Determination of the mitigation potential and possible ranges of emission reduction objectives of Annex I Parties

AWG 4
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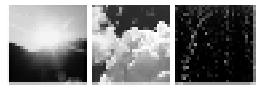
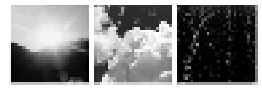
Content



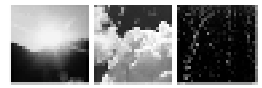
1. Introduction to the technical paper
2. Definition of mitigation potential
3. Synthesis of submissions by Parties
4. Factors and indicators
5. Summary

Introduction to the paper



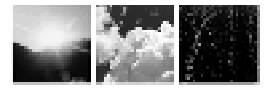
- Four substantive Chapters:
  - Background
  - Synthesis of submissions by Parties
  - Factors and indicators
  - Other information
- Annex with data on factors and indicators

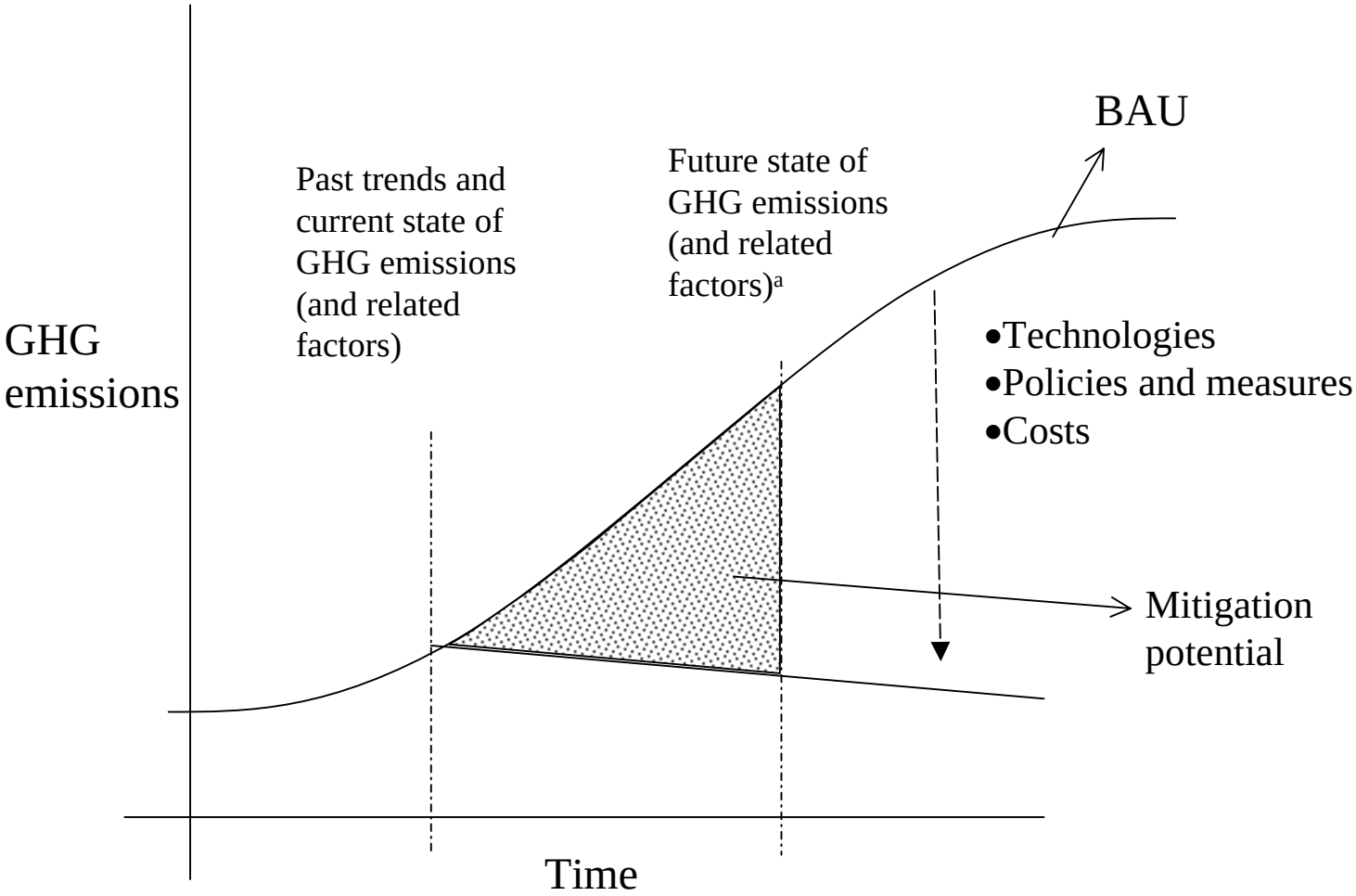
Mitigation potential (MP)



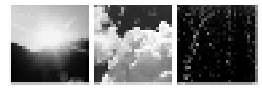
- **Market potential:** based on private costs and private discount rates, noting that barriers limit actual uptake.
- **Economic potential** takes into account social costs and benefits and social discount rates, assuming that market efficiency is improved by policies and measures and that barriers are removed.

Mitigation potential (cont'd)



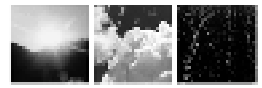


Synthesis of submissions



- Assessing mitigation potential:
  - Efficiency
  - BAT
- Factors and indicators
  - by type: emission-related, economic, social and others
  - by sector: intensities (emissions per output, per area, per household, per freight, etc.)
  - Costs: total/sectoral cost of abatement, economic potential at diff. prices,
  - Other: use of mechanisms, LULUCF, deforestation

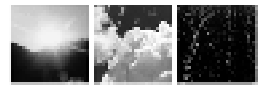
Factors and indicators



- Absolute: Magnitude of MP
- Relative (efficiencies and intensities): improvements contributing to MP

