research conducted in the country on issues related to the impact of climate change on women and the most vulnerable segments of the population

The 2016 Country Gender Assessment for Tajikistan was prepared by the Asian Development Bank as part of Regional Technical Assistance (RTA) 7563. The report addresses important gender issues such as women in power and leadership, civil society participation, economic opportunities for women and men, gender dynamics within the household, health issues, gender-based violence, access to justice, employment in agriculture, access to education and health care, energy resources, business development and transport.

As part of the Technical Assistance (TA) Project of the Asian Development Bank (ADB) – «TA8090-TAJ: Sociological studies on the level of awareness on climate change among the population of the Republic of Tajikistan[20] were conducted in five most exposed to climate change

[20] Report on the survey of the level of awareness of climate change among the population in the selected regions of the Republic of Tajikistan. The Kuhiston Foundation. August 2017.

pilot districts of the country in November 2015 and repeatedly in August 2017 by the NGO “KUHISTON Foundation". The research covered Penjikent district of Sughd, Muminabad and Khamadoni of Khatlon, Darvaz of GBAO and Lyakhsh of RRS. The study involved a quantitative method of interviewing (questionnaire survey). The survey sought information on: a) awareness on current climate change issues at the household level; b) knowledge of households on how to act in any given situation; c) current actions taken to combat climate change; d) household preparedness to respond to climate change in the long-run; e) use of communication to respond to climate change. Both surveys covered 375 respondents each (75 respondents in each district) with 61% male and 39% female respondents.

In September 2015, as part of Phase I-II of the UNDP-UNEP Poverty and Environment Initiative in Tajikistan (P&EI), a report was drafted on **Mainstreaming Gender and Environment in Tajikistan**[21]**:** A Baseline Study. This analysis is the first comprehensive study that examines a wide range of aspects of mainstreaming and promoting gender and environment. Section IV of this report focuses on the nexus between gender, environment and climate change in Tajikistan. This section contains information drawn mainly from the review of available documents. It is also supplemented with inserts containing information collected during semi-structured interviews with representatives of state authorities, civil society and mass media of Gonchi, J. Rasulov and Isfara districts of Sughd Oblast. In this section, gender aspects of access to water and water management and electricity, gender aspects of natural disaster risks management in correlation with climate change issues are reviewed.

In 2016, the Food and Agriculture Organization of the United Nations (FAO) prepared a country assessment of the **National Gender Profile of Agriculture and Rural Households in Tajikistan**. The document is part of the project "Strengthening National Capacity to Produce and Analyze Sex-Disaggregated Data under the FAO System of Gender Statistics in Agriculture (SGSA). Although the national gender profile does not directly address gender aspects of climate change, the statistical information for a set of 18 key gender indicators in agriculture and rural areas developed by the FAO Regional Office for Eastern Europe and Central Asia, is essential for identifying vulnerability and potential for climate change from a gender perspective. The analysis of data on women's access to education, health care, housing conditions, energy resources, safe drinking water and sanitation and transport system[22] is crucial in terms of climate change vulnerability in the national gender profile of agriculture.

In November 2014 the Center for sociological studies “Zerkalo” released a report on "**Gender Assessment of Humanitarian Situations**". It was based on the results of sociological research conducted in the disaster-affected communities in 2014. The overall objective of the study was to undertake gender assessment of humanitarian situations and disaster response in Tajikistan with a view to analyze its dimensions in the context of natural disasters experienced in April-May 2014 in Tajikistan.

Reflecting Gender Aspects of Climate Change in the National Communications of the Republic of Tajikistan under the UN Framework Convention on Climate Change. To date, Tajikistan has produced three National Communications of the RT on the UN Framework Convention on Climate Change. The first National Communication was drafted in 2002, the second in 2008 and the third in 2014.

[21] UNDP - UNEP. Actualization of the relationship between gender and the environment in Tajikistan: A study of the basic situation. Henrieta Martonakova, Zumrad Kataeva, September 2015.
[22] National gender profile of agriculture and rural households - Tajikistan. Food and Agriculture Organization of the United Nations. Ankara, 2016.

The First and Second National Communications are partially reviewed the gender aspects of climate change alongside the issues related to the climate change impact on public health.

In the Third National Communication, the gender aspects of climate change were considered in more detail in assessments of the vulnerability of women's reproductive health to climate change. Much attention in this report is paid to the issues of raising the level of education and awareness, especially of pregnant women, in connection with climate change.

6.4 An overview of other gender-related projects and programs

The projects are significantly different in scope. There are several large projects at the national level with a budget of more than USD 4 million. These projects include the EBRD's Small and Medium Enterprise Support Program (USD 14 million) and the DFID's Gender Enterprise and Markets Program (USD 3 million), USAID's Land Reform and Farm Reconstruction Program (USD 5 million) and the MasterCard Foundation's Rural Income Improvement through Savings and Financial Program (USD 4 million). Most program projects are ranked by budget of USD 1 million to USD 4 million. There are, however, a large number of smaller projects with budgets of less than USD 1 million, including many at the local level with funding of under USD 50,000.

While a range of programs target women only, particularly girls, rural women, women entrepreneurs and women- heads of Small and Medium Enterprises (SMEs), unemployed women, women farmers, etc., many of the other projects serving entrepreneurs address a broader group, such as people in remote mountain areas, the poor, the youth, etc. Under these more recent initiatives, women entrepreneurs or aspiring entrepreneurs have also benefited from access to the services provided.

Across sectors, the focus on rural women and women farmers has been carried out through a significant number of projects supporting women entrepreneurs in building an agricultural value chain. The cottage industry is also given a spotlight through two tailored projects and a number of projects that, while not sector-specific, have promoted women entrepreneurship in the crafts sector.

Another set of programs aims to promote reforms to improve the investment climate in Tajikistan. These programs include USAID's Land Reform and Farm Restructuring project and DFID's Business Regulation and Investment Policy in Tajikistan project. While the first project focuses on women, specifically on raising their legal awareness of land rights and the state's capacity to implement land reforms, the second project has a broader focus on improving the investment climate through research and policy analysis.

6.5 Gender-specific access to basic livelihoods in the context of SDG and Climate Change

In order to take adaptation measures to climate change, it is first necessary to determine women's access to basic livelihoods, taking into account the objectives of the Sustainable Development Goals and Climate Change.

Access to Education. In Tajikistan, the state guarantees general basic compulsory and free education in state educational establishments. To this end, efforts have been made to reduce the gap in the number of girls and boys, young women and men attending educational facilities. However, there is still a gap in education between boys and girls, and it gets worse after the 9th grade (by the end of the compulsory secondary education). In the 2017-2018 academic year, female students accounted for 35.2% of students of higher educational institutions (universities), and 59% of students in the secondary vocational education system.

Access to Healthcare System. The World Health Organization has identified climate change as the biggest global threat to human health in the 21st century. In many countries, women are particularly vulnerable to the effects of climate change. In recent years, investments in improving maternal health and fertility rates have led to a reduction in maternal mortality in general. The maternal mortality rate in the whole country for 2015-2019 decreased from 33.0 to 24.1 per 100 thousand live births. The COVID-19 pandemic has exacerbated the situation and created new health problems, jeopardizing the progress made.

Gender aspects of access to Land resources. The concept of access to land in Tajikistan has a specific legal significance. There is no private ownership of land, but people are entitled to a land use on a land-management basis. Land "ownership" refers to the rights to land use vested in individuals whose names appear on land certificates and licenses. Land relations are regulated by the Land Code of Tajikistan. The Code was amended in 2012, including a clause on ensuring equal access of women and men to land plots. While the majority of agricultural workers are women (75%), the number of dehkan farms headed by women is much lower than that of men. According to official statistics, women headed 19.2% of dehkan farms in 2017.

Table 6.1. Gender Aspects of Access to Land in Tajikistan[23]

Years	Number of dehkan farms	Proportion of dehkan farms headed by (%)	
		Men	Women
2010	37958	88,8	11,2
2011	57372	89,4	10,6
2012	73806	92,2	7,8
2013	87594	92,0	8,0
2014	108035	87,0	13,0
2015	123379	77,5	22,5
2016	145107	78,6	21,4
2017	164631	80,8	19,2

Access to pasture management. Based on some estimates, up to 80 percent of pastures are at risk of degradation and erosion, prompting high demand and competition in pasture use. One of the most important issues facing women is the limited recognition of the roles they play in animal husbandry or the ways in which these roles are allocated on the basis of gender. Since women tend to have less access to land, they are also more constrained in their access to pasture.

Access to forestry. The gender aspect in forestry has not been fully explored. Gender-disaggregated data on employment in leskhoz and other forest product management farms are limited and ambiguous, owing in part to the use of different research methodologies. Labor market statistics for 2018 suggest that the total number of people employed in "forestry" was 1,700, of which 200 (or 12 percent) were women[24].

Gender aspects of access to financial resources. The availability of financial resources is an essential condition for starting and running a small business, and although significant efforts have been made in Tajikistan to improve access to credit (with special attention paid to microcredit programs for women), women are still less likely to take out loans than men.

Gender aspects of access to water and water resources management. Access to clean drinking water is a prerequisite for everyone's life. Spending a significant amount of time taking care of the

[23] Gender indicators of the dehkan farms production for 2010-2017. Agency on Statistics under the President of Tajikistan.
[24] Labour Market 2018. Statistical Agency under the Government of RT.

household (cooking, cleaning) and farming, women and girls in rural areas are largely affected by the lack of clean drinking water

The access of the population of cities and districts of the country to drinking water increased from 48.6% in 2010 to 64.2% in 2020, including 95% in cities and 55.6% in rural areas. The rest of the population consumes water from other sources (springs, wells, irrigation ditches, canals, sediments, etc.) that do not meet sanitary requirements. This, in turn, leads to the spread of infectious diseases transmitted through water.

Despite the lack of an up-to-date and comprehensive set of relevant data, it can be said that women in Tajikistan are underrepresented in water resources management structures (such as Water User Associations), initiatives for the protection and rational use of drinking and irrigation water, training events on water resources management and other awareness-raising and capacity-building activities.

Recommendations

To promote the issues of the relationship between gender and climate change, the general level of understanding of gender inequality is clearly presented. In Tajikistan, as the results of the survey showed, there are two key factors that create a context for ongoing efforts to achieve gender equality: traditions and gender stereotypes adopted in relation to the role of women in the family and in society; as well as a large number of female-headed households due to large-scale labor migration of men.

Based on the findings of the review, to improve progress in promoting the gender and climate change nexus in Tajikistan it is expected to take the following actions.

Raising awareness and understanding of gender and climate change nexus in the development context;

- Initiate a study that provides evidence-based information on the relationship between gender and climate change, as well as the economic and social benefits of improving women's political and economic performance;
- Tailor and apply women's local knowledge, experiences and needs to identify gender-specific implications for addressing climate change threats and disasters;
- Develop and disseminate outreach and educational products (brochures, articles, videos, curricula) and conduct awareness-raising activities (e.g., lectures, seminars, companies) in partnership with media and NGOs;

Improving a system to promote gender and climate change nexus in development planning, budgeting, and implementation;

- Promote and facilitate better integration of a gender and climate change nexus into local development planning;
- Help to reflect men and women relationship with natural resources (land, water) in formulating gender-sensitive laws;
- Develop and promote gender-sensitive public and private financing schemes (e.g. taxes, subsidies, tariffs, grants, bank loans, micro-loans) for impact mitigation efforts;
- Improve funding for women's organizations and companies involved in mitigation and adaptation to climate change;

- Facilitate integration of gender and climate change nexus into international development assistance planning and implementation schemes;

Building capacity and providing opportunities for women to participate in sustainable socio-economic development in response to climate change;

- Strengthen women's capacity to better respond to environmental and climate risks and challenges (e.g., climate risk management trainings, early warnings);
- Promote women's representation and active participation in processes and institutions responsible for climate change, ecosystem and natural resource management (e.g., involving women in land, water, and other resource management structures, such as WUA and PUA (water and pasture user associations);
- Promote better representation of women in development planning processes (e.g., long-term and medium-term development strategies and sector strategies) using quota systems;
- Promote better representation of women in the management and implementation of state or donor-funded projects related to climate change.

7 FINANCIAL, TECHNICAL AND POTENTIAL CONSTRAINTS AND NEEDS

Tajikistan tops the estimated simplified climate change vulnerability index for Europe and Central Asia, being highly sensitive to this criterion due to its low adaptive capacity. Amid the worsening of existing problems and the emergence of new risks, climate change is likely to act as a barrier to Tajikistan's achievement of its development priorities.

The lack of **technological, financial and institutional capacities** to effectively mitigate and manage the risks and impacts of climate change seriously hampers efforts to reduce climate change vulnerability and build the resilience to cope with the impending climate challenges.

Successful climate change adaptation at the country level depends on several factors, such as **adaptation projects** involving national and local governments, development partners as well as the **mechanisms for effective funding** of key sectors of the economy.

7.1 Performance review to identify financial gaps, required technologies and capacity - building for Energy, Agriculture and Industry sectors

Strategic assessment of the programs adopted in Tajikistan following the signing and ratification of the Paris Agreement is indicative of the country's ambition to take the necessary policy measures towards reducing greenhouse gas emissions by way of implementing mitigation and adaptation actions. The key strategic documents adopted in the country on GHG emissions mitigation include the National Development Strategy of the Republic of Tajikistan to 2030, the National Climate Change Adaptation Strategy of the Republic of Tajikistan to 2030, approved by the Government of Tajikistan on October 2, 2019. Tajikistan has adopted a number of industry-specific programs and strategies that are also aimed at climate change mitigation and adaptation actions.

The global experience of climate change financing shows that political, financial and market instruments should work together to achieve common goals simultaneously. Political measures alone will not have an adequate impact on GHG emission mitigation unless an effective financial mechanism is in place.

What are the current financial gaps in introducing new technologies and capacity building in key economic sectors of Tajikistan to mitigate the impact of climate change and consequently reduce greenhouse gas emissions.

Agriculture. Above all, it will take major up-front investments to increase farmer productivity, build their capacity to adapt to climate change, and reduce the level of operational discharges. This will require significantly greater amounts of liquid capital and more **flexible financing terms**. To achieve this, however, funding is needed to finance the second track - promoting an enabling environment, including through flexible climate incentives and pricing policies for farmers who could improve their farm outputs and sustainable production practices as well as marketing and processing of their products. A vast majority of smallholder farmers with limited capacity to invest in productive activities that would improve their economic situation, productivity and incomes would benefit from a more conducive environment.

Energy. Domestic and external investments in the energy sector of Tajikistan dominate the investment portfolio, however there are some challenges in climate financing of the energy sector. It is mainly aimed at resolving large-scale projects in power generation, while the main problem rests with **introduction of new technologies in view of energy efficiency at the level of households, remote villages, small and medium businesses.**

Main constraints and impediments to the introduction of new technologies in the energy sector include:

- ✓ stark economic problems, leading to a shortage of both domestic and foreign investment;
- ✓ relatively high cost of specific equipment for implementation of renewable energy sources due to its small-scale manufacture.

***Industry*.** The sector's major problem is depreciation of fixed assets (up to 80%), which are physically and morally worn out and have become unsuitable for manufacturing products that meet modern requirements. These factors have become the main reason for higher production costs, raw materials and energy resources. Looking at the use of new technologies in industry in relation to GHG emissions, it is those industries that are the largest air polluters (cement and aluminum production).

Currently, a number of new market-based instruments and innovative financing mechanisms are being launched to attract direct investment in low-carbon technologies and approaches, and to reduce adaptation costs. Whether these instruments can create incentives for climate change mitigation and adaptation policies and measures is the focus of this section.

Based on a global experience, this section will look into a framework of sources of climate finance that can be used in Tajikistan to reduce the impact of climate change.

Table 7.1. Sources of funding for climate change mitigation and adaptation

Funding sauces	International sources	National and regional sources
Public sources	Green Climate Fund Adaptation Fund Global Environment Facility Trust Fund Special Climate Change Fund Multilateral Funds Bilateral funds	Discounts and subsidies Low interest loans Green economic incentives Reduced tax duties on imported technology
Private funds	Private investment funds Non-governmental organizations International charity foundations	National charity foundations
Market instruments	Market Certificates for Renewable Energy Quota trading mechanisms Environmental insurance Soft approaches (NAMA, etc.)	Market certificates for renewable energy National carbon projects

7.2 Development of an effective finance for Agriculture, Energy, Industrial processes and Waste to reduce GHG emissions

To develop a mechanism for the effective financing of agriculture, energy, industrial processes and waste sectors as a means of reducing GHG emissions, a list of GHG mitigation measures must first be in place. Effective financing of major sectors may not be fully targeted without a set of necessary mitigation measures.

Agriculture. According to the First Biennial Updated Report on Greenhouse Gas Inventory of Tajikistan under the UNFCCC on climate change, the agriculture sector is a key source of GHG emissions in Tajikistan. In 2014, CO2 equivalent GHG emissions in this sector accounted for about

half of all GHG emissions in the country. The main sources of emissions in the sector include: rice cultivation, intestine fermentation of animals, manure management, urine and nitrogen fertilizers application. Effective measures in agriculture to reduce GHGs are also related to these interventions and other components aimed at reducing climate change impacts.

Livestock sector though being the main source of GHGs, is also a critical area for the development of agriculture in Tajikistan. The share of livestock products in total agricultural production is over 30%. In 2013 - 2018, the volume of gross livestock production has increased by more than 40%.

Crop productivity largely depends on mineral and organic fertilizers. According to the Statistics Agency, in 2018, 124.3 kg of mineral fertilizers per hectare were introduced to plant crops, an increase of 38% compared to 1999 and 5.3% in 2013. Despite the increased number of livestock there is a decline of organic fertilizers used per 1 hectare of crops. So, in 2018, only 2.3 tons of organic fertilizers per 1 hectare of crops were applied, which is lower compared to 35% in 1999 and 45% in 2016.

Based on the above, effective financing of agriculture to reduce GHG emissions includes the following actions:

- Livestock projects that reduce emissions of methane or other greenhouse gases (for example, bioreactor manure removal and improved feeding techniques to reduce methane emissions).
- Agricultural projects that improve existing carbon pools, such as rangeland management, collection and use of bagasse, rice husks or other agricultural waste, reduced use of tillage practices that increase soil carbon content, rehabilitation of degraded land, etc.;
- Reducing non-CO2 emissions in agricultural practices and technologies (e.g., reducing fertilizer use);
- Developing highly efficient and environmentally friendly disposal systems, introducing technologies and equipment for anaerobic manure and poultry droppings collection, storage and processing systems using new and existing technologies;
- Mastering of ecologically safe high-efficiency and energy-saving technologies for utilization and management of agro-industrial waste;
- Production of biofuels, including biodiesel and bioethanol (as long as a net reduction in emissions can be demonstrated);
- The breeding structure of the livestock requires significant modifications. The number of cattle of local types must be reduced and switched to pedigree cattle breeding;
- The interests of sustainable pasture sector development require an integrated approach to different types of animal housing and, most of all, their stabling and pasture varieties, links between the pasture forage base and the forage base of stockbreeding, which relies on arable land and on irrigated cropland, in particular;
- Ensuring sustainable pasture management throughout the country by preparing pasture management plans and ensuring rotation in pasture use.

The review prepared by GIZ "Analysis of the agricultural sector for the revision of ONU in Tajikistan" concludes that when considering GHG reduction in agriculture, it is necessary to proceed from the effects of synergies and trade-offs between adaptation, mitigation and other types of sustainability.

Key issues to highlight:

- There are trade-offs between measures that improve food security, adaptation and achievement of national policy goals, and the goal of mitigating greenhouse gas emissions.
- Achieving sustainable low-emission agricultural development in Tajikistan depends on a balance between biomass and carbon sequestration by soil and increased emissions from nitrogen fertilizers and animal husbandry.

Energy. The second most significant sector of GHG emissions in Tajikistan is the Energy sector. In 2014, emissions in CO2 equivalent in this sector accounted for 28% of all emissions in the country. The major sources in this sector include: energy industries (heat and electricity production), manufacturing industries and construction, transport, other sectors, fugitive emissions from fuels.

Hydropower is the primary source of energy supply in Tajikistan; however, the country has significant untapped potential for hydropower and other types of renewable energy sources.

Tajikistan's energy resources include natural gas, petroleum products, and significant hydropower resources. There are also large coal reserves in the country, however, the coal- field mining is not taken up on a commercial scale as coal properties are located in remote mountainous areas. Tajikistan is expected to have to increase its coal consumption (especially for power generation in winter) due to its growing energy needs, and this will lead to increased GHG emissions.

Based on the current situation in the energy sector, the main efforts to reduce greenhouse gas emissions should be aimed at improving energy efficiency in the main sectors of the economy and the use of renewable energy sources:

- Improving energy efficiency in industry with the installation of more efficient equipment, changes in production technology, reduction of heat losses and/or increased utilization of waste heat and/or resource efficiency;
- Modernization of transmission lines or substations and/or distribution systems to reduce energy consumption and/or technical losses, including improved grid stability/reliability (in case of capacity expansion, only a share of investments that contribute to loss reduction is envisaged);
- Modernization of the thermal power plant converting from a more GHG-intensive to less GHG-intensive fuel;
- Implementation of high-quality architectural designs, energy-efficient appliances and equipment, and construction methods that reduce building power consumption, exceed available standards and meet high energy efficiency certifications or rating schemes;
- Modernization of existing buildings: architectural or construction modifications that reduce energy consumption;
- Improving energy efficiency in the utility sector by installing more efficient lighting or equipment, implementing efficient power consumption, loss reduction or resource efficiency;
- Renovation of district heating and cooling systems. Reduction of heat losses and/or increased utilization of waste heat;
- Widespread use of renewable energy sources and, above all, solar energy, solar

water heaters and other means of thermal utilization of solar energy across all sectors of the economy;

- Use of renewable energy resources in construction and housing and utilities sectors and rational waste heat management associated with power generating units.
- The collection and analysis of data about the energy use in households, by energy sources, technologies and applications (e.g., cooking, heating, lighting, etc.);
- To develop a comparative study on energy use in major industries (including the production of aluminium and cement) and transport in Tajikistan and also in the key sectors of agriculture and food industry;
- To conduct a cost-effective analysis of various power generation technologies adapted to the natural and economic conditions of Tajikistan, within the framework of the updated master plan of the energy sector.

Transport is a key factor in economic development, welfare, and quality of life; it also generates a significant share of GHG emissions (10% in Tajikistan). The railway network in Tajikistan, which could connect different parts of the country, is underdeveloped (mainly because of the mountainous terrain), and more than 90% of freight and passenger traffic is carried by road. The situation with urban public transport is unsatisfactory. The urban areas have a growing number of minibuses. While partially solving the problem of passenger transportation, they create other challenges: congestion and traffic jams, a safety hazard for passengers and pedestrians and increased GHG emissions. Under the baseline scenario, CO2 emissions projections for the transportation sector indicate an overall increase of 81.10% by 2030 compared to 2013, with the share of CO2 emissions from freight transport continuing to be higher.

Based on the above, the key measures to ensure effective financing of the transport sector aimed at reducing GHG emissions can be as follows:

- Conversion of vehicles to environmentally friendly fuels and the use of vehicles with high fuel efficiency in line with world standards;
- Adoption of certain measures for the rational use of fuel, partial or complete transition to other types of energy, or fuel or biofuel, as well as the transition to modern energy efficient transport, shifting from gasoline to liquefied gas, hybrid vehicles (gasoline/electricity), electric cars, etc.;
- Setting up collection and recycling facilities for scrapped vehicles and operating waste;
- Implementing a protective forest plantation (roadside) in the right-of-way along the roads;
- Changing modes of urban transport (Urban public transport, non-motorized transport, bicycles and pedestrian mobility);
- Integration of the transport and urban planning (mixed land use, pedestrian communities, transportation connectivity, etc.), which contributes to reducing the use of passenger cars;
- Rail transportation, ensuring the transfer of freight and/or passenger flows from road to rail (improvement of existing lines or construction of new lines, electrification of rail lines);

Industrial processes and product use. The second sector in terms of carbon dioxide emissions is Industrial Processes and Product Use (IPPU). CO2 emissions in the sector accounted for 24% of total emissions of this gas in 2014. The most important subsectors: cement and aluminum production. Assuming that GHG emissions in this sector are projected to early 2015, while coal mining has increased drastically since 2016, its important to design the GHG response interventions according to this development.

Thus, if statistically, 878 thousand tons of coal was produced in 2014, in 2019 it was over 2 million tons. According to the most conservative projections, the average annual coal production in 2030 could reach more than 4 million tons, which calls for additional measures to reduce GHG emissions. Same applies for cement production. If in 2014, according to the Statistics Agency, 1.15 million tons of cement was produced, in 2018 it made 3.84 million tons. According to projections, cement production by 2030 may reach more than 4 million tons annually. Based on the fact that GHG emissions in the Energy and Industry sectors are interrelated, some of the activities related to energy efficiency in the industrial sector have been noted above. In this section we mostly justified those measures that are primarily related to the cement and coal production, as major long-term sources of GHG emissions in Tajikistan.

The efforts to reduce emissions in cement and coal industry can be divided into the following categories:

- **New capacities:** Modern kilns and dry process technology can be far more energy efficient than older capacities;
- **Energy efficiency efforts:** a range of measures can be applied to improve plant performance, including preventive maintenance, new energy consumption monitoring systems, improved combustion processes in kilns, reduced heat loss/recovery, replacement of grate coolers and use of indirect heating;
- **Fuel consumption:** Different fuels can be used in cement production, including those derived from various wastes. Switching from coal to gas, for example, could reduce emissions by 18%, however, the use of natural gas in cement production is very rare, possible where gas subsidies have traditionally been available. A more prudent option is to use fuels from waste or biomass, which can reduce emissions by 5% or more, depending on the proportion of waste fuels and the type of fuel used;
- **Carbon capture and storage technology projects** that prevent the release of large amounts of CO2 into the atmosphere as a result of burning fossil fuels in power generation, as well as process emissions in other industries;
- Reducing GHG emissions from improved manufacturing processes and cleaner production (e.g., cement, chemical production), excluding carbon capture and storage);
- **Clinker replacement:** replacement of clinker materials can reduce emissions from both process and combustion, including blast furnace slag and fly ash. In practical terms, up to 30% of materials can be substituted, which would contribute to a 23% reduction in emissions;
- Opencast mining in Tajikistan dominates **coal mining**, with less methane emissions than closed mining. However, coal deposits in the country are uncommonly prone to methane emission. Therefore, this area can use methods normally used only in closed pit mining. These measures include the degassing of deposits prior to mining operations. Even if the gas is burned, emissions will be reduced by 95% (compared to blowing out). It is also possible to achieve emission reductions by using the captured methane as fuel for power generation.

Waste. The Waste sector accounts for 14% of greenhouse gas emissions. The sector estimates methane (CH4) and nitrous oxide (N2O) emissions in the following categories: Removal and disposal of municipal solid waste (MSW) in landfills / dumps; Treatment and discharge of

municipal and industrial wastewater into centralized sewage treatment plants (STP).

- Removal and disposal of solid household waste (SHW) at landfills.
- Purification and discharge of urban and industrial wastewater into centralized sewage treatment plants (STP).
- Part of the wastewater treatment that reduces methane emissions (only if GHG emission reductions can be demonstrated) must meet existing requirements, such as regulatory or safety requirements;
- Waste disposal projects that capture or incinerate methane emissions. Waste collection, recycling and disposal projects that recover or reuse materials and wastes as feedstock for new products or as a resource (only if a net reduction in emissions is evident);

7.3 **Assessment of financial resources needed to reduce GHG emissions**

Currently, the international community is developing a number of new political, market and financial instruments to attract direct investment in low-carbon and climate-sustainable technologies and approaches. In many ways, Tajikistan is a unique country for the clean development mechanism, in terms of its natural and climatic conditions.

According to information received from the State Committee for Investments and State Property Management of the Republic of Tajikistan and other sources of development partners for 2016-2020, the total amount of projects aimed at reducing the impact of climate change amounted to more than 3 billion US dollars. In 2016-2020, climate financing in the context of development for Tajikistan averaged US$ 600 million per year, which is three times higher than in 2010-2015.

Of the total amount of climate financing for 2016-2020, 72% were directed to climate change mitigation and 28% to adaptation. At the sector level, the share of climate finance aimed at mitigation in the energy sector is 86% and adaptation -14%, in the transport sector 72% and 28%, respectively, agriculture 41 and 59%, irrigation 42 and 58%, water supply and sanitation 61 and 39% and ecology/emergencies/waste 37 and 63%.

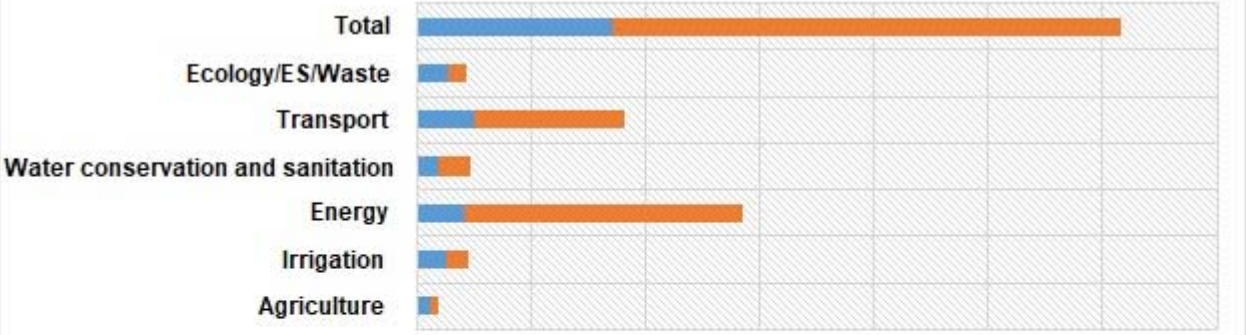
As in previous years, the main part of climate financing was directed to the development of the energy sector - 46.2% and the transport sector - 29.3%. The share of climate financing for water supply and sanitation is 7.4%, irrigation and irrigation - 7.3%, ecology, emergency and waste - 6.8% and agriculture - 3.0%.

Analysis of climate finance sources indicates that in recent years there has been an increase in the credit part of financing and a decrease in the pomegranate component compared to 2014-2015. In 2014-2015, the bulk of climate financing in the context of development for Tajikistan was provided in the form of grants (about 84%) through bilateral or multilateral channels[25].

According to the information received from the climate finance portfolio of the State Committee for Investments and State Property Management of the Republic of Tatarstan, the main contribution to reducing the impact of climate change is made by such international financial institutions as the ADB, the EBRD and the World Bank. Thus, the ADB accounts for 39% of the total amount of financing, the EBRD and the EC - 27.9%, the World Bank - 10.1%, the Islamic Development Bank - 6.1%, the International Fund for Agricultural Development -3.3%, the Government - 5.3% and other development partners - 8.3%. According to the direction, the EBRD and the EC account for more than 35% of the financing of the energy sector, 15% of the transport

[25] Financing of climate policy in Tajikistan. Country study. 2016 GREEN ACTION PROGRAMME.

sector, 45% of the water supply and sanitation system. ADB accounts for about 50% of the transport sector, 34% of the energy sector, 27% of water supply and sanitation systems, and 30.5% of ecology and emergencies. The World Bank mainly finances the irrigation and irrigation system - 36.1%, ecology and emergencies - 57%.



	Agriculture	Irrigation	Energy	Water conservation and sanitation	Transport	Ecology/ES/ Waste	Total
Adaptation	54444	128748	201653	87916	252263	130557	855581
Mitigation	37780	95149	1222191	140687	651619	78349.3	2225774

Source: Website of the State Committee for Investments and State Property Management of the Republic of Tajikistan https://investcom.tj/ru/invest/vneshnjaja-pomosch/102-investicionnye-proekty.html

Fig. 7.1. Climate finance portfolio for 2016-2020 (thousands of US dollars).

Capacity building. Tajikistan has gained some experience in recent years in building both human and organizational capacity to reduce the impact and adapt to climate change. One of the first programs aimed at capacity building is considered to be PPCR. Most of the objectives of this program were aimed at capacity building.

So, at the end of 2018, at the national level, representatives of all sectors of the economy participated in seminars and trainings, both inside and outside the country, on issues related to climate change. In 2018, more than 200 specialists took part in training seminars within the framework of the CDTA project "Increasing the capacity for adaptation to climate change" in the training centers of pilot districts and in Dushanbe. More than 100 specialists at the level of ministries and departments attended training courses organized by UNDP, GIZ and other international organizations in Tajikistan, and more than 30 people attended training courses in other countries.

Public organizations that are part of the TajCN Climate Network play an important role in capacity building in Tajikistan. Public organizations of this network are doing a lot of work to build capacity on climate change issues at the community level, educational institutions.

Table 7.2. Capacity-building measures under PPCR projects

Project name	Capacity building components
Capacity building for climate change adaptation (ADB)	• Development of a new curriculum “Introduction to the science of climate change" in climatology in the curriculum of one university; • Development and application of knowledge management systems on climate change. Creation of Information centers for managing climate change classes in five pilot districts; • Development of local adaptation plans through the mechanism of allocation of small subsidies, involving the local community; • Assessment of the impact of climate change on priority sectors of the economy. Increasing the capacity of specialists in key sectors of the economy to develop adaptation projects; • Development of a climate model for forecasting climate change (dynamic unbundling) and training of specialists from key ministries and departments
Improving the quality of weather, climate and hydrological services (WB)	• The qualifications of NGMS personnel have been improved, taking into account technological changes in the production cycle and the activities of NGMS. Conducting trainings and seminars; • Providing enhanced access for external and internal users to observational data and information products, including climate information
The project of Environmentally Sustainable Land Use and Life Support in Rural Areas (WB, GEF)	• Management of water resources at the farm level. Conducting trainings among farmers and WUAs on the efficient use of water resources; • Sustainable management of community pastures. Conducting trainings among the community on the rational use of pasture lands; • Trainings, analysis and dissemination of network information on advanced technologies in agriculture.
Building resilience to climate change in the Panj River Basin (ADB)	• Conducting training and dissemination of information on the impact of climate change and adaptation measures for representatives of local authorities and local institutions; • Provision of consultations and dissemination of information on water resources management and climate-resilient rural.
Improving climate resilience in the energy sector (infrastructure (EBRD)	• Adoption of best practices used by HPP operators in OECD countries in Barki Tojik and other relevant institutions of Tajikistan.

The issues of capacity building were reflected in the strategic programs and strategies of Tajikistan after the provision of the first INDC and the signing of the Paris Agreement.

Table 7.3. Capacity-building measures under strategies and programmes

Political document	Capacity-building tasks
National Strategy of adaptation to climate change in the Republic of Tajikistan for the period up to 2030	**Energy sector** • Developing short-term models to cope with the effects of extreme weather events. Development of cost-effective adaptation options to mitigate the effects of drought and energy impacts on GDP; • To train employees of the authorities in the field of energy on the use and methodologies necessary for the assessment of climate risks and vulnerability; • Promotion of energy efficiency policy through demand management and a system of incentives in the field of energy efficiency. **Water sector** • Improve the capacity of the Water Users Association (WUAs) and provide recommendations on effective water use methods **Agriculture** • Introduction of crop diversity and plant breeding knowledge, combined method of plant cultivation, structure and planting; • Assistance in the development of pasture management schemes; • Improving farmers' access to information, practices and technologies; • Provide communities and farmers with a set of training manuals on appropriate cultivation options applicable to the predicted climate regime and water availability; • Spread drought-resistant seeds and practices, as well as knowledge about plant protection from freezing **Intersectoral areas** • Creating awareness of climate change at all levels; • Development and implementation of an awareness-raising program on adaptation to the potential impacts of climate change for intersectoral areas of activity; • Improving the early warning system to minimize climate impacts on intersectoral areas of activity; • Encouraging the proper use of meteorological information at all levels
National Development Strategy of the Republic of Tajikistan for the period 2030	• Building national institutional capacity for disaster prevention, preparedness, mitigation; • Formation and implementation of gender-sensitive system information support and training of the population in proactive, protective and restorative actions for natural disasters; • Development of a system for the implementation of climate change issues, prevention of natural disasters in strategic regional documents, strengthening local capacity for emergency and disaster risk management;

	• Positive experience of the implementation of social programs aimed at energy supply and food provision for vulnerable segments of the population, mitigation of energy poverty in rural areas and ensuring productive employment based on the diversification of energy sources is widespread in the regions of the country.
National Strategy of the Republic of Tajikistan on Disaster Risk Reduction for 2019-2030	• Strengthening the capacity and role of mass media at all stages of disaster risk management, including the expansion of gender-sensitive activities to raise awareness and understanding of the population of disaster risks, the importance of public participation in the creation of early warning systems, response, recovery and development; • Preparation of plans and development of disaster preparedness measures at the local and regional levels with the participation of all stakeholders and taking into account the special needs of women and children; • Formation and implementation of gender-sensitive system information support and training of the population in preventive, protective and restorative actions for natural disasters; • Development of a system for the implementation of climate change issues, prevention of natural disasters in regional policy documents, strengthening local disaster risk management capacity; • Increasing the capacity of republican and local authorities, civil society organizations, communities and volunteers in the field of monitoring threats, risks, and social vulnerability; • Conducting research on disaster risk reduction with the involvement of the capabilities of research institutes and international organizations.
Medium-term Development Program of the Republic of Tajikistan for 2021-2025	• Development of a program of joint interdepartmental measures to reduce the vulnerability of the agricultural sector to the effects of climate change; • development of management plans and raising public awareness about the effective use of pastures; • Develop an action plan for adaptation to climate change in the agricultural sector at all levels, taking into account the different agroecological conditions in Tajikistan; • Enhancing the capacity of authorized state bodies and civil society to adapt to climate change and manage disaster risks; • Strengthening the role of the National Platform in coordinating measures to reduce the risk of natural disasters, taking into account climate change, undertaken by government agencies together with the international community; • Identification of a system of target indicators, including gender-sensitive indicators, to achieve national, sectoral and regional adaptation goals and approval of methodological recommendations for assessing climate risks, development of sectoral and regional plans for adaptation to climate change; • Appointment of responsible persons to ensure successful coordination of climate change and disaster risk management in the relevant ministries and departments and increase their capacity;

	• Strengthen the disaster risk warning system based on the use of information and communication technologies, adaptation to climate change and other vital aspects; • Strengthen mechanisms for organizing regular professional development of employees of authorized bodies, civil servants on climate change adaptation and management; • Improvement of educational materials, revision and updating of curricula, introduction of innovative teaching methods and assessment of progress in the process of professional development of authorized bodies, civil servants on adaptation to climate change and management; • Expansion of information activities in the media on climate change and disaster risk management

Introduction of new technologies. Article 4.5 of the United Nations Framework Convention on Climate Change (UNFCCC) states that "Developed country Parties and other developed Parties included in Annex II shall take all practical steps to promote, facilitate and finance, as appropriate, the transfer of environmentally sound technologies and know-how or access to them to other Parties, especially developing country Parties, in order to enable them to comply with the provisions of the Convention."

Achieving the UNFCCC's ultimate goal, as set out in Article 21, will require technological innovation, rapid and widespread transfer and implementation of technologies, including know-how, to reduce the effects of greenhouse gas emissions. Technology transfer for climate change adaptation is also an important element in reducing vulnerability to climate change.

As mentioned in the section Climate finance, on average for 2016-2020, Tajikistan was allocated 600 million US dollars annually by development partners to reduce the impact of climate change. What part of these funds was allocated for technology transfer and what part for capacity building requires in-depth analysis.

National cross-sectoral long-term strategies, national programs and regulations of the Republic of Tajikistan include measures for the use of innovative technologies and capacity building in order to reduce greenhouse gas emissions and adapt to climate change. The development and implementation, as well as monitoring of activities within the framework of regulatory documents, are entrusted to the responsible state bodies. Tajikistan does not have a system for tracking and monitoring technology transfer in connection with climate change. However, the application of new technologies is controlled at the project level by the state executive agency and development partners.