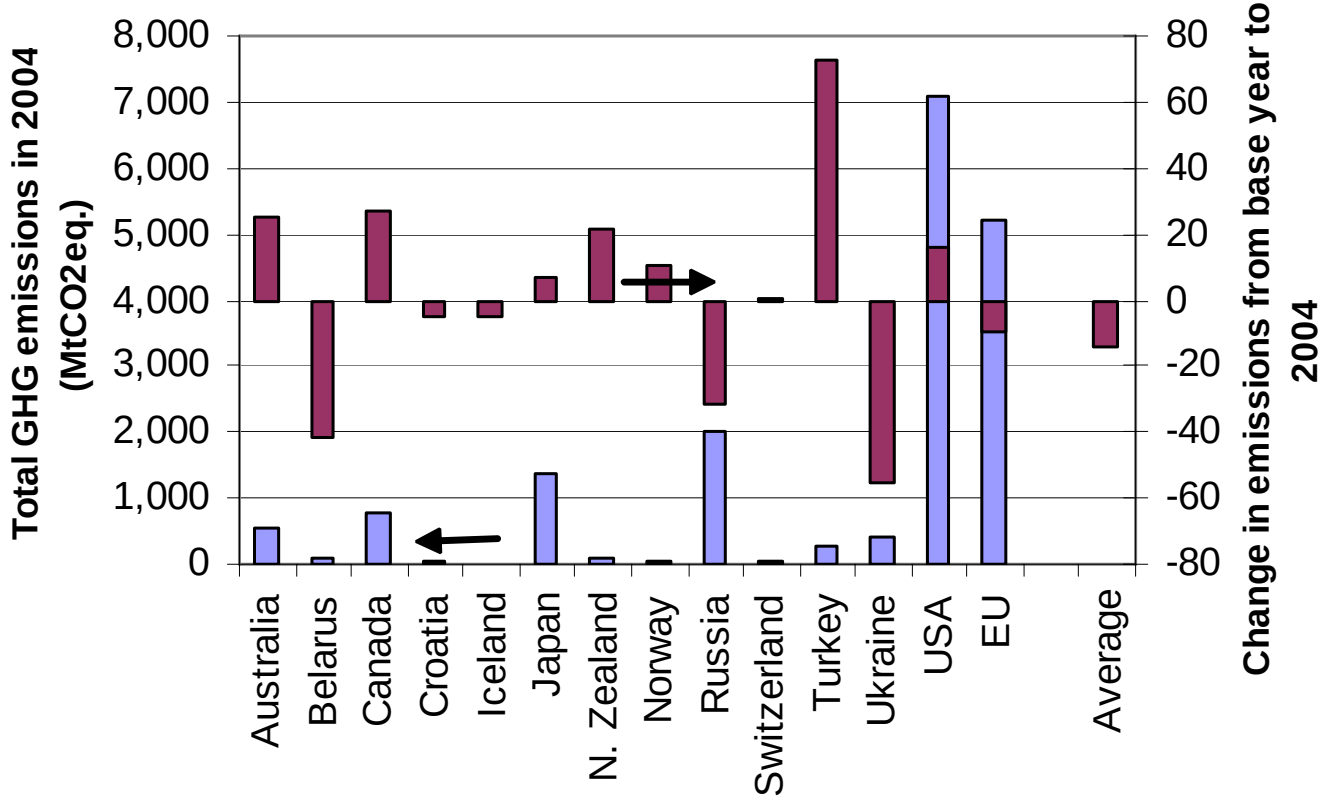
- Nation wide: broad socio-economic
- Sectoral: split based on IPCC
- Crosscutting: technology, policies and measures and costs

Overview of indicators



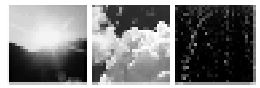
Nation-wide	GHG emissions, trends, sectors, GDP, population, energy supply, fuel mix, GHG/cap, GHG/GDP, TPES/cap, TPES/GDP, share of exports in GDP, human development index
Energy industries and fugitive	GHG/kWh, fuel mix and efficiency in electricity production
Industry	GHG emissions/production, share of process and fugitive emissions
Transport	Fuel efficiency, travel activity, modal split, population density
Households and services	GHG/cap, electricity use in households/cap, heating and cooling degree days
Agriculture	GHG/GDP from agriculture
Waste	Waste/cap, share land-filled and incinerated, percentage of CH4 recovered from landfills
Land-use change and forestry	GHG/km^2 (for forestry and agricultural soils separately)
International transport	Share of international and domestic transport

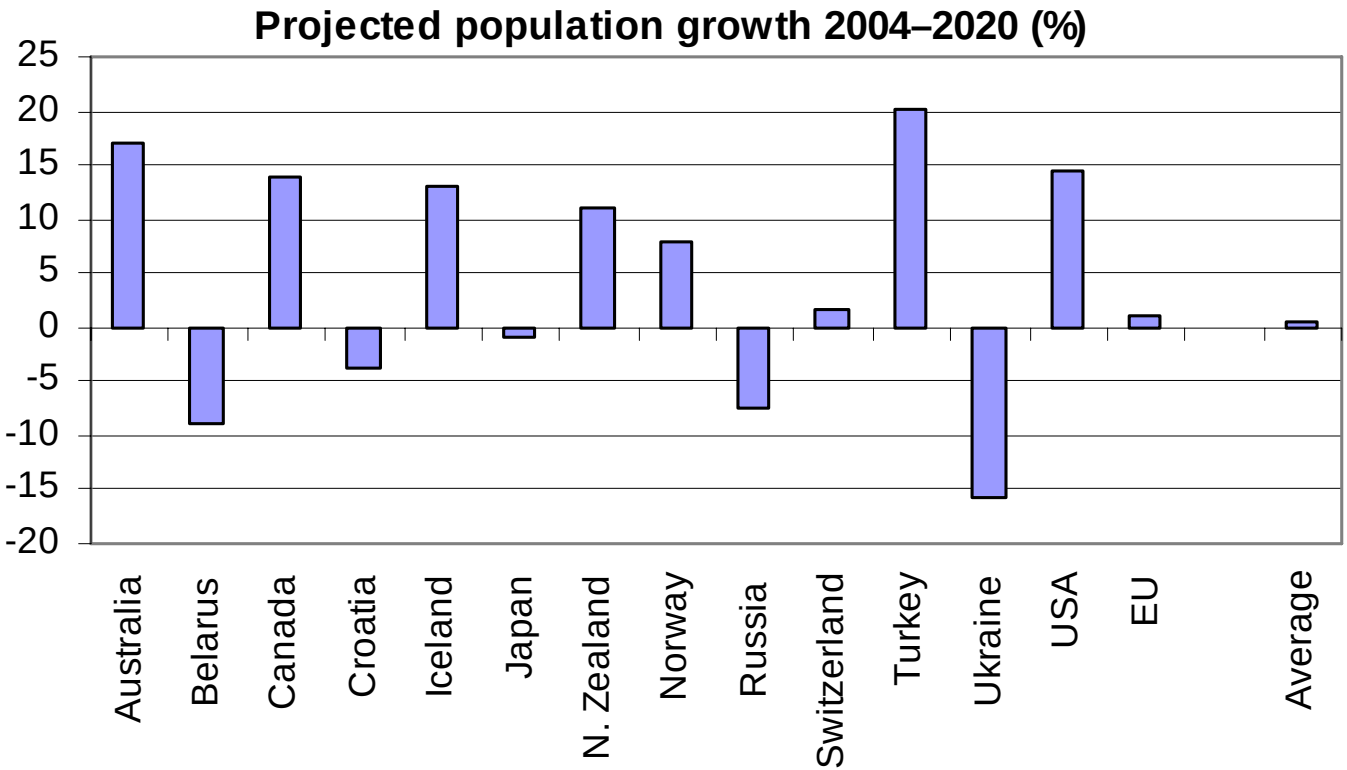
GHG emission and trends



- Declined: EITs, EU
- Increased: AUS, CAN, TUR, USA,…

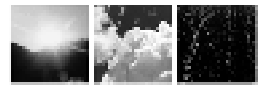
Population trends



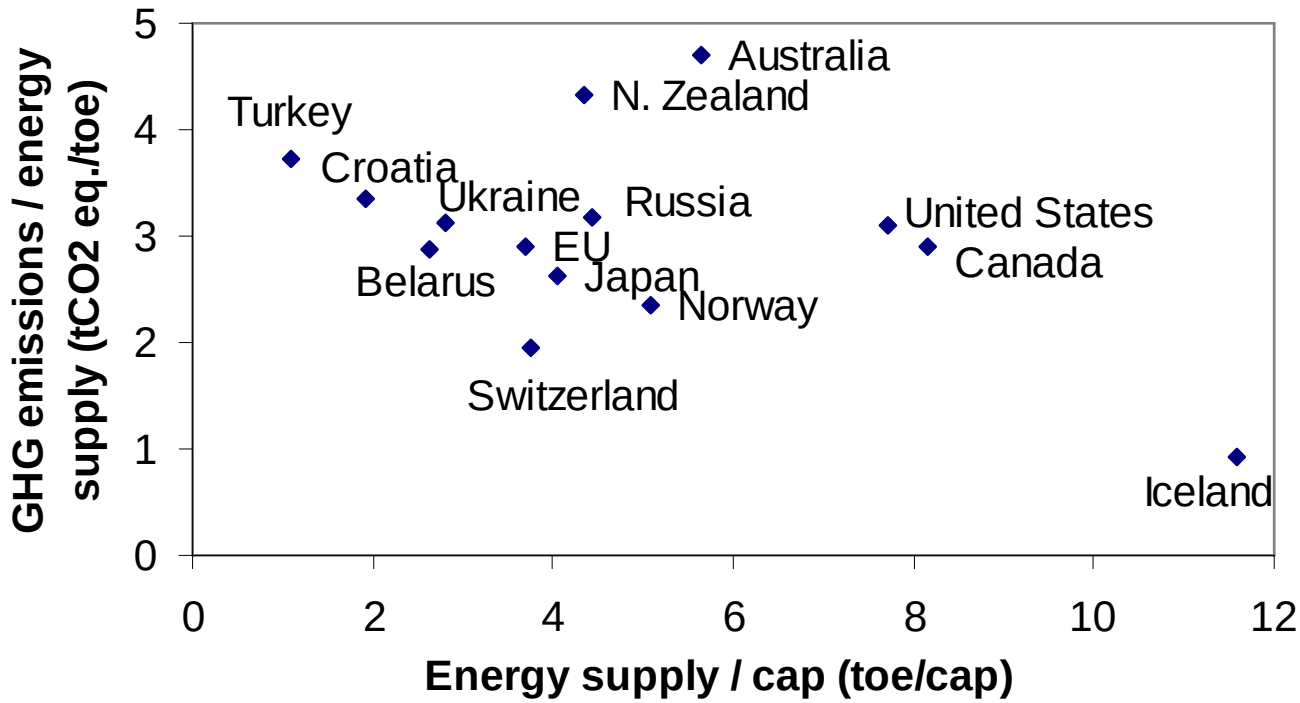


- Declining: Eastern European states
- Increasing: AUS, CAN, TUR, USA,…

GHG and energy intensity

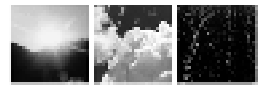


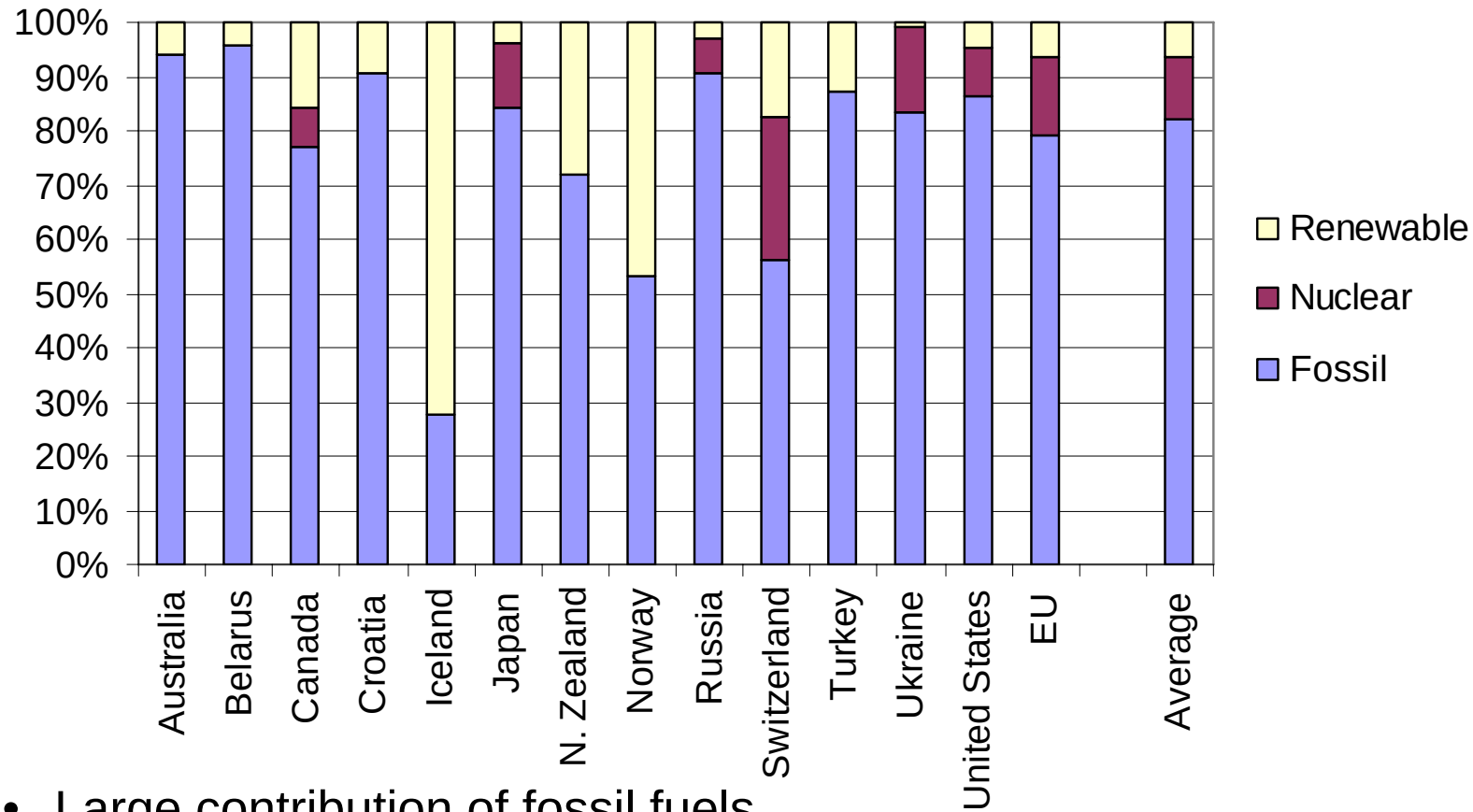
GHG intensive energy



Energy intensive