An analysis of the available technological solutions in Tajikistan within the framework of development partners' projects shows that they cover only the agricultural and water sectors (irrigation technologies, that is, technologies for water conservation and processing of agricultural products), as well as the housing conditions of the population, while in the transport sector and disaster risk management technologies are not included in the list. However, some of the proposed technological solutions are related to climate change mitigation and are aimed at poverty reduction rather than climate change adaptation policies.

Table 7.4. Measures for technology transfer aimed at reducing the impact and adaptation to climate change within the framework of strategies and programs

Political document	Tasks aimed at technology transfer
National Strategy of adaptation to climate change in the Republic of Tajikistan for the period up to 2030	**Energy sector** • Infrastructure protection: Raise the height of the dam, add bypass channels, regulate water discharge; • To review maintenance procedures and technical incentives to improve the safety of transmission networks and distribution lines from extreme weather events; • Promotion of energy efficient technologies; • Development of small hydropower and other renewable energy sources. **Water resources** • Establishment of stricter rules and implementation of wastewater treatment and wastewater regulation technologies to preserve water quality and maintain cleanliness; • Provision of a backup system for water storage, by means of pumping. **Agriculture** • Introduction of crop diversity and plant breeding knowledge, combined method of plant cultivation, structure and planting; • Repair and improvement of irrigation methods, such as drip irrigation for the purpose of economical use of water or more expensive crops; • Distribute drought-resistant seeds.
National Development Strategy of the Republic of Tajikistan for the period 2030	**Energy and transport sector** • Further development of small hydropower and other RES; • Stimulating modernization and technological re-equipment, innovation, energy- and resource-saving innovative technologies; • Development of the electric power industry on the basis of diversification to smooth out seasonal fluctuations in generation, including using renewable energy sources; • Modernization of the electric grid economy to reduce losses, increase the reliability of energy supply and expand the possibilities of using various renewable energy sources; • Development and implementation of measures to reduce the level of industrial and transport emissions into the atmosphere and pollution of land and water resources, improvement of mechanisms for managing industrial waste and chemicals used; **Water sector** • Reconstruction and restoration of irrigation infrastructure and introduction of modern technologies of energy-saving irrigation.

	Agriculture • Introduction of crop diversity and plant breeding knowledge, combined method of plant cultivation, structure and planting; • Disseminate drought-resistant seeds and practices, as well as knowledge about plant protection from freezing • adaptation of agriculture to long-term climate change and implementation of measures to promote international quality certification of agricultural exports.
National Strategy of the Republic of Tajikistan on Disaster Risk Reduction for 2019-2030	• Introduction and active use of information and communication technologies and other innovative solutions; • Assessment of the technical condition of buildings and structures of educational institutions for resilience to natural disasters, taking into account the use of the latest technologies for • The development, demonstration and implementation of innovative technologies and systemic environmental solutions, including eco-system approaches to management in rural areas, especially in mountainous areas.
Medium-term Development Program of the Republic of Tajikistan for 2021-2025	**Development of a "green" economy** • Production of electricity from other renewable energy sources (solar and wind) in mountainous and favorable areas; • Launch industrial production of solar panels and equipment; • Creation of enterprises for the production and installation of electric vehicles; • Introduction of new technologies waste management and recycling as an integral part of the resource base of the national economy; • Introduction of "green" technologies and "green" infrastructure in agro-industrial production **Agriculture** • Increasing food security and improving food quality through the application of the principles of organic agriculture and the principles of "green" trade; • Rehabilitation of irrigation systems and drains to improve the reclamation of saline lands and wetlands; • Strengthening the implementation of forecasting policy taking into account climate change and the structure of the consumer market while preventing crop losses; • Creation of a unified information system for warning agricultural producers to predict hydrometeorological conditions; • Development of action plans for adaptation to climate change in the agricultural sector at all levels, taking into account various agroecological conditions in Tajikistan; • Introduction of "green" technologies and "green" infrastructure in agro-industrial production; • Widespread introduction of water-saving technologies (drip irrigation, rainwater harvesting, etc.)

	Integrated water resources management • introduction of energy-saving irrigation technologies (drip, rain, micro-irrigation); • creation of a database on the drinking water supply and sewerage system in order to improve accounting and reporting in the field of drinking water suppl. **Energy** • development and implementation of projects for the construction of electricity generation facilities from alternative renewable sources in the regions of the country; • implementation of a regional project for the transmission of electricity from Central Asia to South Asia CASA-1000; • implementation of the wholesale electricity metering project (installation of modern smart meters at all power plants and substations); • introduction of industrial production of solar panels and equipment at manufacturing enterprises using domestic raw materials; • implementation of the billing system project.

The current climate change adaptation policy in Tajikistan is mainly funded by development partners and development donors. This is done almost without a systematic approach, even within the international community, with the exception of PPCR projects, which was implemented in Tajikistan by the European Bank for Reconstruction and Development, the Asian Development Bank and the World Bank within the framework of the First Joint Multilateral Development Bank (MDB). Meanwhile, financing of climate change adaptation measures within the state budget is insufficient, either due to budget constraints or due to a misunderstanding of the overall effects of climate change on economic sectors and human health. However, based on the analysis of the sectoral budget, it is possible to find some expenditure items aimed at preserving soil due to flooding in the river basin (protection of the coastal river), for example, in the budget of the Ministry of Energy and Water Resources of Tajikistan. These climate change adaptation measures can be considered as disaster risk management and should be classified as measures taken to minimize the risks of climate change. Another example is the return of degraded soil to cultivation through measures taken to minimize salinization and reduce the water table. Based on the lessons learned from the implementation of projects in Tajikistan based on the experience of other countries, the following mechanism for the introduction of new technologies can be proposed.

Elimination of existing gaps in the introduction of new technologies:

- Political, institutional and managerial gaps;
- Economic and financial gaps;
- Gaps in education and capacity building;
- Gaps in knowledge sharing;
- Gaps in technology, methodology, practice and infrastructure;
- Evidence-based gaps in information and data.

Monitoring and evaluation:

- Assessment of the effectiveness of the implementation of climate change adaptation projects should be monitored throughout the life cycle of projects;
- It is necessary to introduce quantitative and qualitative indicators of the introduction of new technologies and their effectiveness into the monitoring system

Financing mechanism:

- Climate change adaptation technologies can and should be funded within the budget by the private sector and development partners within the framework of a multilateral development fund, co-financing or public-private partnership;
- National funds can be created and used for the introduction of climate adaptation technologies;
- The use of technologies for adaptation to climate change should be expanded by reducing the interest rate on loans intended for the purchase of these technologies for a longer period

Incentives and technology promotion:

- Exemption of imported climate adaptation technologies from customs duties, value added taxes and other related taxes;
- Local producers and service providers should be exempt from income tax if climate resilience technologies are used;
- Allocation of funds from the industry budget for climate adaptation technologies;
- Interest rates can be covered by the government for those who plan to implement climate resilience technology

Knowledge sharing:

- The best experiences of implementing new technologies should be available to all users;
- It is necessary to create technoparks for the introduction of new technologies for adaptation to climate change;
- Regional experience in the exchange of information on new technologies directly or indirectly affects the reduction of the impact of climate change;
- Creation of a platform for the exchange of experience on new technologies at the national and regional levels.

7.4 Forecast calculations of possible costs for long-term mitigation and adaptation, and financing mechanisms

The forecasting of calculations of possible costs for mitigation and adaptation in key sectors of the economy was carried out on the basis of planned measures provided for in the updated Nationally Determined Contribution (NDC), the National Development Strategy (NDS) of the Republic of Tajikistan until 2030, the Medium–term Development Program (MDP) of the Republic of Tajikistan for 2021-2025, the National Strategy for Adaptation to Climate Change until 2030, as well as sectoral strategies and programs.

The National Development Strategy of the Republic of Tatarstan until 2030 considers three independent scenarios: (1) inertial, (2) industrial and (3) industrial-innovative.

In the new *Medium-term Development Program of the Republic of Tajikistan for 2021-2025*, taking into account the inevitable impact of the spread of COVID–19 on the national economy, three scenarios of economic development were considered - crisis, realistic and optimistic.

To predict climate finance, the most optimal option, taking into account the impact of COVID-19 on the national economy, is an inertial development scenario based on the NSD 2030 and a crisis scenario based on the MDP 2021-2025. In both scenarios, the average annual growth rate of the country's GDP is provided in the aisles of 4-5%.

According to the inertial scenario based on the NSD 2030 and the crisis scenario based on the MDP 2021-2025, the share of the agricultural sector will prevail over the development of other sectors of the economy.

Based on the forecast calculations of GDP growth rates of an average of 5%, it is possible to plan the projected possible costs for mitigation and adaptation measures. At the same time, it should be borne in mind that an increase in GDP will automatically lead to an increase in GHG emissions, based on this, the growth rate of investments in mitigation and adaptation measures should be higher than the GDP growth rate, or at least remain at the same level.

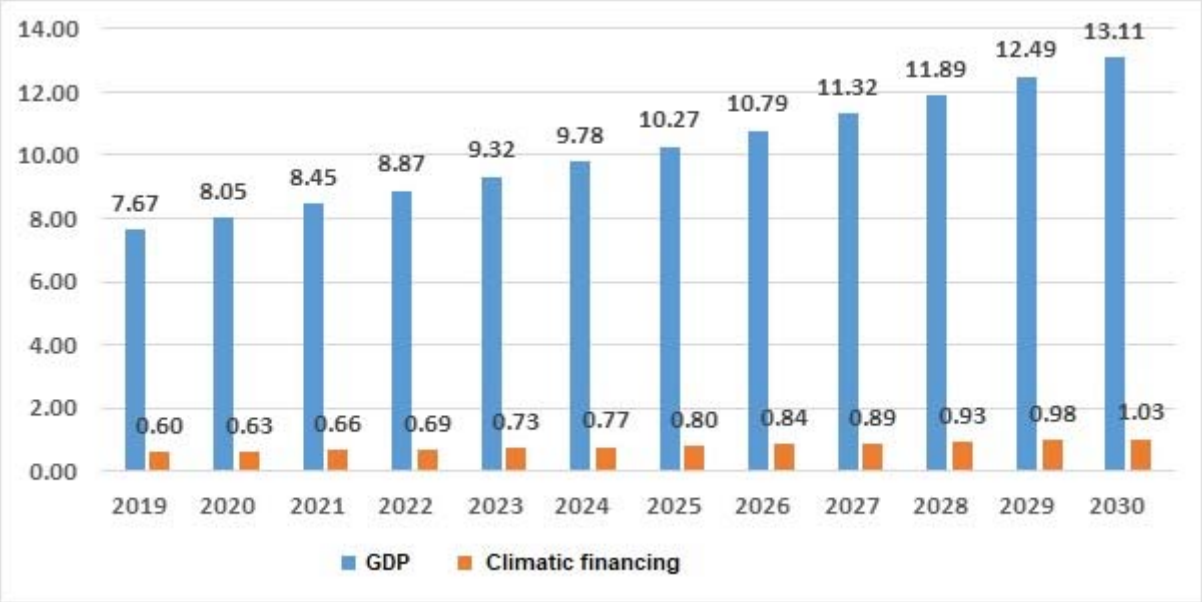


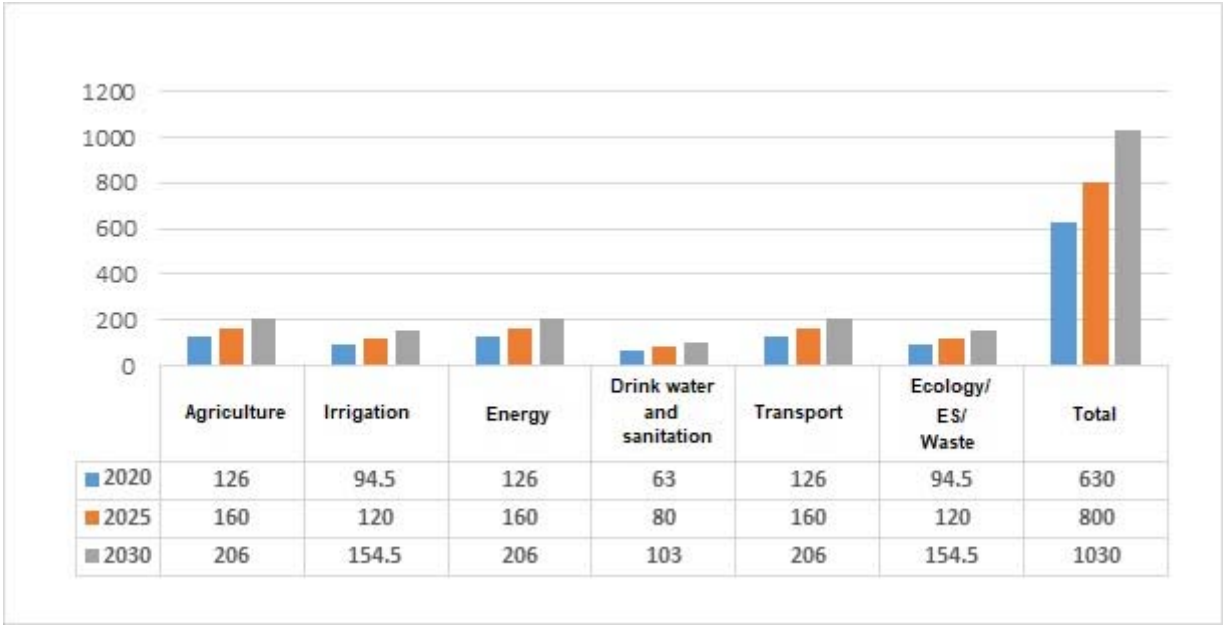
Fig. 7.2. Forecast of GDP and climate financing for motivational and adaptation measures in billions of dollars of USA for 2020-2030.

When forecasting the costs of mitigation and adaptation measures according to the usual (inertial) scenario, first of all, it is necessary to pay more attention to the development of the agricultural sector and the irrigation system, reducing the impact of natural disasters, environmental protection, access to drinking water and sanitation. At the same time, it should be noted that the costs of motivational and adaptation measures for such sectors as energy and transport should remain at a fairly high level.

According to forecast calculations, the share of the energy sector in the structure of costs for mitigation and adaptation measures by 2030 will be 20%, transport - 20%, water supply and sewerage - 10%, irrigation and irrigation - 15%, ecology and natural disasters - 15 and agriculture - 20%.

When forecasting funds for climate finance, it is necessary to adhere to the optimal ratio of expenditures aimed at mitigating the risks of climate change and adaptation measures. Based on the priority directions of the country's economic development, existing problems, best practices in

the implementation of projects to date, and their sustainability, it is necessary that climate financing as a whole at the national level be directed evenly (50/50), both to reduce the impact of climate change and adaptation measures. At the same time, in such key sectors of the economy as energy and transport, the share of climate finance for reducing the impact of climate change may be higher compared to adaptation measures, approximately 60% for mitigation and 40% for adaptation measures. This ratio is based on the strategic directions of Tajikistan and, above all, the National Development Strategy of Tajikistan for the period up to 2030 and the Medium-term Development Program for the period 2021-2025. The main tasks of Tajikistan for this period are to ensure energy security and break the communication deadlock.



	Agriculture	Irrigation	Energy	Drink water and sanitation	Transport	Ecology/ ES/ Waste	Total
2020	126	94.5	126	63	126	94.5	630
2025	160	120	160	80	160	120	800
2030	206	154.5	206	103	206	154.5	1030

Fig. 7.3. Forecast of the distribution of financial resources for motivational and adaptation measures by sector in millions of dollars USA until 2030.

In the water sector, and above all in improving the irrigation and drainage system, which is primarily related to ensuring food security, there should be 50% aimed at mitigation and 50% at adaptation measures. In agriculture, which accounts for half of GHG emissions, 30% of funds should be directed to mitigation and 70% to adaptation measures. In such intersectoral areas as disaster risk reduction, environmental protection, the ratio should be 20% for reducing the impact of climate change and 80% for adaptation measures.

Sources of financing. To solve the problem of climate change, various sources of financing are needed, including national and international, as well as public and private funds.

The review of the national budget of the Republic of Tajikistan indicates that there is currently no special article in it that could determine the direction of financial resources for climate financing. But this does not mean that the state does not allocate funds at all for adaptation and motivational measures aimed at reducing the impact of climate change. The main reason for this situation is the lack of a mechanism and methodology for allocating a special article in the state budget regarding climate financing, both at the national and local levels.

The Paris Agreement in relation to developing countries, which includes the Republic of Tajikistan, defines measures to provide specific assistance for adaptation to climate change. In accordance with Articles 4, developing country Parties are provided with support for the implementation of this Article in accordance with Articles 9, 10 and 11, recognizing that greater support for developing country Parties will increase the ambition of their actions. In accordance

with Article 10, developing country Parties are provided with support, including financial support, for the implementation of this article, including to strengthen joint actions in the field of technology development and transfer at various stages of the technological cycle, in order to ensure a balance between support for climate change prevention and support for adaptation.

The key challenge for developing countries is not only to ensure the inflow of direct investment to meet growing needs and support economic development, but also to channel these investments into low-carbon technologies and thereby contribute to the achievement of their sustainable development goals in the next 30-50 years.

Public funds, private funds, market mechanisms and those international sources of financing listed in Table 7.1 can be used as climate finance mechanisms.

8 EDUCATION, TRAINING AND SOCIETY

In the years since the publication of the First National Communication and Climate Change NAP, the level of public awareness, local media activism on climate change, and secondary and higher education initiatives have shown significant progress. About 10 years ago, only 10 percent of respondents nationwide showed awareness of climate change. By now, this rate has increased to 40-80% (60% on average), depending on location, age, and occupation.

Yet, compared to other regions of the world, awareness and understanding of climate change in general is still low and varies by regions of the country. As shown by the analysis, the most informed are residents of Dushanbe, Sughd and Khatlon. The least informed are residents of the central mountainous regions of the country.

Nearly all the climate change awareness initiatives in Tajikistan are currently conducted as part of projects and programs funded by international organizations and NGOs. Publications and information in Tajik language are limited.

8.1 Education system and access to knowledge

As part of the UNDP environmental education project involving Tajik Technical University and Post-graduate Education Institute, the resource centers on the development of climate change training modules for schools and universities were set up. Overall, climate change issues are not part of secondary or higher education curricula; relevant lectures and workshops are rarely available for schoolchildren and students; they are usually conducted by NGOs and project experts.

A new textbook "Environment for Future Generations" containing chapters on climate change and its impacts was developed involving CAREC experts and approved by the Ministry of Education in 2005.

Stressing the schoolchildren and students' interests, the Youth Eco-Center developed several books and manuals, including "Interesting Ecology" (2007), "Adaptation to Climate Change" (2010), "All About Climate Change" (2011).

Source: *Youth Eco-Center*

Photo 8.1. Weekly youth workshops and debates on climate issues.

The Youth Eco-Center holds weekly seminars for young people and debates on climate issues, including " What you can do at home, in your community and in your country to prevent the climate change hazards". It also conducts workshops and trainings for teachers on the issues of environment and sustainable development. Annual youth summer camps, rallies and campaigns, such as the "Earth Day" and "World Conservation Day", have been organized. The Youth Environmental Center assists in establishing rural information centers on climate change and sets up demonstration plots for farmers.

In 2009, the Youth Environmental Center REC CA and NGO "Little Earth" developed a new training module on climate change for secondary school teachers and university lecturers and delivered a training course for teachers. The "Green Pack" education kit for students developed by REC CA in 2011 for the Central Asian countries was translated and adapted for Tajikistan and approved by the Ministry of Education of RT. The module on sustainable development has been implemented in several leading universities of the country since 2011. A series of lectures for students on human adaptation to climate change and health aspects of climate change were conducted at the Public Health Faculty of Tajik State Medical University in 2000-2012.

As part of the project "Raising awareness of teachers and schoolchildren on climate change, its adverse affects and adaptation measures in Dushanbe and Districts of Republican Subordination" the NGO Peshsaf conducted the following activities in 2020:

- Awareness assessment on climate change and its adverse affects for high school teachers and students of general education schools;
- Development of methodological recommendations and practical handouts for secondary school teachers in selected districts;
- Training sessions on climate change issues for 50 teachers of 10 (pilot) general education schools;
- Awareness-raising sessions on climate change issues in all selected schools of the pilot districts.

Photo 8.2. A training on "Raising awareness about climate change, its adverse effects and adaptation measures" for schoolchildren in Dushanbe and DRS.

The educational programs conducted in the 10 pilot schools showed significant progress among the students. More than 600 students were aware of the CC concept. Students found the CC information more engaging if it was delivered in an interactive way rather than in a formal academic (scientific) language. The younger generation of Tajikistan is eager to act to reduce the carbon footprint, solve the problem of plastic waste and conserve water resources, provided there

is a proper educational and training process on part of educational institutions and other stakeholders.

The teachers were poised to introduce climate change classes into the extracurricular program. Trainings for teachers have shown a sufficiently high awareness of the teaching staff of pilot schools on the issue. Teachers were trained to run information sessions on the CC issue for students using interactive teaching methods.

Photo 8.3. A workshop for teachers in Dushanbe and DRS on "Raising awareness on climate change, its adverse effects and adaptation measures".

8.2 Actions to raise awareness on Climate Change

The realities of glacier degradation and other global warming implications prompt urgent and effective measures to reduce GHG emissions and implement efficient water and energy consumption at all levels of society. However, the public awareness of the causes and impacts of glacier degradation and climate change is still low. Further efforts are needed to popularize scientific information and glacier monitoring results among the media, decision-makers and the general public.

Newsletters, magazine, newspapers and other materials are published by the Committee on Environmental Protection under the Government of Tajikistan (http://www.hifzitabiat.tj) and the Environmental Education Department addressing major environmental topics, including climate change. Additionally, numerous official documents, popular science books and publications are posted on the Agency for Hydrometeorology website (www.meteo.tj). The process of drafting and disseminating information of the National Communications on climate change involves workshops and trainings for professionals and lectures for schools students.

Summer environmental camps for schoolchildren and students include trainings and workshops on installation of solar kitchens, solar water heaters, interactive debates among youth on climate change.

"TajCN" - Tajik NGO network on climate change was established in 2008 as a joint initiative of the Youth Environmental Center, NGO "Little Earth" and the Environmental NGO Club. "TajCN" is an informal association for free exchange of information and dialogue on environmental protection, climate change and energy issues. The network includes almost 100 users and promotes civil society interests on climate change at the national policy level, builds a platform for the exchange of information and views.

8.3 Initiatives and projects of the non-governmental sector and public organizations

Non-profit (non-governmental) civil society organizations in Tajikistan play an important role in raising public awareness on climate change, showcasing approaches to reducing the carbon footprint, improving the provision of clean energy for communities and adaptation measures. A group of NGOs promotes the activities of climate change information network of Tajikistan, debates and discussions on climate change, organizes environmental actions. The network holds roundtables, NGO conferences, has its own website, regular newsletter "Climate Digest" containing local and international information on climate change and public participation.

Below are some some examples of SCOs/NGOs in Tajikistan in different areas. NGO "Youth Environmental Center" runs information campaigns among the youth, farmers, communities, has published a number of manuals, brochures and posters on climate change. The organization has implemented a number of adaptation projects for the rural communities in the south of Tajikistan. Based on the vulnerability and risk assessment together with the communities it developed local (community) action plans for climate change adaptation in Shahritus, Kabodyon, Nosiri Khusrav and Gissar districts of Tajikistan. As a result more than 200 houses were insulated and 100 energy efficient stoves were built, cropland and water supply was improved, 15 solar greenhouses and 30 glasshouses were created, fruit tree nurseries for 20 thousand seedlings, solar photovoltaic panels were installed in health centers. Importantly, in many cases the recipients of aid are women as heads of households.

Source: *Youth Environmental Center NGO https://ecocentre.tj/*

Photo 8.4. Using Solar Energy in Households.

On the one hand, the insulation of homes and the construction of stoves may seem somewhat strange or incomprehensible in the context of climate change (warming). But the reality is that in the winter of 2008, due to an unexpected snowstorm, extreme cold and a serious energy crisis, hundreds of farms were hit, livestock froze and died, potato seeds and vegetable seedlings damaged in many southern regions of Tajikistan, causing a food crisis and a serious risk of famine. The increased crop losses, plummeting farm incomes, increased vulnerability of the poorest communities due to natural hydrometeorological events and uncommon weather patterns were the major cause for the extensive promotion of adaptation programs and projects by local NGOs.

To raise awareness among local communities, the Youth Environmental Center with the support of Act Central Asia created four Climate Change Adaptation Centers. The centers train local communities to cope with the extreme situation on their own by means of more efficient use of heat, construction of hotbeds, solar greenhouses, energy efficient stoves, as well as simple plant protection methods, emergency seeds supplies, drought resistant crops, more efficient use of water for irrigation, introduction of alternative energy sources. Demonstration plots have been created for practical lessons and extension of knowledge on adaptation. The use of energy-efficient stoves and improved insulation of houses enabled a 30% reduction in the consumption of firewood and coal, which, in addition to benefits for the climate system, also lowers the impact of emissions from burning fuel and biomass in or near the premises on the health of the local communities. More than 300 farmers were trained to implement adaptation measures, and over 3,000 households have benefited from adaptation activities.

A great deal of awareness raising is undertaken by the NGO Little Earth, which has implemented a number of projects on the construction of solar greenhouses, energy-efficient stoves and community energy-saving measures. It issues a newsletter "Green Energy and Us" to promote the idea of alternative energy sources.

With financial support of the Norwegian Nature Conservation Society, the NGO "Little Earth" installed solar photovoltaic panels in 7 schools in the mountainous Pamir and central Tajikistan and also implemented thermal insulation measures. Ten solar greenhouses were constructed, which improved the quality of life and partially solved the food security problem. Training workshops on constructing energy-efficient stoves contributed to their dissemination in the southern parts of the country.

Source: *Little Earth NGO http://leworld.org*

Photo 8.5. First Solar Kitchen in Alichur.

One of the key projects of the "Little Earth" NGO is the International School Project on Resource and Energy Use, aimed at making schoolchildren aware of the close relationship between household energy use and global environmental problems. Today about 70 schools in Dushanbe, Sughd, Khatlon and GBAO are involved in the project.

The NGO “Zan va Zamin” promotes the resilience of women-headed farms to weather hazards and climate change in the Hamadoni, Vose and Farkhor districts of southeastern Tajikistan. In particular, trainings were conducted on alternative energy sources, demonstration plots were established where weather resistant varieties of plants are grown, and local centers were established to implement adaptation measures and awareness-raising of farmers.

Funded by GIZ, the GEF Small Grants Program, the NGO Center for Jamoat Development "Komsomol" together with the NGO "Kalidi Donish" and "Javononi Asri 21" in Nosiri Khusrav District in Southern Tajikistan promoted solar dryer technology and the development of fruit and vegetable dehydration business to increase the income of the local population. The project reached 200 farmers and owners of homestead plots, producing up to 10,000 tons of various fruits and vegetables (apricots, apples, grapes, eggplants, carrots, onions, etc.) annually. The workshops covered the harvesting, drying, cleaning and bagging techniques, a small enterprise for dryer production was established and the staff was trained, 12 demonstration solar dryers were built, as well as solar greenhouses and water heaters.

With the financial support of the Christensen Fund, the NGO "Hamkori bahri tarakkiyot" contributed to the adaptation of rural communities to climate change and conservation of biodiversity in the Hissar and Rasht valleys of central Tajikistan. Within the project 10 nurseries fruit and non-bearing trees were established, workshops on setting up seed stock and fruit nurseries were conducted, brochures and booklets on climate change, including "Agrobiodiversity and traditional knowledge" and photo atlas "Agrobiodiversity - our food, resource and wealth" were published for distribution among farmers, women, students and schoolchildren.

Public organization "Azal" operates in Tavildara district and Rasht valley on efficient use of natural resources and community-level climate change adaptation. Projects were implemented on expansion of forest plantations and nursery development, pasture management, crop conservation in extreme weather conditions. Conducted lectures and trainings on climate change impacts.

"The Civil Initiatives Support Fund" and "Dastgiri Center" promote soil and water conservation measures to adapt farming communities to climate change. For this purpose, traditional knowledge and methods are studied and used, including biological drainage - i.e. lowering the level of saline groundwater by moisture transpiration through perennial shrubs and trees, and hedging.

Through the efforts of the micro loan fund "Madina", GBAO, in the Murghab district of GBAO, in eastern Tajikistan more than 100 houses were insulated, energy-efficient stoves "Vulkan" were installed, the supply of firewood from the Pamir regions was ensured in 2011. This significantly reduced the use of teresken as fuel for the local population. This activity was partially sponsored by GIZ. The microcredit of $500 and over was disbursed (mostly as the cost of equipment and labor) for home insulation, energy efficiency improvements in heating and cooking systems, and installation of solar water heaters. Households invest their money, but then save through reduced fuel consumption and health risks.

In northern Tajikistan, the Public Association "Youth Environmental Protection Group" has produced 20 educational radio programs on community preparedness for extreme weather events, climate change and CC mitigation, as well as a local quarterly magazine "Best Practices in Preparing and Responding to Emergencies and Climate Change impacts." Solar greenhouses were built in three schools in B. Gafurov and Kanibadam districts, and workshops were held for secondary school teachers on climate change and interactive methods of teaching. In 2011, the organization contributed to the trade fair "Energy Saving and Resource Recycling Technologies".

There was a great deal of work on introducing adaptation practices in local economic development programs and farm support being carried out by the NGO Nau Agency for Development Processes in Sogd Province. The NGO promotes better market access for agricultural producers, increases

adaptation capacity in rural areas, supports farmers' projects, develops demonstration plots for testing crops and various natural resource adaptation measures based on farms.

With the financial support of the European Union, NGO "Oftob" in partnership with the Center for Research and Renewable Energy at the Physics and Technical Institute under the Academy of Sciences promoted the implementation of renewable energy sources in the mountain villages of Muminabad, Shuroabad and Khovaling, including 30 photoelectric and 7 wind turbines, as well as 4 biogas production systems from animal waste. 5 solar cookers were produced for residents of Murghab district. All the units were designed for demonstration and educational purposes and mainly to draw attention of the communities and local authorities to climate change and energy security concerns. The Tajik branch of the CA Regional Environmental Center (CAREC) in cooperation with the Climate Change and Disaster Risk Reduction Center conducted trainings and awareness-raising courses for government officials and experts.

Local NGOs' efforts lead to low-cost and practical implementation of climate system mitigation and adaptation measures. The capacity and funding of NGOs and microcredit organizations should be strengthened to expand their climate change activities.

8.4 **Media**

Climate change perspective is covered in the print media, on television and radio, and on the Internet. Local media outlets cover the issue in the context of water and energy scarcity. Mainstream media's interest in environmental problems and climate change is mostly commercial, with articles or reports produced at donors' expense. In the last 2-3 years the journalists are increasingly interested in covering climate change issues in press and on TV. The Eco-journalists Club was established to cover environmental issues. Mass media, including press, radio and TV are regularly invited to workshops, conferences and round tables on climate change, lead experts of Tajikistan make TV and radio programs.

While drafting the TNC, television and radio programs on climate change were regularly organized, following the tradition of the first, second and third communications, i.e. since 2000. In the summer of 2013, in a time of a severe heatwave in the country (temperatures reached 47°C), Professor Kayumov hosted a series of appearances on national television to prevent negative health effects and reduce the adverse impacts of heatwave on vulnerable communities and sectors of the economy of the Republic. The outcomes of the well-coordinated efforts with the media helped to produce a short film on status of glaciers and the hydrological regime of the Vakhsh and Panj Rivers based on the results of the expedition. Together with the NGO "Homa" trainings on climate change were conducted for journalists from across the republic. Two journalists-contest winners participated in and covered the work of the Conference of the Parties to the UNFCCC in Cancun (Mexico).

Media representatives are regularly invited to participate in workshops, conferences, roundtables organized by NGOs, however, there is still a limited dissemination of knowledge. Media plays an important role in public campaigns that address climate change issues: "Earth Hour", "Earth Day", "Energy Efficiency Day", etc. At the same time, NGOs generate their own sources of information on the websites of the Youth Eco Center www.ecocentre.tj, NGO "Little Earth" http://leworld.org, website of EECCA Climate Network of NGOs http://infoclimate.org, electronic digests, printed magazines "Green Energy and Us", "Tabiat", etc. are published.

8.5 **Capacity development needs**

Climate Network NGO of Tajikistan was one of the first in Central Asia, initiated by NGOs in 2008 to enhance the capacity and awareness of civil society organizations. The network currently brings together more than 70 actors from public, academic and expert circles, including more than 30 NGOs from different parts of Tajikistan and Dushanbe. One of the main goals of the network is to implement more public participation modalities in the decision-making process, as well as in environmental programs and projects, as opposed to the current, rather limited participation. The main problems in the way of more qualified participation at the moment include:

- A poor understanding by NGOs of national environmental and climate policy processes;
- Insufficient understanding of the significance of collaborative efforts to promote public opinion and positions; lack of effective strategies for public participation, insufficient strategic planning among NGOs;
- "Digital inequality" in NGOs, different nature of access to ICT, which constrains the effectiveness of electronic mailing lists and involvement in discussions.

The NGOs Climate Network, in order to participate more fully in decision-making, should not only engage in making recommendations and comments, awareness-raising and seminars. It's important to develop more active forms of public participation, including:

- Organizing and conducting public monitoring and assessments;
- Ensuring financial transparency and effectiveness of climate change financing.

At the moment, NGOs Climate Network members and other public organizations need to focus on improving the understanding of national climate policies, activities of international financial institutions implementing climate investment programs, it is also important to develop a strategy for public participation, to improve coordination of activities. In addition, NGOs need to develop communication skills and cooperation with the media. This will serve to raise awareness among citizens on climate change issues, successful adaptation practices and climate risk management.

9 RESEARCH AND SYSTEMATIC OBSERVATION

9.1 Scientific research and knowledge development

Detailed studies on climate and meteorology, agrometeorology, hydrology, and natural hydrometeorological phenomena were carried out in Soviet times. The results were used in the publication of reference books, atlases and compilations. Over the last 10 years, scientific studies have focused on climate change trends, river flows, natural disaster trends and risk assessment. Expert groups in drafting national communications on climate change for UNFCCC have conducted a number of pioneering studies on assessment of climate change impact and consequences.

Based on the Science and Technology Strategy of the Republic of Tajikistan for 2007-2015, the Academy of Sciences of Tajikistan conducts the following activities

- Studying climate change, man-made and anthropogenic impacts on biodiversity, natural eco-systems and agricultural crops;
- Physiological and biochemical adaptation and regulatory mechanisms of resistance of living organisms to stresses.

Institute of Botany, Plant Physiology and Genetics carries out researches on the impact of climate-induced stress factors in Tajikistan on physiological and biochemical processes in wheat, as well as on the impact of climate change on growth, development and yield of wheat.

The Pamir Biological Institute of the Academy of Sciences of the Republic of Tajikistan runs the work on Physiological and biochemical aspects of plant adaptation to changes in climate factors of the Pamir highlands.

It is noteworthy that in recent years, as part of the state programs not only academic institutions, but also industry institutes run climate change related research activities. Based on the Resolution of the Government of Republic of Tajikistan № 587 of November 27, 2007 the Ministry of Health of RT issued an order (№449 of 16.08.08), one of the key items of the order being studies climate change impact on reproductive health.

A Center for Glacier Research of the Academy of Sciences of the Republic of Tajikistan was established in 2017 at the behest of Emomali Rahmon, the Founder of Peace and National Unity and Leader of the Nation and President of the Republic of Tajikistan. The Center revived new scientific and fundamental studies on cryosphere and glaciology. In 2019, the Center conducted scientific research using remote sensing to monitor glaciers. One of the significant results of the Center's work is implementation of practices of using unmanned aerial vehicles to study glaciers with a resolution of 5 to 7 centimeters. Comparative analysis of satellite data and drones made it possible to accurately assess the status of glaciers to determine their locations on the map. Twelve volumes of the Atlas of Glaciers of the Republic of Tajikistan are expected to be published in the nearest future.

In recent years major scientific expeditions were organized by the assignment of the government:

- 2008-2009. First Tajik Antarctic Expedition within the framework of IPY;
- 2011 г. First complex international scientific expedition to study the condition of glaciers and environmental situation in the upper reaches of the Vakhsh and Panj rivers, involving participants from Central Asia and Russia.
- In 2019 12 scientific expeditions were conducted: Glacier Zulmart - Eastern Pamir; Glacier Didal - Surkhob river basin; Glaciers of Kamarob basin; Glacier Kuliken of Markansu river basin; Lake Karakul - Eastern Pamir (hydrological and hydrochemical research); Glaciers

of the upper Siyoma; Glaciers of Gunt River basin; Glaciers of Patkhur Lake basin; Abramov Glacier (Republic of Kyrgyzstan); Golubin Glacier (Republic of Kyrgyzstan); Zerafshan and Rama Glaciers of Zerafshan River basin; Yakarcha Glaciers of Varzob River basin.

In 2019, Tajikistan joined the Unified Global Glacier Monitoring System.

In 2011, there was a new shift of the Medvezhiy Glacier. The glacier advanced by 800 m. A comparative analysis of the expedition findings indicated that the climate change trends and glacier degradation in the highlands of Tajikistan and Antarctica are similar. The results were reported at the meeting of the World Meteorological Organization on the cryosphere and posted on the UN website (http://www. unmultimedia.org/radio/russian/archives/98071), indicating the resonance at the global level and the significance of this expedition.

Based on the results of the Pamir and Antarctic expeditions, an information event was organized during the "UN International Conference on Water Cooperation" (Dushanbe, August 2013). Concurrently, an information campaign was launched to promote awareness on the state of glaciers in the Pamirs and Antarctica.

The Research Center of Geodesy and Cartography "Tojikkoinot" in 2001-2006 performed a budget-funded study on glaciation trends in Tajikistan based on cartographic, aerial photo and satellite data for 1949, 1975, 1985 with a forecast to 2005. The study found that different glaciers in Tajikistan had lost from 5-10% to 25-30% of their area.

In 2003-2010, international and local experts have implemented a project "TajHaz" on assessment and monitoring of glacial lakes in the Pamir-Alai. The results of the assessment are available only to the project members. A set of GIS-data was transferred to the Committee of Emergency Situations of the RT.

In 2008-2013, joint efforts of experts from Germany and Tajikistan were carried out to drill cores and analyze bottom sediments in the basin of the drainless Lake Karakul to study the paleoclimate of the Pamirs.

The international project and partnership GLIMS (Global Land Ice Measurements from Space) aims at assessing and mapping the global glacier cover of the Earth based on modern satellite data for 2000-2010 with a unified approach. The U.S. Geological Survey (USGS) is the GLIMS coordinator. The Institute of Geography of the Russian Academy of Sciences (IGRAN) was designated as the regional center for GLIMS for Central Asia, the Caucasus, and Russia. The GLIMS project has covered a significant portion of the glaciation of the Pamirs, but the data of this inventory requires further adjustment.

The regional climate model (REMO) work done by the CAWa project in 2010-2014 is noteworthy. As part of the project, local experts participated in the trainings and were provided with baseline modeling data for further application.

Recommendations for capacity building of scientific studies on climate change.

Climate change issues should be studies by scientific institutions in partnership with the universities involving students and young professionals.

Capacity of building of scientific studies on climate change requires:

- Train qualified personnel;
- Develop new areas for climate change research;

- Attract budget and international funding for research areas on climate change impacts;
- Establish new scientific units within the academic and industry institutions dealing with climate change;
- Intensify international cooperation on scientific aspects and involve Tajik scientists in the Intergovernmental Panel on Climate Change.

9.2 Systematic observations

The environmental data collection system is based on the observation network, comprising a ground-based system of stationary and automatic observation points designed to observe physical and chemical processes transpiring in the environment, determine its hydrometeorological, agrometeorological and climatic characteristics and determine the level of pollution of the air, soil and water bodies, including hydrobiological indicators.

The observation network would be developed through the integrated solution of tasks on expansion of different types of observations. The most important types of observations, such as meteorological, hydrological, agrometeorological and pollution observations, shall get a significant development.

The most important part of the observation network is the State observation network - the observation network of the Republic of Tajikistan, which combines the functions of synoptic (the framework of operational hydrometeorological support), climatic (the framework of climate monitoring) and agrometeorological (the framework of ten-day weather observations and phenology of crops) networks. The state observation network provides more than 30 types of meteorological, hydrological, agrometeorological, climatic and other observations.

To address the modernization and development of the state observation network and improve the quality of data provision, it is expected to:

- increase the number of the state observation network stations (with due regard for the recommendations of the World Meteorological Organization WMO);
- equip the stations with modern computerized and automatic observation facilities, tools, analytical and auxiliary equipment, as well as reliable communication systems;
- ensure proper industrial buildings and premises;
- create an enabling environment for attracting highly qualified specialists.

According to Hydrometeorological Activities Act (Art.6) of the Republic of Tajikistan, the development of the state observation network and social infrastructure should be carried out in conjunction with the socio-economic development programs of the country and ensure monitoring of the activities of physical and legal persons involved in hydrometeorological operations in their respective jurisdictions.

Changes in the number of hydrometeorological and gauging stations between 1924 and 2020

Period of time	1924	1925-1934	1935-1944	1945-1954	1955-1964	1965-1974	1975-1984	1985-1994	1995-2001	2002-2007	2008-2012	2013-2020
Meteostation	6	35	39	53	62	67	73	58	53	57	58	59
Gauging static	2	46	46	72	96	100	138	138	97	96	96	96

To address the development of ground-based meteorological observations it is important to increase the density of the state observation network by bringing the number of meteorological observations available today (52 out of 59 in operation) and automated hydrometeorological agrometeorological stations and PHS (74 units) up to the minimum required number - 70 units of weather stations and 100 units of automated stations, respectively, by 2025. At that point the density index of observation stations of the meteorological network throughout the country would be 3.5, which is closer to the recommended by the World Meteorological Organization indicator. Meanwhile, the scientific and methodological rationale and economic factors affecting the geography of hydrometeorological observation stations should be taken into account.

As part of the project "Modernization of the Central Asian Hydrometeorological Service: Component C" 54 automatic Stymax stations and 26 container-type meteorological stations have been installed at the Agency's meteostations supported by the World Bank. At present, 40 meteorological stations should be overhauled.

As of May 2020, out of 96 gauging stations 89 perform water level measurements and 44 gauging stations measure river flow discharge.

The key priority of the Hydrometeorology Agency is a large-scale technical modernization of its units, aimed at enabling more reliable forecasts with greater lead time, as well as improving professional skills of the staff. Improved communication systems, data collection and provision of information will allow a better provision of hydrometeorological services and this, in turn, will create conditions for:

- Achieving the modernization goal, that is, minimizing the human life risk and reducing any economic losses associated with weather and climate events and natural disasters;
- Meeting Tajikistan's regional and international obligations;
- Filling the gap between the Government's growing demand for hydrometeorological information and the Agency's ability to provide the relevant information and products;
- Attaining a "good" technological level by the Agency, compatible with the majority of National Hydrometeorological Services (NHMS) of WMO member countries.

9.3 **Capacity development needs**

Capacity development priorities include optimizing and ensuring compatibility of existing and newly available equipment and materials, up-keeping the observation systems, increasing access to data, minimizing overlaps, and increasing paybacks from investments in equipment, communications and human resources. Costly information technology and organizational capacity development projects will be more effective when there is a sustained follow-up support from the government and project implementing organizations. The staffing is one of the most pressing issues. Unless adequate financial remuneration for professional observers and local experts is ensured, technical and organizational support is not likely to have the proper long-term effect, since human resources and sustainable financial support are essential.

The training and internship of young professionals is a strategically important step and a prerequisite for the successful implementation of planned activities, especially in the medium and long-term. While the scientific basis and underlying concepts remain intact, new technologies, improved approaches, globalization and computerization of measurements are evolving year by year. It is important to keep abreast of developments and invest in specialists and human capital, while adequately evaluating and capitalizing on the experience of accomplished experts.

Expanding the network and improving the quality of hydrometeorological observations in the high mountain zone (including the measurement of snow cover properties in different river basins and

altitude zones, as well as the use of automatic stations) is one of the key conditions for a full-fledged analysis of climate change trends and glacier dynamics. Automation of observations, especially in the runoff generation zones, is a highly promising area. However, the expertise of implementing and managing the automatic weather and gauging stations and their integration into the regular observation network in Tajikistan remains limited. The functioning of AMSs is complicated due to the problems of comparability of equipment and observation series, calibration requirements, preservation and maintenance of the stations.

While data exchange between NHMSs of Central Asia is essentially in place within the framework of bilateral and interstate agreements, access of users to hydrometeorological data both within the countries and in the neighboring states is still constrained. This problem is being gradually addressed as services to users, especially to the local and international scientific community, are improving. The World Bank's project on modernizing and improving hydrometeorological network and services is aimed at addressing these challenges.

The glaciers with an area of 2-15 km (the optimal size in terms of field work and glacier representativity) with a minimal frozen surface are of great interest for studies of interaction between glaciation and climate. The smaller the area, the more pronounced the impact of local factors is. With larger areas, the macroclimatic conditions of the region are better reflected in the glacier regime, however it brings about some technical challenges and increased research costs.

Permafrost and rock glaciers continue to be poorly studied. Since they potentially contain enormous water reserves, observation of high-altitude permafrost is of great practical significance. Along with glaciers and permafrost, the pattern of high-altitude lakes, including Karakul and Sarez, could be viewed as an indicator of climate and runoff fluctuations and changes. According to the experts, a modern inventory of glaciers is a priority. Where possible, ice volume and thickness should be assessed when conducting inventories. There should be greater openness and cooperation to ensure data consistency and quality on the part of various researchers and organizations. Primary processed data on key meteorological and hydrological stations and glaciological research sites should be made available in e-databases, in line with international norms and standards.

Studies of paleoclimatic conditions over the past centuries and millennia based on analysis of ice cores, vegetation and bottom sediments identify the signs and significance of current anthropogenic climate change in relation to the recent past. In this regard, there is a need to support paleoclimatic and geobotanical monitoring initiatives in mountainous areas. Scientific and popular science expeditions and conferences involving public interest groups and journalists provide good opportunities to promote public interest and awareness of climate change and glacier retreat. Local expeditions can increase local capacity, consolidate local and foreign knowledge and resources, and improve information and experience sharing.

Voluntary observation data (e.g. climbers' reports on mountain hikes) have previously been used in glaciology and the natural sciences. Expanding the use of civic observation data going forward and encouraging data sharing to fill the gaps, public involvement and interested user groups would be helpful. Developing a partnership with Afghanistan for joint hydrological observations, assessment of glaciers and climate change impacts on the transboundary Panj River basin can help improve the quality of forecasts and adaptation planning.

Based on the analysis of the current situation the following recommendations would contribute to improving the climate change aspects:

- Improvement of the hydrometeorological monitoring system to increase the lead time and reliability of weather forecasts, storm warnings of dangerous hydrometeorological events and climate forecasts;

- Technical retrofitting of hydrometeorological and agrometeorological observation network (hand-held instruments);
- Installation of meteorological Doppler radars;
- Improvement of quality and reliability of measurements;
- Introduction of modern telecommunication facilities, supercomputers and powerful servers for data reception, processing and storage;
- Building a database and archive management system, data digitization and storage, printing and dissemination of information;
- Implementation of high resolution satellite observations;
- Systematic monitoring of glaciers, glaciological and mountain lakes;
- Implementation of automated snow measuring systems;
- Introduction of fixed and mobile stations for monitoring air pollution, surface water and soil quality;
- Development and adoption of Climate Change Laws or Climate Doctrines;
- Establishment of international Fund for glacier conservation in Tajikistan;
- Implementation of contemporary models for climate and weather forecasts, water resources and natural disasters;
- Modernization of the service delivery system;
- Improving the level of training and professional development;
- Enabling the recruitment and retention of university and other graduates in the Hydrometeorological Agency, including housing for young specialists.

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ANNEXES

LIST OF PERFORMERS

National coordinators:

Sheralizoda B.A. – Chairman of the Committee for Environmental Protection under the Government of the Republic of Tajikistan

Kurbonzoda A.H. – Director of the Agency for Hydrometeorology of the Committee for Environmental Protection under the Government of the Republic of Tajikistan

Editorial Board:

Sheralizoda B.A.

Kurbonzoda A.H.

Minikulov N.Kh. (candidate of phys.-math. sciences)

Hristova V. (PhD)

Karimov U.Kh. (doctor of phys.-math. sciences)

Saidov F.S. (candidate of economic sciences)

Usmanova N.

List of leading experts:

Abdullaev S.F. (doctor of phys.-math. sciences)	National Academy of Sciences of the Republic of Tajikistan
Abdulhamidzoda Z.A.	Agency for Statistics under the President of the Republic of Tajikistan
Asanova V.V.	Agency for Hydrometeorology of the Committee for Environmental Protection under the Government of the Republic of Tajikistan
Azimov T.A.	Ministry of Industry and New Technologies of the Republic of Tajikistan
Baidulloeva J.	Agency for Hydrometeorology of the Committee for Environmental Protection under the Government of the Republic of Tajikistan
Davlatzoda K.	Agency for Statistics under the President of the Republic of Tajikistan
Karimov U.Kh. (doctor of phys.-math. sciences)	National Academy of Sciences of the Republic of Tajikistan
Khamidov V.	Agency for Hydrometeorology of the Committee for Environmental Protection under the Government of the Republic of Tajikistan
Khomidov A.Sh.	Independent expert
Khudoyorova R.Kh.	Agency for Hydrometeorology of the Committee for Environmental Protection under the Government of the Republic of Tajikistan

Kirillova T.F.	Private enterprise TA LLC JV "Anzob"
Kuropatkina N.A.	Private enterprise LLC "Loiha-Gidroenergo"
Kodirov A. (candidate of technical sciences)	National Academy of Sciences of the Republic of Tajikistan
Mukhtorova Z.B.	Ministry of Economic Development and Trade of the Republic of Tajikistan
Nazarov A.	Forestry Agency under the Government of the Republic of Tajikistan
Nazarov B.G.	Ministry of Agriculture of the Republic of Tajikistan
Nazarov F.	Ministry of Transport of the Republic of Tajikistan
Normatov I.Sh. (doctor of chemical sciences, correspond. member of NAS)	Tajik National University, National Academy of Sciences of the Republic of Tajikistan
Partoev K. (doctor of agricultural sciences)	National Academy of Sciences of the Republic of Tajikistan
Pulatov Ya. (doctor of agricultural sciences, professor)	National Academy of Sciences of the Republic of Tajikistan
Rajabov N.Sh.	Agency for Hydrometeorology of the Committee for Environmental Protection under the Government of the Republic of Tajikistan
Rajabova N.S.	Agency for Statistics under the President of the Republic of Tajikistan
Rahmonov R.	Agency for Hydrometeorology of the Committee for Environmental Protection under the Government of the Republic of Tajikistan
Safarov Sh.J. (doctor of agricultural sciences)	Ministry of Agriculture of the Republic of Tajikistan
Saidov F.S. (candidate of economic sciences)	Independent expert
Saidzoda M.I.	Forestry Agency under the Government of the Republic of Tajikistan
Sharifov G.V.	Ministry of Energy and Water Resources of the Republic of Tajikistan
Shodmonov M.T.	Agency for Hydrometeorology of the Committee for Environmental Protection under the Government of the Republic of Tajikistan
Sulaimonov R.	SUE «Khojagii manziliyu kommunali»
Ustyan I.P.	Forestry Institute of the Forestry Agency under the Government of the Republic of Tajikistan

TABLES OF INVENTORY OF GREENHOUSE GAS EMISSIONS AND REMOVALS FOR 1990-2016

Inventory Year: 2016

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
Total National Emissions and Removals	6093.452817	230.781	5.037	0	383.762	NE	NO	NO	17	83.7	98.9	7.8
1 - Energy	6415.844376	3.8448	0.13	0	0	NO	NO	NO	16	14.5	2.8	4.7
1.A - Fuel Combustion Activities	6412.497952	1.15473	0.13	0	0	NO	NO	NO	16	14.5	2.8	4.6
1.A.1 - Energy Industries	2702.271423	0.04578	0.036						3.12	0.208	0.052	0.04
1.A.2 - Manufacturing Industries and Construction	1954.880913	0.18038	0.028						9	4.14	0.57	0.3
1.A.3 - Transport	1336.745334	0.75242	0.061						2	6	1.14	0.3
1.A.4 - Other Sectors	418.6002817	0.17615	0.005						2	4.1	1	4
1.A.5 - Non-Specified	0	0	0						NO	NO	NO	NO
1.B - Fugitive emissions from fuels	3.3464242	2.69007	0	0	0	NE	NE	NE	0.002	0.002	0.02	0.02
1.B.1 - Solid Fuels	3.2387706	1.18578	0						NO	NO	NO	NO
1.B.2 - Oil and Natural Gas	0.1076536	1.50429	0						0.002	0.002	0.02	0.02
1.B.3 - Other emissions from Energy Production	0	0	0						NO	NO	NO	NO
1.C - Carbon dioxide Transport and Storage	0	0	0	0	0	NO	NO	NO	0	0	0	0
1.C.1 - Transport of CO2	0								0	0	0	0
1.C.2 - Injection and Storage	0								0	0	0	0
1.C.3 - Other	0								0	0	0	0
2 - Industrial Processes and Product Use	1238.588568	0	0	0	383.762	NE	NO	NO	0	69	96	3
2.A - Mineral Industry	1031.708568	0	0	0	0	NO	NO	NO	NO	NO	46	1
2.A.1 - Cement production	978.464988								0	0	0	0
2.A.2 - Lime production	11.475								0	0	0	0
2.A.3 - Glass Production	1.071								0	0	0	0
2.A.4 - Other Process Uses of Carbonates	40.69758					NO	NO	NO	0	0	0	0
2.A.5 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.B - Chemical Industry	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.B.1 - Ammonia Production	0								NO	NO	NO	NO
2.B.2 - Nitric Acid Production			0						NO	NO	NO	NO
2.B.3 - Adipic Acid Production			0						NO	NO	NO	NO
2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production			0						NO	NO	NO	NO
2.B.5 - Carbide Production	0	0							NO	NO	NO	NO
2.B.6 - Titanium Dioxide Production	0								NO	NO	NO	NO
2.B.7 - Soda Ash Production	0								NO	NO	NO	NO
2.B.8 - Petrochemical and Carbon Black Production	0	0							0	0	0	0
2.B.9 - Fluorochemical Production				0	0	0	0	0	0	0	0	0
2.B.10 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.C - Metal Industry	206.88	0	0	0	383.762	NO	NO	NO	0	69	NO	2
2.C.1 - Iron and Steel Production	0	0							NO	NO	NO	NO
2.C.2 - Ferroalloys Production	0	0							NO	NO	NO	NO

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
2.C.3 - Aluminium production	206.88				383.762				0	69	NO	2
2.C.4 - Magnesium production	0					NO			NO	NO	NO	NO
2.C.5 - Lead Production	0								NO	NO	NO	NO
2.C.6 - Zinc Production	0								NO	NO	NO	NO
2.C.7 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.D - Non-Energy Products from Fuels and Solvent Use	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.D.1 - Lubricant Use	0								NO	NO	NO	NO
2.D.2 - Paraffin Wax Use	0								NO	NO	NO	NO
2.D.3 - Solvent Use									NO	NO	39	NO
2.D.4 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.E - Electronics Industry	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.E.1 - Integrated Circuit or Semiconductor				0	0	NO		NO	NO	NO	NO	NO
2.E.2 - TFT Flat Panel Display					0	NO		NO	NO	NO	NO	NO
2.E.3 - Photovoltaics					0				NO	NO	NO	NO
2.E.4 - Heat Transfer Fluid					0				NO	NO	NO	NO
2.E.5 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.F - Product Uses as Substitutes for Ozone Depleting Substances	0	0	0	0	0	NE	NE	NE	NE	NE	NE	NE
2.F.1 - Refrigeration and Air Conditioning				0		NE	NE	NE	NE	NE	NE	NE
2.F.2 - Foam Blowing Agents				0				NO	NO	NO	NO	NO
2.F.3 - Fire Protection				0	0				NO	NO	NO	NO
2.F.4 - Aerosols				0				NE	NE	NE	NE	NE
2.F.5 - Solvents				0	0			NO	NO	NO	NO	NO
2.F.6 - Other Applications (please specify)				0	0			NO	NO	NO	NO	NO
2.G - Other Product Manufacture and Use	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.G.1 - Electrical Equipment					0	NO	NO	NO	NO	NO	NO	NO
2.G.2 - SF6 and PFCs from Other Product Uses					0	0		0	0	0	0	0
2.G.3 - N2O from Product Uses			0						0	0	0	0
2.G.4 - Other (Please specify)	0	0	0	0	0				0	0	0	0
2.H - Other	0	0	0	0	0	NO	NO	NO	NO	NO	11	NO
2.H.1 - Pulp and Paper Industry	0	0							NO	NO	NO	NO
2.H.2 - Food and Beverages Industry	0	0							NO	NO	11	NO
2.H.3 - Other (please specify)	0	0	0						NO	NO	NO	NO
3 - Agriculture, Forestry, and Other Land Use	-1560.980127	210.058	4.585	0	0	NA	NA	NA	0	0	0	0
3.A - Livestock	0	199.768	2.205	0	0	NA	NA	NA	0	0	0	0
3.A.1 - Enteric Fermentation		166.912							0	0	0	0
3.A.2 - Manure Management		32.8561	2.205						0	0	0	0
3.B - Land	-1598.318527	0	0	0	0	NA	NA	NA	0	0	0	0
3.B.1 - Forest land	-1598.190194								0	0	0	0
3.B.2 - Cropland	-0.099								0	0	0	0

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
3.B.3 - Grassland	-0.029333333								0	0	0	0
3.B.4 - Wetlands	0		0						0	0	0	0
3.B.5 - Settlements	0								0	0	0	0
3.B.6 - Other Land	0								0	0	0	0
3.C - Aggregate sources and non-CO2 emissions sources on land	37.3384	10.29	2.38	0	0	NA	NA	NA	0	0	0	0
3.C.1 - Emissions from biomass burning		0	0						0	0	0	0
3.C.2 - Liming	0								0	0	0	0
3.C.3 - Urea application	37.3384								0	0	0	0
3.C.4 - Direct N2O Emissions from managed soils			1.572						0	0	0	0
3.C.5 - Indirect N2O Emissions from managed soils			0.588						0	0	0	0
3.C.6 - Indirect N2O Emissions from manure management			0.22						0	0	0	0
3.C.7 - Rice cultivations		10.29							0	0	0	0
3.C.8 - Other (please specify)		0	0						0	0	0	0
3.D - Other	0	0	0	0	0	NO	NO	NO	0	0	0	0
3.D.1 - Harvested Wood Products	0								0	0	0	0
3.D.2 - Other (please specify)	0	0	0						0	0	0	0
4 - Waste	0	16.8784	0.322	0	0	NO	NO	NO	0	0	0	0
4.A - Solid Waste Disposal	0	12.247	0	0	0	NO	NO	NO	0	0	0	0
4.B - Biological Treatment of Solid Waste	0	0	0	0	0	NO	NO	NO	0	0	0	0
4.C - Incineration and Open Burning of Waste	0	0	0	0	0	NO	NO	NO	0	0	0	0
4.D - Wastewater Treatment and Discharge	0	4.63136	0.322	0	0	NO	NO	NO	0	0	0	0
4.E - Other (please specify)	0	0	0	0	0	NO	NO	NO	0	0	0	0
5 - Other	0	0	0	0	0	NO	NO	NO	0	0	0	0
5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3	0	0	0	0	0	NO	NO	NO	0	0	0	0
5.B - Other (please specify)	0	0	0	0	0	NO	NO	NO	0	0	0	0
Memo Items (5)												
International Bunkers	164.909745	0.00115	0.005	0	0	NO	NO	NO	1	0.2	0.1	0.1
1.A.3.a.i - International Aviation (International Bunkers)	164.909745	0.00115	0.005						1	0.2	0.1	0.1
1.A.3.d.i - International water-borne navigation (International bunkers)	0	0	0						NO	NO	NO	NO
1.A.5.c - Multilateral Operations	0	0	0	0	0	NO	NO	NO	0	0	0	0

Inventory Year: 2015

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
Total National Emissions and Removals	3949.038541	221.717	5.021	0	412.849	NE	NO	NO	15	92.2	96.1	11.05
1 - Energy	4530.207764	2.89752	0.076	0	0	NO	NO	NO	14	18	3	8
1.A - Fuel Combustion Activities	4527.623107	0.50853	0.076	0	0	NO	NO	NO	14	18	3	8
1.A.1 - Energy Industries	2147.863028	0.0395	0.028						3.22	0.215	0.053	0.02
1.A.2 - Manufacturing Industries and Construction	1712.962339	0.15777	0.024						7	3	0.4	0.2
1.A.3 - Transport	247.419551	0.0762	0.019						3	10	2	1
1.A.4 - Other Sectors	419.378189	0.23506	0.005						2	5	1	7
1.A.5 - Non-Specified	0	0	0						NO	NO	NO	NO
1.B - Fugitive emissions from fuels	2.5846569	2.38899	0	0	0	NE	NE	NE	0.001	0.002	0.02	0.02
1.B.1 - Solid Fuels	2.4786801	0.90749	0						NO	NO	NO	NO
1.B.2 - Oil and Natural Gas	0.1059768	1.48149	0						0.001	0.002	0.02	0.02
1.B.3 - Other emissions from Energy Production	0	0	0						NO	NO	NO	NO
1.C - Carbon dioxide Transport and Storage	0	0	0	0	0	NO	NO	NO	0	0	0	0
1.C.1 - Transport of CO2	0								0	0	0	0
1.C.2 - Injection and Storage	0								0	0	0	0
1.C.3 - Other	0								0	0	0	0
2 - Industrial Processes and Product Use	966.785186	0	0	0	412.849	NE	NO	NO	0	74	93	3
2.A - Mineral Industry	744.225186	0	0	0	0	NO	NO	NO	NO	NO	45	0
2.A.1 - Cement production	693.384984								NO	NO	NO	0
2.A.2 - Lime production	10.575								NO	NO	NO	NO
2.A.3 - Glass Production	0.33201								NO	NO	NO	NO
2.A.4 - Other Process Uses of Carbonates	39.933192					NO	NO	NO	0	0	0	0
2.A.5 - Other (please specify)	0	0	0						0	0	0	0
2.B - Chemical Industry	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.B.1 - Ammonia Production	0								NO	NO	NO	NO
2.B.2 - Nitric Acid Production			0						NO	NO	NO	NO
2.B.3 - Adipic Acid Production			0						NO	NO	NO	NO
2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production			0						NO	NO	NO	NO
2.B.5 - Carbide Production	0	0							NO	NO	NO	NO
2.B.6 - Titanium Dioxide Production	0								NO	NO	NO	NO
2.B.7 - Soda Ash Production	0								NO	NO	NO	NO
2.B.8 - Petrochemical and Carbon Black Production	0	0							0	0	0	0
2.B.9 - Fluorochemical Production				0	0	0	0	0	0	0	0	0
2.B.10 - Other (Please specify)	0	0	0	0	0				0	0	0	0
2.C - Metal Industry	222.56	0	0	0	412.849	NO	NO	NO	0	74	NO	3
2.C.1 - Iron and Steel Production	0	0							NO	NO	NO	NO
2.C.2 - Ferroalloys Production	0	0							NO	NO	NO	NO
2.C.3 - Aluminium production	222.56				412.849				0	74	NO	3

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
2.C.4 - Magnesium production	0					NO			NO	NO	NO	NO
2.C.5 - Lead Production	0								NO	NO	NO	NO
2.C.6 - Zinc Production	0								NO	NO	NO	NO
2.C.7 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.D - Non-Energy Products from Fuels and Solvent Use	0	0	0	0	0	NO	NO	NO	NO	NO	38	NO
2.D.1 - Lubricant Use	0								NO	NO	NO	NO
2.D.2 - Paraffin Wax Use	0								NO	NO	NO	NO
2.D.3 - Solvent Use									NO	NO	38	NO
2.D.4 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.E - Electronics Industry	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.E.1 - Integrated Circuit or Semiconductor				0	0	NO		NO	NO	NO	NO	NO
2.E.2 - TFT Flat Panel Display					0	NO		NO	NO	NO	NO	NO
2.E.3 - Photovoltaics					0				NO	NO	NO	NO
2.E.4 - Heat Transfer Fluid					0				NO	NO	NO	NO
2.E.5 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.F - Product Uses as Substitutes for Ozone Depleting Substances	0	0	0	0	0	NE	NE	NE	NE	NE	NE	NE
2.F.1 - Refrigeration and Air Conditioning				0		NE	NE	NE	NE	NE	NE	NE
2.F.2 - Foam Blowing Agents				0				NO	0	0	0	0
2.F.3 - Fire Protection				0	0				0	0	0	0
2.F.4 - Aerosols				0				NE	0	0	0	0
2.F.5 - Solvents				0	0			NO	0	0	0	0
2.F.6 - Other Applications (please specify)				0	0			NO	0	0	0	0
2.G - Other Product Manufacture and Use	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.G.1 - Electrical Equipment					0	NO	NO	NO	NO	NO	NO	NO
2.G.2 - SF6 and PFCs from Other Product Uses					0	0		0	0	0	0	0
2.G.3 - N2O from Product Uses			0						0	0	0	0
2.G.4 - Other (Please specify)	0	0	0	0	0				0	0	0	0
2.H - Other	0	0	0	0	0	NO	NO	NO	NO	NO	10	NO
2.H.1 - Pulp and Paper Industry	0	0							NO	NO	NO	NO
2.H.2 - Food and Beverages Industry	0	0							NO	NO	10	NO
2.H.3 - Other (please specify)	0	0	0						NO	NO	NO	NO
3 - Agriculture, Forestry, and Other Land Use	-1547.954409	202.282	4.63	0	0	NA	NA	NA	NA	NA	NA	NA
3.A - Livestock	0	193.836	2.136	0	0	NA	NA	NA	NA	NA	NA	NA
3.A.1 - Enteric Fermentation		162.123							NA	NA	NA	NA
3.A.2 - Manure Management		31.7129	2.136						NA	NA	NA	NA
3.B - Land	-1590.753209	0	0	0	0	NA	NA	NA	NA	NA	NA	NA
3.B.1 - Forest land	-1590.624876								NA	NA	NA	NA
3.B.2 - Cropland	-0.099								NA	NA	NA	NA
3.B.3 - Grassland	-0.029333333								NA	NA	NA	NA

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
3.B.4 - Wetlands	0		0						NA	NA	NA	NA
3.B.5 - Settlements	0								NA	NA	NA	NA
3.B.6 - Other Land	0								NA	NA	NA	NA
3.C - Aggregate sources and non-CO2 emissions sources on land	42.7988	8.44531	2.494	0	0	NA	NA	NA	NO	NO	NO	NO
3.C.1 - Emissions from biomass burning		0	0						NO	NO	NO	NO
3.C.2 - Liming	0								NO	NO	NO	NO
3.C.3 - Urea application	42.7988								NO	NO	NO	NO
3.C.4 - Direct N2O Emissions from managed soils			1.665						NO	NO	NO	NO
3.C.5 - Indirect N2O Emissions from managed soils			0.616						NO	NO	NO	NO
3.C.6 - Indirect N2O Emissions from manure management			0.214						NO	NO	NO	NO
3.C.7 - Rice cultivations		8.44531							NO	NO	NO	NO
3.C.8 - Other (please specify)		0	0						NO	NO	NO	NO
3.D - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
3.D.1 - Harvested Wood Products	0								NO	NO	NO	NO
3.D.2 - Other (please specify)	0	0	0						NO	NO	NO	NO
4 - Waste	0	16.5378	0.315	0	0	NO	NO	NO	NO	NO	NO	NO
4.A - Solid Waste Disposal	0	12.0224	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.B - Biological Treatment of Solid Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.C - Incineration and Open Burning of Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.D - Wastewater Treatment and Discharge	0	4.51542	0.315	0	0	NO	NO	NO	NO	NO	NO	NO
4.E - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5 - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.B - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
Memo Items (5)												
International Bunkers	145.6061607	0.00102	0.004	0	0	NO	NO	NO	1	0.2	0.1	0.05
1.A.3.a.i - International Aviation (International Bunkers)	145.6061607	0.00102	0.004						1	2	0.1	0.05
1.A.3.d.i - International water-borne navigation (International bunkers)	0	0	0						NO	NO	NO	NO
1.A.5.c - Multilateral Operations	0	0	0	0	0	NO	NO	NO	0	0	0	0

Inventory Year: 2014

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
Total National Emissions and Removals	1564.724153	213.937	5.288	0	359.903	NE	NO	NO	8	76.7	78.1	6.1
1 - Energy	2284.98512	2.63292	0.038	0	0	NO	NO	NO	7	11.4	2	4
1.A - Fuel Combustion Activities	2282.790616	0.39381	0.038	0	0	NO	NO	NO	7	11.4	2	4
1.A.1 - Energy Industries	756.3562234	0.02084	0.007						0.01	0.001	0.0002	0.02
1.A.2 - Manufacturing Industries and Construction	878.8436921	0.07259	0.011						3	1.37	0.2	0.3
1.A.3 - Transport	205.2099034	0.10098	0.015						2	6	1	0.3
1.A.4 - Other Sectors	442.3807972	0.19939	0.005						2	4	0.5	3
1.A.5 - Non-Specified	0	0	0						NO	NO	NO	NO
1.B - Fugitive emissions from fuels	2.1945035	2.23911	0	0	0	NE	NE	NE	0.001	0.002	0.02	0.02
1.B.1 - Solid Fuels	2.0889999	0.76483	0						NO	NO	NO	NO
1.B.2 - Oil and Natural Gas	0.1055036	1.47429	0						0.001	0.002	0.02	0.02
1.B.3 - Other emissions from Energy Production	0	0	0						NO	NO	NO	NO
1.C - Carbon dioxide Transport and Storage	0	0	0	0	0	NO	NO	NO	0	0	0	0
1.C.1 - Transport of CO2	0								0	0	0	0
1.C.2 - Injection and Storage	0								0	0	0	0
1.C.3 - Other	0								0	0	0	0
2 - Industrial Processes and Product Use	798.750308	0	0	0	359.903	NE	NO	NO	0	65	76	2
2.A - Mineral Industry	604.732708	0	0	0	0	NO	NO	NO	NO	NO	30	0
2.A.1 - Cement production	562.3362								NO	NO	NO	0
2.A.2 - Lime production	9.15								NO	NO	NO	NO
2.A.3 - Glass Production	0.3366								NO	NO	NO	NO
2.A.4 - Other Process Uses of Carbonates	32.909908					NO	NO	NO	0	0	0	0
2.A.5 - Other (please specify)	0	0	0						0	0	0	0
2.B - Chemical Industry	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.B.1 - Ammonia Production	0								NO	NO	NO	NO
2.B.2 - Nitric Acid Production			0						NO	NO	NO	NO
2.B.3 - Adipic Acid Production			0						NO	NO	NO	NO
2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production			0						NO	NO	NO	NO
2.B.5 - Carbide Production	0	0							NO	NO	NO	NO
2.B.6 - Titanium Dioxide Production	0								NO	NO	NO	NO
2.B.7 - Soda Ash Production	0								NO	NO	NO	NO
2.B.8 - Petrochemical and Carbon Black Production	0	0							0	0	0	0
2.B.9 - Fluorochemical Production				0	0	0	0	0	0	0	0	0
2.B.10 - Other (Please specify)	0	0	0	0	0				0	0	0	0
2.C - Metal Industry	194.0176	0	0	0	359.903	NO	NO	NO	0	65	NO	2
2.C.1 - Iron and Steel Production	0	0							NO	NO	NO	NO
2.C.2 - Ferroalloys Production	0	0							NO	NO	NO	NO
2.C.3 - Aluminium production	194.0176				359.903				0	65	NO	2

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
2.C.4 - Magnesium production	0					NO			NO	NO	NO	NO
2.C.5 - Lead Production	0								NO	NO	NO	NO
2.C.6 - Zinc Production	0								NO	NO	NO	NO
2.C.7 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.D - Non-Energy Products from Fuels and Solvent Use	0	0	0	0	0	NO	NO	NO	NO	NO	38	NO
2.D.1 - Lubricant Use	0								NO	NO	NO	NO
2.D.2 - Paraffin Wax Use	0								NO	NO	NO	NO
2.D.3 - Solvent Use									NO	NO	38	NO
2.D.4 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.E - Electronics Industry	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.E.1 - Integrated Circuit or Semiconductor				0	0	NO		NO	NO	NO	NO	NO
2.E.2 - TFT Flat Panel Display					0	NO		NO	NO	NO	NO	NO
2.E.3 - Photovoltaics					0				NO	NO	NO	NO
2.E.4 - Heat Transfer Fluid					0				NO	NO	NO	NO
2.E.5 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.F - Product Uses as Substitutes for Ozone Depleting Substances	0	0	0	0	0	NE	NE	NE	NE	NE	NE	NE
2.F.1 - Refrigeration and Air Conditioning				0		NE	NE	NE	NE	NE	NE	NE
2.F.2 - Foam Blowing Agents				0				NO	NO	NO	NO	NO
2.F.3 - Fire Protection				0	0				NO	NO	NO	NO
2.F.4 - Aerosols				0				NE	NE	NE	NE	NE
2.F.5 - Solvents				0	0			NO	NO	NO	NO	NO
2.F.6 - Other Applications (please specify)				0	0			NO	NO	NO	NO	NO
2.G - Other Product Manufacture and Use	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.G.1 - Electrical Equipment					0	NO	NO	NO	NO	NO	NO	NO
2.G.2 - SF6 and PFCs from Other Product Uses					0	0		0	0	0	0	0
2.G.3 - N2O from Product Uses			0						0	0	0	0
2.G.4 - Other (Please specify)	0	0	0	0	0				0	0	0	0
2.H - Other	0	0	0	0	0	NO	NO	NO	NO	NO	8	NO
2.H.1 - Pulp and Paper Industry	0	0							NO	NO	NO	NO
2.H.2 - Food and Beverages Industry	0	0							NO	NO	8	NO
2.H.3 - Other (please specify)	0	0	0						NO	NO	NO	NO
3 - Agriculture, Forestry, and Other Land Use	-1519.011275	195.188	4.943	0	0	NA	NA	NA	NA	NA	NA	NA
3.A - Livestock	0	187.162	2.063	0	0	NA	NA	NA	NA	NA	NA	NA
3.A.1 - Enteric Fermentation		156.522							NA	NA	NA	NA
3.A.2 - Manure Management		30.64	2.063						NA	NA	NA	NA
3.B - Land	-1576.898408	0	0	0	0	NA	NA	NA	NA	NA	NA	NA
3.B.1 - Forest land	-1576.770075								NA	NA	NA	NA
3.B.2 - Cropland	-0.099								NA	NA	NA	NA
3.B.3 - Grassland	-0.029333333								NA	NA	NA	NA

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
3.B.4 - Wetlands	0		0						NA	NA	NA	NA
3.B.5 - Settlements	0								NA	NA	NA	NA
3.B.6 - Other Land	0								NA	NA	NA	NA
3.C - Aggregate sources and non-CO2 emissions sources on land	57.88713333	8.02603	2.879	0	0	NA	NA	NA	NO	NO	NO	NO
3.C.1 - Emissions from biomass burning		0	0						NO	NO	NO	NO
3.C.2 - Liming	0								NO	NO	NO	NO
3.C.3 - Urea application	57.88713333								NO	NO	NO	NO
3.C.4 - Direct N2O Emissions from managed soils			1.963						NO	NO	NO	NO
3.C.5 - Indirect N2O Emissions from managed soils			0.71						NO	NO	NO	NO
3.C.6 - Indirect N2O Emissions from manure management			0.206						NO	NO	NO	NO
3.C.7 - Rice cultivations		8.02603							NO	NO	NO	NO
3.C.8 - Other (please specify)		0	0						NO	NO	NO	NO
3.D - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
3.D.1 - Harvested Wood Products	0								NO	NO	NO	NO
3.D.2 - Other (please specify)	0	0	0						NO	NO	NO	NO
4 - Waste	0	16.1161	0.308	0	0	NO	NO	NO	NO	NO	NO	NO
4.A - Solid Waste Disposal	0	11.7512	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.B - Biological Treatment of Solid Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.C - Incineration and Open Burning of Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.D - Wastewater Treatment and Discharge	0	4.36492	0.308	0	0	NO	NO	NO	NO	NO	NO	NO
4.E - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5 - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.B - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
Memo Items (5)												
International Bunkers	181.9178361	0.00127	0.005	0	0	NO	NO	NO	1	0.3	0.1	0.1
1.A.3.a.i - International Aviation (International Bunkers)	181.9178361	0.00127	0.005						1	0.3	0.1	0.1
1.A.3.d.i - International water-borne navigation (International bunkers)	0	0	0						NO	NO	NO	NO
1.A.5.c - Multilateral Operations	0	0	0	0	0	NO	NO	NO	0	0	0	0

Inventory Year: 2013

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
Total National Emissions and Removals	1056.384459	211.126	4.599	0	642.183	NE	NO	NO	8.1	130.2	93.6	5.53
1 - Energy	1988.22569	2.5019	0.035	0	0	NO	NO	NO	7.5	14	2.5	2.43
1.A - Fuel Combustion Activities	1986.881505	0.40972	0.035	0	0	NO	NO	NO	7.5	14	2.5	2.4
1.A.1 - Energy Industries	772.2334429	0.02629	0.005						0.02	0.003	0.001	0.1
1.A.2 - Manufacturing Industries and Construction	433.8838123	0.01608	0.003						1.5	0.14	0.04	0.3
1.A.3 - Transport	359.9086354	0.16753	0.023						4	10	2	1
1.A.4 - Other Sectors	420.8556146	0.19982	0.005						2	3.3	0.5	1
1.A.5 - Non-Specified	0	0	0						NO	NO	NO	NO
1.B - Fugitive emissions from fuels	1.3441848	2.09218	0	0	0	NE	NE	NE	0.002	0.002	0.02	0.03
1.B.1 - Solid Fuels	1.2266124	0.44909	0						NO	NO	NO	NO
1.B.2 - Oil and Natural Gas	0.1175724	1.64309	0						0.002	0.002	0.02	0.03
1.B.3 - Other emissions from Energy Production	0	0	0						NO	NO	NO	NO
1.C - Carbon dioxide Transport and Storage	0	0	0	0	0	NO	NO	NO	0	0	0	0
1.C.1 - Transport of CO2	0								0	0	0	0
1.C.2 - Injection and Storage	0								0	0	0	0
1.C.3 - Other	0								0	0	0	0
2 - Industrial Processes and Product Use	572.1468084	0	0	0	642.183	NE	NO	NO	0	116	91	3
2.A - Mineral Industry	225.9564084	0	0	0	0	NO	NO	NO	NO	NO	39	0
2.A.1 - Cement production	187.6735944								NO	NO	NO	0
2.A.2 - Lime production	8.175								NO	NO	NO	NO
2.A.3 - Glass Production	0.92565								NO	NO	NO	NO
2.A.4 - Other Process Uses of Carbonates	29.182164					NO	NO	NO	NO	NO	NO	NO
2.A.5 - Other (please specify)	0	0	0						0	0	0	0
2.B - Chemical Industry	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.B.1 - Ammonia Production	0								NO	NO	NO	NO
2.B.2 - Nitric Acid Production			0						NO	NO	NO	NO
2.B.3 - Adipic Acid Production			0						NO	NO	NO	NO
2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production			0						NO	NO	NO	NO
2.B.5 - Carbide Production	0	0							NO	NO	NO	NO
2.B.6 - Titanium Dioxide Production	0								NO	NO	NO	NO
2.B.7 - Soda Ash Production	0								NO	NO	NO	NO
2.B.8 - Petrochemical and Carbon Black Production	0	0							0	0	0	0
2.B.9 - Fluorochemical Production				0	0	0	0	0	0	0	0	0
2.B.10 - Other (Please specify)	0	0	0	0	0				0	0	0	0
2.C - Metal Industry	346.1904	0	0	0	642.183	NO	NO	NO	0	116	NO	3
2.C.1 - Iron and Steel Production	0	0							NO	NO	NO	NO
2.C.2 - Ferroalloys Production	0	0							NO	NO	NO	NO
2.C.3 - Aluminium production	346.1904				642.183				0	116	NO	3