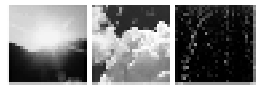
Energy mix

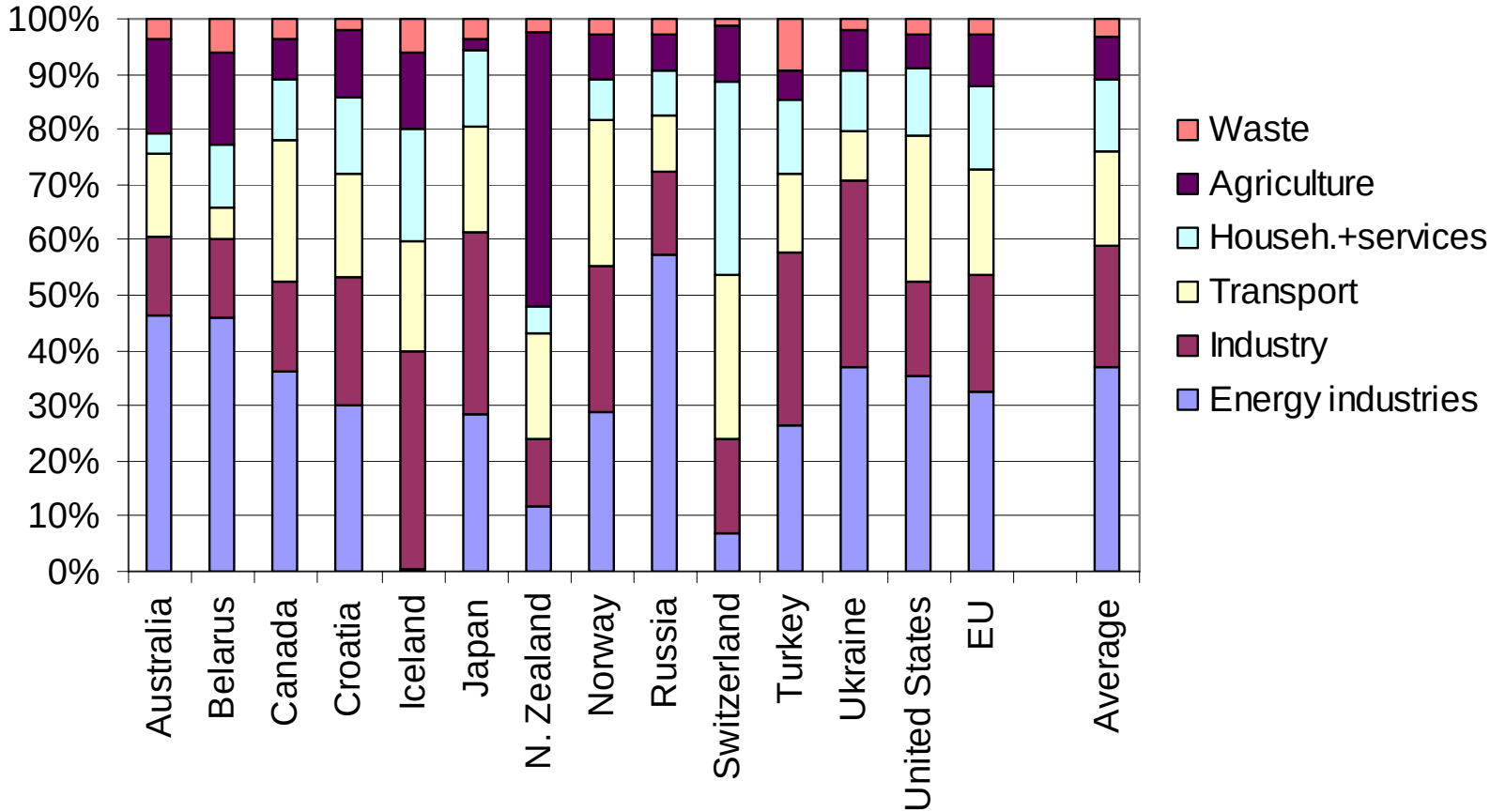




- Large contribution of fossil fuels
- Renewables high: CAN, ICE, NZL, NOR, CHE
- Share of renewables (without hydro) usually below 5%

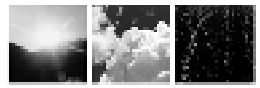
GHG emissions per sector

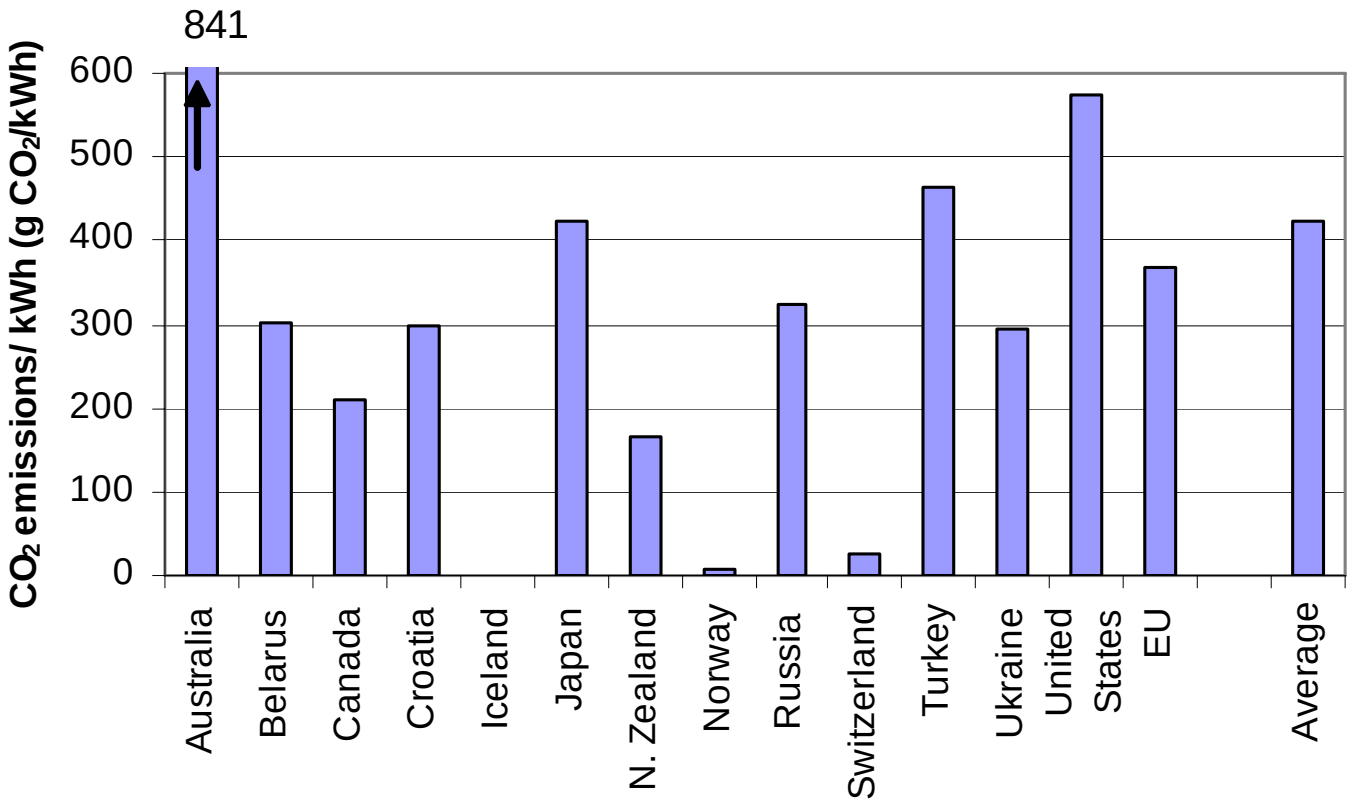




- Significant difference to the average in some small countries
- Most emissions from energy industries followed by industry/transport

CO_2 intensity of electricity production

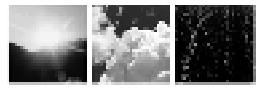


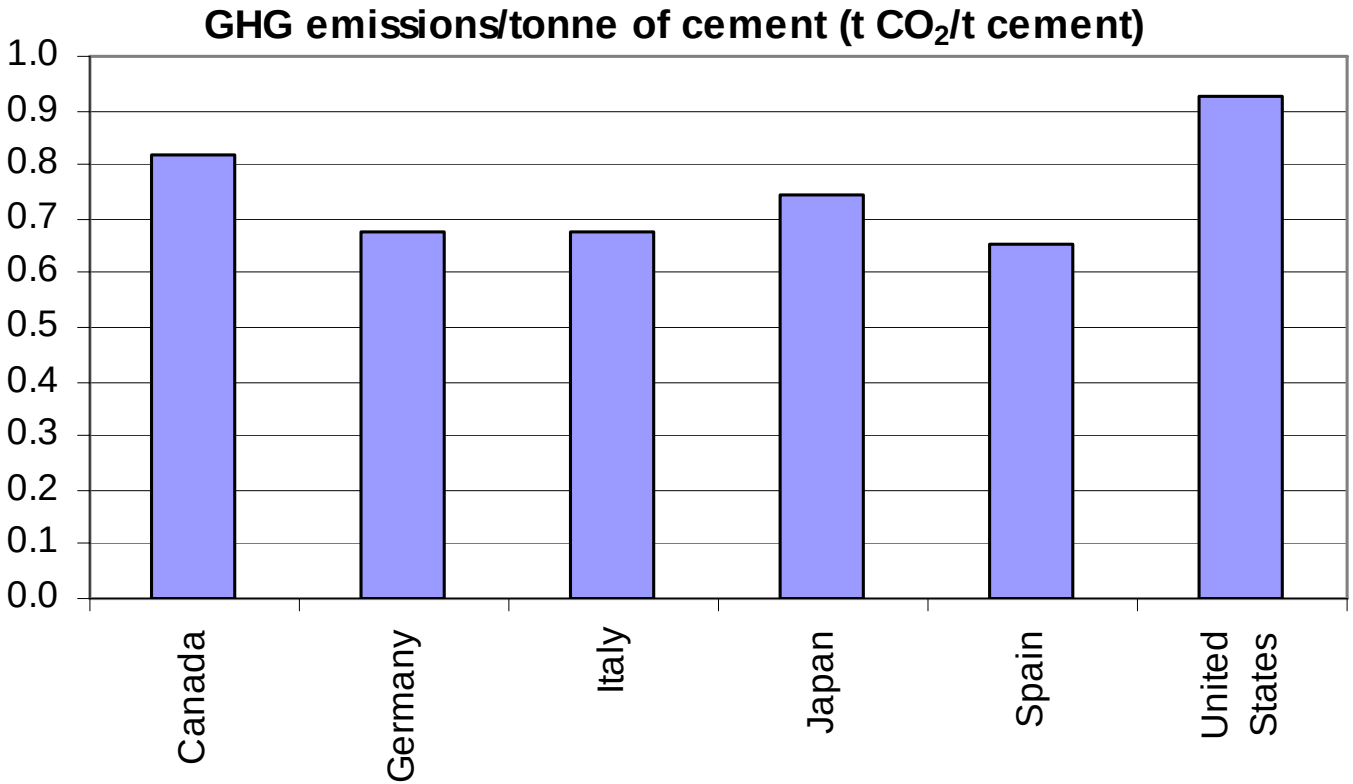


- Higher intensity for countries with high use of fossil fuels
- Lower intensity for countries with significant use of renewables

Note: values includes electricity *and* heat production, hence countries with high share of CHP (common in EITs) have low values