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
2.C.4 - Magnesium production	0					NO			NO	NO	NO	NO
2.C.5 - Lead Production	0								NO	NO	NO	NO
2.C.6 - Zinc Production	0								NO	NO	NO	NO
2.C.7 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.D - Non-Energy Products from Fuels and Solvent Use	0	0	0	0	0	NO	NO	NO	NO	NO	37	NO
2.D.1 - Lubricant Use	0								NO	NO	NO	NO
2.D.2 - Paraffin Wax Use	0								NO	NO	NO	NO
2.D.3 - Solvent Use									NO	NO	37	NO
2.D.4 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.E - Electronics Industry	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.E.1 - Integrated Circuit or Semiconductor				0	0	NO		NO	NO	NO	NO	NO
2.E.2 - TFT Flat Panel Display					0	NO		NO	NO	NO	NO	NO
2.E.3 - Photovoltaics					0				NO	NO	NO	NO
2.E.4 - Heat Transfer Fluid					0				NO	NO	NO	NO
2.E.5 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.F - Product Uses as Substitutes for Ozone Depleting Substances	0	0	0	0	0	NE	NE	NE	NE	NE	NE	NE
2.F.1 - Refrigeration and Air Conditioning				0		NE	NE	NE	NE	NE	NE	NE
2.F.2 - Foam Blowing Agents				0				NO	NO	NO	NO	NO
2.F.3 - Fire Protection				0	0				NO	NO	NO	NO
2.F.4 - Aerosols				0				NE	NE	NE	NE	NE
2.F.5 - Solvents				0	0			NO	NO	NO	NO	NO
2.F.6 - Other Applications (please specify)				0	0			NO	NO	NO	NO	NO
2.G - Other Product Manufacture and Use	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.G.1 - Electrical Equipment					0	NO	NO	NO	NO	NO	NO	NO
2.G.2 - SF6 and PFCs from Other Product Uses					0	0		0	0	0	0	0
2.G.3 - N2O from Product Uses			0						0	0	0	0
2.G.4 - Other (Please specify)	0	0	0	0	0				0	0	0	0
2.H - Other	0	0	0	0	0	NO	NO	NO	NO	NO	15	NO
2.H.1 - Pulp and Paper Industry	0	0							NO	NO	NO	NO
2.H.2 - Food and Beverages Industry	0	0							NO	NO	15	NO
2.H.3 - Other (please specify)	0	0	0						NO	NO	NO	NO
3 - Agriculture, Forestry, and Other Land Use	-1503.988039	192.843	4.263	0	0	NA	NA	NA	NA	NA	NA	NA
3.A - Livestock	0	184.192	1.596	0	0	NA	NA	NA	NA	NA	NA	NA
3.A.1 - Enteric Fermentation		154.024							NA	NA	NA	NA
3.A.2 - Manure Management		30.1681	1.596						NA	NA	NA	NA
3.B - Land	-1564.276839	0	0	0	0	NA	NA	NA	NA	NA	NA	NA
3.B.1 - Forest land	-1564.148506								NA	NA	NA	NA
3.B.2 - Cropland	-0.099								NA	NA	NA	NA
3.B.3 - Grassland	-0.029333333								NA	NA	NA	NA

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
3.B.4 - Wetlands	0		0						NA	NA	NA	NA
3.B.5 - Settlements	0								NA	NA	NA	NA
3.B.6 - Other Land	0								NA	NA	NA	NA
3.C - Aggregate sources and non-CO2 emissions sources on land	60.2888	8.6503	2.667	0	0	NA	NA	NA	NO	NO	NO	NO
3.C.1 - Emissions from biomass burning		0	0						NO	NO	NO	NO
3.C.2 - Liming	0								NO	NO	NO	NO
3.C.3 - Urea application	60.2888								NO	NO	NO	NO
3.C.4 - Direct N2O Emissions from managed soils			1.85						NO	NO	NO	NO
3.C.5 - Indirect N2O Emissions from managed soils			0.657						NO	NO	NO	NO
3.C.6 - Indirect N2O Emissions from manure management			0.16						NO	NO	NO	NO
3.C.7 - Rice cultivations		8.6503							NO	NO	NO	NO
3.C.8 - Other (please specify)		0	0						NO	NO	NO	NO
3.D - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
3.D.1 - Harvested Wood Products	0								NO	NO	NO	NO
3.D.2 - Other (please specify)	0	0	0						NO	NO	NO	NO
4 - Waste	0	15.7813	0.3	0	0	NO	NO	NO	NO	NO	NO	NO
4.A - Solid Waste Disposal	0	11.5327	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.B - Biological Treatment of Solid Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.C - Incineration and Open Burning of Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.D - Wastewater Treatment and Discharge	0	4.24855	0.3	0	0	NO	NO	NO	NO	NO	NO	NO
4.E - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5 - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.B - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
Memo Items (5)												
International Bunkers	166.9876709	0.00117	0.005	0	0	NO	NO	NO	0.6	0.2	0.1	0.1
1.A.3.a.i - International Aviation (International Bunkers)	166.9876709	0.00117	0.005						0.6	0.2	0.1	0.1
1.A.3.d.i - International water-borne navigation (International bunkers)	0	0	0						NO	NO	NO	NO
1.A.5.c - Multilateral Operations	0	0	0	0	0	NO	NO	NO	0	0	0	0

Inventory Year: 2012

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
Total National Emissions and Removals	603.1622067	209.098	5.68	0	808.798	NE	NO	NO	7.3	155.4	74.1	6.1
1 - Energy	1511.38988	2.38579	0.031	0	0	NO	NO	NO	5.3	9.1	2	2
1.A - Fuel Combustion Activities	1510.281059	0.22406	0.031	0	0	NO	NO	NO	5.3	9.1	2	2
1.A.1 - Energy Industries	507.3531525	0.01836	0.004						0.1	0.01	0.003	0.15
1.A.2 - Manufacturing Industries and Construction	360.0481949	0.01578	0.003						1.2	0.1	0.04	0.4
1.A.3 - Transport	175.3670182	0.06225	0.02						2	6	1.1	0.4
1.A.4 - Other Sectors	467.5126937	0.12767	0.004						2	3	0.4	1
1.A.5 - Non-Specified	0	0	0						NO	NO	NO	NO
1.B - Fugitive emissions from fuels	1.1088208	2.16173	0	0	0	NE	NE	NE	0.002	0.003	0.02	0.03
1.B.1 - Solid Fuels	0.980148	0.35885	0						NO	NO	NO	NO
1.B.2 - Oil and Natural Gas	0.1286728	1.80287	0						0.002	0.003	0.02	0.03
1.B.3 - Other emissions from Energy Production	0	0	0						NO	NO	NO	NO
1.C - Carbon dioxide Transport and Storage	0	0	0	0	0	NO	NO	NO	0	0	0	0
1.C.1 - Transport of CO2	0								0	0	0	0
1.C.2 - Injection and Storage	0								0	0	0	0
1.C.3 - Other	0								0	0	0	0
2 - Industrial Processes and Product Use	584.3881412	0	0	0	808.798	NE	NO	NO	1	146	72	4
2.A - Mineral Industry	148.3785412	0	0	0	0	NO	NO	NO	NO	NO	21	0
2.A.1 - Cement production	122.9315832								NO	NO	NO	0
2.A.2 - Lime production	4.125								NO	NO	NO	NO
2.A.3 - Glass Production	0.50235								NO	NO	NO	NO
2.A.4 - Other Process Uses of Carbonates	20.819608					NO	NO	NO	NO	NO	NO	NO
2.A.5 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.B - Chemical Industry	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.B.1 - Ammonia Production	0								NO	NO	NO	NO
2.B.2 - Nitric Acid Production			0						NO	NO	NO	NO
2.B.3 - Adipic Acid Production			0						NO	NO	NO	NO
2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production			0						NO	NO	NO	NO
2.B.5 - Carbide Production	0	0							NO	NO	NO	NO
2.B.6 - Titanium Dioxide Production	0								NO	NO	NO	NO
2.B.7 - Soda Ash Production	0								NO	NO	NO	NO
2.B.8 - Petrochemical and Carbon Black Production	0	0							0	0	0	0
2.B.9 - Fluorochemical Production				0	0	0	0	0	0	0	0	0
2.B.10 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.C - Metal Industry	436.0096	0	0	0	808.798	NO	NO	NO	1	146	NO	4
2.C.1 - Iron and Steel Production	0	0							NO	NO	NO	NO
2.C.2 - Ferroalloys Production	0	0							NO	NO	NO	NO
2.C.3 - Aluminium production	436.0096				808.798				1	146	NO	4

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
2.C.4 - Magnesium production	0					NO			NO	NO	NO	NO
2.C.5 - Lead Production	0								NO	NO	NO	NO
2.C.6 - Zinc Production	0								NO	NO	NO	NO
2.C.7 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.D - Non-Energy Products from Fuels and Solvent Use	0	0	0	0	0	NO	NO	NO	NO	NO	36	NO
2.D.1 - Lubricant Use	0								NO	NO	NO	NO
2.D.2 - Paraffin Wax Use	0								NO	NO	NO	NO
2.D.3 - Solvent Use									NO	NO	36	NO
2.D.4 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.E - Electronics Industry	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.E.1 - Integrated Circuit or Semiconductor				0	0	NO		NO	NO	NO	NO	NO
2.E.2 - TFT Flat Panel Display					0	NO		NO	NO	NO	NO	NO
2.E.3 - Photovoltaics					0				NO	NO	NO	NO
2.E.4 - Heat Transfer Fluid					0				NO	NO	NO	NO
2.E.5 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.F - Product Uses as Substitutes for Ozone Depleting Substances	0	0	0	0	0	NE	NE	NE	NE	NE	NE	NE
2.F.1 - Refrigeration and Air Conditioning				0		NE	NE	NE	NE	NE	NE	NE
2.F.2 - Foam Blowing Agents				0				NO	NO	NO	NO	NO
2.F.3 - Fire Protection				0	0				NO	NO	NO	NO
2.F.4 - Aerosols				0				NE	NE	NE	NE	NE
2.F.5 - Solvents				0	0			NO	NO	NO	NO	NO
2.F.6 - Other Applications (please specify)				0	0			NO	NO	NO	NO	NO
2.G - Other Product Manufacture and Use	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.G.1 - Electrical Equipment					0	NO	NO	NO	NO	NO	NO	NO
2.G.2 - SF6 and PFCs from Other Product Uses					0	0		0	0	0	0	0
2.G.3 - N2O from Product Uses			0						0	0	0	0
2.G.4 - Other (Please specify)	0	0	0	0	0	0	0	0	0	0	0	0
2.H - Other	0	0	0	0	0	NO	NO	NO	NO	NO	15	NO
2.H.1 - Pulp and Paper Industry	0	0							NO	NO	NO	NO
2.H.2 - Food and Beverages Industry	0	0							NO	NO	15	NO
2.H.3 - Other (please specify)	0	0	0						NO	NO	NO	NO
3 - Agriculture, Forestry, and Other Land Use	-1492.615815	191.28	5.356	0	0	NA	NA	NA	NA	NA	NA	NA
3.A - Livestock	0	179.124	2.317	0	0	NA	NA	NA	NA	NA	NA	NA
3.A.1 - Enteric Fermentation		149.724							NA	NA	NA	NA
3.A.2 - Manure Management		29.4004	2.317						NA	NA	NA	NA
3.B - Land	-1550.785281	0	0	0	0	NA	NA	NA	NA	NA	NA	NA
3.B.1 - Forest land	-1550.656948								NA	NA	NA	NA
3.B.2 - Cropland	-0.099								NA	NA	NA	NA
3.B.3 - Grassland	-0.029333333								NA	NA	NA	NA

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
3.B.4 - Wetlands	0		0						NA	NA	NA	NA
3.B.5 - Settlements	0								NA	NA	NA	NA
3.B.6 - Other Land	0								NA	NA	NA	NA
3.C - Aggregate sources and non-CO2 emissions sources on land	58.16946667	12.1561	3.039	0	0	NA	NA	NA	NO	NO	NO	NO
3.C.1 - Emissions from biomass burning		0	0						NO	NO	NO	NO
3.C.2 - Liming	0								NO	NO	NO	NO
3.C.3 - Urea application	58.16946667								NO	NO	NO	NO
3.C.4 - Direct N2O Emissions from managed soils			2.057						NO	NO	NO	NO
3.C.5 - Indirect N2O Emissions from managed soils			0.75						NO	NO	NO	NO
3.C.6 - Indirect N2O Emissions from manure management			0.232						NO	NO	NO	NO
3.C.7 - Rice cultivations		12.1561							NO	NO	NO	NO
3.C.8 - Other (please specify)		0	0						NO	NO	NO	NO
3.D - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	0
3.D.1 - Harvested Wood Products	0								NO	NO	NO	1
3.D.2 - Other (please specify)	0	0	0						NO	NO	NO	2
4 - Waste	0	15.432	0.294	0	0	NO	NO	NO	NO	NO	NO	NO
4.A - Solid Waste Disposal	0	11.2567	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.B - Biological Treatment of Solid Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.C - Incineration and Open Burning of Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.D - Wastewater Treatment and Discharge	0	4.1753	0.294	0	0	NO	NO	NO	NO	NO	NO	NO
4.E - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5 - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.B - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
Memo Items (5)												
International Bunkers	196.7849384	0.00138	0.006	0	0	NO	NO	NO	1	0.3	0.1	0.1
1.A.3.a.i - International Aviation (International Bunkers)	196.7849384	0.00138	0.006						1	0.3	0.1	0.1
1.A.3.d.i - International water-borne navigation (International bunkers)	0	0	0						NO	NO	NO	NO
1.A.5.c - Multilateral Operations	0	0	0	0	0	NO	NO	NO	0	0	0	0

Inventory Year: 2011

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
Total National Emissions and Removals	1193.943633	205.785	5.525	0	826.184	NE	NO	NO	11.24	165.3	65.6	7.8
1 - Energy	2060.173821	2.23008	0.047	0	0	NO	NO	NO	9.24	16	3.5	3.7
1.A - Fuel Combustion Activities	2059.488847	0.30138	0.047	0	0	NO	NO	NO	9.2	16	3.5	3.7
1.A.1 - Energy Industries	581.9652834	0.02231	0.004						0.04	0.005	0.001	0.6
1.A.2 - Manufacturing Industries and Construction	552.1623607	0.02286	0.004						2	0.14	0.05	1
1.A.3 - Transport	421.9963105	0.16031	0.034						5	15	3	1.1
1.A.4 - Other Sectors	503.3648927	0.0959	0.004						2.2	1	0.4	1
1.A.5 - Non-Specified	0	0	0						NO	NO	NO	NO
1.B - Fugitive emissions from fuels	0.6849736	1.92869	0	0	0	NE	NE	NE	0.002	0.003	0.02	0.03
1.B.1 - Solid Fuels	0.5623956	0.2059	0						NO	NO	NO	NO
1.B.2 - Oil and Natural Gas	0.122578	1.72279	0						0.002	0.003	0.02	0.03
1.B.3 - Other emissions from Energy Production	0	0	0						NO	NO	NO	NO
1.C - Carbon dioxide Transport and Storage	0	0	0	0	0	NO	NO	NO	0	0	0	0
1.C.1 - Transport of CO2	0								0	0	0	0
1.C.2 - Injection and Storage	0								0	0	0	0
1.C.3 - Other	0								0	0	0	0
2 - Industrial Processes and Product Use	616.1681652	0	0	0	826.184	NE	NO	NO	1	149	62	4
2.A - Mineral Industry	170.7857652	0	0	0	0	NO	NO	NO	NO	NO	13	0
2.A.1 - Cement production	146.4030072								NO	NO	NO	0
2.A.2 - Lime production	1.5								NO	NO	NO	NO
2.A.3 - Glass Production	0.75225								NO	NO	NO	NO
2.A.4 - Other Process Uses of Carbonates	22.130508					NO	NO	NO	NO	NO	NO	NO
2.A.5 - Other (please specify)	0	0	0						0	0	0	0
2.B - Chemical Industry	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.B.1 - Ammonia Production	0								NO	NO	NO	NO
2.B.2 - Nitric Acid Production			0						NO	NO	NO	NO
2.B.3 - Adipic Acid Production			0						NO	NO	NO	NO
2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production			0						NO	NO	NO	NO
2.B.5 - Carbide Production	0	0							NO	NO	NO	NO
2.B.6 - Titanium Dioxide Production	0								NO	NO	NO	NO
2.B.7 - Soda Ash Production	0								NO	NO	NO	NO
2.B.8 - Petrochemical and Carbon Black Production	0	0							0	0	0	0
2.B.9 - Fluorochemical Production				0	0	0	0	0	0	0	0	0
2.B.10 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.C - Metal Industry	445.3824	0	0	0	826.184	NO	NO	NO	1	149	NO	4
2.C.1 - Iron and Steel Production	0	0							NO	NO	NO	NO
2.C.2 - Ferroalloys Production	0	0							NO	NO	NO	NO
2.C.3 - Aluminium production	445.3824				826.184				1	149	NO	4

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
2.C.4 - Magnesium production	0					NO			NO	NO	NO	NO
2.C.5 - Lead Production	0								NO	NO	NO	NO
2.C.6 - Zinc Production	0								NO	NO	NO	NO
2.C.7 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.D - Non-Energy Products from Fuels and Solvent Use	0	0	0	0	0	NO	NO	NO	NO	NO	35	NO
2.D.1 - Lubricant Use	0								NO	NO	NO	NO
2.D.2 - Paraffin Wax Use	0								NO	NO	NO	NO
2.D.3 - Solvent Use									NO	NO	35	NO
2.D.4 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.E - Electronics Industry	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.E.1 - Integrated Circuit or Semiconductor				0	0	NO		NO	NO	NO	NO	NO
2.E.2 - TFT Flat Panel Display					0	NO		NO	NO	NO	NO	NO
2.E.3 - Photovoltaics					0				NO	NO	NO	NO
2.E.4 - Heat Transfer Fluid					0				NO	NO	NO	NO
2.E.5 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.F - Product Uses as Substitutes for Ozone Depleting Substances	0	0	0	0	0	NE	NE	NE	NE	NE	NE	NE
2.F.1 - Refrigeration and Air Conditioning				0		NE	NE	NE	NE	NE	NE	NE
2.F.2 - Foam Blowing Agents				0				NO	NO	NO	NO	NO
2.F.3 - Fire Protection				0	0				NO	NO	NO	NO
2.F.4 - Aerosols				0				NE	NE	NE	NE	NE
2.F.5 - Solvents				0	0			NO	NO	NO	NO	NO
2.F.6 - Other Applications (please specify)				0	0			NO	NO	NO	NO	NO
2.G - Other Product Manufacture and Use	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.G.1 - Electrical Equipment					0	NO	NO	NO	NO	NO	NO	NO
2.G.2 - SF6 and PFCs from Other Product Uses					0	0		0	0	0	0	0
2.G.3 - N2O from Product Uses			0						0	0	0	0
2.G.4 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.H - Other	0	0	0	0	0	NO	NO	NO	NO	NO	14	NO
2.H.1 - Pulp and Paper Industry	0	0							NO	NO	NO	NO
2.H.2 - Food and Beverages Industry	0	0							NO	NO	14	NO
2.H.3 - Other (please specify)	0	0	0						NO	NO	NO	NO
3 - Agriculture, Forestry, and Other Land Use	-1482.398353	188.484	5.191	0	0	NA	NA	NA	NA	NA	NA	NA
3.A - Livestock	0	176.381	2.29	0	0	NA	NA	NA	NA	NA	NA	NA
3.A.1 - Enteric Fermentation		147.331							NA	NA	NA	NA
3.A.2 - Manure Management		29.0498	2.29						NA	NA	NA	NA
3.B - Land	-1536.269019	0	0	0	0	NA	NA	NA	NA	NA	NA	NA
3.B.1 - Forest land	-1536.140686								NA	NA	NA	NA
3.B.2 - Cropland	-0.099								NA	NA	NA	NA
3.B.3 - Grassland	-0.029333333								NA	NA	NA	NA

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
3.B.4 - Wetlands	0		0						NA	NA	NA	NA
3.B.5 - Settlements	0								NA	NA	NA	NA
3.B.6 - Other Land	0								NA	NA	NA	NA
3.C - Aggregate sources and non-CO2 emissions sources on land	53.87066667	12.1034	2.901	0	0	NA	NA	NA	NO	NO	NO	NO
3.C.1 - Emissions from biomass burning		0	0						NO	NO	NO	NO
3.C.2 - Liming	0								NO	NO	NO	NO
3.C.3 - Urea application	53.87066667								NO	NO	NO	NO
3.C.4 - Direct N2O Emissions from managed soils			1.956						NO	NO	NO	NO
3.C.5 - Indirect N2O Emissions from managed soils			0.716						NO	NO	NO	NO
3.C.6 - Indirect N2O Emissions from manure management			0.229						NO	NO	NO	NO
3.C.7 - Rice cultivations		12.1034							NO	NO	NO	NO
3.C.8 - Other (please specify)		0	0						NO	NO	NO	NO
3.D - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
3.D.1 - Harvested Wood Products	0								NO	NO	NO	NO
3.D.2 - Other (please specify)	0	0	0						NO	NO	NO	NO
4 - Waste	0	15.0706	0.287	0	0	NO	NO	NO	NO	NO	NO	NO
4.A - Solid Waste Disposal	0	11.0145	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.B - Biological Treatment of Solid Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.C - Incineration and Open Burning of Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.D - Wastewater Treatment and Discharge	0	4.05613	0.287	0	0	NO	NO	NO	NO	NO	NO	NO
4.E - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5 - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.B - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
Memo Items (5)												
International Bunkers	181.7223408	0.00127	0.005	0	0	NO	NO	NO	1	0.3	0.1	0.1
1.A.3.a.i - International Aviation (International Bunkers)	181.7223408	0.00127	0.005						1	0.3	0.1	0.1
1.A.3.d.i - International water-borne navigation (International bunkers)	0	0	0						NO	NO	NO	NO
1.A.5.c - Multilateral Operations	0	0	0	0	0	NO	NO	NO	0	0	0	0

Inventory Year: 2010

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
Total National Emissions and Removals	630.0199664	196.684	4.389	0	1035.957	NE	NO	NO	8.402	201.9	51.822	7.23
1 - Energy	1367.870792	2.10477	0.031	0	0	NO	NO	NO	6.402	9.712	1.722	2.13
1.A - Fuel Combustion Activities	1367.278632	0.28363	0.031	0	0	NO	NO	NO	6.4	9.71	1.702	2.1
1.A.1 - Energy Industries	250.5791256	0.00863	0.002						0.1	0.01	0.002	0.1
1.A.2 - Manufacturing Industries and Construction	390.475267	0.02323	0.004						1.3	0.3	0.1	0.8
1.A.3 - Transport	245.5997953	0.15425	0.022						3	7	1.2	0.5
1.A.4 - Other Sectors	480.6244436	0.09752	0.004						2	2.4	0.4	0.7
1.A.5 - Non-Specified	0	0	0						NO	NO	NO	NO
1.B - Fugitive emissions from fuels	0.5921607	1.82114	0	0	0	NE	NE	NE	0.002	0.002	0.02	0.03
1.B.1 - Solid Fuels	0.4750863	0.17394	0						NE	NE	NE	NE
1.B.2 - Oil and Natural Gas	0.1170744	1.6472	0						0.002	0.002	0.02	0.03
1.B.3 - Other emissions from Energy Production	0	0	0						NO	NO	NO	NO
1.C - Carbon dioxide Transport and Storage	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
1.C.1 - Transport of CO2	0								NO	NO	NO	NO
1.C.2 - Injection and Storage	0								NO	NO	NO	NO
1.C.3 - Other	0								NO	NO	NO	NO
2 - Industrial Processes and Product Use	735.3219778	0	0	0	1035.957	NE	NO	NO	1	192	50	5
2.A - Mineral Industry	176.8547778	0	0	0	0	NO	NO	NO	NO	NO	3	0
2.A.1 - Cement production	143.5752								NO	NO	NO	0
2.A.2 - Lime production	5.925								NO	NO	NO	NO
2.A.3 - Glass Production	0.3366								NO	NO	NO	NO
2.A.4 - Other Process Uses of Carbonates	27.01797776					NO	NO	NO	NO	NO	NO	NO
2.A.5 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.B - Chemical Industry	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.B.1 - Ammonia Production	0								NO	NO	NO	NO
2.B.2 - Nitric Acid Production			0						NO	NO	NO	NO
2.B.3 - Adipic Acid Production			0						NO	NO	NO	NO
2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production			0						NO	NO	NO	NO
2.B.5 - Carbide Production	0	0							NO	NO	NO	NO
2.B.6 - Titanium Dioxide Production	0								NO	NO	NO	NO
2.B.7 - Soda Ash Production	0								NO	NO	NO	NO
2.B.8 - Petrochemical and Carbon Black Production	0	0							0	0	0	0
2.B.9 - Fluorochemical Production				0	0	0	0	0	0	0	0	0
2.B.10 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.C - Metal Industry	558.4672	0	0	0	1035.957	NO	NO	NO	1	192	NO	5
2.C.1 - Iron and Steel Production	0	0							NO	NO	NO	NO
2.C.2 - Ferroalloys Production	0	0							NO	NO	NO	NO
2.C.3 - Aluminium production	558.4672				1035.957				1	192	NO	5

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
2.C.4 - Magnesium production	0					NO			NO	NO	NO	NO
2.C.5 - Lead Production	0								NO	NO	NO	NO
2.C.6 - Zinc Production	0								NO	NO	NO	NO
2.C.7 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.D - Non-Energy Products from Fuels and Solvent Use	0	0	0	0	0	NO	NO	NO	NO	NO	33	NO
2.D.1 - Lubricant Use	0								NO	NO	NO	NO
2.D.2 - Paraffin Wax Use	0								NO	NO	NO	NO
2.D.3 - Solvent Use									NO	NO	33	NO
2.D.4 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.E - Electronics Industry	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.E.1 - Integrated Circuit or Semiconductor				0	0	NO		NO	NO	NO	NO	NO
2.E.2 - TFT Flat Panel Display					0	NO		NO	NO	NO	NO	NO
2.E.3 - Photovoltaics					0				NO	NO	NO	NO
2.E.4 - Heat Transfer Fluid					0				NO	NO	NO	NO
2.E.5 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.F - Product Uses as Substitutes for Ozone Depleting Substances	0	0	0	0	0	NE	NE	NE	NE	NE	NE	NE
2.F.1 - Refrigeration and Air Conditioning				0		NE	NE	NE	NE	NE	NE	NE
2.F.2 - Foam Blowing Agents				0				NO	NO	NO	NO	NO
2.F.3 - Fire Protection				0	0				NO	NO	NO	NO
2.F.4 - Aerosols				0				NE	NE	NE	NE	NE
2.F.5 - Solvents				0	0			NO	NO	NO	NO	NO
2.F.6 - Other Applications (please specify)				0	0			NO	NO	NO	NO	NO
2.G - Other Product Manufacture and Use	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.G.1 - Electrical Equipment					0	NO	NO	NO	NO	NO	NO	NO
2.G.2 - SF6 and PFCs from Other Product Uses					0	0		0	0	0	0	0
2.G.3 - N2O from Product Uses			0						0	0	0	0
2.G.4 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.H - Other	0	0	0	0	0	NO	NO	NO	NO	NO	14	NO
2.H.1 - Pulp and Paper Industry	0	0							NO	NO	NO	NO
2.H.2 - Food and Beverages Industry	0	0							NO	NO	14	NO
2.H.3 - Other (please specify)	0	0	0						NO	NO	NO	NO
3 - Agriculture, Forestry, and Other Land Use	-1473.172804	179.869	4.077	0	0	NA	NA	NA	NA	NA	NA	NA
3.A - Livestock	0	166.976	1.859	0	0	NA	NA	NA	NA	NA	NA	NA
3.A.1 - Enteric Fermentation		139.385							NA	NA	NA	NA
3.A.2 - Manure Management		27.5907	1.859						NA	NA	NA	NA
3.B - Land	-1512.122337	0	0	0	0	NA	NA	NA	NA	NA	NA	NA
3.B.1 - Forest land	-1511.994004								NA	NA	NA	NA
3.B.2 - Cropland	-0.099								NA	NA	NA	NA
3.B.3 - Grassland	-0.029333333								NA	NA	NA	NA

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
3.B.4 - Wetlands	0		0						NA	NA	NA	NA
3.B.5 - Settlements	0								NA	NA	NA	NA
3.B.6 - Other Land	0								NA	NA	NA	NA
3.C - Aggregate sources and non-CO2 emissions sources on land	38.94953333	12.8929	2.219	0	0	NA	NA	NA	NO	NO	NO	NO
3.C.1 - Emissions from biomass burning		0	0						NO	NO	NO	NO
3.C.2 - Liming	0								NO	NO	NO	NO
3.C.3 - Urea application	38.94953333								NO	NO	NO	NO
3.C.4 - Direct N2O Emissions from managed soils			1.485						NO	NO	NO	NO
3.C.5 - Indirect N2O Emissions from managed soils			0.548						NO	NO	NO	NO
3.C.6 - Indirect N2O Emissions from manure management			0.186						NO	NO	NO	NO
3.C.7 - Rice cultivations		12.8929							NO	NO	NO	NO
3.C.8 - Other (please specify)		0	0						NO	NO	NO	NO
3.D - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
3.D.1 - Harvested Wood Products	0								NO	NO	NO	NO
3.D.2 - Other (please specify)	0	0	0						NO	NO	NO	NO
4 - Waste	0	14.71	0.281	0	0	NO	NO	NO	NO	NO	NO	NO
4.A - Solid Waste Disposal	0	10.7484	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.B - Biological Treatment of Solid Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.C - Incineration and Open Burning of Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.D - Wastewater Treatment and Discharge	0	3.96153	0.281	0	0	NO	NO	NO	NO	NO	NO	NO
4.E - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5 - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.B - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
Memo Items (5)												
International Bunkers	176.2863102	0.00123	0.005	0	0	NO	NO	NO	1	0.2	0.1	0.1
1.A.3.a.i - International Aviation (International Bunkers)	176.2863102	0.00123	0.005						1	0.2	0.1	0.1
1.A.3.d.i - International water-borne navigation (International bunkers)	0	0	0						NO	NO	NO	NO
1.A.5.c - Multilateral Operations	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO

Inventory Year: 2009

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
Total National Emissions and Removals	1398.056344	188.974	4.362	0	1066.658	NE	NO	NO	8.602	204.3	53.152	8.67
1 - Energy	2156.999162	2.12139	0.04	0	0	NO	NO	NO	7.102	11.11	2.052	3.62
1.A - Fuel Combustion Activities	2156.461544	0.37225	0.04	0	0	NO	NO	NO	7.1	11.11	2.032	3.6
1.A.1 - Energy Industries	299.1781386	0.01109	0.002						0.1	0.01	0.002	0.1
1.A.2 - Manufacturing Industries and Construction	397.8546786	0.01726	0.003						1	0.1	0.03	0.5
1.A.3 - Transport	250.1922351	0.19516	0.027						3	6	1	1
1.A.4 - Other Sectors	1209.236492	0.14874	0.007						3	5	1	2
1.A.5 - Non-Specified	0	0	0						NO	NO	NO	NO
1.B - Fugitive emissions from fuels	0.5376181	1.74914	0	0	0	NE	NE	NE	0.002	0.002	0.02	0.02
1.B.1 - Solid Fuels	0.4241757	0.1553	0						NE	NE	NE	NE
1.B.2 - Oil and Natural Gas	0.1134424	1.59384	0						0.002	0.002	0.02	0.02
1.B.3 - Other emissions from Energy Production	0	0	0						NO	NO	NO	NO
1.C - Carbon dioxide Transport and Storage	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
1.C.1 - Transport of CO2	0								NO	NO	NO	NO
1.C.2 - Injection and Storage	0								NO	NO	NO	NO
1.C.3 - Other	0								NO	NO	NO	NO
2 - Industrial Processes and Product Use	696.4902955	0	0	0	1066.658	NE	NO	NO	1	193	51	5
2.A - Mineral Industry	121.4726955	0	0	0	0	NO	NO	NO	NO	NO	6	0
2.A.1 - Cement production	95.35266								NO	NO	NO	0
2.A.2 - Lime production	3.3								NO	NO	NO	NO
2.A.3 - Glass Production	1.74675								NO	NO	NO	NO
2.A.4 - Other Process Uses of Carbonates	21.07328551					NO	NO	NO	NO	NO	NO	NO
2.A.5 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.B - Chemical Industry	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.B.1 - Ammonia Production	0								NO	NO	NO	NO
2.B.2 - Nitric Acid Production			0						NO	NO	NO	NO
2.B.3 - Adipic Acid Production			0						NO	NO	NO	NO
2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production			0						NO	NO	NO	NO
2.B.5 - Carbide Production	0	0							NO	NO	NO	NO
2.B.6 - Titanium Dioxide Production	0								NO	NO	NO	NO
2.B.7 - Soda Ash Production	0								NO	NO	NO	NO
2.B.8 - Petrochemical and Carbon Black Production	0	0							0	0	0	0
2.B.9 - Fluorochemical Production				0	0	0	0	0	0	0	0	0
2.B.10 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.C - Metal Industry	575.0176	0	0	0	1066.658	NO	NO	NO	1	192	NO	5
2.C.1 - Iron and Steel Production	0	0							NO	NO	NO	NO
2.C.2 - Ferroalloys Production	0	0							NO	NO	NO	NO
2.C.3 - Aluminium production	575.0176				1066.658				1	192	NO	5

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
2.C.4 - Magnesium production	0					NO			NO	NO	NO	NO
2.C.5 - Lead Production	0								NO	NO	NO	NO
2.C.6 - Zinc Production	0								NO	NO	NO	NO
2.C.7 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.D - Non-Energy Products from Fuels and Solvent Use	0	0	0	0	0	NO	NO	NO	NO	NO	33	NO
2.D.1 - Lubricant Use	0								NO	NO	NO	NO
2.D.2 - Paraffin Wax Use	0								NO	NO	NO	NO
2.D.3 - Solvent Use									NO	NO	33	NO
2.D.4 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.E - Electronics Industry	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.E.1 - Integrated Circuit or Semiconductor				0	0	NO		NO	NO	NO	NO	NO
2.E.2 - TFT Flat Panel Display					0	NO		NO	NO	NO	NO	NO
2.E.3 - Photovoltaics					0				NO	NO	NO	NO
2.E.4 - Heat Transfer Fluid					0				NO	NO	NO	NO
2.E.5 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.F - Product Uses as Substitutes for Ozone Depleting Substances	0	0	0	0	0	NE	NE	NE	NE	NE	NE	NE
2.F.1 - Refrigeration and Air Conditioning				0		NE	NE	NE	NE	NE	NE	NE
2.F.2 - Foam Blowing Agents				0				NO	NO	NO	NO	NO
2.F.3 - Fire Protection				0	0				NO	NO	NO	NO
2.F.4 - Aerosols				0				NE	NE	NE	NE	NE
2.F.5 - Solvents				0	0			NO	NO	NO	NO	NO
2.F.6 - Other Applications (please specify)				0	0			NO	NO	NO	NO	NO
2.G - Other Product Manufacture and Use	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.G.1 - Electrical Equipment					0	NO	NO	NO	NO	NO	NO	NO
2.G.2 - SF6 and PFCs from Other Product Uses					0	0		0	0	0	0	0
2.G.3 - N2O from Product Uses			0						0	0	0	0
2.G.4 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.H - Other	0	0	0	0	0	NO	NO	NO	NO	NO	12	NO
2.H.1 - Pulp and Paper Industry	0	0							NO	NO	NO	NO
2.H.2 - Food and Beverages Industry	0	0							NO	NO	12	NO
2.H.3 - Other (please specify)	0	0	0						NO	NO	NO	NO
3 - Agriculture, Forestry, and Other Land Use	-1455.433113	172.514	4.086	0	0	NA	NA	NA	NA	NA	NA	NA
3.A - Livestock	0	160.681	1.796	0	0	NA	NA	NA	NA	NA	NA	NA
3.A.1 - Enteric Fermentation		134.039							NA	NA	NA	NA
3.A.2 - Manure Management		26.6424	1.796						NA	NA	NA	NA
3.B - Land	-1498.245113	0	0	0	0	NA	NA	NA	NA	NA	NA	NA
3.B.1 - Forest land	-1498.11678								NA	NA	NA	NA
3.B.2 - Cropland	-0.099								NA	NA	NA	NA
3.B.3 - Grassland	-0.029333333								NA	NA	NA	NA

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
3.B.4 - Wetlands	0		0						NA	NA	NA	NA
3.B.5 - Settlements	0								NA	NA	NA	NA
3.B.6 - Other Land	0								NA	NA	NA	NA
3.C - Aggregate sources and non-CO2 emissions sources on land	42.812	11.8324	2.291	0	0	NA	NA	NA	NO	NO	NO	NO
3.C.1 - Emissions from biomass burning		0	0						NO	NO	NO	NO
3.C.2 - Liming	0								NO	NO	NO	NO
3.C.3 - Urea application	42.812								NO	NO	NO	NO
3.C.4 - Direct N2O Emissions from managed soils			1.546						NO	NO	NO	NO
3.C.5 - Indirect N2O Emissions from managed soils			0.565						NO	NO	NO	NO
3.C.6 - Indirect N2O Emissions from manure management			0.18						NO	NO	NO	NO
3.C.7 - Rice cultivations		11.8324							NO	NO	NO	NO
3.C.8 - Other (please specify)		0	0						NO	NO	NO	NO
3.D - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
3.D.1 - Harvested Wood Products	0								NO	NO	NO	NO
3.D.2 - Other (please specify)	0	0	0						NO	NO	NO	NO
4 - Waste	0	14.3386	0.236	0	0	NO	NO	NO	NO	NO	NO	NO
4.A - Solid Waste Disposal	0	10.4824	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.B - Biological Treatment of Solid Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.C - Incineration and Open Burning of Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.D - Wastewater Treatment and Discharge	0	3.8562	0.236	0	0	NO	NO	NO	NO	NO	NO	NO
4.E - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5 - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.B - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
Memo Items (5)												
International Bunkers	147.0818349	0.00103	0.004	0	0	NO	NO	NO	0.5	0.2	0.1	0.05
1.A.3.a.i - International Aviation (International Bunkers)	147.0818349	0.00103	0.004						0.5	0.2	0.1	0.05
1.A.3.d.i - International water-borne navigation (International bunkers)	0	0	0						NO	NO	NO	NO
1.A.5.c - Multilateral Operations	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO