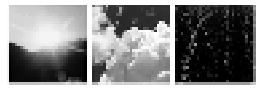
Industrial efficiency

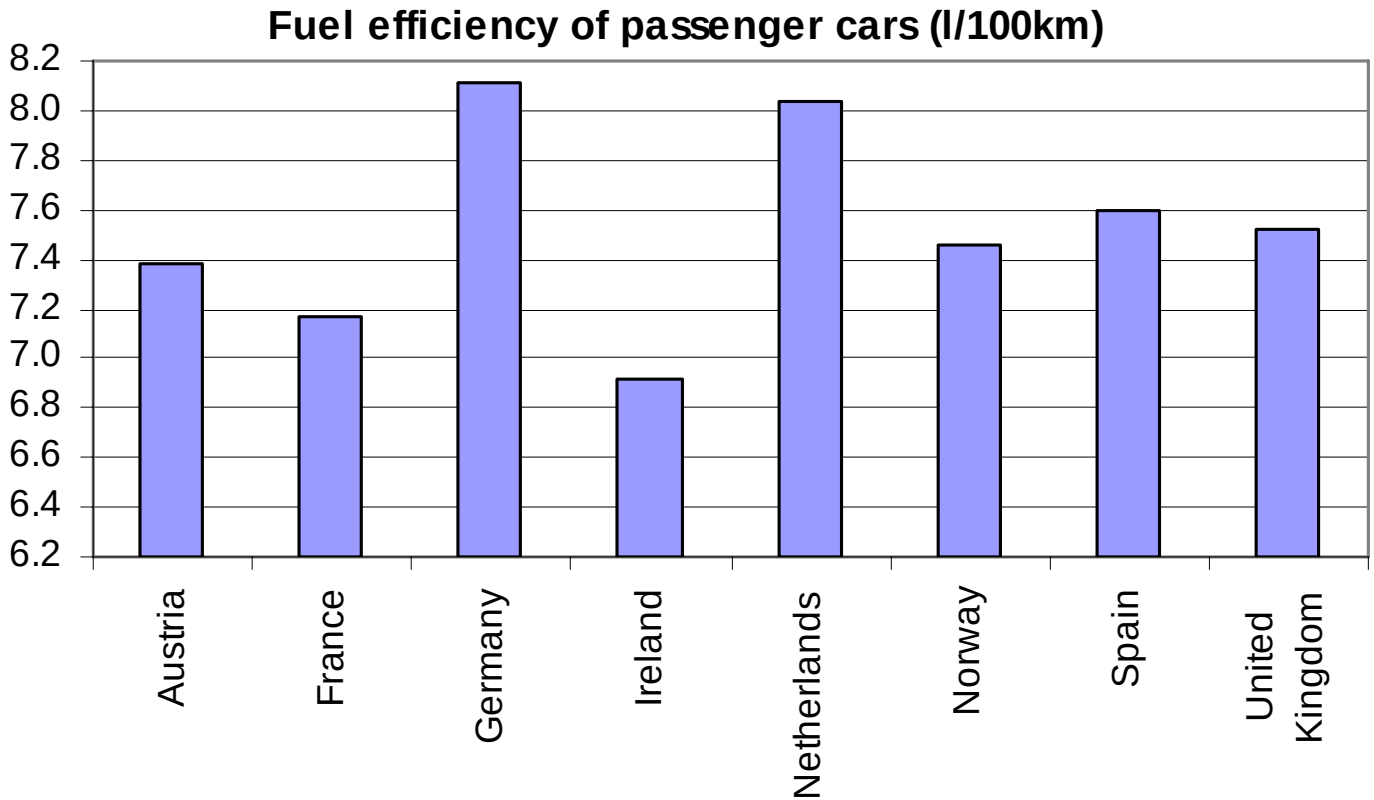




- Comparable data rarely available

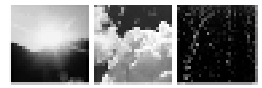
Transport

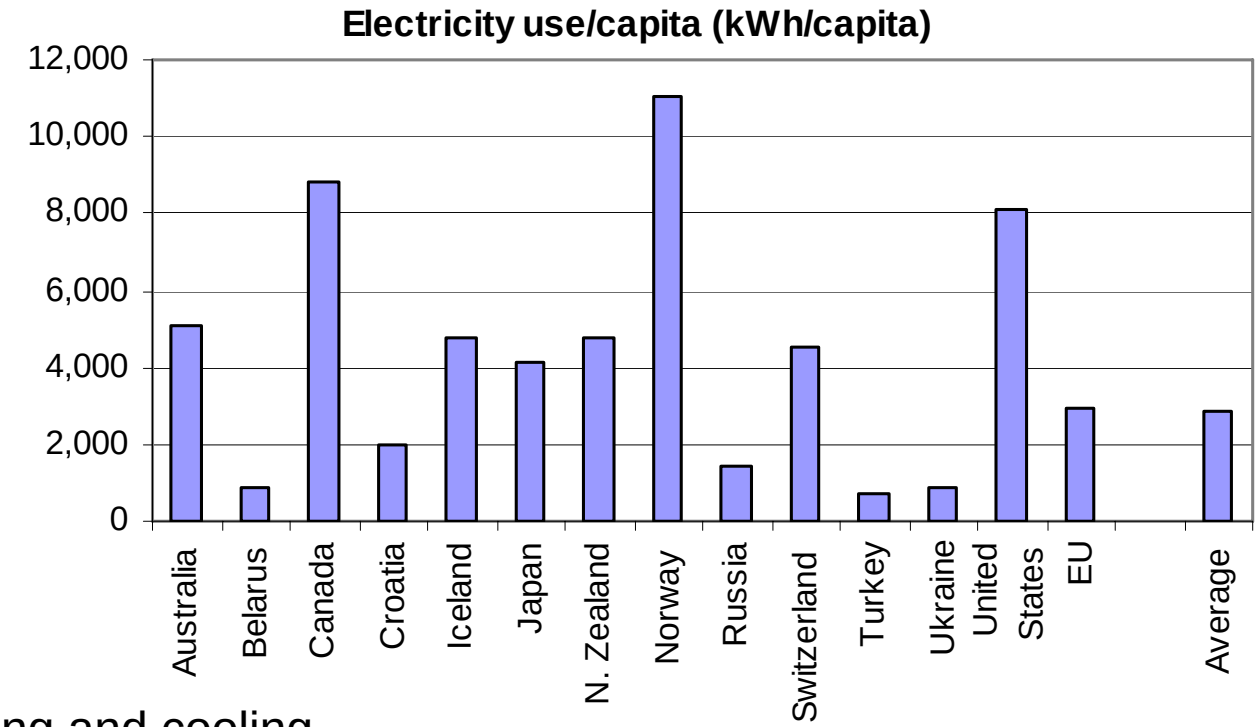




- Emissions vary substantially due to practices and geography
- Modal split, level of travel and efficiencies not readily available

Households and services





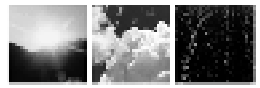
Heating and cooling

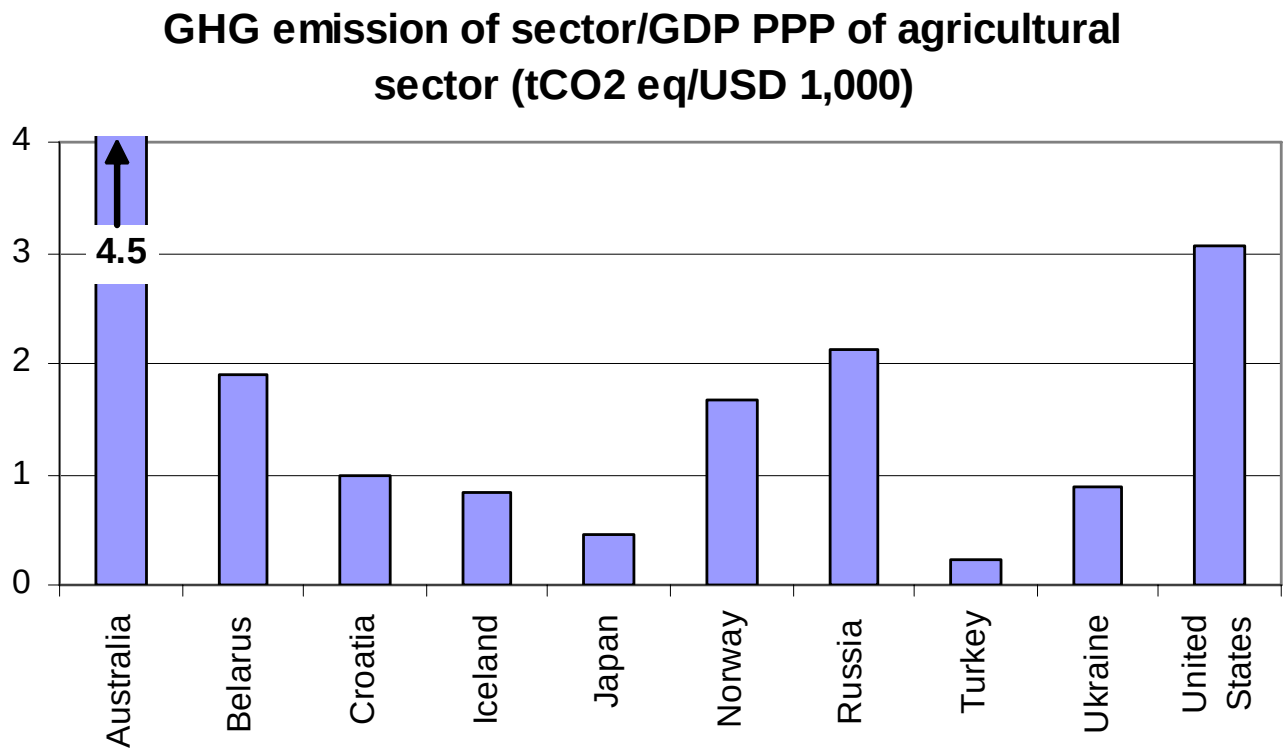
- Heating and cooling needs vary substantially
- Area of heated/cooled space is not available

Electricity use

- Efficiencies and number of appliances are not available
- Emissions depend on carbon intensity of energy

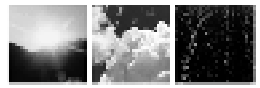
Indicators

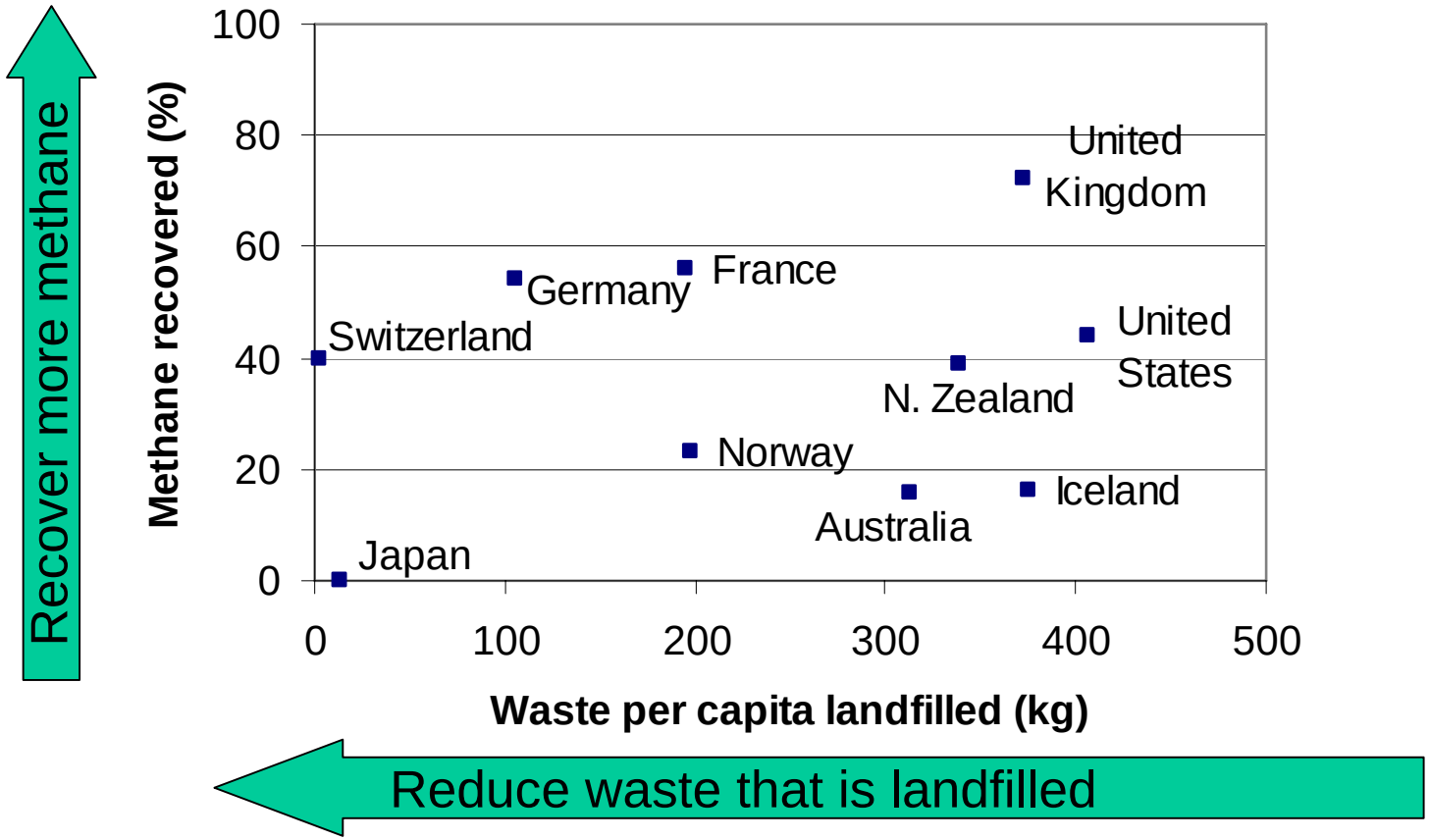




- Emissions from agriculture vary due to products and practices
- More specific indicators necessary

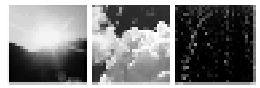
Waste

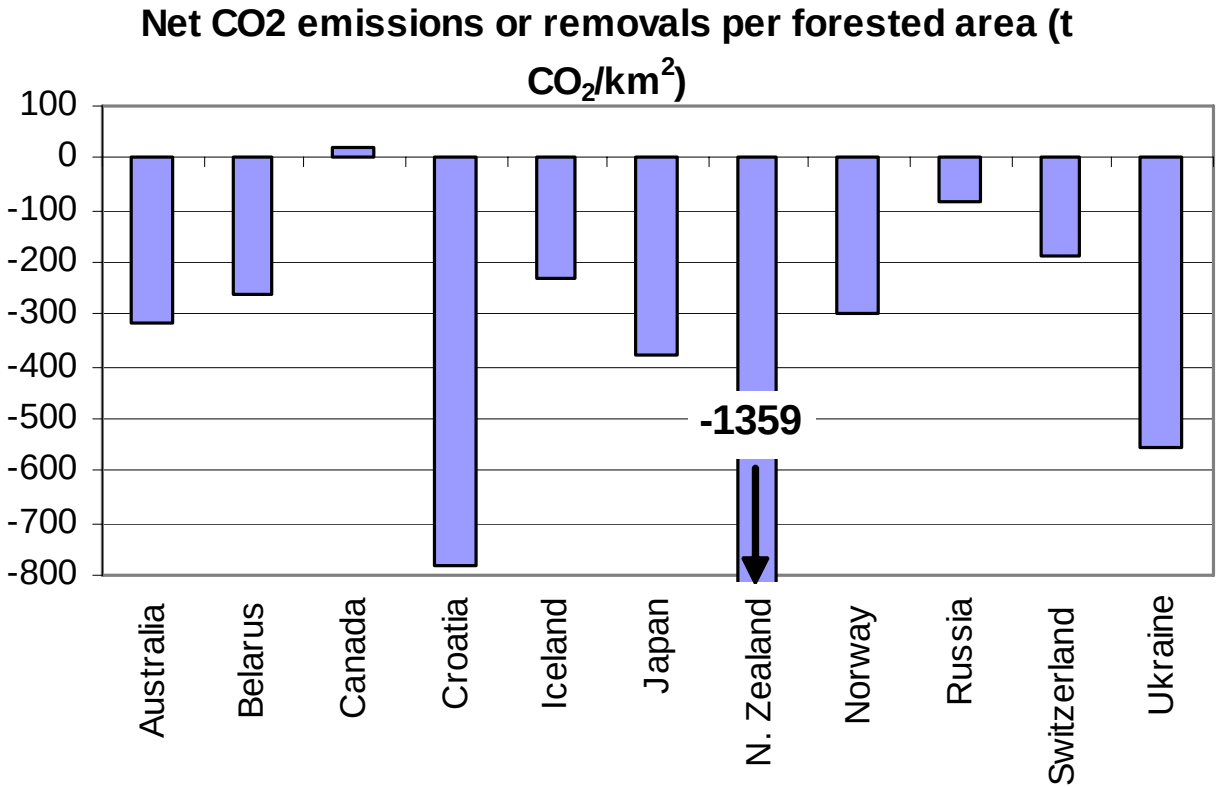




- Substantially different practices to handle waste

Land use, land-use change and forestry





- Removals from forests vary substantially
- Emissions from soils vary substantially