Inventory Year: 2008

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
Total National Emissions and Removals	2204.372747	184.275	4.71	0	1185.36	NE	NO	NO	9.403	226.5	53.22005	10.57
1 - Energy	2891.673049	2.05311	0.04	0	0	NO	NO	NO	8.003	12.3	2.12005	4.53
1.A - Fuel Combustion Activities	2891.089302	0.31614	0.04	0	0	NO	NO	NO	8.001	12.3	2.10005	4.51
1.A.1 - Energy Industries	299.3673629	0.01146	0.002						0.001	2E-04	0.00005	0.01
1.A.2 - Manufacturing Industries and Construction	549.6324524	0.02473	0.004						2	0.3	0.1	1
1.A.3 - Transport	202.9185447	0.07026	0.027						2	8	1	0.5
1.A.4 - Other Sectors	1839.170942	0.20969	0.007						4	4	1	3
1.A.5 - Non-Specified	0	0	0						NO	NO	NO	NO
1.B - Fugitive emissions from fuels	0.5837475	1.73697	0	0	0	NE	NE	NE	0.002	0.002	0.02	0.02
1.B.1 - Solid Fuels	0.4722315	0.17289	0						NE	NE	NE	NE
1.B.2 - Oil and Natural Gas	0.111516	1.56408	0						0.002	0.002	0.02	0.02
1.B.3 - Other emissions from Energy Production	0	0	0						NO	NO	NO	NO
1.C - Carbon dioxide Transport and Storage	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
1.C.1 - Transport of CO2	0								NO	NO	NO	NO
1.C.2 - Injection and Storage	0								NO	NO	NO	NO
1.C.3 - Other	0								NO	NO	NO	NO
2 - Industrial Processes and Product Use	773.0575121	0	0	0	1185.36	NE	NO	NO	1	214	51	6
2.A - Mineral Industry	121.5442134	0	0	0	0	NO	NO	NO	NO	NO	10	0
2.A.1 - Cement production	93.06378								NO	NO	NO	0
2.A.2 - Lime production	4.275								NO	NO	NO	NO
2.A.3 - Glass Production	1.7442								NO	NO	NO	NO
2.A.4 - Other Process Uses of Carbonates	22.46123343					NO	NO	NO	NO	NO	NO	NO
2.A.5 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.B - Chemical Industry	12.50529867	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.B.1 - Ammonia Production	12.50529867								NO	NO	NO	NO
2.B.2 - Nitric Acid Production			0						NO	NO	NO	NO
2.B.3 - Adipic Acid Production			0						NO	NO	NO	NO
2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production			0						NO	NO	NO	NO
2.B.5 - Carbide Production	0	0							NO	NO	NO	NO
2.B.6 - Titanium Dioxide Production	0								NO	NO	NO	NO
2.B.7 - Soda Ash Production	0								NO	NO	NO	NO
2.B.8 - Petrochemical and Carbon Black Production	0	0							0	0	0	0
2.B.9 - Fluorochemical Production				0	0	0	0	0	0	0	0	0
2.B.10 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.C - Metal Industry	639.008	0	0	0	1185.36	NO	NO	NO	1	214	NO	6
2.C.1 - Iron and Steel Production	0	0							NO	NO	NO	NO
2.C.2 - Ferroalloys Production	0	0							NO	NO	NO	NO
2.C.3 - Aluminium production	639.008				1185.36				1	214	NO	6

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
2.C.4 - Magnesium production	0					NO			NO	NO	NO	NO
2.C.5 - Lead Production	0								NO	NO	NO	NO
2.C.6 - Zinc Production	0								NO	NO	NO	NO
2.C.7 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.D - Non-Energy Products from Fuels and Solvent Use	0	0	0	0	0	NO	NO	NO	NO	NO	32	NO
2.D.1 - Lubricant Use	0								NO	NO	NO	NO
2.D.2 - Paraffin Wax Use	0								NO	NO	NO	NO
2.D.3 - Solvent Use									NO	NO	32	NO
2.D.4 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.E - Electronics Industry	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.E.1 - Integrated Circuit or Semiconductor				0	0	NO		NO	NO	NO	NO	NO
2.E.2 - TFT Flat Panel Display					0	NO		NO	NO	NO	NO	NO
2.E.3 - Photovoltaics					0				NO	NO	NO	NO
2.E.4 - Heat Transfer Fluid					0				NO	NO	NO	NO
2.E.5 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.F - Product Uses as Substitutes for Ozone Depleting Substances	0	0	0	0	0	NE	NE	NE	NE	NE	NE	NE
2.F.1 - Refrigeration and Air Conditioning				0		NE	NE	NE	NE	NE	NE	NE
2.F.2 - Foam Blowing Agents				0				NO	NO	NO	NO	NO
2.F.3 - Fire Protection				0	0				NO	NO	NO	NO
2.F.4 - Aerosols				0				NE	NE	NE	NE	NE
2.F.5 - Solvents				0	0			NO	NO	NO	NO	NO
2.F.6 - Other Applications (please specify)				0	0			NO	NO	NO	NO	NO
2.G - Other Product Manufacture and Use	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.G.1 - Electrical Equipment					0	NO	NO	NO	NO	NO	NO	NO
2.G.2 - SF6 and PFCs from Other Product Uses					0	0		0	0	0	0	0
2.G.3 - N2O from Product Uses			0						0	0	0	0
2.G.4 - Other (Please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	9	NO
2.H - Other	0	0	0	0	0				NO	NO	NO	NO
2.H.1 - Pulp and Paper Industry	0	0							NO	NO	9	NO
2.H.2 - Food and Beverages Industry	0	0							NO	NO	NO	NO
2.H.3 - Other (please specify)	0	0	0						0	0	0	0
3 - Agriculture, Forestry, and Other Land Use	-1460.357814	167.505	4.439	0	0	NA	NA	NA	NA	NA	NA	NA
3.A - Livestock	0	157.858	2.06	0	0	NA	NA	NA	NA	NA	NA	NA
3.A.1 - Enteric Fermentation		131.723							NA	NA	NA	NA
3.A.2 - Manure Management		26.1352	2.06						NA	NA	NA	NA
3.B - Land	-1501.962747	0	0	0	0	NA	NA	NA	NA	NA	NA	NA
3.B.1 - Forest land	-1501.834414								NA	NA	NA	NA
3.B.2 - Cropland	-0.099								NA	NA	NA	NA
3.B.3 - Grassland	-0.029333333								NA	NA	NA	NA

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
3.B.4 - Wetlands	0		0						NA	NA	NA	NA
3.B.5 - Settlements	0								NA	NA	NA	NA
3.B.6 - Other Land	0								NA	NA	NA	NA
3.C - Aggregate sources and non-CO2 emissions sources on land	41.60493333	9.64699	2.379	0	0	NA	NA	NA	NO	NO	NO	NO
3.C.1 - Emissions from biomass burning		0	0						NO	NO	NO	NO
3.C.2 - Liming	0								NO	NO	NO	NO
3.C.3 - Urea application	41.60493333								NO	NO	NO	NO
3.C.4 - Direct N2O Emissions from managed soils			1.586						NO	NO	NO	NO
3.C.5 - Indirect N2O Emissions from managed soils			0.587						NO	NO	NO	NO
3.C.6 - Indirect N2O Emissions from manure management			0.206						NO	NO	NO	NO
3.C.7 - Rice cultivations		9.64699							NO	NO	NO	NO
3.C.8 - Other (please specify)		0	0						NO	NO	NO	NO
3.D - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
3.D.1 - Harvested Wood Products	0								NO	NO	NO	NO
3.D.2 - Other (please specify)	0	0	0						NO	NO	NO	NO
4 - Waste	0	14.7167	0.231	0	0	NO	NO	NO	NO	NO	NO	NO
4.A - Solid Waste Disposal	0	10.2256	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.B - Biological Treatment of Solid Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.C - Incineration and Open Burning of Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.D - Wastewater Treatment and Discharge	0	4.49113	0.231	0	0	NO	NO	NO	NO	NO	NO	NO
4.E - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5 - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.B - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
Memo Items (5)												
International Bunkers	116.603487	0.00082	0.003	0	0	NO	NO	NO	0.4	0.2	0.1	0.04
1.A.3.a.i - International Aviation (International Bunkers)	116.603487	0.00082	0.003						0.4	0.2	0.1	0.04
1.A.3.d.i - International water-borne navigation (International bunkers)	0	0	0						NO	NO	NO	NO
1.A.5.c - Multilateral Operations	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO

Inventory Year: 2007

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
Total National Emissions and Removals	2523.667007	176.18	4.385	0	1243.77	NE	NO	NO	9.512	235.3	43.1503	9.89
1 - Energy	3118.766312	2.12441	0.038	0	0	NO	NO	NO	8.012	11.1	2.0503	3.85
1.A - Fuel Combustion Activities	3118.2629	0.4077	0.038	0	0	NO	NO	NO	8.01	11.1	2.0303	3.83
1.A.1 - Energy Industries	250.0543179	0.00813	0.002						0.01	0.001	0.0003	0.03
1.A.2 - Manufacturing Industries and Construction	389.44491	0.01488	0.003						1	0.1	0.03	0.4
1.A.3 - Transport	262.2537152	0.14425	0.027						3	7	1	0.4
1.A.4 - Other Sectors	2216.509957	0.24044	0.007						4	4	1	3
1.A.5 - Non-Specified	0	0	0						NO	NO	NO	NO
1.B - Fugitive emissions from fuels	0.5034115	1.71671	0	0	0	NE	NE	NE	0.002	0.002	0.02	0.02
1.B.1 - Solid Fuels	0.3913455	0.14328	0						NE	NE	NE	NE
1.B.2 - Oil and Natural Gas	0.112066	1.57343	0						0.002	0.002	0.02	0.02
1.B.3 - Other emissions from Energy Production	0	0	0						NO	NO	NO	NO
1.C - Carbon dioxide Transport and Storage	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
1.C.1 - Transport of CO2	0								NO	NO	NO	NO
1.C.2 - Injection and Storage	0								NO	NO	NO	NO
1.C.3 - Other	0								NO	NO	NO	NO
2 - Industrial Processes and Product Use	863.686239	0	0	0	1243.77	NE	NO	NO	1	224	41	6
2.A - Mineral Industry	178.8861323	0	0	0	0	NO	NO	NO	NO	NO	2	0
2.A.1 - Cement production	153.09486								NO	NO	NO	0
2.A.2 - Lime production	3.075								NO	NO	NO	NO
2.A.3 - Glass Production	1.7799								NO	NO	NO	NO
2.A.4 - Other Process Uses of Carbonates	20.93637234					NO	NO	NO	NO	NO	NO	NO
2.A.5 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.B - Chemical Industry	14.30410667	0	0	0	0	NO	NO	NO	NO	0	0	0
2.B.1 - Ammonia Production	14.30410667								NO	0	0	0
2.B.2 - Nitric Acid Production			0						NO	NO	NO	NO
2.B.3 - Adipic Acid Production			0						NO	NO	NO	NO
2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production			0						NO	NO	NO	NO
2.B.5 - Carbide Production	0	0							NO	NO	NO	NO
2.B.6 - Titanium Dioxide Production	0								NO	NO	NO	NO
2.B.7 - Soda Ash Production	0								NO	NO	NO	NO
2.B.8 - Petrochemical and Carbon Black Production	0	0							0	0	0	0
2.B.9 - Fluorochemical Production				0	0	0	0	0	0	0	0	0
2.B.10 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.C - Metal Industry	670.496	0	0	0	1243.77	NO	NO	NO	1	224	NO	6
2.C.1 - Iron and Steel Production	0	0							NO	NO	NO	NO
2.C.2 - Ferroalloys Production	0	0							NO	NO	NO	NO
2.C.3 - Aluminium production	670.496				1243.77				1	224	NO	6

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
2.C.4 - Magnesium production	0					NO			NO	NO	NO	NO
2.C.5 - Lead Production	0								NO	NO	NO	NO
2.C.6 - Zinc Production	0								NO	NO	NO	NO
2.C.7 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.D - Non-Energy Products from Fuels and Solvent Use	0	0	0	0	0	NO	NO	NO	NO	NO	31	NO
2.D.1 - Lubricant Use	0								NO	NO	NO	NO
2.D.2 - Paraffin Wax Use	0								NO	NO	NO	NO
2.D.3 - Solvent Use									NO	NO	31	NO
2.D.4 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.E - Electronics Industry	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.E.1 - Integrated Circuit or Semiconductor				0	0	NO		NO	NO	NO	NO	NO
2.E.2 - TFT Flat Panel Display					0	NO		NO	NO	NO	NO	NO
2.E.3 - Photovoltaics					0				NO	NO	NO	NO
2.E.4 - Heat Transfer Fluid					0				NO	NO	NO	NO
2.E.5 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.F - Product Uses as Substitutes for Ozone Depleting Substances	0	0	0	0	0	NE	NE	NE	NE	NE	NE	NE
2.F.1 - Refrigeration and Air Conditioning				0		NE	NE	NE	NE	NE	NE	NE
2.F.2 - Foam Blowing Agents				0				NO	NO	NO	NO	NO
2.F.3 - Fire Protection				0	0				NO	NO	NO	NO
2.F.4 - Aerosols				0				NE	NE	NE	NE	NE
2.F.5 - Solvents				0	0			NO	NO	NO	NO	NO
2.F.6 - Other Applications (please specify)				0	0			NO	NO	NO	NO	NO
2.G - Other Product Manufacture and Use	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.G.1 - Electrical Equipment					0	NO	NO	NO	NO	NO	NO	NO
2.G.2 - SF6 and PFCs from Other Product Uses					0	0		0	0	0	0	0
2.G.3 - N2O from Product Uses			0						0	0	0	0
2.G.4 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.H - Other	0	0	0	0	0	NO	NO	NO	NO	NO	8	NO
2.H.1 - Pulp and Paper Industry	0	0							NO	NO	NO	NO
2.H.2 - Food and Beverages Industry	0	0							NO	NO	8	NO
2.H.3 - Other (please specify)	0	0	0						NO	NO	NO	NO
3 - Agriculture, Forestry, and Other Land Use	-1458.785544	158.736	4.121	0	0	NA	NA	NA	NA	NA	NA	NA
3.A - Livestock	0	147.831	1.909	0	0	NA	NA	NA	NA	NA	NA	NA
3.A.1 - Enteric Fermentation		123.572							NA	NA	NA	NA
3.A.2 - Manure Management		24.2598	1.909						NA	NA	NA	NA
3.B - Land	-1496.473744	0	0	0	0	0	0	0	NA	NA	NA	NA
3.B.1 - Forest land	-1496.345411								NA	NA	NA	NA
3.B.2 - Cropland	-0.099								NA	NA	NA	NA
3.B.3 - Grassland	-0.029333333								NA	NA	NA	NA

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
3.B.4 - Wetlands	0		0						NA	NA	NA	NA
3.B.5 - Settlements	0								NA	NA	NA	NA
3.B.6 - Other Land	0								NA	NA	NA	NA
3.C - Aggregate sources and non-CO2 emissions sources on land	37.6882	10.9043	2.213	0	0	NA	NA	NA	NO	NO	NO	NO
3.C.1 - Emissions from biomass burning		0	0						NO	NO	NO	NO
3.C.2 - Liming	0								NO	NO	NO	NO
3.C.3 - Urea application	37.6882								NO	NO	NO	NO
3.C.4 - Direct N2O Emissions from managed soils			1.476						NO	NO	NO	NO
3.C.5 - Indirect N2O Emissions from managed soils			0.546						NO	NO	NO	NO
3.C.6 - Indirect N2O Emissions from manure management			0.191						NO	NO	NO	NO
3.C.7 - Rice cultivations		10.9043							NO	NO	NO	NO
3.C.8 - Other (please specify)		0	0						NO	NO	NO	NO
3.D - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
3.D.1 - Harvested Wood Products	0								NO	NO	NO	NO
3.D.2 - Other (please specify)	0	0	0						NO	NO	NO	NO
4 - Waste	0	15.3195	0.226	0	0	NO	NO	NO	NO	NO	NO	NO
4.A - Solid Waste Disposal	0	9.98539	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.B - Biological Treatment of Solid Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.C - Incineration and Open Burning of Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.D - Wastewater Treatment and Discharge	0	5.33412	0.226	0	0	NO	NO	NO	NO	NO	NO	NO
4.E - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5 - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.B - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
Memo Items (5)												
International Bunkers	130.4268966	0.00091	0.004	0	0	NO	NO	NO	0.5	0.2	0.1	0.04
1.A.3.a.i - International Aviation (International Bunkers)	130.4268966	0.00091	0.004						0.5	0.2	0.1	0.04
1.A.3.d.i - International water-borne navigation (International bunkers)	0	0	0						NO	NO	NO	NO
1.A.5.c - Multilateral Operations	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO

Inventory Year: 2006

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
Total National Emissions and Removals	3151.069628	152.833	3.18	0	1228.158	NE	NO	NO	13.5	233.5	41.219	10.66
1 - Energy	3775.207425	2.18599	0.038	0	0	NO	NO	NO	12.1	11.31	2.119	4.62
1.A - Fuel Combustion Activities	3774.860347	0.65095	0.038	0	0	NO	NO	NO	12.1	11.31	2.104	4.6
1.A.1 - Energy Industries	399.3519848	0.00793	0.001						0.1	0.01	0.004	0.1
1.A.2 - Manufacturing Industries and Construction	694.6778556	0.02242	0.003						2	0.3	0.1	1
1.A.3 - Transport	498.0344195	0.39184	0.026						5	7	1	0.5
1.A.4 - Other Sectors	2182.796087	0.22876	0.007						5	4	1	3
1.A.5 - Non-Specified	0	0	0						NO	NO	NO	NO
1.B - Fugitive emissions from fuels	0.3470781	1.53504	0	0	0	NE	NE	NE	0.001	0.002	0.015	0.02
1.B.1 - Solid Fuels	0.2443233	0.08945	0						NE	NE	NE	NE
1.B.2 - Oil and Natural Gas	0.1027548	1.44558	0						0.001	0.002	0.015	0.02
1.B.3 - Other emissions from Energy Production	0	0	0						NO	NO	NO	NO
1.C - Carbon dioxide Transport and Storage	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
1.C.1 - Transport of CO2	0								NO	NO	NO	NO
1.C.2 - Injection and Storage	0								NO	NO	NO	NO
1.C.3 - Other	0								NO	NO	NO	NO
2 - Industrial Processes and Product Use	845.3101698	0	0	0	1228.158	NE	NO	NO	1	222	39	6
2.A - Mineral Industry	161.8052571	0	0	0	0	NO	NO	NO	NO	NO	2	0
2.A.1 - Cement production	137.64492								NO	NO	NO	0
2.A.2 - Lime production	3.75								NO	NO	NO	NO
2.A.3 - Glass Production	1.7493								NO	NO	NO	NO
2.A.4 - Other Process Uses of Carbonates	18.66103712					NO	NO	NO	NO	NO	NO	NO
2.A.5 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.B - Chemical Industry	21.42491267	0	0	0	0	NO	NO	NO	NO	0	0	0
2.B.1 - Ammonia Production	21.42491267								NO	0	0	0
2.B.2 - Nitric Acid Production			0						NO	NO	NO	NO
2.B.3 - Adipic Acid Production			0						NO	NO	NO	NO
2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production			0						NO	NO	NO	NO
2.B.5 - Carbide Production	0	0							NO	NO	NO	NO
2.B.6 - Titanium Dioxide Production	0								NO	NO	NO	NO
2.B.7 - Soda Ash Production	0								NO	NO	NO	NO
2.B.8 - Petrochemical and Carbon Black Production	0	0							0	0	0	0
2.B.9 - Fluorochemical Production				0	0	0	0	0	0	0	0	0
2.B.10 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.C - Metal Industry	662.08	0	0	0	1228.158	NO	NO	NO	1	221	NO	6
2.C.1 - Iron and Steel Production	0	0							NO	NO	NO	NO
2.C.2 - Ferroalloys Production	0	0							NO	NO	NO	NO
2.C.3 - Aluminium production	662.08				1228.158				1	221	NO	6

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
2.C.4 - Magnesium production	0					NO			NO	NO	NO	NO
2.C.5 - Lead Production	0								NO	NO	NO	NO
2.C.6 - Zinc Production	0								NO	NO	NO	NO
2.C.7 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.D - Non-Energy Products from Fuels and Solvent Use	0	0	0	0	0	NO	NO	NO	NO	NO	31	NO
2.D.1 - Lubricant Use	0								NO	NO	NO	NO
2.D.2 - Paraffin Wax Use	0								NO	NO	NO	NO
2.D.3 - Solvent Use									NO	NO	31	NO
2.D.4 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.E - Electronics Industry	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.E.1 - Integrated Circuit or Semiconductor				0	0	NO		NO	NO	NO	NO	NO
2.E.2 - TFT Flat Panel Display					0	NO		NO	NO	NO	NO	NO
2.E.3 - Photovoltaics					0				NO	NO	NO	NO
2.E.4 - Heat Transfer Fluid					0				NO	NO	NO	NO
2.E.5 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.F - Product Uses as Substitutes for Ozone Depleting Substances	0	0	0	0	0	NE	NE	NE	NE	NE	NE	NE
2.F.1 - Refrigeration and Air Conditioning				0		NE	NE	NE	NE	NE	NE	NE
2.F.2 - Foam Blowing Agents				0				NO	NO	NO	NO	NO
2.F.3 - Fire Protection				0	0				NO	NO	NO	NO
2.F.4 - Aerosols				0				NE	NE	NE	NE	NE
2.F.5 - Solvents				0	0			NO	NO	NO	NO	NO
2.F.6 - Other Applications (please specify)				0	0			NO	NO	NO	NO	NO
2.G - Other Product Manufacture and Use	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.G.1 - Electrical Equipment					0	NO	NO	NO	NO	NO	NO	NO
2.G.2 - SF6 and PFCs from Other Product Uses					0	0		0	0	0	0	0
2.G.3 - N2O from Product Uses			0						0	0	0	0
2.G.4 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.H - Other	0	0	0	0	0	NO	NO	NO	NO	NO	6	NO
2.H.1 - Pulp and Paper Industry	0	0							NO	NO	NO	NO
2.H.2 - Food and Beverages Industry	0	0							NO	NO	6	NO
2.H.3 - Other (please specify)	0	0	0						NO	NO	NO	NO
3 - Agriculture, Forestry, and Other Land Use	-1469.447968	136.282	2.92	0	0	NA	NA	NA	NA	NA	NA	NA
3.A - Livestock	0	125.588	1.428	0	0	NA	NA	NA	NA	NA	NA	NA
3.A.1 - Enteric Fermentation		104.419							NA	NA	NA	NA
3.A.2 - Manure Management		21.1694	1.428						NA	NA	NA	NA
3.B - Land	-1491.906301	0	0	0	0	0	0	0	NA	NA	NA	NA
3.B.1 - Forest land	-1491.777968								NA	NA	NA	NA
3.B.2 - Cropland	-0.099								NA	NA	NA	NA
3.B.3 - Grassland	-0.029333333								NA	NA	NA	NA

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
3.B.4 - Wetlands	0		0						NA	NA	NA	NA
3.B.5 - Settlements	0								NA	NA	NA	NA
3.B.6 - Other Land	0								NA	NA	NA	NA
3.C - Aggregate sources and non-CO2 emissions sources on land	22.45833333	10.6935	1.493	0	0	NA	NA	NA	NO	NO	NO	NO
3.C.1 - Emissions from biomass burning		0	0						NO	NO	NO	NO
3.C.2 - Liming	0								NO	NO	NO	NO
3.C.3 - Urea application	22.45833333								NO	NO	NO	NO
3.C.4 - Direct N2O Emissions from managed soils			0.981						NO	NO	NO	NO
3.C.5 - Indirect N2O Emissions from managed soils			0.369						NO	NO	NO	NO
3.C.6 - Indirect N2O Emissions from manure management			0.143						NO	NO	NO	NO
3.C.7 - Rice cultivations		10.6935							NO	NO	NO	NO
3.C.8 - Other (please specify)		0	0						NO	NO	NO	NO
3.D - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
3.D.1 - Harvested Wood Products	0								NO	NO	NO	NO
3.D.2 - Other (please specify)	0	0	0						NO	NO	NO	NO
4 - Waste	0	14.3649	0.222	0	0	NO	NO	NO	NO	NO	NO	NO
4.A - Solid Waste Disposal	0	9.71516	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.B - Biological Treatment of Solid Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.C - Incineration and Open Burning of Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.D - Wastewater Treatment and Discharge	0	4.64972	0.222	0	0	NO	NO	NO	NO	NO	NO	NO
4.E - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5 - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.B - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
Memo Items (5)												
International Bunkers	112.4728605	0.00079	0.003	0	0	NO	NO	NO	0.4	0.2	0.1	0.04
1.A.3.a.i - International Aviation (International Bunkers)	112.4728605	0.00079	0.003						0.4	0.2	0.1	0.04
1.A.3.d.i - International water-borne navigation (International bunkers)	0	0	0						NO	NO	NO	NO
1.A.5.c - Multilateral Operations	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO

Inventory Year: 2005

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
Total National Emissions and Removals	2493.784648	146.913	5.618	0	1126.742	NE	NO	NO	12.43	216.2	40.1	11.04
1 - Energy	3106.326226	2.15933	0.048	0	0	NO	NO	NO	11	12	2	5
1.A - Fuel Combustion Activities	3105.997284	0.73522	0.048	0	0	NO	NO	NO	11	12	2	5
1.A.1 - Energy Industries	90.79379973	0.00351	7E-04						0.004	0.001	0.0001	0.02
1.A.2 - Manufacturing Industries and Construction	251.042806	0.01025	0.002						1	0.1	0.02	0.3
1.A.3 - Transport	438.309287	0.47614	0.037						5	7	1	1
1.A.4 - Other Sectors	2325.851391	0.24532	0.008						5	5	1	3
1.A.5 - Non-Specified	0	0	0						NO	NO	NO	NO
1.B - Fugitive emissions from fuels	0.3289423	1.42411	0	0	0	NE	NE	NE	0.001	0.002	0.013	0.02
1.B.1 - Solid Fuels	0.2343315	0.08579	0						NO	NO	NO	NO
1.B.2 - Oil and Natural Gas	0.0946108	1.33831	0						0.001	0.002	0.013	0.02
1.B.3 - Other emissions from Energy Production	0	0	0						NO	NO	NO	NO
1.C - Carbon dioxide Transport and Storage	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
1.C.1 - Transport of CO2	0								NO	NO	NO	NO
1.C.2 - Injection and Storage	0								NO	NO	NO	NO
1.C.3 - Other	0								NO	NO	NO	NO
2 - Industrial Processes and Product Use	799.1400135	0	0	0	1126.742	NE	NO	NO	1	204	38	6
2.A - Mineral Industry	154.1730549	0	0	0	0	NO	NO	NO	NO	NO	1	0
2.A.1 - Cement production	123.75558								NO	NO	NO	0
2.A.2 - Lime production	2.4								NO	NO	NO	NO
2.A.3 - Glass Production	3.6015								NO	NO	NO	NO
2.A.4 - Other Process Uses of Carbonates	24.41597485					NO	NO	NO	NO	NO	NO	NO
2.A.5 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.B - Chemical Industry	24.77337867	0	0	0	0	NO	NO	NO	NO	0	0	0
2.B.1 - Ammonia Production	24.77337867								NO	NO	NO	NO
2.B.2 - Nitric Acid Production			0						NO	NO	NO	NO
2.B.3 - Adipic Acid Production			0						NO	NO	NO	NO
2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production			0						NO	NO	NO	NO
2.B.5 - Carbide Production	0	0							NO	NO	NO	NO
2.B.6 - Titanium Dioxide Production	0								NO	NO	NO	NO
2.B.7 - Soda Ash Production	0								NO	NO	NO	NO
2.B.8 - Petrochemical and Carbon Black Production	0	0							0	0	0	0
2.B.9 - Fluorochemical Production				0	0	0	0	0	0	0	0	0
2.B.10 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.C - Metal Industry	620.19358	0	0	0	1126.742	NO	NO	NO	1	203	NO	6
2.C.1 - Iron and Steel Production	12.78558	0							NO	NO	NO	NO
2.C.2 - Ferroalloys Production	0	0							NO	NO	NO	NO
2.C.3 - Aluminium production	607.408				1126.742				1	203	NO	6

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
2.C.4 - Magnesium production	0					NO			NO	NO	NO	NO
2.C.5 - Lead Production	0								NO	NO	NO	NO
2.C.6 - Zinc Production	0								NO	NO	NO	NO
2.C.7 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.D - Non-Energy Products from Fuels and Solvent Use	0	0	0	0	0	NO	NO	NO	NO	NO	31	NO
2.D.1 - Lubricant Use	0								NO	NO	NO	NO
2.D.2 - Paraffin Wax Use	0								NO	NO	NO	NO
2.D.3 - Solvent Use									NO	NO	31	NO
2.D.4 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.E - Electronics Industry	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.E.1 - Integrated Circuit or Semiconductor				0	0	NO		NO	NO	NO	NO	NO
2.E.2 - TFT Flat Panel Display					0	NO		NO	NO	NO	NO	NO
2.E.3 - Photovoltaics					0				NO	NO	NO	NO
2.E.4 - Heat Transfer Fluid					0				NO	NO	NO	NO
2.E.5 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.F - Product Uses as Substitutes for Ozone Depleting Substances	0	0	0	0	0	NE	NE	NE	NE	NE	NE	NE
2.F.1 - Refrigeration and Air Conditioning				0		NE	NE	NE	NE	NE	NE	NE
2.F.2 - Foam Blowing Agents				0				NO	NO	NO	NO	NO
2.F.3 - Fire Protection				0	0				NO	NO	NO	NO
2.F.4 - Aerosols				0				NE	NE	NE	NE	NE
2.F.5 - Solvents				0	0			NO	NO	NO	NO	NO
2.F.6 - Other Applications (please specify)				0	0			NO	NO	NO	NO	NO
2.G - Other Product Manufacture and Use	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.G.1 - Electrical Equipment					0	NO	NO	NO	NO	NO	NO	NO
2.G.2 - SF6 and PFCs from Other Product Uses					0	0		0	0	0	0	0
2.G.3 - N2O from Product Uses			0						0	0	0	0
2.G.4 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.H - Other	0	0	0	0	0	NO	NO	NO	NO	NO	6	NO
2.H.1 - Pulp and Paper Industry	0	0							NO	NO	NO	NO
2.H.2 - Food and Beverages Industry	0	0							NO	NO	6	NO
2.H.3 - Other (please specify)	0	0	0						NO	NO	NO	NO
3 - Agriculture, Forestry, and Other Land Use	-1411.681591	129.474	5.341	0	0	NA	NA	NA	NA	NA	NA	NA
3.A - Livestock	0	118.846	1E-04	0	0	NA	NA	NA	NA	NA	NA	NA
3.A.1 - Enteric Fermentation		99.0181							NA	NA	NA	NA
3.A.2 - Manure Management		19.828	1E-04						NA	NA	NA	NA
3.B - Land	-1460.814925	0	0	0	0	NA	NA	NA	NA	NA	NA	NA
3.B.1 - Forest land	-1460.583925								NA	NA	NA	NA
3.B.2 - Cropland	-0.198								NA	NA	NA	NA
3.B.3 - Grassland	-0.033								NA	NA	NA	NA

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
3.B.4 - Wetlands	0		0						NA	NA	NA	NA
3.B.5 - Settlements	0								NA	NA	NA	NA
3.B.6 - Other Land	0								NA	NA	NA	NA
3.C - Aggregate sources and non-CO2 emissions sources on land	49.13333333	10.6283	5.341	0	0	NA	NA	NA	NO	NO	NO	NO
3.C.1 - Emissions from biomass burning		0	0						NO	NO	NO	NO
3.C.2 - Liming	0								NO	NO	NO	NO
3.C.3 - Urea application	49.13333333								NO	NO	NO	NO
3.C.4 - Direct N2O Emissions from managed soils			2.547						NO	NO	NO	NO
3.C.5 - Indirect N2O Emissions from managed soils			2.795						NO	NO	NO	NO
3.C.6 - Indirect N2O Emissions from manure management			5E-06						NO	NO	NO	NO
3.C.7 - Rice cultivations		10.6283							NO	NO	NO	NO
3.C.8 - Other (please specify)		0	0						NO	NO	NO	NO
3.D - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
3.D.1 - Harvested Wood Products	0								NO	NO	NO	NO
3.D.2 - Other (please specify)	0	0	0						NO	NO	NO	NO
4 - Waste	0	15.2798	0.229	0	0	NO	NO	NO	NO	NO	NO	NO
4.A - Solid Waste Disposal	0	9.45621	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.B - Biological Treatment of Solid Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.C - Incineration and Open Burning of Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.D - Wastewater Treatment and Discharge	0	5.82356	0.229	0	0	NO	NO	NO	NO	NO	NO	NO
4.E - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5 - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.B - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
Memo Items (5)												
International Bunkers	124.0480742	0.00087	0.003	0	0	NO	NO	NO	0.43	0.2	0.1	0.04
1.A.3.a.i - International Aviation (International Bunkers)	124.0480742	0.00087	0.003						0.43	0.2	0.1	0.04
1.A.3.d.i - International water-borne navigation (International bunkers)	0	0	0						NO	NO	NO	NO
1.A.5.c - Multilateral Operations	0	0	0	0	0	NO	NO	NO	0	0	0	0

Inventory Year: 2004

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
Total National Emissions and Removals	3310.58626	141.373	2.296	0	1062.787	NE	NO	NO	10.4	210.2	38.1	11.04
1 - Energy	3970.082034	1.69965	0.054	0	0	NO	NO	NO	9	18	3	6
1.A - Fuel Combustion Activities	3969.780012	0.44306	0.054	0	0	NO	NO	NO	9	18	3	6
1.A.1 - Energy Industries	282.080391	0.01152	0.002						0.01	0.001	0.0002	0.31
1.A.2 - Manufacturing Industries and Construction	486.44765	0.02204	0.004						1.34	0.15	0.04	0.6
1.A.3 - Transport	394.9793943	0.0937	0.035						4.3	16	3	1
1.A.4 - Other Sectors	2806.272577	0.3158	0.012						3	2.3	0.3	4
1.A.5 - Non-Specified	0	0	0						NO	NO	NO	NO
1.B - Fugitive emissions from fuels	0.3020212	1.2566	0	0	0	NE	NE	NE	0.001	0.002	0.012	0.02
1.B.1 - Solid Fuels	0.2193438	0.08031	0						NO	NO	NO	NO
1.B.2 - Oil and Natural Gas	0.0826774	1.17629	0						0.001	0.002	0.012	0.02
1.B.3 - Other emissions from Energy Production	0	0	0						NO	NO	NO	NO
1.C - Carbon dioxide Transport and Storage	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
1.C.1 - Transport of CO2	0								NO	NO	NO	NO
1.C.2 - Injection and Storage	0								NO	NO	NO	NO
1.C.3 - Other	0								NO	NO	NO	NO
2 - Industrial Processes and Product Use	735.4925826	0	0	0	1062.787	NE	NO	NO	1	192	35	5
2.A - Mineral Industry	122.691374	0	0	0	0	NO	NO	NO	NO	NO	0	0
2.A.1 - Cement production	94.62438								NO	NO	NO	0
2.A.2 - Lime production	7.05								NO	NO	NO	NO
2.A.3 - Glass Production	3.00825								NO	NO	NO	NO
2.A.4 - Other Process Uses of Carbonates	18.00874396					NO	NO	NO	NO	NO	NO	NO
2.A.5 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.B - Chemical Industry	27.09954867	0	0	0	0	NO	NO	NO	NO	0	0	0
2.B.1 - Ammonia Production	27.09954867								NO	0	0	0
2.B.2 - Nitric Acid Production			0						NO	NO	NO	NO
2.B.3 - Adipic Acid Production			0						NO	NO	NO	NO
2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production			0						NO	NO	NO	NO
2.B.5 - Carbide Production	0	0							NO	NO	NO	NO
2.B.6 - Titanium Dioxide Production	0								NO	NO	NO	NO
2.B.7 - Soda Ash Production	0								NO	NO	NO	NO
2.B.8 - Petrochemical and Carbon Black Production	0	0							0	0	0	0
2.B.9 - Fluorochemical Production				0	0	0	0	0	0	0	0	0
2.B.10 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.C - Metal Industry	585.70166	0	0	0	1062.787	NO	NO	NO	1	192	NO	5
2.C.1 - Iron and Steel Production	12.77046	0							NO	NO	NO	NO
2.C.2 - Ferroalloys Production	0	0							NO	NO	NO	NO
2.C.3 - Aluminium production	572.9312				1062.787				1	192	NO	5

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
2.C.4 - Magnesium production	0					NO			NO	NO	NO	NO
2.C.5 - Lead Production	0								NO	NO	NO	NO
2.C.6 - Zinc Production	0								NO	NO	NO	NO
2.C.7 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.D - Non-Energy Products from Fuels and Solvent Use	0	0	0	0	0	NO	NO	NO	NO	NO	30	NO
2.D.1 - Lubricant Use	0								NO	NO	NO	NO
2.D.2 - Paraffin Wax Use	0								NO	NO	NO	NO
2.D.3 - Solvent Use									NO	NO	30	NO
2.D.4 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.E - Electronics Industry	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.E.1 - Integrated Circuit or Semiconductor				0	0	NO		NO	NO	NO	NO	NO
2.E.2 - TFT Flat Panel Display					0	NO		NO	NO	NO	NO	NO
2.E.3 - Photovoltaics					0				NO	NO	NO	NO
2.E.4 - Heat Transfer Fluid					0				NO	NO	NO	NO
2.E.5 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.F - Product Uses as Substitutes for Ozone Depleting Substances	0	0	0	0	0	NE	NE	NE	NE	NE	NE	NE
2.F.1 - Refrigeration and Air Conditioning				0		NE	NE	NE	NE	NE	NE	NE
2.F.2 - Foam Blowing Agents				0				NO	NO	NO	NO	NO
2.F.3 - Fire Protection				0	0				NO	NO	NO	NO
2.F.4 - Aerosols				0				NE	NE	NE	NE	NE
2.F.5 - Solvents				0	0			NO	NO	NO	NO	NO
2.F.6 - Other Applications (please specify)				0	0			NO	NO	NO	NO	NO
2.G - Other Product Manufacture and Use	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.G.1 - Electrical Equipment					0	NO	NO	NO	NO	NO	NO	NO
2.G.2 - SF6 and PFCs from Other Product Uses					0	0		0	0	0	0	0
2.G.3 - N2O from Product Uses			0						0	0	0	0
2.G.4 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.H - Other	0	0	0	0	0	NO	NO	NO	NO	NO	4	NO
2.H.1 - Pulp and Paper Industry	0	0							NO	NO	NO	NO
2.H.2 - Food and Beverages Industry	0	0							NO	NO	4	NO
2.H.3 - Other (please specify)	0	0	0						NO	NO	NO	NO
3 - Agriculture, Forestry, and Other Land Use	-1412.37008	124.68	2.014	0	0	NA	NA	NA	NA	NA	NA	NA
3.A - Livestock	0	114.38	0	0	0	NA	NA	NA	NA	NA	NA	NA
3.A.1 - Enteric Fermentation		94.8168							NA	NA	NA	NA
3.A.2 - Manure Management		19.5636	0						NA	NA	NA	NA
3.B - Land	-1460.77008	0	0	0	0	NA	NA	NA	NA	NA	NA	NA
3.B.1 - Forest land	-1460.53908								NA	NA	NA	NA
3.B.2 - Cropland	-0.198								NA	NA	NA	NA
3.B.3 - Grassland	-0.033								NA	NA	NA	NA

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
3.B.4 - Wetlands	0		0						NA	NA	NA	NA
3.B.5 - Settlements	0								NA	NA	NA	NA
3.B.6 - Other Land	0								NA	NA	NA	NA
3.C - Aggregate sources and non-CO2 emissions sources on land	48.4	10.2995	2.014	0	0	NA	NA	NA	NO	NO	NO	NO
3.C.1 - Emissions from biomass burning		0	0						NO	NO	NO	NO
3.C.2 - Liming	0								NO	NO	NO	NO
3.C.3 - Urea application	48.4								NO	NO	NO	NO
3.C.4 - Direct N2O Emissions from managed soils			1.486						NO	NO	NO	NO
3.C.5 - Indirect N2O Emissions from managed soils			0.528						NO	NO	NO	NO
3.C.6 - Indirect N2O Emissions from manure management			0						NO	NO	NO	NO
3.C.7 - Rice cultivations		10.2995							NO	NO	NO	NO
3.C.8 - Other (please specify)		0	0						NO	NO	NO	NO
3.D - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
3.D.1 - Harvested Wood Products	0								NO	NO	NO	NO
3.D.2 - Other (please specify)	0	0	0						NO	NO	NO	NO
4 - Waste	0	14.9939	0.228	0	0	NO	NO	NO	NO	NO	NO	NO
4.A - Solid Waste Disposal	0	9.18844	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.B - Biological Treatment of Solid Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.C - Incineration and Open Burning of Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.D - Wastewater Treatment and Discharge	0	5.80549	0.228	0	0	NO	NO	NO	NO	NO	NO	NO
4.E - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5 - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.B - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
Memo Items (5)												
International Bunkers	120.3147446	0.00084	0.003	0	0	NO	NO	NO	0.4	0.2	0.1	0.04
1.A.3.a.i - International Aviation (International Bunkers)	120.3147446	0.00084	0.003						0.4	0.2	0.1	0.04
1.A.3.d.i - International water-borne navigation (International bunkers)	0	0	0						NO	NO	NO	NO
1.A.5.c - Multilateral Operations	0	0	0	0	0	NO	NO	NO	0	0	0	0

Inventory Year: 2003

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
Total National Emissions and Removals	2147.915528	128.807	5.422	0	947.86	NE	NO	NO	5.4	179.2	35.1	10.03
1 - Energy	2908.491298	1.47477	0.038	0	0	NO	NO	NO	5	8	1	5
1.A - Fuel Combustion Activities	2908.286312	0.33282	0.038	0	0	NO	NO	NO	5	8	1	5
1.A.1 - Energy Industries	25.214781	0.00098	2E-04						0.003	3E-04	0.0001	0.02
1.A.2 - Manufacturing Industries and Construction	499.090304	0.01322	0.002						1	0.2	0.03	1
1.A.3 - Transport	200.3755547	0.05662	0.025						2.3	6	1	1
1.A.4 - Other Sectors	2183.605673	0.262	0.01						2	1.3	0.2	3
1.A.5 - Non-Specified	0	0	0						NO	NO	NO	NO
1.B - Fugitive emissions from fuels	0.2049861	1.14195	0	0	0	NE	NE	NE	0.001	0.002	0.011	0.02
1.B.1 - Solid Fuels	0.1277523	0.04677	0						NO	NO	NO	NO
1.B.2 - Oil and Natural Gas	0.0772338	1.09517	0						0.001	0.002	0.011	0.02
1.B.3 - Other emissions from Energy Production	0	0	0						NO	NO	NO	NO
1.C - Carbon dioxide Transport and Storage	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
1.C.1 - Transport of CO2	0								NO	NO	NO	NO
1.C.2 - Injection and Storage	0								NO	NO	NO	NO
1.C.3 - Other	0								NO	NO	NO	NO
2 - Industrial Processes and Product Use	648.6933915	0	0	0	947.86	NE	NO	NO	0	171	34	5
2.A - Mineral Industry	112.4614212	0	0	0	0	NO	NO	NO	NO	NO	0	0
2.A.1 - Cement production	82.183797								NO	NO	NO	0
2.A.2 - Lime production	9.075								NO	NO	NO	NO
2.A.3 - Glass Production	3.31275								NO	NO	NO	NO
2.A.4 - Other Process Uses of Carbonates	17.88987417					NO	NO	NO	NO	NO	NO	NO
2.A.5 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.B - Chemical Industry	12.76037033	0	0	0	0	NO	NO	NO	NO	0	0	0
2.B.1 - Ammonia Production	12.76037033								NO	0	0	0
2.B.2 - Nitric Acid Production			0						NO	NO	NO	NO
2.B.3 - Adipic Acid Production			0						NO	NO	NO	NO
2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production			0						NO	NO	NO	NO
2.B.5 - Carbide Production	0	0							NO	NO	NO	NO
2.B.6 - Titanium Dioxide Production	0								NO	NO	NO	NO
2.B.7 - Soda Ash Production	0								NO	NO	NO	NO
2.B.8 - Petrochemical and Carbon Black Production	0	0							0	0	0	0
2.B.9 - Fluorochemical Production				0	0	0	0	0	0	0	0	0
2.B.10 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.C - Metal Industry	523.4716	0	0	0	947.86	NO	NO	NO	0	171	NO	5
2.C.1 - Iron and Steel Production	12.4956	0							NO	NO	NO	NO
2.C.2 - Ferroalloys Production	0	0							NO	NO	NO	NO
2.C.3 - Aluminium production	510.976				947.86				0	171	NO	5

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
2.C.4 - Magnesium production	0					NO			NO	NO	NO	NO
2.C.5 - Lead Production	0								NO	NO	NO	NO
2.C.6 - Zinc Production	0								NO	NO	NO	NO
2.C.7 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.D - Non-Energy Products from Fuels and Solvent Use	0	0	0	0	0	NO	NO	NO	NO	NO	30	NO
2.D.1 - Lubricant Use	0								NO	NO	NO	NO
2.D.2 - Paraffin Wax Use	0								NO	NO	NO	NO
2.D.3 - Solvent Use									NO	NO	30	NO
2.D.4 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.E - Electronics Industry	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.E.1 - Integrated Circuit or Semiconductor				0	0	NO		NO	NO	NO	NO	NO
2.E.2 - TFT Flat Panel Display					0	NO		NO	NO	NO	NO	NO
2.E.3 - Photovoltaics					0				NO	NO	NO	NO
2.E.4 - Heat Transfer Fluid					0				NO	NO	NO	NO
2.E.5 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.F - Product Uses as Substitutes for Ozone Depleting Substances	0	0	0	0	0	NE	NE	NE	NE	NE	NE	NE
2.F.1 - Refrigeration and Air Conditioning				0		NE	NE	NE	NE	NE	NE	NE
2.F.2 - Foam Blowing Agents				0				NO	NO	NO	NO	NO
2.F.3 - Fire Protection				0	0				NO	NO	NO	NO
2.F.4 - Aerosols				0				NE	NE	NE	NE	NE
2.F.5 - Solvents				0	0			NO	NO	NO	NO	NO
2.F.6 - Other Applications (please specify)				0	0			NO	NO	NO	NO	NO
2.G - Other Product Manufacture and Use	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.G.1 - Electrical Equipment					0	NO	NO	NO	NO	NO	NO	NO
2.G.2 - SF6 and PFCs from Other Product Uses					0	0		0	0	0	0	0
2.G.3 - N2O from Product Uses			0						0	0	0	0
2.G.4 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.H - Other	0	0	0	0	0	NO	NO	NO	NO	NO	4	NO
2.H.1 - Pulp and Paper Industry	0	0							NO	NO	NO	NO
2.H.2 - Food and Beverages Industry	0	0							NO	NO	4	NO
2.H.3 - Other (please specify)	0	0	0						NO	NO	NO	NO
3 - Agriculture, Forestry, and Other Land Use	-1409.269162	112.266	5.174	0	0	NA	NA	NA	NA	NA	NA	NA
3.A - Livestock	0	106.547	1.201	0	0	NA	NA	NA	NA	NA	NA	NA
3.A.1 - Enteric Fermentation		88.3							NA	NA	NA	NA
3.A.2 - Manure Management		18.2471	1.201						NA	NA	NA	NA
3.B - Land	-1450.555829	0	0	0	0	NA	NA	NA	NA	NA	NA	NA
3.B.1 - Forest land	-1450.324829								NA	NA	NA	NA
3.B.2 - Cropland	-0.198								NA	NA	NA	NA
3.B.3 - Grassland	-0.033								NA	NA	NA	NA

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
3.B.4 - Wetlands	0		0						NA	NA	NA	NA
3.B.5 - Settlements	0								NA	NA	NA	NA
3.B.6 - Other Land	0								NA	NA	NA	NA
3.C - Aggregate sources and non-CO2 emissions sources on land	41.28666667	5.71893	3.973	0	0	NA	NA	NA	NO	NO	NO	NO
3.C.1 - Emissions from biomass burning		0	0						NO	NO	NO	NO
3.C.2 - Liming	0								NO	NO	NO	NO
3.C.3 - Urea application	41.28666667								NO	NO	NO	NO
3.C.4 - Direct N2O Emissions from managed soils			1.305						NO	NO	NO	NO
3.C.5 - Indirect N2O Emissions from managed soils			2.548						NO	NO	NO	NO
3.C.6 - Indirect N2O Emissions from manure management			0.12						NO	NO	NO	NO
3.C.7 - Rice cultivations		5.71893							NO	NO	NO	NO
3.C.8 - Other (please specify)		0	0						NO	NO	NO	NO
3.D - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
3.D.1 - Harvested Wood Products	0								NO	NO	NO	NO
3.D.2 - Other (please specify)	0	0	0						NO	NO	NO	NO
4 - Waste	0	15.0658	0.21	0	0	NO	NO	NO	NO	NO	NO	NO
4.A - Solid Waste Disposal	0	9.02556	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.B - Biological Treatment of Solid Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.C - Incineration and Open Burning of Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.D - Wastewater Treatment and Discharge	0	6.04022	0.21	0	0	NO	NO	NO	NO	NO	NO	NO
4.E - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5 - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.B - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
Memo Items (5)												
International Bunkers	109.2787196	0.00076	0.003	0	0	NO	NO	NO	0.4	0.2	0.1	0.03
1.A.3.a.i - International Aviation (International Bunkers)	109.2787196	0.00076	0.003						0.4	0.2	0.1	0.03
1.A.3.d.i - International water-borne navigation (International bunkers)	0	0	0						NO	NO	NO	NO
1.A.5.c - Multilateral Operations	0	0	0	0	0	NO	NO	NO	0	0	0	0

Inventory Year: 2002

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
Total National Emissions and Removals	2311.077852	121.135	4.617	0	912.924	NE	NO	NO	8.4	183.1	36.1	10.03
1 - Energy	3154.762843	1.41642	0.047	0	0	NO	NO	NO	8	18	3	5
1.A - Fuel Combustion Activities	3154.614521	0.39461	0.047	0	0	NO	NO	NO	8	18	3	5
1.A.1 - Energy Industries	53.573913	0.00191	4E-04						0.03	0.003	0.001	0.1
1.A.2 - Manufacturing Industries and Construction	462.632405	0.01247	0.002						1	0.13	0.03	1
1.A.3 - Transport	416.9260376	0.12262	0.035						4	16	3	1
1.A.4 - Other Sectors	2221.482166	0.25761	0.01						2	2	0.3	3
1.A.5 - Non-Specified	0	0	0						NO	NO	NO	NO
1.B - Fugitive emissions from fuels	0.1483213	1.02181	0	0	0	NE	NE	NE	0.001	0.001	0.01	0.015
1.B.1 - Solid Fuels	0.0782691	0.02866	0						NO	NO	NO	NO
1.B.2 - Oil and Natural Gas	0.0700522	0.99316	0						0.001	0.001	0.01	0.015
1.B.3 - Other emissions from Energy Production	0	0	0						NO	NO	NO	NO
1.C - Carbon dioxide Transport and Storage	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
1.C.1 - Transport of CO2	0								NO	NO	NO	NO
1.C.2 - Injection and Storage	0								NO	NO	NO	NO
1.C.3 - Other	0								NO	NO	NO	NO
2 - Industrial Processes and Product Use	598.4775153	0	0	0	912.924	NE	NO	NO	0	165	33	5
2.A - Mineral Industry	82.92938331	0	0	0	0	NO	NO	NO	NO	NO	0	0
2.A.1 - Cement production	44.081748								NO	NO	NO	0
2.A.2 - Lime production	18.675								NO	NO	NO	NO
2.A.3 - Glass Production	3.843								NO	NO	NO	NO
2.A.4 - Other Process Uses of Carbonates	16.32963531					NO	NO	NO	NO	NO	NO	NO
2.A.5 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.B - Chemical Industry	11.630762	0	0	0	0	NO	NO	NO	NO	0	0	0
2.B.1 - Ammonia Production	11.630762								NO	0	0	0
2.B.2 - Nitric Acid Production			0						NO	NO	NO	NO
2.B.3 - Adipic Acid Production			0						NO	NO	NO	NO
2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production			0						NO	NO	NO	NO
2.B.5 - Carbide Production	0	0							NO	NO	NO	NO
2.B.6 - Titanium Dioxide Production	0								NO	NO	NO	NO
2.B.7 - Soda Ash Production	0								NO	NO	NO	NO
2.B.8 - Petrochemical and Carbon Black Production	0	0							0	0	0	0
2.B.9 - Fluorochemical Production				0	0	0	0	0	0	0	0	0
2.B.10 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.C - Metal Industry	503.91737	0	0	0	912.924	NO	NO	NO	0	165	NO	5
2.C.1 - Iron and Steel Production	11.77497	0							NO	NO	NO	NO
2.C.2 - Ferroalloys Production	0	0							NO	NO	NO	NO
2.C.3 - Aluminium production	492.1424				912.924				0	165	NO	5

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
2.C.4 - Magnesium production	0					NO			NO	NO	NO	NO
2.C.5 - Lead Production	0								NO	NO	NO	NO
2.C.6 - Zinc Production	0								NO	NO	NO	NO
2.C.7 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.D - Non-Energy Products from Fuels and Solvent Use	0	0	0	0	0	NO	NO	NO	NO	NO	29	NO
2.D.1 - Lubricant Use	0								NO	NO	NO	NO
2.D.2 - Paraffin Wax Use	0								NO	NO	NO	NO
2.D.3 - Solvent Use									NO	NO	29	NO
2.D.4 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.E - Electronics Industry	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.E.1 - Integrated Circuit or Semiconductor				0	0	NO		NO	NO	NO	NO	NO
2.E.2 - TFT Flat Panel Display					0	NO		NO	NO	NO	NO	NO
2.E.3 - Photovoltaics					0				NO	NO	NO	NO
2.E.4 - Heat Transfer Fluid					0				NO	NO	NO	NO
2.E.5 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.F - Product Uses as Substitutes for Ozone Depleting Substances	0	0	0	0	0	NE	NE	NE	NE	NE	NE	NE
2.F.1 - Refrigeration and Air Conditioning				0		NE	NE	NE	NE	NE	NE	NE
2.F.2 - Foam Blowing Agents				0				NO	NO	NO	NO	NO
2.F.3 - Fire Protection				0	0				NO	NO	NO	NO
2.F.4 - Aerosols				0				NE	NE	NE	NE	NE
2.F.5 - Solvents				0	0			NO	NO	NO	NO	NO
2.F.6 - Other Applications (please specify)				0	0			NO	NO	NO	NO	NO
2.G - Other Product Manufacture and Use	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.G.1 - Electrical Equipment					0	NO	NO	NO	NO	NO	NO	NO
2.G.2 - SF6 and PFCs from Other Product Uses					0	0		0	0	0	0	0
2.G.3 - N2O from Product Uses			0						0	0	0	0
2.G.4 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.H - Other	0	0	0	0	0	NO	NO	NO	NO	NO	4	NO
2.H.1 - Pulp and Paper Industry	0	0							NO	NO	NO	NO
2.H.2 - Food and Beverages Industry	0	0							NO	NO	4	NO
2.H.3 - Other (please specify)	0	0	0						NO	NO	NO	NO
3 - Agriculture, Forestry, and Other Land Use	-1442.162506	104.932	4.375	0	0	NA	NA	NA	NA	NA	NA	NA
3.A - Livestock	0	98.9032	1.107	0	0	NA	NA	NA	NA	NA	NA	NA
3.A.1 - Enteric Fermentation		82.1005							NA	NA	NA	NA
3.A.2 - Manure Management		16.8027	1.107						NA	NA	NA	NA
3.B - Land	-1479.929173	0	0	0	0	NA	NA	NA	NA	NA	NA	NA
3.B.1 - Forest land	-1479.698173								NA	NA	NA	NA
3.B.2 - Cropland	-0.198								NA	NA	NA	NA
3.B.3 - Grassland	-0.033								NA	NA	NA	NA

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
3.B.4 - Wetlands	0		0						NA	NA	NA	NA
3.B.5 - Settlements	0								NA	NA	NA	NA
3.B.6 - Other Land	0								NA	NA	NA	NA
3.C - Aggregate sources and non-CO2 emissions sources on land	37.76666667	6.02862	3.268	0	0	NA	NA	NA	NO	NO	NO	NO
3.C.1 - Emissions from biomass burning		0	0						NO	NO	NO	NO
3.C.2 - Liming	0								NO	NO	NO	NO
3.C.3 - Urea application	37.76666667								NO	NO	NO	NO
3.C.4 - Direct N2O Emissions from managed soils			1.197						NO	NO	NO	NO
3.C.5 - Indirect N2O Emissions from managed soils			1.96						NO	NO	NO	NO
3.C.6 - Indirect N2O Emissions from manure management			0.111						NO	NO	NO	NO
3.C.7 - Rice cultivations		6.02862							NO	NO	NO	NO
3.C.8 - Other (please specify)		0	0						NO	NO	NO	NO
3.D - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
3.D.1 - Harvested Wood Products	0								NO	NO	NO	NO
3.D.2 - Other (please specify)	0	0	0						NO	NO	NO	NO
4 - Waste	0	14.7872	0.196	0	0	NO	NO	NO	NO	NO	NO	NO
4.A - Solid Waste Disposal	0	8.86553	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.B - Biological Treatment of Solid Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.C - Incineration and Open Burning of Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.D - Wastewater Treatment and Discharge	0	5.92168	0.196	0	0	NO	NO	NO	NO	NO	NO	NO
4.E - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5 - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.B - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
Memo Items (5)												
International Bunkers	105.1417868	0.00074	0.003	0	0	NO	NO	NO	0.4	0.1	0.1	0.03
1.A.3.a.i - International Aviation (International Bunkers)	105.1417868	0.00074	0.003						0.4	0.1	0.1	0.03
1.A.3.d.i - International water-borne navigation (International bunkers)	0	0	0						NO	NO	NO	NO
1.A.5.c - Multilateral Operations	0	0	0	0	0	NO	NO	NO	0	0	0	0

Inventory Year: 2001

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
Total National Emissions and Removals	2050.773844	116.908	4.33	0	857.969	NE	NO	NO	7.23	175.1	38.05	8.02
1 - Energy	2929.623676	1.43799	0.042	0	0	NO	NO	NO	6	20	4	4
1.A - Fuel Combustion Activities	2929.490281	0.39081	0.042	0	0	NO	NO	NO	6	20	4	4
1.A.1 - Energy Industries	13.861883	0.00052	1E-04						0.004	5E-04	0.00012	0.02
1.A.2 - Manufacturing Industries and Construction	211.434497	0.00672	0.001						1	0.1	0.01	0.3
1.A.3 - Transport	347.9709758	0.11503	0.031						4	19	3	1
1.A.4 - Other Sectors	2356.222925	0.26855	0.009						2	2	0.2	3
1.A.5 - Non-Specified	0	0	0						NO	NO	NO	NO
1.B - Fugitive emissions from fuels	0.1333956	1.04717	0	0	0	NE	NE	NE	0.001	0.002	0.01	0.02
1.B.1 - Solid Fuels	0.061854	0.02265	0						NO	NO	NO	NO
1.B.2 - Oil and Natural Gas	0.0715416	1.02453	0						0.001	0.002	0.01	0.02
1.B.3 - Other emissions from Energy Production	0	0	0						NO	NO	NO	NO
1.C - Carbon dioxide Transport and Storage	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
1.C.1 - Transport of CO2	0								NO	NO	NO	NO
1.C.2 - Injection and Storage	0								NO	NO	NO	NO
1.C.3 - Other	0								NO	NO	NO	NO
2 - Industrial Processes and Product Use	535.3076707	0	0	0	857.969	NE	NO	NO	1	155	34	4
2.A - Mineral Industry	56.60409274	0	0	0	0	NO	NO	NO	NO	NO	0	0
2.A.1 - Cement production	34.049691								NO	NO	NO	0
2.A.2 - Lime production	7.05								NO	NO	NO	NO
2.A.3 - Glass Production	3.59625								NO	NO	NO	NO
2.A.4 - Other Process Uses of Carbonates	11.90815174					NO	NO	NO	NO	NO	NO	NO
2.A.5 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.B - Chemical Industry	4.330403	0	0	0	0	NO	NO	NO	NO	0	0	0
2.B.1 - Ammonia Production	4.330403								NO	0	0	0
2.B.2 - Nitric Acid Production			0						NO	NO	NO	NO
2.B.3 - Adipic Acid Production			0						NO	NO	NO	NO
2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production			0						NO	NO	NO	NO
2.B.5 - Carbide Production	0	0							NO	NO	NO	NO
2.B.6 - Titanium Dioxide Production	0								NO	NO	NO	NO
2.B.7 - Soda Ash Production	0								NO	NO	NO	NO
2.B.8 - Petrochemical and Carbon Black Production	0	0							0	0	0	0
2.B.9 - Fluorochemical Production				0	0	0	0	0	0	0	0	0
2.B.10 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.C - Metal Industry	474.373175	0	0	0	857.969	NO	NO	NO	1	155	NO	4
2.C.1 - Iron and Steel Production	11.856375	0							NO	NO	NO	NO
2.C.2 - Ferroalloys Production	0	0							NO	NO	NO	NO
2.C.3 - Aluminium production	462.5168				857.969				1	155	NO	4

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
2.C.4 - Magnesium production	0					NO			NO	NO	NO	NO
2.C.5 - Lead Production	0								NO	NO	NO	NO
2.C.6 - Zinc Production	0								NO	NO	NO	NO
2.C.7 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.D - Non-Energy Products from Fuels and Solvent Use	0	0	0	0	0	NO	NO	NO	NO	NO	29	NO
2.D.1 - Lubricant Use	0								NO	NO	NO	NO
2.D.2 - Paraffin Wax Use	0								NO	NO	NO	NO
2.D.3 - Solvent Use									NO	NO	29	NO
2.D.4 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.E - Electronics Industry	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.E.1 - Integrated Circuit or Semiconductor				0	0	NO		NO	NO	NO	NO	NO
2.E.2 - TFT Flat Panel Display					0	NO		NO	NO	NO	NO	NO
2.E.3 - Photovoltaics					0				NO	NO	NO	NO
2.E.4 - Heat Transfer Fluid					0				NO	NO	NO	NO
2.E.5 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.F - Product Uses as Substitutes for Ozone Depleting Substances	0	0	0	0	0	NE	NE	NE	NE	NE	NE	NE
2.F.1 - Refrigeration and Air Conditioning				0		NE	NE	NE	NE	NE	NE	NE
2.F.2 - Foam Blowing Agents				0				NO	NO	NO	NO	NO
2.F.3 - Fire Protection				0	0				NO	NO	NO	NO
2.F.4 - Aerosols				0				NE	NE	NE	NE	NE
2.F.5 - Solvents				0	0			NO	NO	NO	NO	NO
2.F.6 - Other Applications (please specify)				0	0			NO	NO	NO	NO	NO
2.G - Other Product Manufacture and Use	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.G.1 - Electrical Equipment					0	NO	NO	NO	NO	NO	NO	NO
2.G.2 - SF6 and PFCs from Other Product Uses					0	0		0	0	0	0	0
2.G.3 - N2O from Product Uses			0						0	0	0	0
2.G.4 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.H - Other	0	0	0	0	0	NO	NO	NO	NO	NO	5	NO
2.H.1 - Pulp and Paper Industry	0	0							NO	NO	NO	NO
2.H.2 - Food and Beverages Industry	0	0							NO	NO	5	NO
2.H.3 - Other (please specify)	0	0	0						NO	NO	NO	NO
3 - Agriculture, Forestry, and Other Land Use	-1414.157503	101.3	4.103	0	0	NA	NA	NA	NA	NA	NA	NA
3.A - Livestock	0	94.1601	1.055	0	0	NA	NA	NA	NA	NA	NA	NA
3.A.1 - Enteric Fermentation		78.1866							NA	NA	NA	NA
3.A.2 - Manure Management		15.9735	1.055						NA	NA	NA	NA
3.B - Land	-1437.550837	0	0	0	0	NA	NA	NA	NA	NA	NA	NA
3.B.1 - Forest land	-1437.319837								NA	NA	NA	NA
3.B.2 - Cropland	-0.198								NA	NA	NA	NA
3.B.3 - Grassland	-0.033								NA	NA	NA	NA

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
3.B.4 - Wetlands	0		0						NA	NA	NA	NA
3.B.5 - Settlements	0								NA	NA	NA	NA
3.B.6 - Other Land	0								NA	NA	NA	NA
3.C - Aggregate sources and non-CO2 emissions sources on land	23.39333333	7.13988	3.048	0	0	NA	NA	NA	NO	NO	NO	NO
3.C.1 - Emissions from biomass burning		0	0						NO	NO	NO	NO
3.C.2 - Liming	0								NO	NO	NO	NO
3.C.3 - Urea application	23.39333333								NO	NO	NO	NO
3.C.4 - Direct N2O Emissions from managed soils			0.871						NO	NO	NO	NO
3.C.5 - Indirect N2O Emissions from managed soils			2.072						NO	NO	NO	NO
3.C.6 - Indirect N2O Emissions from manure management			0.106						NO	NO	NO	NO
3.C.7 - Rice cultivations		7.13988							NO	NO	NO	NO
3.C.8 - Other (please specify)		0	0						NO	NO	NO	NO
3.D - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
3.D.1 - Harvested Wood Products	0								NO	NO	NO	NO
3.D.2 - Other (please specify)	0	0	0						NO	NO	NO	NO
4 - Waste	0	14.17	0.185	0	0	NO	NO	NO	NO	NO	NO	NO
4.A - Solid Waste Disposal	0	8.70704	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.B - Biological Treatment of Solid Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.C - Incineration and Open Burning of Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.D - Wastewater Treatment and Discharge	0	5.46291	0.185	0	0	NO	NO	NO	NO	NO	NO	NO
4.E - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5 - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.B - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
Memo Items (5)												
International Bunkers	66.45263625	0.00046	0.002	0	0	NO	NO	NO	0.23	0.1	0.05	0.02
1.A.3.a.i - International Aviation (International Bunkers)	66.45263625	0.00046	0.002						0.23	0.1	0.05	0.02
1.A.3.d.i - International water-borne navigation (International bunkers)	0	0	0						NO	NO	NO	NO
1.A.5.c - Multilateral Operations	0	0	0	0	0	NO	NO	NO	0	0	0	0

Inventory Year: 2000

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
Total National Emissions and Removals	2248.621006	117.548	4.741	0	798.873	NE	NO	NO	6.1	152	32.02	9.01
1 - Energy	3143.701516	1.52289	0.033	0	0	NO	NO	NO	5	8	1	5
1.A - Fuel Combustion Activities	3143.571344	0.34569	0.033	0	0	NO	NO	NO	5	8	1	5
1.A.1 - Energy Industries	9.667743	0.00038	8E-05						0.001	1E-04	0.00003	0.012
1.A.2 - Manufacturing Industries and Construction	574.920006	0.01406	0.002						1.22	0.2	0.04	1
1.A.3 - Transport	204.0177262	0.07186	0.022						2.3	6	1.1	0.32
1.A.4 - Other Sectors	2354.965869	0.25938	0.008						2	2	0.22	4
1.A.5 - Non-Specified	0	0	0						NO	NO	NO	NO
1.B - Fugitive emissions from fuels	0.1301716	1.17721	0	0	0	NE	NE	NE	0.011	0.002	0.011	0.1
1.B.1 - Solid Fuels	0.0490074	0.01794	0						NO	NO	NO	NO
1.B.2 - Oil and Natural Gas	0.0811642	1.15927	0						0.011	0.002	0.011	0.1
1.B.3 - Other emissions from Energy Production	0	0	0						NO	NO	NO	NO
1.C - Carbon dioxide Transport and Storage	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
1.C.1 - Transport of CO2	0								NO	NO	NO	NO
1.C.2 - Injection and Storage	0								NO	NO	NO	NO
1.C.3 - Other	0								NO	NO	NO	NO
2 - Industrial Processes and Product Use	502.1753612	0	0	0	798.873	NE	NO	NO	1	144	31	4
2.A - Mineral Industry	52.08274653	0	0	0	0	NO	NO	NO	NO	NO	0	0
2.A.1 - Cement production	27.081612								NO	NO	NO	0
2.A.2 - Lime production	8.4								NO	NO	NO	NO
2.A.3 - Glass Production	2.13675								NO	NO	NO	NO
2.A.4 - Other Process Uses of Carbonates	14.46438453					NO	NO	NO	NO	NO	NO	NO
2.A.5 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.B - Chemical Industry	14.65036467	0	0	0	0	NO	NO	NO	NO	0	0	0
2.B.1 - Ammonia Production	14.65036467								NO	0	0	0
2.B.2 - Nitric Acid Production			0						NO	NO	NO	NO
2.B.3 - Adipic Acid Production			0						NO	NO	NO	NO
2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production			0						NO	NO	NO	NO
2.B.5 - Carbide Production	0	0							NO	NO	NO	NO
2.B.6 - Titanium Dioxide Production	0								NO	NO	NO	NO
2.B.7 - Soda Ash Production	0								NO	NO	NO	NO
2.B.8 - Petrochemical and Carbon Black Production	0	0							0	0	0	0
2.B.9 - Fluorochemical Production				0	0	0	0	0	0	0	0	0
2.B.10 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.C - Metal Industry	435.44225	0	0	0	798.873	NO	NO	NO	1	144	NO	4
2.C.1 - Iron and Steel Production	4.78305	0							NO	NO	NO	NO
2.C.2 - Ferroalloys Production	0	0							NO	NO	NO	NO
2.C.3 - Aluminium production	430.6592				798.873				1	144	NO	4

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
2.C.4 - Magnesium production	0					NO			NO	NO	NO	NO
2.C.5 - Lead Production	0								NO	NO	NO	NO
2.C.6 - Zinc Production	0								NO	NO	NO	NO
2.C.7 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.D - Non-Energy Products from Fuels and Solvent Use	0	0	0	0	0	NO	NO	NO	NO	NO	28	NO
2.D.1 - Lubricant Use	0								NO	NO	NO	NO
2.D.2 - Paraffin Wax Use	0								NO	NO	NO	NO
2.D.3 - Solvent Use									NO	NO	28	NO
2.D.4 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.E - Electronics Industry	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.E.1 - Integrated Circuit or Semiconductor				0	0	NO		NO	NO	NO	NO	NO
2.E.2 - TFT Flat Panel Display					0	NO		NO	NO	NO	NO	NO
2.E.3 - Photovoltaics					0				NO	NO	NO	NO
2.E.4 - Heat Transfer Fluid					0				NO	NO	NO	NO
2.E.5 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.F - Product Uses as Substitutes for Ozone Depleting Substances	0	0	0	0	0	NE	NE	NE	NE	NE	NE	NE
2.F.1 - Refrigeration and Air Conditioning				0		NE	NE	NE	NE	NE	NE	NE
2.F.2 - Foam Blowing Agents				0				NO	NO	NO	NO	NO
2.F.3 - Fire Protection				0	0				NO	NO	NO	NO
2.F.4 - Aerosols				0				NE	NE	NE	NE	NE
2.F.5 - Solvents				0	0			NO	NO	NO	NO	NO
2.F.6 - Other Applications (please specify)				0	0			NO	NO	NO	NO	NO
2.G - Other Product Manufacture and Use	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.G.1 - Electrical Equipment					0	NO	NO	NO	NO	NO	NO	NO
2.G.2 - SF6 and PFCs from Other Product Uses					0	0		0	0	0	0	0
2.G.3 - N2O from Product Uses			0						0	0	0	0
2.G.4 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.H - Other	0	0	0	0	0	NO	NO	NO	NO	NO	3	NO
2.H.1 - Pulp and Paper Industry	0	0							NO	NO	NO	NO
2.H.2 - Food and Beverages Industry	0	0							NO	NO	3	NO
2.H.3 - Other (please specify)	0	0	0						NO	NO	NO	NO
3 - Agriculture, Forestry, and Other Land Use	-1397.255871	101.805	4.523	0	0	NA	NA	NA	NA	NA	NA	NA
3.A - Livestock	0	91.8063	1.041	0	0	NA	NA	NA	NA	NA	NA	NA
3.A.1 - Enteric Fermentation		76.1207							NA	NA	NA	NA
3.A.2 - Manure Management		15.6856	1.041						NA	NA	NA	NA
3.B - Land	-1427.909205	0	0	0	0	NA	NA	NA	NA	NA	NA	NA
3.B.1 - Forest land	-1427.678205								NA	NA	NA	NA
3.B.2 - Cropland	-0.198								NA	NA	NA	NA
3.B.3 - Grassland	-0.033								NA	NA	NA	NA

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
3.B.4 - Wetlands	0		0						NA	NA	NA	NA
3.B.5 - Settlements	0								NA	NA	NA	NA
3.B.6 - Other Land	0								NA	NA	NA	NA
3.C - Aggregate sources and non-CO2 emissions sources on land	30.65333333	9.99834	3.481	0	0	NA	NA	NA	NO	NO	NO	NO
3.C.1 - Emissions from biomass burning		0	0						NO	NO	NO	NO
3.C.2 - Liming	0								NO	NO	NO	NO
3.C.3 - Urea application	30.65333333								NO	NO	NO	NO
3.C.4 - Direct N2O Emissions from managed soils			1.021						NO	NO	NO	NO
3.C.5 - Indirect N2O Emissions from managed soils			2.356						NO	NO	NO	NO
3.C.6 - Indirect N2O Emissions from manure management			0.104						NO	NO	NO	NO
3.C.7 - Rice cultivations		9.99834							NO	NO	NO	NO
3.C.8 - Other (please specify)		0	0						NO	NO	NO	NO
3.D - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
3.D.1 - Harvested Wood Products	0								NO	NO	NO	NO
3.D.2 - Other (please specify)	0	0	0						NO	NO	NO	NO
4 - Waste	0	14.2202	0.186	0	0	NO	NO	NO	NO	NO	NO	NO
4.A - Solid Waste Disposal	0	8.54907	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.B - Biological Treatment of Solid Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.C - Incineration and Open Burning of Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.D - Wastewater Treatment and Discharge	0	5.67117	0.186	0	0	NO	NO	NO	NO	NO	NO	NO
4.E - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5 - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.B - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
Memo Items (5)												
International Bunkers	26.9972703	0.00019	8E-04	0	0	NO	NO	NO	0.1	0.04	0.02	0.01
1.A.3.a.i - International Aviation (International Bunkers)	26.9972703	0.00019	8E-04						0.1	0.04	0.02	0.01
1.A.3.d.i - International water-borne navigation (International bunkers)	0	0	0						NO	NO	NO	NO
1.A.5.c - Multilateral Operations	0	0	0	0	0	NO	NO	NO	0	0	0	0

Inventory Year: 1999

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
Total National Emissions and Removals	2389.062104	112.909	3.898	0	680.096	NE	NO	NO	11.1	137	35.02	8.01
1 - Energy	3391.585732	1.60301	0.033	0	0	NO	NO	NO	11	14	3	5
1.A - Fuel Combustion Activities	3391.463835	0.41444	0.033	0	0	NO	NO	NO	11	14	3	5
1.A.1 - Energy Industries	12.043119	0.00046	9E-05						0.003	4E-04	0.0001	0.02
1.A.2 - Manufacturing Industries and Construction	678.359637	0.01753	0.003						1.23	0.15	0.04	1
1.A.3 - Transport	459.1275737	0.14986	0.024						5	10	2	1
1.A.4 - Other Sectors	2241.933505	0.2466	0.007						5	4	1	3
1.A.5 - Non-Specified	0	0	0						NO	NO	NO	NO
1.B - Fugitive emissions from fuels	0.121897	1.18857	0	0	0	NE	NE	NE	0.001	0.002	0.012	0.02
1.B.1 - Solid Fuels	0.0394914	0.01446	0						NO	NO	NO	NO
1.B.2 - Oil and Natural Gas	0.0824056	1.17411	0						0.001	0.002	0.012	0.02
1.B.3 - Other emissions from Energy Production	0	0	0						NO	NO	NO	NO
1.C - Carbon dioxide Transport and Storage	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
1.C.1 - Transport of CO2	0								NO	NO	NO	NO
1.C.2 - Injection and Storage	0								NO	NO	NO	NO
1.C.3 - Other	0								NO	NO	NO	NO
2 - Industrial Processes and Product Use	418.4623237	0	0	0	680.096	NE	NO	NO	0	123	32	3
2.A - Mineral Industry	40.42747468	0	0	0	0	NO	NO	NO	NO	NO	0	0
2.A.1 - Cement production	16.407108								NO	NO	NO	0
2.A.2 - Lime production	6.675								NO	NO	NO	NO
2.A.3 - Glass Production	1.74825								NO	NO	NO	NO
2.A.4 - Other Process Uses of Carbonates	15.59711668					NO	NO	NO	NO	NO	NO	NO
2.A.5 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.B - Chemical Industry	9.121849	0	0	0	0	NO	NO	NO	NO	0	0	0
2.B.1 - Ammonia Production	9.121849								NO	0	0	0
2.B.2 - Nitric Acid Production			0						NO	NO	NO	NO
2.B.3 - Adipic Acid Production			0						NO	NO	NO	NO
2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production			0						NO	NO	NO	NO
2.B.5 - Carbide Production	0	0							NO	NO	NO	NO
2.B.6 - Titanium Dioxide Production	0								NO	NO	NO	NO
2.B.7 - Soda Ash Production	0								NO	NO	NO	NO
2.B.8 - Petrochemical and Carbon Black Production	0	0							0	0	0	0
2.B.9 - Fluorochemical Production				0	0	0	0	0	0	0	0	0
2.B.10 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.C - Metal Industry	368.913	0	0	0	680.096	NO	NO	NO	0	123	NO	3
2.C.1 - Iron and Steel Production	2.2842	0							NO	NO	NO	NO
2.C.2 - Ferroalloys Production	0	0							NO	NO	NO	NO
2.C.3 - Aluminium production	366.6288				680.096				0	123	NO	3

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
2.C.4 - Magnesium production	0					NO			NO	NO	NO	NO
2.C.5 - Lead Production	0								NO	NO	NO	NO
2.C.6 - Zinc Production	0								NO	NO	NO	NO
2.C.7 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.D - Non-Energy Products from Fuels and Solvent Use	0	0	0	0	0	NO	NO	NO	NO	NO	28	NO
2.D.1 - Lubricant Use	0								NO	NO	NO	NO
2.D.2 - Paraffin Wax Use	0								NO	NO	NO	NO
2.D.3 - Solvent Use									NO	NO	28	NO
2.D.4 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.E - Electronics Industry	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.E.1 - Integrated Circuit or Semiconductor				0	0	NO		NO	NO	NO	NO	NO
2.E.2 - TFT Flat Panel Display					0	NO		NO	NO	NO	NO	NO
2.E.3 - Photovoltaics					0				NO	NO	NO	NO
2.E.4 - Heat Transfer Fluid					0				NO	NO	NO	NO
2.E.5 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.F - Product Uses as Substitutes for Ozone Depleting Substances	0	0	0	0	0	NE	NE	NE	NE	NE	NE	NE
2.F.1 - Refrigeration and Air Conditioning				0		NE	NE	NE	NE	NE	NE	NE
2.F.2 - Foam Blowing Agents				0				NO	NO	NO	NO	NO
2.F.3 - Fire Protection				0	0				NO	NO	NO	NO
2.F.4 - Aerosols				0				NE	NE	NE	NE	NE
2.F.5 - Solvents				0	0			NO	NO	NO	NO	NO
2.F.6 - Other Applications (please specify)				0	0			NO	NO	NO	NO	NO
2.G - Other Product Manufacture and Use	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.G.1 - Electrical Equipment					0	NO	NO	NO	NO	NO	NO	NO
2.G.2 - SF6 and PFCs from Other Product Uses					0	0		0	0	0	0	0
2.G.3 - N2O from Product Uses			0						0	0	0	0
2.G.4 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.H - Other	0	0	0	0	0	NO	NO	NO	NO	NO	4	NO
2.H.1 - Pulp and Paper Industry	0	0							NO	NO	NO	NO
2.H.2 - Food and Beverages Industry	0	0							NO	NO	4	NO
2.H.3 - Other (please specify)	0	0	0						NO	NO	NO	NO
3 - Agriculture, Forestry, and Other Land Use	-1420.985951	97.6935	3.685	0	0	NA	NA	NA	NA	NA	NA	NA
3.A - Livestock	0	88.9279	0.999	0	0	NA	NA	NA	NA	NA	NA	NA
3.A.1 - Enteric Fermentation		73.9045							NA	NA	NA	NA
3.A.2 - Manure Management		15.0234	0.999						NA	NA	NA	NA
3.B - Land	-1437.999285	0	0	0	0	NA	NA	NA	NA	NA	NA	NA
3.B.1 - Forest land	-1437.768285								NA	NA	NA	NA
3.B.2 - Cropland	-0.198								NA	NA	NA	NA
3.B.3 - Grassland	-0.033								NA	NA	NA	NA

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
3.B.4 - Wetlands	0		0						NA	NA	NA	NA
3.B.5 - Settlements	0								NA	NA	NA	NA
3.B.6 - Other Land	0								NA	NA	NA	NA
3.C - Aggregate sources and non-CO2 emissions sources on land	17.01333333	8.76561	2.686	0	0	NA	NA	NA	NO	NO	NO	NO
3.C.1 - Emissions from biomass burning		0	0						NO	NO	NO	NO
3.C.2 - Liming	0								NO	NO	NO	NO
3.C.3 - Urea application	17.01333333								NO	NO	NO	NO
3.C.4 - Direct N2O Emissions from managed soils			0.714						NO	NO	NO	NO
3.C.5 - Indirect N2O Emissions from managed soils			1.872						NO	NO	NO	NO
3.C.6 - Indirect N2O Emissions from manure management			0.1						NO	NO	NO	NO
3.C.7 - Rice cultivations		8.76561							NO	NO	NO	NO
3.C.8 - Other (please specify)		0	0						NO	NO	NO	NO
3.D - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
3.D.1 - Harvested Wood Products	0								NO	NO	NO	NO
3.D.2 - Other (please specify)	0	0	0						NO	NO	NO	NO
4 - Waste	0	13.612	0.179	0	0	NO	NO	NO	NO	NO	NO	NO
4.A - Solid Waste Disposal	0	8.39969	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.B - Biological Treatment of Solid Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.C - Incineration and Open Burning of Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.D - Wastewater Treatment and Discharge	0	5.21228	0.179	0	0	NO	NO	NO	NO	NO	NO	NO
4.E - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5 - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.B - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
Memo Items (5)												
International Bunkers	27.4071798	0.00019	8E-04	0	0	NO	NO	NO	0.1	0.04	0.02	0.01
1.A.3.a.i - International Aviation (International Bunkers)	27.4071798	0.00019	8E-04						0.1	0.04	0.02	0.01
1.A.3.d.i - International water-borne navigation (International bunkers)	0	0	0						NO	NO	NO	NO
1.A.5.c - Multilateral Operations	0	0	0	0	0	NO	NO	NO	0	0	0	0

Inventory Year: 1998

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
Total National Emissions and Removals	1585.024714	111.044	5.086	0	580.588	NE	NO	NO	13.1	123.1	34.02	7.01
1 - Energy	2660.871719	1.54176	0.037	0	0	NO	NO	NO	13	18	3	4
1.A - Fuel Combustion Activities	2660.748329	0.31542	0.037	0	0	NO	NO	NO	13	18	3	4
1.A.1 - Energy Industries	10.542972	0.00041	8E-05						0.002	3E-04	0.0001	0.02
1.A.2 - Manufacturing Industries and Construction	365.086734	0.01249	0.002						1	0.1	0.02	1
1.A.3 - Transport	514.20789	0.07467	0.027						5.4	13	2	1
1.A.4 - Other Sectors	1770.910733	0.22785	0.008						6.2	6	1	3
1.A.5 - Non-Specified	0	0	0						NO	NO	NO	NO
1.B - Fugitive emissions from fuels	0.12338992	1.22634	0	0	0	NE	NE	NE	0.001	0.002	0.01	0.02
1.B.1 - Solid Fuels	0.038064	0.01394	0						NO	NO	NO	NO
1.B.2 - Oil and Natural Gas	0.08532592	1.2124	0						0.001	0.002	0.01	0.02
1.B.3 - Other emissions from Energy Production	0	0	0						NO	NO	NO	NO
1.C - Carbon dioxide Transport and Storage	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
1.C.1 - Transport of CO2	0								NO	NO	NO	NO
1.C.2 - Injection and Storage	0								NO	NO	NO	NO
1.C.3 - Other	0								NO	NO	NO	NO
2 - Industrial Processes and Product Use	362.6856775	0	0	0	580.588	NE	NO	NO	0	105	31	3
2.A - Mineral Industry	29.96938983	0	0	0	0	NO	NO	NO	NO	NO	0	0
2.A.1 - Cement production	8.747163								NO	NO	NO	0
2.A.2 - Lime production	4.5								NO	NO	NO	NO
2.A.3 - Glass Production	1.3545								NO	NO	NO	NO
2.A.4 - Other Process Uses of Carbonates	15.36772683					NO	NO	NO	NO	NO	NO	NO
2.A.5 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.B - Chemical Industry	16.49608767	0	0	0	0	NO	NO	NO	NO	0	0	0
2.B.1 - Ammonia Production	16.49608767								NO	0	0	0
2.B.2 - Nitric Acid Production			0						NO	NO	NO	NO
2.B.3 - Adipic Acid Production			0						NO	NO	NO	NO
2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production			0						NO	NO	NO	NO
2.B.5 - Carbide Production	0	0							NO	NO	NO	NO
2.B.6 - Titanium Dioxide Production	0								NO	NO	NO	NO
2.B.7 - Soda Ash Production	0								NO	NO	NO	NO
2.B.8 - Petrochemical and Carbon Black Production	0	0							0	0	0	0
2.B.9 - Fluorochemical Production				0	0	0	0	0	0	0	0	0
2.B.10 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.C - Metal Industry	316.2202	0	0	0	580.588	NO	NO	NO	0	105	NO	3
2.C.1 - Iron and Steel Production	3.2346	0							NO	NO	NO	NO
2.C.2 - Ferroalloys Production	0	0							NO	NO	NO	NO
2.C.3 - Aluminium production	312.9856				580.588				0	105	NO	3

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
2.C.4 - Magnesium production	0					NO			NO	NO	NO	NO
2.C.5 - Lead Production	0								NO	NO	NO	NO
2.C.6 - Zinc Production	0								NO	NO	NO	NO
2.C.7 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.D - Non-Energy Products from Fuels and Solvent Use	0	0	0	0	0	NO	NO	NO	NO	NO	27	NO
2.D.1 - Lubricant Use	0								NO	NO	NO	NO
2.D.2 - Paraffin Wax Use	0								NO	NO	NO	NO
2.D.3 - Solvent Use									NO	NO	27	NO
2.D.4 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.E - Electronics Industry	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.E.1 - Integrated Circuit or Semiconductor				0	0	NO		NO	NO	NO	NO	NO
2.E.2 - TFT Flat Panel Display					0	NO		NO	NO	NO	NO	NO
2.E.3 - Photovoltaics					0				NO	NO	NO	NO
2.E.4 - Heat Transfer Fluid					0				NO	NO	NO	NO
2.E.5 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.F - Product Uses as Substitutes for Ozone Depleting Substances	0	0	0	0	0	NE	NE	NE	NE	NE	NE	NE
2.F.1 - Refrigeration and Air Conditioning				0		NE	NE	NE	NE	NE	NE	NE
2.F.2 - Foam Blowing Agents				0				NO	NO	NO	NO	NO
2.F.3 - Fire Protection				0	0				NO	NO	NO	NO
2.F.4 - Aerosols				0				NE	NE	NE	NE	NE
2.F.5 - Solvents				0	0			NO	NO	NO	NO	NO
2.F.6 - Other Applications (please specify)				0	0			NO	NO	NO	NO	NO
2.G - Other Product Manufacture and Use	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.G.1 - Electrical Equipment					0	NO	NO	NO	NO	NO	NO	NO
2.G.2 - SF6 and PFCs from Other Product Uses					0	0		0	0	0	0	0
2.G.3 - N2O from Product Uses			0						0	0	0	0
2.G.4 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.H - Other	0	0	0	0	0	NO	NO	NO	NO	NO	4	NO
2.H.1 - Pulp and Paper Industry	0	0							NO	NO	NO	NO
2.H.2 - Food and Beverages Industry	0	0							NO	NO	4	NO
2.H.3 - Other (please specify)	0	0	0						NO	NO	NO	NO
3 - Agriculture, Forestry, and Other Land Use	-1438.532682	96.0281	4.857	0	0	NA	NA	NA	NA	NA	NA	NA
3.A - Livestock	0	88.4736	0.987	0	0	NA	NA	NA	NA	NA	NA	NA
3.A.1 - Enteric Fermentation		73.6436							NA	NA	NA	NA
3.A.2 - Manure Management		14.83	0.987						NA	NA	NA	NA
3.B - Land	-1474.099349	0	0	0	0	NA	NA	NA	NA	NA	NA	NA
3.B.1 - Forest land	-1473.868349								NA	NA	NA	NA
3.B.2 - Cropland	-0.198								NA	NA	NA	NA
3.B.3 - Grassland	-0.033								NA	NA	NA	NA

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
3.B.4 - Wetlands	0		0						NA	NA	NA	NA
3.B.5 - Settlements	0								NA	NA	NA	NA
3.B.6 - Other Land	0								NA	NA	NA	NA
3.C - Aggregate sources and non-CO2 emissions sources on land	35.56666667	7.55447	3.87	0	0	NA	NA	NA	NO	NO	NO	NO
3.C.1 - Emissions from biomass burning		0	0						NO	NO	NO	NO
3.C.2 - Liming	0								NO	NO	NO	NO
3.C.3 - Urea application	35.56666667								NO	NO	NO	NO
3.C.4 - Direct N2O Emissions from managed soils			1.108						NO	NO	NO	NO
3.C.5 - Indirect N2O Emissions from managed soils			2.663						NO	NO	NO	NO
3.C.6 - Indirect N2O Emissions from manure management			0.099						NO	NO	NO	NO
3.C.7 - Rice cultivations		7.55447							NO	NO	NO	NO
3.C.8 - Other (please specify)		0	0						NO	NO	NO	NO
3.D - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
3.D.1 - Harvested Wood Products	0								NO	NO	NO	NO
3.D.2 - Other (please specify)	0	0	0						NO	NO	NO	NO
4 - Waste	0	13.4745	0.192	0	0	NO	NO	NO	NO	NO	NO	NO
4.A - Solid Waste Disposal	0	8.25387	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.B - Biological Treatment of Solid Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.C - Incineration and Open Burning of Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.D - Wastewater Treatment and Discharge	0	5.2206	0.192	0	0	NO	NO	NO	NO	NO	NO	NO
4.E - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5 - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.B - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
Memo Items (5)												
International Bunkers	32.9567238	0.00023	9E-04	0	0	NO	NO	NO	0.1	0.05	0.02	0.01
1.A.3.a.i - International Aviation (International Bunkers)	32.9567238	0.00023	9E-04						0.1	0.05	0.02	0.01
1.A.3.d.i - International water-borne navigation (International bunkers)	0	0	0						NO	NO	NO	NO
1.A.5.c - Multilateral Operations	0	0	0	0	0	NO	NO	NO	0	0	0	0

Inventory Year: 1997

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
Total National Emissions and Removals	2409.289709	110.216	5.06	0	560.507	NE	NO	NO	13.1	120.1	32.03	8.01
1 - Energy	3592.368488	2.0369	0.037	0	0	NO	NO	NO	13	19	3	5
1.A - Fuel Combustion Activities	3592.220434	0.40861	0.037	0	0	NO	NO	NO	13	19	3	5
1.A.1 - Energy Industries	33.447188	0.00078	1E-04						0.05	0.01	0.002	0.05
1.A.2 - Manufacturing Industries and Construction	704.155184	0.01863	0.003						2	0.2	0.05	1
1.A.3 - Transport	465.1283771	0.0886	0.024						5	12	2	1
1.A.4 - Other Sectors	2389.489685	0.30061	0.01						6	6	1	4
1.A.5 - Non-Specified	0	0	0						NO	NO	NO	NO
1.B - Fugitive emissions from fuels	0.1480544	1.62829	0	0	0	NE	NE	NE	0.002	0.002	0.02	0.02
1.B.1 - Solid Fuels	0.0342576	0.01254	0						NO	NO	NO	NO
1.B.2 - Oil and Natural Gas	0.1137968	1.61574	0						0.002	0.002	0.02	2
1.B.3 - Other emissions from Energy Production	0	0	0						NO	NO	NO	NO
1.C - Carbon dioxide Transport and Storage	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
1.C.1 - Transport of CO2	0								NO	NO	NO	NO
1.C.2 - Injection and Storage	0								NO	NO	NO	NO
1.C.3 - Other	0								NO	NO	NO	NO
2 - Industrial Processes and Product Use	361.3958998	0	0	0	560.507	NE	NO	NO	0	101	29	3
2.A - Mineral Industry	38.74018682	0	0	0	0	NO	NO	NO	NO	NO	0	0
2.A.1 - Cement production	17.988516								NO	NO	NO	0
2.A.2 - Lime production	5.625								NO	NO	NO	NO
2.A.3 - Glass Production	1.3755								NO	NO	NO	NO
2.A.4 - Other Process Uses of Carbonates	13.75117082					NO	NO	NO	NO	NO	NO	NO
2.A.5 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.B - Chemical Industry	15.870613	0	0	0	0	NO	NO	NO	NO	0	0	0
2.B.1 - Ammonia Production	15.870613								NO	0	0	0
2.B.2 - Nitric Acid Production			0						NO	NO	NO	NO
2.B.3 - Adipic Acid Production			0						NO	NO	NO	NO
2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production			0						NO	NO	NO	NO
2.B.5 - Carbide Production	0	0							NO	NO	NO	NO
2.B.6 - Titanium Dioxide Production	0								NO	NO	NO	NO
2.B.7 - Soda Ash Production	0								NO	NO	NO	NO
2.B.8 - Petrochemical and Carbon Black Production	0	0							0	0	0	0
2.B.9 - Fluorochemical Production				0	0	0	0	0	0	0	0	0
2.B.10 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.C - Metal Industry	306.7851	0	0	0	560.507	NO	NO	NO	0	101	NO	3
2.C.1 - Iron and Steel Production	4.6251	0							NO	NO	NO	NO
2.C.2 - Ferroalloys Production	0	0							NO	NO	NO	NO
2.C.3 - Aluminium production	302.16				560.507				0	105	NO	3

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
2.C.4 - Magnesium production	0					NO			NO	NO	NO	NO
2.C.5 - Lead Production	0								NO	NO	NO	NO
2.C.6 - Zinc Production	0								NO	NO	NO	NO
2.C.7 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.D - Non-Energy Products from Fuels and Solvent Use	0	0	0	0	0	NO	NO	NO	NO	NO	26	NO
2.D.1 - Lubricant Use	0								NO	NO	NO	NO
2.D.2 - Paraffin Wax Use	0								NO	NO	NO	NO
2.D.3 - Solvent Use									NO	NO	26	NO
2.D.4 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.E - Electronics Industry	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.E.1 - Integrated Circuit or Semiconductor				0	0	NO		NO	NO	NO	NO	NO
2.E.2 - TFT Flat Panel Display					0	NO		NO	NO	NO	NO	NO
2.E.3 - Photovoltaics					0				NO	NO	NO	NO
2.E.4 - Heat Transfer Fluid					0				NO	NO	NO	NO
2.E.5 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.F - Product Uses as Substitutes for Ozone Depleting Substances	0	0	0	0	0	NE	NE	NE	NE	NE	NE	NE
2.F.1 - Refrigeration and Air Conditioning				0		NE	NE	NE	NE	NE	NE	NE
2.F.2 - Foam Blowing Agents				0				NO	NO	NO	NO	NO
2.F.3 - Fire Protection				0	0				NO	NO	NO	NO
2.F.4 - Aerosols				0				NE	NE	NE	NE	NE
2.F.5 - Solvents				0	0			NO	NO	NO	NO	NO
2.F.6 - Other Applications (please specify)				0	0			NO	NO	NO	NO	NO
2.G - Other Product Manufacture and Use	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.G.1 - Electrical Equipment					0	NO	NO	NO	NO	NO	NO	NO
2.G.2 - SF6 and PFCs from Other Product Uses					0	0		0	0	0	0	0
2.G.3 - N2O from Product Uses			0						0	0	0	0
2.G.4 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.H - Other	0	0	0	0	0	NO	NO	NO	NO	NO	3	NO
2.H.1 - Pulp and Paper Industry	0	0							NO	NO	NO	NO
2.H.2 - Food and Beverages Industry	0	0							NO	NO	3	NO
2.H.3 - Other (please specify)	0	0	0						NO	NO	NO	NO
3 - Agriculture, Forestry, and Other Land Use	-1544.474679	95.9105	4.827	0	0	NA	NA	NA	NA	NA	NA	NA
3.A - Livestock	0	88.3158	0.967	0	0	NA	NA	NA	NA	NA	NA	NA
3.A.1 - Enteric Fermentation		73.8869							NA	NA	NA	NA
3.A.2 - Manure Management		14.429	0.967						NA	NA	NA	NA
3.B - Land	-1571.681346	0	0	0	0	NA	NA	NA	NA	NA	NA	NA
3.B.1 - Forest land	-1571.450346								NA	NA	NA	NA
3.B.2 - Cropland	-0.198								NA	NA	NA	NA
3.B.3 - Grassland	-0.033								NA	NA	NA	NA

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
3.B.4 - Wetlands	0		0						NA	NA	NA	NA
3.B.5 - Settlements	0								NA	NA	NA	NA
3.B.6 - Other Land	0								NA	NA	NA	NA
3.C - Aggregate sources and non-CO2 emissions sources on land	27.20666667	7.59462	3.86	0	0	NA	NA	NA	NO	NO	NO	NO
3.C.1 - Emissions from biomass burning		0	0						NO	NO	NO	NO
3.C.2 - Liming	0								NO	NO	NO	NO
3.C.3 - Urea application	27.20666667								NO	NO	NO	NO
3.C.4 - Direct N2O Emissions from managed soils			0.922						NO	NO	NO	NO
3.C.5 - Indirect N2O Emissions from managed soils			2.842						NO	NO	NO	NO
3.C.6 - Indirect N2O Emissions from manure management			0.097						NO	NO	NO	NO
3.C.7 - Rice cultivations		7.59462							NO	NO	NO	NO
3.C.8 - Other (please specify)		0	0						NO	NO	NO	NO
3.D - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
3.D.1 - Harvested Wood Products	0								NO	NO	NO	NO
3.D.2 - Other (please specify)	0	0	0						NO	NO	NO	NO
4 - Waste	0	12.2691	0.197	0	0	NO	NO	NO	NO	NO	NO	NO
4.A - Solid Waste Disposal	0	8.11069	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.B - Biological Treatment of Solid Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.C - Incineration and Open Burning of Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.D - Wastewater Treatment and Discharge	0	4.15836	0.197	0	0	NO	NO	NO	NO	NO	NO	NO
4.E - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5 - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.B - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
Memo Items (5)												
International Bunkers	42.28058835	0.0003	0.001	0	0	NO	NO	NO	0.1	0.1	0.03	0.01
1.A.3.a.i - International Aviation (International Bunkers)	42.28058835	0.0003	0.001						0.1	0.1	0.03	0.01
1.A.3.d.i - International water-borne navigation (International bunkers)	0	0	0						NO	NO	NO	NO
1.A.5.c - Multilateral Operations	0	0	0	0	0	NO	NO	NO	0	0	0	0

Inventory Year: 1996

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
Total National Emissions and Removals	2055.681657	112.868	4.342	0	588.703	NE	NO	NO	11.1	122	32.02	8.01
1 - Energy	3345.43249	2.01782	0.031	0	0	NO	NO	NO	11	16	3	5
1.A - Fuel Combustion Activities	3345.271932	0.38898	0.031	0	0	NO	NO	NO	11	16	3	5
1.A.1 - Energy Industries	241.980498	0.0041	4E-04						0.2	0.03	0.01	0.2
1.A.2 - Manufacturing Industries and Construction	704.852436	0.01835	0.003						2	0.2	0.05	1
1.A.3 - Transport	397.8986623	0.08132	0.02						4	11	2	1
1.A.4 - Other Sectors	2000.540336	0.28521	0.008						5	5	1	3
1.A.5 - Non-Specified	0	0	0						NO	NO	NO	NO
1.B - Fugitive emissions from fuels	0.1605573	1.62885	0	0	0	NE	NE	NE	0.002	0.002	0.02	0.02
1.B.1 - Solid Fuels	0.0473421	0.01733	0						NO	NO	NO	NO
1.B.2 - Oil and Natural Gas	0.1132152	1.61152	0						0.002	0.002	0.02	0.02
1.B.3 - Other emissions from Energy Production	0	0	0						NO	NO	NO	NO
1.C - Carbon dioxide Transport and Storage	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
1.C.1 - Transport of CO2	0								NO	NO	NO	NO
1.C.2 - Injection and Storage	0								NO	NO	NO	NO
1.C.3 - Other	0								NO	NO	NO	NO
2 - Industrial Processes and Product Use	388.8562629	0	0	0	588.703	NE	NO	NO	0	106	29	3
2.A - Mineral Industry	50.18610125	0	0	0	0	NO	NO	NO	NO	NO	0	0
2.A.1 - Cement production	24.363567								NO	NO	NO	0
2.A.2 - Lime production	5.475								NO	NO	NO	NO
2.A.3 - Glass Production	1.848								NO	NO	NO	NO
2.A.4 - Other Process Uses of Carbonates	18.49953425					NO	NO	NO	NO	NO	NO	NO
2.A.5 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.B - Chemical Industry	13.37081167	0	0	0	0	NO	NO	NO	NO	0	0	0
2.B.1 - Ammonia Production	13.37081167								NO	0	0	0
2.B.2 - Nitric Acid Production			0						NO	NO	NO	NO
2.B.3 - Adipic Acid Production			0						NO	NO	NO	NO
2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production			0						NO	NO	NO	NO
2.B.5 - Carbide Production	0	0							NO	NO	NO	NO
2.B.6 - Titanium Dioxide Production	0								NO	NO	NO	NO
2.B.7 - Soda Ash Production	0								NO	NO	NO	NO
2.B.8 - Petrochemical and Carbon Black Production	0	0							0	0	0	0
2.B.9 - Fluorochemical Production				0	0	0	0	0	0	0	0	0
2.B.10 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.C - Metal Industry	325.29935	0	0	0	588.703	NO	NO	NO	0	106	NO	3
2.C.1 - Iron and Steel Production	7.93935	0							NO	NO	NO	NO
2.C.2 - Ferroalloys Production	0	0							NO	NO	NO	NO
2.C.3 - Aluminium production	317.36				588.703				0	106	NO	3

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
2.C.4 - Magnesium production	0					NO			NO	NO	NO	NO
2.C.5 - Lead Production	0								NO	NO	NO	NO
2.C.6 - Zinc Production	0								NO	NO	NO	NO
2.C.7 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.D - Non-Energy Products from Fuels and Solvent Use	0	0	0	0	0	NO	NO	NO	NO	NO	26	NO
2.D.1 - Lubricant Use	0								NO	NO	NO	NO
2.D.2 - Paraffin Wax Use	0								NO	NO	NO	NO
2.D.3 - Solvent Use									NO	NO	26	NO
2.D.4 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.E - Electronics Industry	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.E.1 - Integrated Circuit or Semiconductor				0	0	NO		NO	NO	NO	NO	NO
2.E.2 - TFT Flat Panel Display					0	NO		NO	NO	NO	NO	NO
2.E.3 - Photovoltaics					0				NO	NO	NO	NO
2.E.4 - Heat Transfer Fluid					0				NO	NO	NO	NO
2.E.5 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.F - Product Uses as Substitutes for Ozone Depleting Substances	0	0	0	0	0	NE	NE	NE	NE	NE	NE	NE
2.F.1 - Refrigeration and Air Conditioning				0		NE	NE	NE	NE	NE	NE	NE
2.F.2 - Foam Blowing Agents				0				NO	NO	NO	NO	NO
2.F.3 - Fire Protection				0	0				NO	NO	NO	NO
2.F.4 - Aerosols				0				NE	NE	NE	NE	NE
2.F.5 - Solvents				0	0			NO	NO	NO	NO	NO
2.F.6 - Other Applications (please specify)				0	0			NO	NO	NO	NO	NO
2.G - Other Product Manufacture and Use	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.G.1 - Electrical Equipment					0	NO	NO	NO	NO	NO	NO	NO
2.G.2 - SF6 and PFCs from Other Product Uses					0	0		0	0	0	0	0
2.G.3 - N2O from Product Uses			0						0	0	0	0
2.G.4 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.H - Other	0	0	0	0	0	NO	NO	NO	NO	NO	3	NO
2.H.1 - Pulp and Paper Industry	0	0							NO	NO	NO	NO
2.H.2 - Food and Beverages Industry	0	0							NO	NO	3	NO
2.H.3 - Other (please specify)	0	0	0						NO	NO	NO	NO
3 - Agriculture, Forestry, and Other Land Use	-1678.607095	97.7226	4.109	0	0	NA	NA	NA	NA	NA	NA	NA
3.A - Livestock	0	91.958	0.991	0	0	NA	NA	NA	NA	NA	NA	NA
3.A.1 - Enteric Fermentation		77.1624							NA	NA	NA	NA
3.A.2 - Manure Management		14.7957	0.991						NA	NA	NA	NA
3.B - Land	-1708.233762	0	0	0	0	NA	NA	NA	NA	NA	NA	NA
3.B.1 - Forest land	-1708.002762								NA	NA	NA	NA
3.B.2 - Cropland	-0.198								NA	NA	NA	NA
3.B.3 - Grassland	-0.033								NA	NA	NA	NA

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
3.B.4 - Wetlands	0		0						NA	NA	NA	NA
3.B.5 - Settlements	0								NA	NA	NA	NA
3.B.6 - Other Land	0								NA	NA	NA	NA
3.C - Aggregate sources and non-CO2 emissions sources on land	29.62666667	5.7646	3.118	0	0	NA	NA	NA	NO	NO	NO	NO
3.C.1 - Emissions from biomass burning		0	0						NO	NO	NO	NO
3.C.2 - Liming	0								NO	NO	NO	NO
3.C.3 - Urea application	29.62666667								NO	NO	NO	NO
3.C.4 - Direct N2O Emissions from managed soils			0						NO	NO	NO	NO
3.C.5 - Indirect N2O Emissions from managed soils			3.019						NO	NO	NO	NO
3.C.6 - Indirect N2O Emissions from manure management			0.099						NO	NO	NO	NO
3.C.7 - Rice cultivations		5.7646							NO	NO	NO	NO
3.C.8 - Other (please specify)		0	0						NO	NO	NO	NO
3.D - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
3.D.1 - Harvested Wood Products	0								NO	NO	NO	NO
3.D.2 - Other (please specify)	0	0	0						NO	NO	NO	NO
4 - Waste	0	13.128	0.202	0	0	NO	NO	NO	NO	NO	NO	NO
4.A - Solid Waste Disposal	0	7.96663	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.B - Biological Treatment of Solid Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.C - Incineration and Open Burning of Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.D - Wastewater Treatment and Discharge	0	5.16136	0.202	0	0	NO	NO	NO	NO	NO	NO	NO
4.E - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5 - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.B - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
Memo Items (5)												
International Bunkers	26.07339735	0.00018	7E-04	0	0	NO	NO	NO	0.1	0.04	0.02	0.01
1.A.3.a.i - International Aviation (International Bunkers)	26.07339735	0.00018	7E-04						0.1	0.04	0.02	0.01
1.A.3.d.i - International water-borne navigation (International bunkers)	0	0	0						NO	NO	NO	NO
1.A.5.c - Multilateral Operations	0	0	0	0	0	NO	NO	NO	0	0	0	0

Inventory Year: 1995

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
Total National Emissions and Removals	4171.355828	117.327	8.638	0	703.416	NE	NO	NO	12.2	147.1	30.03	12.02
1 - Energy	5425.795078	2.36534	0.039	0	0	NO	NO	NO	11	20	3	8
1.A - Fuel Combustion Activities	5425.601156	0.73578	0.039	0	0	NO	NO	NO	11	20	3	8
1.A.1 - Energy Industries	341.922026	0.00633	7E-04						1	0.1	0.02	0.5
1.A.2 - Manufacturing Industries and Construction	423.248699	0.01385	0.002						1	0.12	0.03	1
1.A.3 - Transport	434.5327793	0.1915	0.022						4	14	3	1
1.A.4 - Other Sectors	4225.897652	0.5241	0.014						5	6	1	6
1.A.5 - Non-Specified	0	0	0						NO	NO	NO	NO
1.B - Fugitive emissions from fuels	0.1939215	1.62956	0	0	0	NE	NE	NE	0.002	0.002	0.02	0.02
1.B.1 - Solid Fuels	0.0811239	0.0297	0						NO	NO	NO	NO
1.B.2 - Oil and Natural Gas	0.1127976	1.59986	0						0.002	0.002	0.02	0.02
1.B.3 - Other emissions from Energy Production	0	0	0						NO	NO	NO	NO
1.C - Carbon dioxide Transport and Storage	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
1.C.1 - Transport of CO2	0								NO	NO	NO	NO
1.C.2 - Injection and Storage	0								NO	NO	NO	NO
1.C.3 - Other	0								NO	NO	NO	NO
2 - Industrial Processes and Product Use	486.7155766	0	0	0	703.416	NE	NO	NO	1	127	27	4
2.A - Mineral Industry	86.01848657	0	0	0	0	NO	NO	NO	NO	NO	0	0
2.A.1 - Cement production	38.54682								NO	NO	NO	0
2.A.2 - Lime production	10.2								NO	NO	NO	NO
2.A.3 - Glass Production	2.04225								NO	NO	NO	NO
2.A.4 - Other Process Uses of Carbonates	35.22941657					NO	NO	NO	NO	NO	NO	NO
2.A.5 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.B - Chemical Industry	16.63574	0	0	0	0	NO	NO	NO	NO	0	0	0
2.B.1 - Ammonia Production	16.63574								NO	0	0	0
2.B.2 - Nitric Acid Production			0						NO	NO	NO	NO
2.B.3 - Adipic Acid Production			0						NO	NO	NO	NO
2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production			0						NO	NO	NO	NO
2.B.5 - Carbide Production	0	0							NO	NO	NO	NO
2.B.6 - Titanium Dioxide Production	0								NO	NO	NO	NO
2.B.7 - Soda Ash Production	0								NO	NO	NO	NO
2.B.8 - Petrochemical and Carbon Black Production	0	0							0	0	0	0
2.B.9 - Fluorochemical Production				0	0	0	0	0	0	0	0	0
2.B.10 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.C - Metal Industry	384.06135	0	0	0	703.416	NO	NO	NO	1	127	NO	4
2.C.1 - Iron and Steel Production	4.86135	0							NO	NO	NO	NO
2.C.2 - Ferroalloys Production	0	0							NO	NO	NO	NO
2.C.3 - Aluminium production	379.2				703.416				1	127	NO	4

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
2.C.4 - Magnesium production	0					NO			NO	NO	NO	NO
2.C.5 - Lead Production	0								NO	NO	NO	NO
2.C.6 - Zinc Production	0								NO	NO	NO	NO
2.C.7 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.D - Non-Energy Products from Fuels and Solvent Use	0	0	0	0	0	NO	NO	NO	NO	NO	26	NO
2.D.1 - Lubricant Use	0								NO	NO	NO	NO
2.D.2 - Paraffin Wax Use	0								NO	NO	NO	NO
2.D.3 - Solvent Use									NO	NO	26	NO
2.D.4 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.E - Electronics Industry	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.E.1 - Integrated Circuit or Semiconductor				0	0	NO		NO	NO	NO	NO	NO
2.E.2 - TFT Flat Panel Display					0	NO		NO	NO	NO	NO	NO
2.E.3 - Photovoltaics					0				NO	NO	NO	NO
2.E.4 - Heat Transfer Fluid					0				NO	NO	NO	NO
2.E.5 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.F - Product Uses as Substitutes for Ozone Depleting Substances	0	0	0	0	0	NE	NE	NE	NE	NE	NE	NE
2.F.1 - Refrigeration and Air Conditioning				0		NE	NE	NE	NE	NE	NE	NE
2.F.2 - Foam Blowing Agents				0				NO	NO	NO	NO	NO
2.F.3 - Fire Protection				0	0				NO	NO	NO	NO
2.F.4 - Aerosols				0				NE	NE	NE	NE	NE
2.F.5 - Solvents				0	0			NO	NO	NO	NO	NO
2.F.6 - Other Applications (please specify)				0	0			NO	NO	NO	NO	NO
2.G - Other Product Manufacture and Use	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.G.1 - Electrical Equipment					0	NO	NO	NO	NO	NO	NO	NO
2.G.2 - SF6 and PFCs from Other Product Uses					0	0		0	0	0	0	0
2.G.3 - N2O from Product Uses			0						0	0	0	0
2.G.4 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.H - Other	0	0	0	0	0	NO	NO	NO	NO	NO	1	NO
2.H.1 - Pulp and Paper Industry	0	0							NO	NO	NO	NO
2.H.2 - Food and Beverages Industry	0	0							NO	NO	1	NO
2.H.3 - Other (please specify)	0	0	0						NO	NO	NO	NO
3 - Agriculture, Forestry, and Other Land Use	-1741.154826	101.521	8.377	0	0	NA	NA	NA	NA	NA	NA	NA
3.A - Livestock	0	95.1127	1.004	0	0	NA	NA	NA	NA	NA	NA	NA
3.A.1 - Enteric Fermentation		79.9556							NA	NA	NA	NA
3.A.2 - Manure Management		15.1571	1.004						NA	NA	NA	NA
3.B - Land	-1772.541493	0	0	0	0	NA	NA	NA	NA	NA	NA	NA
3.B.1 - Forest land	-1772.310493								NA	NA	NA	NA
3.B.2 - Cropland	-0.198								NA	NA	NA	NA
3.B.3 - Grassland	-0.033								NA	NA	NA	NA

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
3.B.4 - Wetlands	0		0						NA	NA	NA	NA
3.B.5 - Settlements	0								NA	NA	NA	NA
3.B.6 - Other Land	0								NA	NA	NA	NA
3.C - Aggregate sources and non-CO2 emissions sources on land	31.38666667	6.40807	7.373	0	0	NA	NA	NA	NO	NO	NO	NO
3.C.1 - Emissions from biomass burning		0	0						NO	NO	NO	NO
3.C.2 - Liming	0								NO	NO	NO	NO
3.C.3 - Urea application	31.38666667								NO	NO	NO	NO
3.C.4 - Direct N2O Emissions from managed soils			1.024						NO	NO	NO	NO
3.C.5 - Indirect N2O Emissions from managed soils			6.249						NO	NO	NO	NO
3.C.6 - Indirect N2O Emissions from manure management			0.1						NO	NO	NO	NO
3.C.7 - Rice cultivations		6.40807							NO	NO	NO	NO
3.C.8 - Other (please specify)		0	0						NO	NO	NO	NO
3.D - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
3.D.1 - Harvested Wood Products	0								NO	NO	NO	NO
3.D.2 - Other (please specify)	0	0	0						NO	NO	NO	NO
4 - Waste	0	13.4407	0.222	0	0	NO	NO	NO	NO	NO	NO	NO
4.A - Solid Waste Disposal	0	7.80921	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.B - Biological Treatment of Solid Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.C - Incineration and Open Burning of Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.D - Wastewater Treatment and Discharge	0	5.63146	0.222	0	0	NO	NO	NO	NO	NO	NO	NO
4.E - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5 - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.B - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
Memo Items (5)												
International Bunkers	49.48868925	0.00035	0.001	0	0	NO	NO	NO	0.2	0.1	0.03	0.02
1.A.3.a.i - International Aviation (International Bunkers)	49.48868925	0.00035	0.001						0.2	0.1	0.03	0.02
1.A.3.d.i - International water-borne navigation (International bunkers)	0	0	0						NO	NO	NO	NO
1.A.5.c - Multilateral Operations	0	0	0	0	0	NO	NO	NO	0	0	0	0

Inventory Year: 1994

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
Total National Emissions and Removals	7305.668046	124.098	8.287	0	701.932	NE	NO	NO	26	170.3	34.2	16.1
1 - Energy	8543.226397	3.50572	0.093	0	0	NO	NO	NO	24	43	7	12
1.A - Fuel Combustion Activities	8542.824361	1.40994	0.093	0	0	NO	NO	NO	24	43	7	12
1.A.1 - Energy Industries	235.436166	0.00599	9E-04						0.3	0.04	0.01	0.2
1.A.2 - Manufacturing Industries and Construction	2137.491828	0.06328	0.009						4	1	0.2	3
1.A.3 - Transport	1324.580519	0.80079	0.069						13	34	6	2
1.A.4 - Other Sectors	4845.315848	0.53988	0.014						7	8	1	7
1.A.5 - Non-Specified	0	0	0						0	0	0	0
1.B - Fugitive emissions from fuels	0.4020362	2.09578	0	0	0	NE	NE	NE	0.002	0.003	0.02	0.03
1.B.1 - Solid Fuels	0.2602626	0.09529	0						NO	NO	NO	NO
1.B.2 - Oil and Natural Gas	0.1417736	2.00049	0						0.002	0.003	0.02	0.03
1.B.3 - Other emissions from Energy Production	0	0	0						NO	NO	NO	NO
1.C - Carbon dioxide Transport and Storage	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
1.C.1 - Transport of CO2	0								NO	NO	NO	NO
1.C.2 - Injection and Storage	0								NO	NO	NO	NO
1.C.3 - Other	0								NO	NO	NO	NO
2 - Industrial Processes and Product Use	543.5870777	0	0	0	701.932	NE	NO	NO	1	127	27	4
2.A - Mineral Industry	139.9502167	0	0	0	0	NO	NO	NO	NO	NO	0	0
2.A.1 - Cement production	88.064658								NO	NO	NO	0
2.A.2 - Lime production	11.85								NO	NO	NO	NO
2.A.3 - Glass Production	3.90075								NO	NO	NO	NO
2.A.4 - Other Process Uses of Carbonates	36.13480872					NO	NO	NO	NO	NO	NO	NO
2.A.5 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.B - Chemical Industry	9.620061	0	0	0	0	NO	NO	NO	NO	0	0	0
2.B.1 - Ammonia Production	9.620061								NO	0	0	0
2.B.2 - Nitric Acid Production			0						NO	NO	NO	NO
2.B.3 - Adipic Acid Production			0						NO	NO	NO	NO
2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production			0						NO	NO	NO	NO
2.B.5 - Carbide Production	0	0							NO	NO	NO	NO
2.B.6 - Titanium Dioxide Production	0								NO	NO	NO	NO
2.B.7 - Soda Ash Production	0								NO	NO	NO	NO
2.B.8 - Petrochemical and Carbon Black Production	0	0							0	0	0	0
2.B.9 - Fluorochemical Production				0	0	0	0	0	0	0	0	0
2.B.10 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.C - Metal Industry	394.0168	0	0	0	701.932	NO	NO	NO	1	127	NO	4
2.C.1 - Iron and Steel Production	15.6168	0							NO	NO	NO	NO
2.C.2 - Ferroalloys Production	0	0							NO	NO	NO	NO
2.C.3 - Aluminium production	378.4				701.932				1	127	NO	4

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
2.C.4 - Magnesium production	0					NO			NO	NO	NO	NO
2.C.5 - Lead Production	0								NO	NO	NO	NO
2.C.6 - Zinc Production	0								NO	NO	NO	NO
2.C.7 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.D - Non-Energy Products from Fuels and Solvent Use	0	0	0	0	0	NO	NO	NO	NO	NO	25	NO
2.D.1 - Lubricant Use	0								NO	NO	NO	NO
2.D.2 - Paraffin Wax Use	0								NO	NO	NO	NO
2.D.3 - Solvent Use									NO	NO	25	NO
2.D.4 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.E - Electronics Industry	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.E.1 - Integrated Circuit or Semiconductor				0	0	NO		NO	NO	NO	NO	NO
2.E.2 - TFT Flat Panel Display					0	NO		NO	NO	NO	NO	NO
2.E.3 - Photovoltaics					0				NO	NO	NO	NO
2.E.4 - Heat Transfer Fluid					0				NO	NO	NO	NO
2.E.5 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.F - Product Uses as Substitutes for Ozone Depleting Substances	0	0	0	0	0	NE	NE	NE	NE	NE	NE	NE
2.F.1 - Refrigeration and Air Conditioning				0		NE	NE	NE	NE	NE	NE	NE
2.F.2 - Foam Blowing Agents				0				NO	NO	NO	NO	NO
2.F.3 - Fire Protection				0	0				NO	NO	NO	NO
2.F.4 - Aerosols				0				NE	NE	NE	NE	NE
2.F.5 - Solvents				0	0			NO	NO	NO	NO	NO
2.F.6 - Other Applications (please specify)				0	0			NO	NO	NO	NO	NO
2.G - Other Product Manufacture and Use	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.G.1 - Electrical Equipment					0	NO	NO	NO	NO	NO	NO	NO
2.G.2 - SF6 and PFCs from Other Product Uses					0	0		0	0	0	0	0
2.G.3 - N2O from Product Uses			0						0	0	0	0
2.G.4 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.H - Other	0	0	0	0	0	NO	NO	NO	NO	NO	2	NO
2.H.1 - Pulp and Paper Industry	0	0							NO	NO	NO	NO
2.H.2 - Food and Beverages Industry	0	0							NO	NO	2	NO
2.H.3 - Other (please specify)	0	0	0						NO	NO	NO	NO
3 - Agriculture, Forestry, and Other Land Use	-1781.145429	107.469	7.968	0	0	NA	NA	NA	NA	NA	NA	NA
3.A - Livestock	0	100.766	1.037	0	0	NA	NA	NA	NA	NA	NA	NA
3.A.1 - Enteric Fermentation		84.6974							NA	NA	NA	NA
3.A.2 - Manure Management		16.0688	1.037						NA	NA	NA	NA
3.B - Land	-1820.525429	0	0	0	0	NA	NA	NA	NA	NA	NA	NA
3.B.1 - Forest land	-1820.294429								NA	NA	NA	NA
3.B.2 - Cropland	-0.198								NA	NA	NA	NA
3.B.3 - Grassland	-0.033								NA	NA	NA	NA

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
3.B.4 - Wetlands	0		0						NA	NA	NA	NA
3.B.5 - Settlements	0								NA	NA	NA	NA
3.B.6 - Other Land	0								NA	NA	NA	NA
3.C - Aggregate sources and non-CO2 emissions sources on land	39.38	6.7032	6.932	0	0	NA	NA	NA	NO	NO	NO	NO
3.C.1 - Emissions from biomass burning		0	0						NO	NO	NO	NO
3.C.2 - Liming	0								NO	NO	NO	NO
3.C.3 - Urea application	39.38								NO	NO	NO	NO
3.C.4 - Direct N2O Emissions from managed soils			1.207						NO	NO	NO	NO
3.C.5 - Indirect N2O Emissions from managed soils			5.621						NO	NO	NO	NO
3.C.6 - Indirect N2O Emissions from manure management			0.104						NO	NO	NO	NO
3.C.7 - Rice cultivations		6.7032							NO	NO	NO	NO
3.C.8 - Other (please specify)		0	0						NO	NO	NO	NO
3.D - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
3.D.1 - Harvested Wood Products	0								NO	NO	NO	NO
3.D.2 - Other (please specify)	0	0	0						NO	NO	NO	NO
4 - Waste	0	13.123	0.226	0	0	NO	NO	NO	NO	NO	NO	NO
4.A - Solid Waste Disposal	0	7.63696	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.B - Biological Treatment of Solid Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.C - Incineration and Open Burning of Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.D - Wastewater Treatment and Discharge	0	5.48601	0.226	0	0	NO	NO	NO	NO	NO	NO	NO
4.E - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5 - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.B - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
Memo Items (5)												
International Bunkers	235.7358003	0.00165	0.007	0	0	NO	NO	NO	1	0.3	0.2	0.1
1.A.3.a.i - International Aviation (International Bunkers)	235.7358003	0.00165	0.007						1	0.3	0.2	0.1
1.A.3.d.i - International water-borne navigation (International bunkers)	0	0	0						NO	NO	NO	NO
1.A.5.c - Multilateral Operations	0	0	0	0	0	NO	NO	NO	0	0	0	0

Inventory Year: 1993

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
Total National Emissions and Removals	13501.61571	125.166	1.389	0	748.826	NE	NO	NO	38	223.2	44.12	24.1
1 - Energy	14664.93728	4.39195	0.108	0	0	NO	NO	NO	36	88	16	20
1.A - Fuel Combustion Activities	14664.3099	1.64968	0.108	0	0	NO	NO	NO	36	88	16	20
1.A.1 - Energy Industries	1611.341532	0.03259	0.004						3	0.4	0.1	2.1
1.A.2 - Manufacturing Industries and Construction	3178.415238	0.0887	0.013						7	1.2	0.22	4
1.A.3 - Transport	1267.727809	0.46074	0.063						12	70	13	2
1.A.4 - Other Sectors	8606.825317	1.06764	0.028						15	17	3	12
1.A.5 - Non-Specified	0	0	0						NO	NO	NO	NO
1.B - Fugitive emissions from fuels	0.6273854	2.74227	0	0	0	NE	NE	NE	0.003	0.004	0.03	0.04
1.B.1 - Solid Fuels	0.444873	0.16288	0						NO	NO	NO	NO
1.B.2 - Oil and Natural Gas	0.1825124	2.57939	0						0.003	0.004	0.03	0.04
1.B.3 - Other emissions from Energy Production	0	0	0						NO	NO	NO	NO
1.C - Carbon dioxide Transport and Storage	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
1.C.1 - Transport of CO2	0								NO	NO	NO	NO
1.C.2 - Injection and Storage	0								NO	NO	NO	NO
1.C.3 - Other	0								NO	NO	NO	NO
2 - Industrial Processes and Product Use	653.1678301	0	0	0	748.826	NE	NO	NO	1	135	28	4
2.A - Mineral Industry	205.3367818	0	0	0	0	NO	NO	NO	NO	NO	0	0
2.A.1 - Cement production	129.230685								NO	NO	NO	0
2.A.2 - Lime production	15.8775								NO	NO	NO	NO
2.A.3 - Glass Production	9.87								NO	NO	NO	NO
2.A.4 - Other Process Uses of Carbonates	50.35859678					NO	NO	NO	NO	NO	NO	NO
2.A.5 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.B - Chemical Industry	17.98534833	0	0	0	0	NO	NO	NO	NO	0	0	0
2.B.1 - Ammonia Production	17.98534833								NO	0	0	0
2.B.2 - Nitric Acid Production			0						NO	NO	NO	NO
2.B.3 - Adipic Acid Production			0						NO	NO	NO	NO
2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production			0						NO	NO	NO	NO
2.B.5 - Carbide Production	0	0							NO	NO	NO	NO
2.B.6 - Titanium Dioxide Production	0								NO	NO	NO	NO
2.B.7 - Soda Ash Production	0								NO	NO	NO	NO
2.B.8 - Petrochemical and Carbon Black Production	0	0							0	0	0	0
2.B.9 - Fluorochemical Production				0	0	0	0	0	0	0	0	0
2.B.10 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.C - Metal Industry	429.8457	0	0	0	748.826	NO	NO	NO	1	135	NO	4
2.C.1 - Iron and Steel Production	26.1657	0							NO	NO	NO	NO
2.C.2 - Ferroalloys Production	0	0							NO	NO	NO	NO
2.C.3 - Aluminium production	403.68				748.826				1	135	NO	4

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
2.C.4 - Magnesium production	0					NO			NO	NO	NO	NO
2.C.5 - Lead Production	0								NO	NO	NO	NO
2.C.6 - Zinc Production	0								NO	NO	NO	NO
2.C.7 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.D - Non-Energy Products from Fuels and Solvent Use	0	0	0	0	0	NO	NO	NO	NO	NO	25	NO
2.D.1 - Lubricant Use	0								NO	NO	NO	NO
2.D.2 - Paraffin Wax Use	0								NO	NO	NO	NO
2.D.3 - Solvent Use									NO	NO	25	NO
2.D.4 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.E - Electronics Industry	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.E.1 - Integrated Circuit or Semiconductor				0	0	NO		NO	NO	NO	NO	NO
2.E.2 - TFT Flat Panel Display					0	NO		NO	NO	NO	NO	NO
2.E.3 - Photovoltaics					0				NO	NO	NO	NO
2.E.4 - Heat Transfer Fluid					0				NO	NO	NO	NO
2.E.5 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.F - Product Uses as Substitutes for Ozone Depleting Substances	0	0	0	0	0	NE	NE	NE	NE	NE	NE	NE
2.F.1 - Refrigeration and Air Conditioning				0		NE	NE	NE	NE	NE	NE	NE
2.F.2 - Foam Blowing Agents				0				NO	NO	NO	NO	NO
2.F.3 - Fire Protection				0	0				NO	NO	NO	NO
2.F.4 - Aerosols				0				NE	NE	NE	NE	NE
2.F.5 - Solvents				0	0			NO	NO	NO	NO	NO
2.F.6 - Other Applications (please specify)				0	0			NO	NO	NO	NO	NO
2.G - Other Product Manufacture and Use	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.G.1 - Electrical Equipment					0	NO	NO	NO	NO	NO	NO	NO
2.G.2 - SF6 and PFCs from Other Product Uses					0	0		0	0	0	0	0
2.G.3 - N2O from Product Uses			0						0	0	0	0
2.G.4 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.H - Other	0	0	0	0	0	NO	NO	NO	NO	NO	3	NO
2.H.1 - Pulp and Paper Industry	0	0							NO	NO	NO	NO
2.H.2 - Food and Beverages Industry	0	0							NO	NO	3	NO
2.H.3 - Other (please specify)	0	0	0						NO	NO	NO	NO
3 - Agriculture, Forestry, and Other Land Use	-1816.489397	106.56	1.056	0	0	NA	NA	NA	NA	NA	NA	NA
3.A - Livestock	0	106.56	1.056	0	0	NA	NA	NA	NA	NA	NA	NA
3.A.1 - Enteric Fermentation		89.7322							NA	NA	NA	NA
3.A.2 - Manure Management		16.8281	1.056						NA	NA	NA	NA
3.B - Land	-1816.489397	0	0	0	0	NA	NA	NA	NA	NA	NA	NA
3.B.1 - Forest land	-1816.258397								NA	NA	NA	NA
3.B.2 - Cropland	-0.198								NA	NA	NA	NA
3.B.3 - Grassland	-0.033								NA	NA	NA	NA

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
3.B.4 - Wetlands	0		0						NA	NA	NA	NA
3.B.5 - Settlements	0								NA	NA	NA	NA
3.B.6 - Other Land	0								NA	NA	NA	NA
3.C - Aggregate sources and non-CO2 emissions sources on land	0	0	0	0	0	NA	NA	NA	NO	NO	NO	NO
3.C.1 - Emissions from biomass burning		0	0						NO	NO	NO	NO
3.C.2 - Liming	0								NO	NO	NO	NO
3.C.3 - Urea application	0								NO	NO	NO	NO
3.C.4 - Direct N2O Emissions from managed soils			0						NO	NO	NO	NO
3.C.5 - Indirect N2O Emissions from managed soils			0						NO	NO	NO	NO
3.C.6 - Indirect N2O Emissions from manure management			0						NO	NO	NO	NO
3.C.7 - Rice cultivations		0							NO	NO	NO	NO
3.C.8 - Other (please specify)		0	0						NO	NO	NO	NO
3.D - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
3.D.1 - Harvested Wood Products	0								NO	NO	NO	NO
3.D.2 - Other (please specify)	0	0	0						NO	NO	NO	NO
4 - Waste	0	14.2135	0.225	0	0	NO	NO	NO	NO	NO	NO	NO
4.A - Solid Waste Disposal	0	7.44397	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.B - Biological Treatment of Solid Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.C - Incineration and Open Burning of Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.D - Wastewater Treatment and Discharge	0	6.76954	0.225	0	0	NO	NO	NO	NO	NO	NO	NO
4.E - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5 - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.B - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
Memo Items (5)												
International Bunkers	162.9138011	0.00114	0.005	0	0	NO	NO	NO	1	0.2	0.12	0.1
1.A.3.a.i - International Aviation (International Bunkers)	162.9138011	0.00114	0.005						1	0.2	0.12	0.1
1.A.3.d.i - International water-borne navigation (International bunkers)	0	0	0						NO	NO	NO	NO
1.A.5.c - Multilateral Operations	0	0	0	0	0	NO	NO	NO	0	0	0	0

Inventory Year: 1992

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
Total National Emissions and Removals	16487.68956	138.075	31.361	0	1024.88	NE	NO	NO	55	345.2	58.1	29.1
1 - Energy	17224.60558	6.54322	0.1957	0	0	NO	NO	NO	53	159	29	24
1.A - Fuel Combustion Activities	17223.83614	2.57896	0.1957	0	0	NO	NO	NO	53	159	29	24
1.A.1 - Energy Industries	754.3565244	0.01593	0.0021						1.2	0.2	0.04	1
1.A.2 - Manufacturing Industries and Construction	5451.758888	0.16515	0.0235						11	3	0.4	7
1.A.3 - Transport	2920.886349	1.54848	0.1469						28	145	27	4
1.A.4 - Other Sectors	8096.834378	0.84939	0.0232						12	10	2	12
1.A.5 - Non-Specified	0	0	0						NO	NO	NO	NO
1.B - Fugitive emissions from fuels	0.769445	3.96426	0	0	0	NE	NE	NE	0.004	0.01	0.04	0.1
1.B.1 - Solid Fuels	0.501969	0.18378	0						0	0	0	0
1.B.2 - Oil and Natural Gas	0.267476	3.78048	0						0.004	0.01	0.04	0.1
1.B.3 - Other emissions from Energy Production	0	0	0						NO	NO	NO	NO
1.C - Carbon dioxide Transport and Storage	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
1.C.1 - Transport of CO2	0								NO	NO	NO	NO
1.C.2 - Injection and Storage	0								NO	NO	NO	NO
1.C.3 - Other	0								NO	NO	NO	NO
2 - Industrial Processes and Product Use	975.2162551	0	0	0	1024.88	NE	NO	NO	1	186	29	5
2.A - Mineral Industry	346.4357151	0	0	0	0	NO	NO	NO	NO	NO	0	0
2.A.1 - Cement production	220.804092								NO	NO	NO	0
2.A.2 - Lime production	41.7								NO	NO	NO	NO
2.A.3 - Glass Production	5.78025								NO	NO	NO	NO
2.A.4 - Other Process Uses of Carbonates	78.15137313					NO	NO	NO	NO	NO	NO	NO
2.A.5 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.B - Chemical Industry	33.92829	0	0	0	0	NO	NO	NO	NO	1	0	0
2.B.1 - Ammonia Production	33.92829								NO	1	0	0
2.B.2 - Nitric Acid Production			0						NO	NO	NO	NO
2.B.3 - Adipic Acid Production			0						NO	NO	NO	NO
2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production			0						NO	NO	NO	NO
2.B.5 - Carbide Production	0	0							NO	NO	NO	NO
2.B.6 - Titanium Dioxide Production	0								NO	NO	NO	NO
2.B.7 - Soda Ash Production	0								NO	NO	NO	NO
2.B.8 - Petrochemical and Carbon Black Production	0	0							0	0	0	0
2.B.9 - Fluorochemical Production				0	0	0	0	0	0	0	0	0
2.B.10 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.C - Metal Industry	594.85225	0	0	0	1024.88	NO	NO	NO	1	185	NO	5
2.C.1 - Iron and Steel Production	42.35625	0							NO	NO	NO	NO
2.C.2 - Ferroalloys Production	0	0							NO	NO	NO	NO
2.C.3 - Aluminium production	552.496				1024.88				1	185	NO	5

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
2.C.4 - Magnesium production	0					NO			NO	NO	NO	NO
2.C.5 - Lead Production	0								NO	NO	NO	NO
2.C.6 - Zinc Production	0								NO	NO	NO	NO
2.C.7 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.D - Non-Energy Products from Fuels and Solvent Use	0	0	0	0	0	NO	NO	NO	NO	NO	25	NO
2.D.1 - Lubricant Use	0								NO	NO	NO	NO
2.D.2 - Paraffin Wax Use	0								NO	NO	NO	NO
2.D.3 - Solvent Use									NO	NO	25	NO
2.D.4 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.E - Electronics Industry	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.E.1 - Integrated Circuit or Semiconductor				0	0	NO		NO	NO	NO	NO	NO
2.E.2 - TFT Flat Panel Display					0	NO		NO	NO	NO	NO	NO
2.E.3 - Photovoltaics					0				NO	NO	NO	NO
2.E.4 - Heat Transfer Fluid					0				NO	NO	NO	NO
2.E.5 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.F - Product Uses as Substitutes for Ozone Depleting Substances	0	0	0	0	0	NE	NE	NE	NE	NE	NE	NE
2.F.1 - Refrigeration and Air Conditioning				0		NE	NE	NE	NE	NE	NE	NE
2.F.2 - Foam Blowing Agents				0				NO	NO	NO	NO	NO
2.F.3 - Fire Protection				0	0				NO	NO	NO	NO
2.F.4 - Aerosols				0				NE	NE	NE	NE	NE
2.F.5 - Solvents				0	0			NO	NO	NO	NO	NO
2.F.6 - Other Applications (please specify)				0	0			NO	NO	NO	NO	NO
2.G - Other Product Manufacture and Use	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.G.1 - Electrical Equipment					0	NO	NO	NO	NO	NO	NO	NO
2.G.2 - SF6 and PFCs from Other Product Uses					0	0		0	0	0	0	0
2.G.3 - N2O from Product Uses			0						0	0	0	0
2.G.4 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.H - Other	0	0	0	0	0	NO	NO	NO	NO	NO	4	NO
2.H.1 - Pulp and Paper Industry	0	0							NO	NO	NO	NO
2.H.2 - Food and Beverages Industry	0	0							NO	NO	4	NO
2.H.3 - Other (please specify)	0	0	0						NO	NO	NO	NO
3 - Agriculture, Forestry, and Other Land Use	-1712.132279	116.01	30.93	0	0	NA	NA	NA	NA	NA	NA	NA
3.A - Livestock	0	110.948	1.0271	0	0	NA	NA	NA	NA	NA	NA	NA
3.A.1 - Enteric Fermentation		94.4687							NA	NA	NA	NA
3.A.2 - Manure Management		16.4789	1.0271						NA	NA	NA	NA
3.B - Land	-1829.538946	0	0	0	0	NA	NA	NA	NA	NA	NA	NA
3.B.1 - Forest land	-1829.307946								NA	NA	NA	NA
3.B.2 - Cropland	-0.198								NA	NA	NA	NA
3.B.3 - Grassland	-0.033								NA	NA	NA	NA

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
3.B.4 - Wetlands	0		0						NA	NA	NA	NA
3.B.5 - Settlements	0								NA	NA	NA	NA
3.B.6 - Other Land	0								NA	NA	NA	NA
3.C - Aggregate sources and non-CO2 emissions sources on land	117.4066667	5.06241	29.903	0	0	NA	NA	NA	NO	NO	NO	NO
3.C.1 - Emissions from biomass burning		0	0						NO	NO	NO	NO
3.C.2 - Liming	0								NO	NO	NO	NO
3.C.3 - Urea application	117.4066667								NO	NO	NO	NO
3.C.4 - Direct N2O Emissions from managed soils			28.425						NO	NO	NO	NO
3.C.5 - Indirect N2O Emissions from managed soils			1.3746						NO	NO	NO	NO
3.C.6 - Indirect N2O Emissions from manure management			0.1027						NO	NO	NO	NO
3.C.7 - Rice cultivations		5.06241							NO	NO	NO	NO
3.C.8 - Other (please specify)		0	0						NO	NO	NO	NO
3.D - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
3.D.1 - Harvested Wood Products	0								NO	NO	NO	NO
3.D.2 - Other (please specify)	0	0	0						NO	NO	NO	NO
4 - Waste	0	15.522	0.2355	0	0	NO	NO	NO	NO	NO	NO	NO
4.A - Solid Waste Disposal	0	7.22656	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.B - Biological Treatment of Solid Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.C - Incineration and Open Burning of Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.D - Wastewater Treatment and Discharge	0	8.29548	0.2355	0	0	NO	NO	NO	NO	NO	NO	NO
4.E - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5 - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.B - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
Memo Items (5)												
International Bunkers	176.7372107	0.00124	0.0049	0	0	NO	NO	NO	1	0.2	0.1	0.1
1.A.3.a.i - International Aviation (International Bunkers)	176.7372107	0.00124	0.0049						1	0.2	0.1	0.1
1.A.3.d.i - International water-borne navigation (International bunkers)	0	0	0						NO	NO	NO	NO
1.A.5.c - Multilateral Operations	0	0	0	0	0	NO	NO	NO	0	0	0	0

Inventory Year: 1991

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
Total National Emissions and Removals	19649.01276	152.743	31.742	0	1127.84	NE	NO	NO	76.3	443	74.3	33.1
1 - Energy	19883.53699	10.7264	0.2945	0	0	NO	NO	NO	74	238	43	27
1.A - Fuel Combustion Activities	19882.33409	3.87123	0.2945	0	0	NO	NO	NO	74	238	43	27
1.A.1 - Energy Industries	797.5471848	0.01549	0.0018						1.4	0.2	0.05	1.11
1.A.2 - Manufacturing Industries and Construction	5890.612954	0.20663	0.031						13	3.2	0.5	8
1.A.3 - Transport	4645.816899	2.73162	0.2343						44	220	40	6
1.A.4 - Other Sectors	8548.357052	0.91749	0.0274						16	14	2.4	12
1.A.5 - Non-Specified	0	0	0						NO	NO	NO	NO
1.B - Fugitive emissions from fuels	1.2028989	6.85518	0	0	0	NE	NE	NE	0.01	0.01	0.1	0.1
1.B.1 - Solid Fuels	0.7353489	0.26923	0						NO	NO	NO	NO
1.B.2 - Oil and Natural Gas	0.46755	6.58595	0						0.01	0.01	0.1	0.1
1.B.3 - Other emissions from Energy Production	0	0	0						NO	NO	NO	NO
1.C - Carbon dioxide Transport and Storage	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
1.C.1 - Transport of CO2	0								NO	NO	NO	NO
1.C.2 - Injection and Storage	0								NO	NO	NO	NO
1.C.3 - Other	0								NO	NO	NO	NO
2 - Industrial Processes and Product Use	1463.508471	0	0	0	1127.84	NE	NO	NO	1	204	31	6
2.A - Mineral Industry	718.411154	0	0	0	0	NO	NO	NO	NO	NO	0	0
2.A.1 - Cement production	500.416794								NO	NO	NO	0
2.A.2 - Lime production	73.5								NO	NO	NO	NO
2.A.3 - Glass Production	5.48625								NO	NO	NO	NO
2.A.4 - Other Process Uses of Carbonates	139.00811					NO	NO	NO	NO	NO	NO	NO
2.A.5 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.B - Chemical Industry	53.63086667	0	0	0	0	NO	NO	NO	NO	1	1	0
2.B.1 - Ammonia Production	53.63086667								NO	1	1	0
2.B.2 - Nitric Acid Production			0						NO	NO	NO	NO
2.B.3 - Adipic Acid Production			0						NO	NO	NO	NO
2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production			0						NO	NO	NO	NO
2.B.5 - Carbide Production	0	0							NO	NO	NO	NO
2.B.6 - Titanium Dioxide Production	0								NO	NO	NO	NO
2.B.7 - Soda Ash Production	0								NO	NO	NO	NO
2.B.8 - Petrochemical and Carbon Black Production	0	0							0	0	0	0
2.B.9 - Fluorochemical Production				0	0	0	0	0	0	0	0	0
2.B.10 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.C - Metal Industry	691.46645	0	0	0	1127.84	NO	NO	NO	1	203	NO	6
2.C.1 - Iron and Steel Production	83.46645	0							NO	NO	NO	NO
2.C.2 - Ferroalloys Production	0	0							NO	NO	NO	NO
2.C.3 - Aluminium production	608				1127.84				1	203	NO	6

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
2.C.4 - Magnesium production	0					NO			NO	NO	NO	NO
2.C.5 - Lead Production	0								NO	NO	NO	NO
2.C.6 - Zinc Production	0								NO	NO	NO	NO
2.C.7 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.D - Non-Energy Products from Fuels and Solvent Use	0	0	0	0	0	NO	NO	NO	NO	NO	25	NO
2.D.1 - Lubricant Use	0								NO	NO	NO	NO
2.D.2 - Paraffin Wax Use	0								NO	NO	NO	NO
2.D.3 - Solvent Use									NO	NO	25	NO
2.D.4 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.E - Electronics Industry	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.E.1 - Integrated Circuit or Semiconductor				0	0	NO		NO	NO	NO	NO	NO
2.E.2 - TFT Flat Panel Display					0	NO		NO	NO	NO	NO	NO
2.E.3 - Photovoltaics					0				NO	NO	NO	NO
2.E.4 - Heat Transfer Fluid					0				NO	NO	NO	NO
2.E.5 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.F - Product Uses as Substitutes for Ozone Depleting Substances	0	0	0	0	0	NE	NE	NE	NE	NE	NE	NE
2.F.1 - Refrigeration and Air Conditioning				0		NE	NE	NE	NE	NE	NE	NE
2.F.2 - Foam Blowing Agents				0				NO	NO	NO	NO	NO
2.F.3 - Fire Protection				0	0				NO	NO	NO	NO
2.F.4 - Aerosols				0				NE	NE	NE	NE	NE
2.F.5 - Solvents				0	0			NO	NO	NO	NO	NO
2.F.6 - Other Applications (please specify)				0	0			NO	NO	NO	NO	NO
2.G - Other Product Manufacture and Use	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.G.1 - Electrical Equipment					0	NO	NO	NO	NO	NO	NO	NO
2.G.2 - SF6 and PFCs from Other Product Uses					0	0		0	0	0	0	0
2.G.3 - N2O from Product Uses			0						0	0	0	0
2.G.4 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.H - Other	0	0	0	0	0	NO	NO	NO	NO	NO	5	NO
2.H.1 - Pulp and Paper Industry	0	0							NO	NO	NO	NO
2.H.2 - Food and Beverages Industry	0	0							NO	NO	5	NO
2.H.3 - Other (please specify)	0	0	0						NO	NO	NO	NO
3 - Agriculture, Forestry, and Other Land Use	-1698.032699	126.858	31.213	0	0	NA	NA	NA	NA	NA	NA	NA
3.A - Livestock	0	121.796	1.1056	0	0	NA	NA	NA	NA	NA	NA	NA
3.A.1 - Enteric Fermentation		102.74							NA	NA	NA	NA
3.A.2 - Manure Management		19.0555	1.1056						NA	NA	NA	NA
3.B - Land	-1818.446033	0	0	0	0	NA	NA	NA	NA	NA	NA	NA
3.B.1 - Forest land	-1818.276413								NA	NA	NA	NA
3.B.2 - Cropland	-0.198								NA	NA	NA	NA
3.B.3 - Grassland	0.02838								NA	NA	NA	NA

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
3.B.4 - Wetlands	0		0						NA	NA	NA	NA
3.B.5 - Settlements	0								NA	NA	NA	NA
3.B.6 - Other Land	0								NA	NA	NA	NA
3.C - Aggregate sources and non-CO2 emissions sources on land	120.4133333	5.06241	30.107	0	0	NA	NA	NA	NO	NO	NO	NO
3.C.1 - Emissions from biomass burning		0	0						NO	NO	NO	NO
3.C.2 - Liming	0								NO	NO	NO	NO
3.C.3 - Urea application	120.4133333								NO	NO	NO	NO
3.C.4 - Direct N2O Emissions from managed soils			28.453						NO	NO	NO	NO
3.C.5 - Indirect N2O Emissions from managed soils			1.5439						NO	NO	NO	NO
3.C.6 - Indirect N2O Emissions from manure management			0.1106						NO	NO	NO	NO
3.C.7 - Rice cultivations		5.06241							NO	NO	NO	NO
3.C.8 - Other (please specify)		0	0						NO	NO	NO	NO
3.D - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
3.D.1 - Harvested Wood Products	0								NO	NO	NO	NO
3.D.2 - Other (please specify)	0	0	0						NO	NO	NO	NO
4 - Waste	0	15.159	0.2345	0	0	NO	NO	NO	NO	NO	NO	NO
4.A - Solid Waste Disposal	0	6.98124	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.B - Biological Treatment of Solid Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.C - Incineration and Open Burning of Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.D - Wastewater Treatment and Discharge	0	8.17779	0.2345	0	0	NO	NO	NO	NO	NO	NO	NO
4.E - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5 - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.B - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
Memo Items (5)												
International Bunkers	374.6383641	0.00262	0.0105	0	0	NO	NO	NO	1.3	1	0.3	0.1
1.A.3.a.i - International Aviation (International Bunkers)	374.6383641	0.00262	0.0105						1.3	1	0.3	0.1
1.A.3.d.i - International water-borne navigation (International bunkers)	0	0	0						NO	NO	NO	NO
1.A.5.c - Multilateral Operations	0	0	0	0	0	NO	NO	NO	0	0	0	0

Inventory Year: 1990

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
Total National Emissions and Removals	20919.61884	152.796	31.027	0	1336.496	NE	NO	NO	78	532	83.3	36.13
1 - Energy	20981.36223	12.2798	0.2871	0	0	NO	NO	NO	75	289	54	29
1.A - Fuel Combustion Activities	20979.62838	3.11414	0.2871	0	0	NO	NO	NO	75	289	53	28
1.A.1 - Energy Industries	994.4874264	0.01902	0.0021						2	0.24	0.1	1.4
1.A.2 - Manufacturing Industries and Construction	6481.841087	0.22766	0.0339						14	4	0.5	9
1.A.3 - Transport	4467.525157	1.89525	0.2214						43	270	51	6
1.A.4 - Other Sectors	9035.774711	0.97222	0.0297						16	15	2.4	13
1.A.5 - Non-Specified	0	0	0						NO	NO	NO	NO
1.B - Fugitive emissions from fuels	1.7338468	9.16567	0	0	0	NE	NE	NE	0.01	0.01	0.1	0.13
1.B.1 - Solid Fuels	1.1114688	0.40693	0						NO	NO	NO	NO
1.B.2 - Oil and Natural Gas	0.622378	8.75874	0						0.01	0.01	0.1	0.13
1.B.3 - Other emissions from Energy Production	0	0	0						NO	NO	NO	NO
1.C - Carbon dioxide Transport and Storage	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
1.C.1 - Transport of CO2	0								NO	NO	NO	NO
1.C.2 - Injection and Storage	0								NO	NO	NO	NO
1.C.3 - Other	0								NO	NO	NO	NO
2 - Industrial Processes and Product Use	1632.370185	0	0	0	1336.496	NE	NO	NO	1	242	29	7
2.A - Mineral Industry	766.978037	0	0	0	0	NO	NO	NO	NO	NO	0	0
2.A.1 - Cement production	527.448987								NO	NO	NO	0
2.A.2 - Lime production	80.55								NO	NO	NO	NO
2.A.3 - Glass Production	5.48625								NO	NO	NO	NO
2.A.4 - Other Process Uses of Carbonates	153.4928					NO	NO	NO	NO	NO	NO	NO
2.A.5 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.B - Chemical Industry	53.37894833	0	0	0	0	NO	NO	NO	NO	1	1	0
2.B.1 - Ammonia Production	53.37894833								NO	1	1	0
2.B.2 - Nitric Acid Production			0						NO	NO	NO	NO
2.B.3 - Adipic Acid Production			0						NO	NO	NO	NO
2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production			0						NO	NO	NO	NO
2.B.5 - Carbide Production	0	0							NO	NO	NO	NO
2.B.6 - Titanium Dioxide Production	0								NO	NO	NO	NO
2.B.7 - Soda Ash Production	0								NO	NO	NO	NO
2.B.8 - Petrochemical and Carbon Black Production	0	0							0	0	0	0
2.B.9 - Fluorochemical Production				0	0	0	0	0	0	0	0	0
2.B.10 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.C - Metal Industry	812.0132	0	0	0	1336.496	NO	NO	NO	1	241	NO	7
2.C.1 - Iron and Steel Production	91.53	0							NO	NO	NO	NO
2.C.2 - Ferroalloys Production	0	0							NO	NO	NO	NO
2.C.3 - Aluminium production	720.4832				1336.496				1	241	NO	7

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
2.C.4 - Magnesium production	0					NO			NO	NO	NO	NO
2.C.5 - Lead Production	0								NO	NO	NO	NO
2.C.6 - Zinc Production	0								NO	NO	NO	NO
2.C.7 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.D - Non-Energy Products from Fuels and Solvent Use	0	0	0	0	0	NO	NO	NO	NO	NO	24	NO
2.D.1 - Lubricant Use	0								NO	NO	NO	NO
2.D.2 - Paraffin Wax Use	0								NO	NO	NO	NO
2.D.3 - Solvent Use									NO	NO	24	NO
2.D.4 - Other (please specify)	0	0	0						NO	NO	NO	NO
2.E - Electronics Industry	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.E.1 - Integrated Circuit or Semiconductor				0	0	NO		NO	NO	NO	NO	NO
2.E.2 - TFT Flat Panel Display					0	NO		NO	NO	NO	NO	NO
2.E.3 - Photovoltaics					0				NO	NO	NO	NO
2.E.4 - Heat Transfer Fluid					0				NO	NO	NO	NO
2.E.5 - Other (please specify)	0	0	0	0	0				NO	NO	NO	NO
2.F - Product Uses as Substitutes for Ozone Depleting Substances	0	0	0	0	0	NE	NE	NE	NE	NE	NE	NE
2.F.1 - Refrigeration and Air Conditioning				0		NE	NE	NE	NE	NE	NE	NE
2.F.2 - Foam Blowing Agents				0				NO	NO	NO	NO	NO
2.F.3 - Fire Protection				0	0				NO	NO	NO	NO
2.F.4 - Aerosols				0				NE	NE	NE	NE	NE
2.F.5 - Solvents				0	0			NO	NO	NO	NO	NO
2.F.6 - Other Applications (please specify)				0	0			NO	NO	NO	NO	NO
2.G - Other Product Manufacture and Use	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
2.G.1 - Electrical Equipment					0	NO	NO	NO	NO	NO	NO	NO
2.G.2 - SF6 and PFCs from Other Product Uses					0	0		0	0	0	0	0
2.G.3 - N2O from Product Uses			0						0	0	0	0
2.G.4 - Other (Please specify)	0	0	0	0	0				NO	NO	NO	NO
2.H - Other	0	0	0	0	0	NO	NO	NO	NO	NO	4	NO
2.H.1 - Pulp and Paper Industry	0	0							NO	NO	NO	NO
2.H.2 - Food and Beverages Industry	0	0							NO	NO	4	NO
2.H.3 - Other (please specify)	0	0	0						NO	NO	NO	NO
3 - Agriculture, Forestry, and Other Land Use	-1694.113575	124.494	30.511	0	0	NA	NA	NA	NA	NA	NA	NA
3.A - Livestock	0	119.676	1.0509	0	0	NA	NA	NA	NA	NA	NA	NA
3.A.1 - Enteric Fermentation		100.868							NA	NA	NA	NA
3.A.2 - Manure Management		18.8074	1.0509						NA	NA	NA	NA
3.B - Land	-1825.086909	0	0	0	0	NA	NA	NA	NA	NA	NA	NA
3.B.1 - Forest land	-1824.778909								NA	NA	NA	NA
3.B.2 - Cropland	-0.198								NA	NA	NA	NA
3.B.3 - Grassland	-0.11								NA	NA	NA	NA

	Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)				
Categories	Net CO2 (1)(2)	CH4	N2O	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2
3.B.4 - Wetlands	0		0						NA	NA	NA	NA
3.B.5 - Settlements	0								NA	NA	NA	NA
3.B.6 - Other Land	0								NA	NA	NA	NA
3.C - Aggregate sources and non-CO2 emissions sources on land	130.9733333	4.81848	29.46	0	0	NA	NA	NA	NO	NO	NO	NO
3.C.1 - Emissions from biomass burning		0	0						NO	NO	NO	NO
3.C.2 - Liming	0								NO	NO	NO	NO
3.C.3 - Urea application	130.9733333								NO	NO	NO	NO
3.C.4 - Direct N2O Emissions from managed soils			28.434						NO	NO	NO	NO
3.C.5 - Indirect N2O Emissions from managed soils			0.9211						NO	NO	NO	NO
3.C.6 - Indirect N2O Emissions from manure management			0.1051						NO	NO	NO	NO
3.C.7 - Rice cultivations		4.81848							NO	NO	NO	NO
3.C.8 - Other (please specify)		0	0						NO	NO	NO	NO
3.D - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
3.D.1 - Harvested Wood Products	0								NO	NO	NO	NO
3.D.2 - Other (please specify)	0	0	0						NO	NO	NO	NO
4 - Waste	0	16.0224	0.2295	0	0	NO	NO	NO	NO	NO	NO	NO
4.A - Solid Waste Disposal	0	6.73063	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.B - Biological Treatment of Solid Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.C - Incineration and Open Burning of Waste	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
4.D - Wastewater Treatment and Discharge	0	9.29175	0.2295	0	0	NO	NO	NO	NO	NO	NO	NO
4.E - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5 - Other	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
5.B - Other (please specify)	0	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
Memo Items (5)												
International Bunkers	425.3536287	0.00297	0.0119	0	0	NO	NO	NO	2	1	0.3	0.13
1.A.3.a.i - International Aviation (International Bunkers)	425.3536287	0.00297	0.0119						2	1	0.3	0.13
1.A.3.d.i - International water-borne navigation (International bunkers)	0	0	0						NO	NO	NO	NO
1.A.5.c - Multilateral Operations	0	0	0	0	0	NO	NO	NO	0	0	0	0