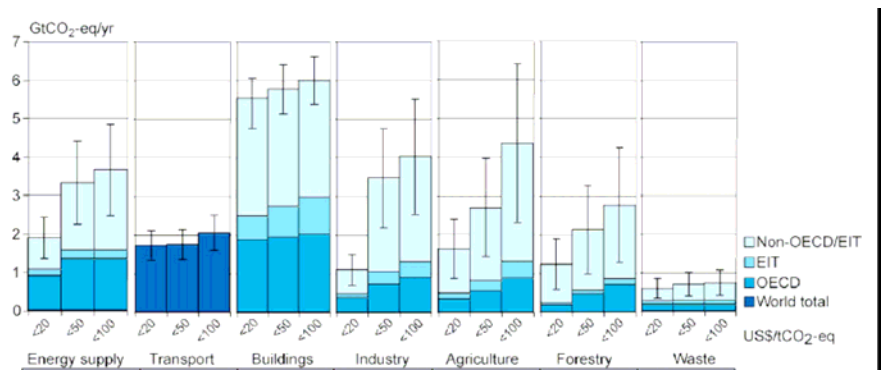
Summary

Summary

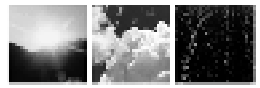
1. What are the reductions necessary to reach a certain stabilization level?

Category	CO_2 equivalent concentration (parts per million CO_2 equivalent)	Global mean temperature increase above pre-industrial at equilibrium using 'best estimate' climate sensitivity (°C)	Change in global CO_2 emissions in 2050 (% of 2000 emissions)	Range of reduction in GDP in 2050 because of mitigation (%)	Allowed emissions by Annex I Parties in 2020 (% change from 1990 emissions)	Allowed emissions by Annex I Parties in 2050 (% change from 1990 emissions)
I	445–490	2.0–2.4	-85 to -50	Decrease of up to 5.5	-25 to -40	-80 to -95
II	490–535	2.4–2.8	-60 to -30			
III	535–590	2.8–3.2	-30 to +5	Slight gain to decrease of 4	-10 to -30	-40 to -90
IV	590–710	3.2–4.0	+10 to +60	Gain of 1 to decrease of 2	0 to -25	-30 to -80
V	710–855	4.0–4.9	+25 to +85			
VI	855–1 130	4.9–6.1	+90 to +140			

2. What are the costs to reach these levels?



Stabilization levels and Annex I reductions



Category	CO_2 equivalent concentration (parts per million CO_2 equivalent)	Global mean temperature increase above pre-industrial at equilibrium using 'best estimate' climate sensitivity[3] (°C)	Change in global CO_2 emissions in 2050 (% of 2000 emissions)	Range of reduction in GDP in 2050 because of mitigation (%)	Allowed emissions by Annex I Parties in 2020 (% change from 1990 emissions)	Allowed emissions by Annex I Parties in 2050 (% change from 1990 emissions)
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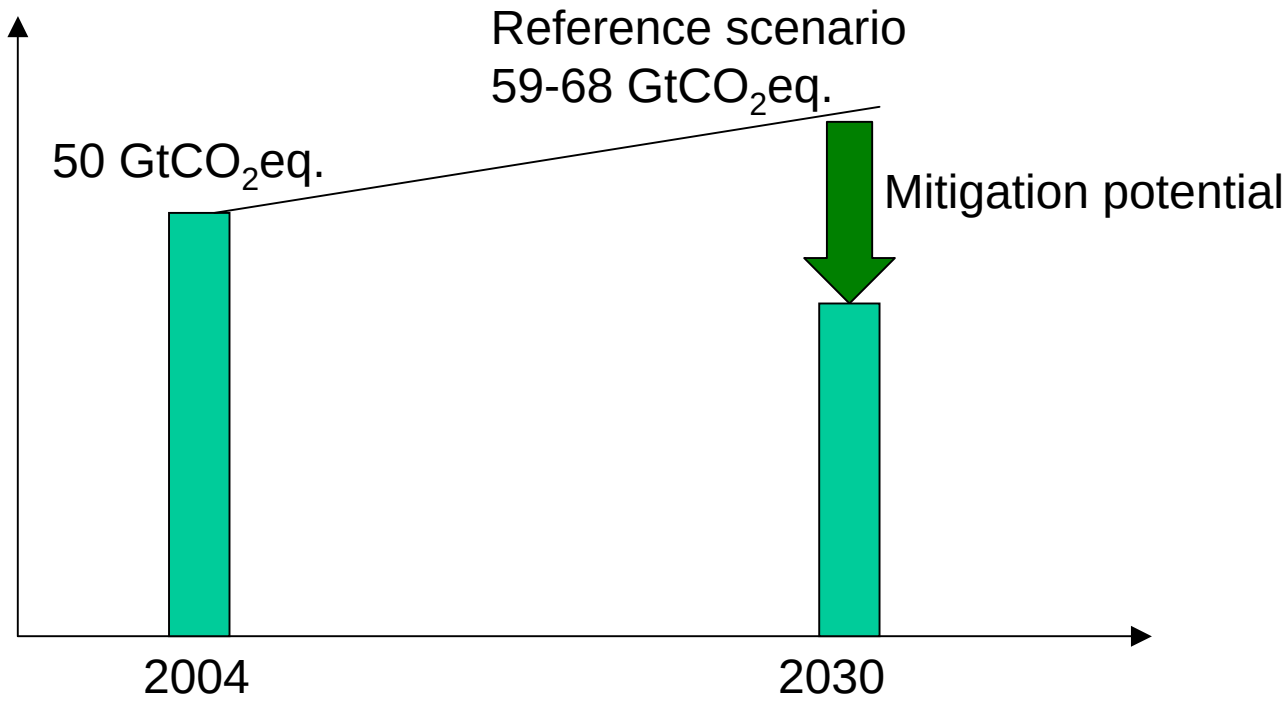
VI	855–1,130	4.9–6.1	+90 to +140			

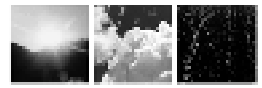
Review of studies that provided possible emission targets for countries (before trading) to reach a certain stabilization level

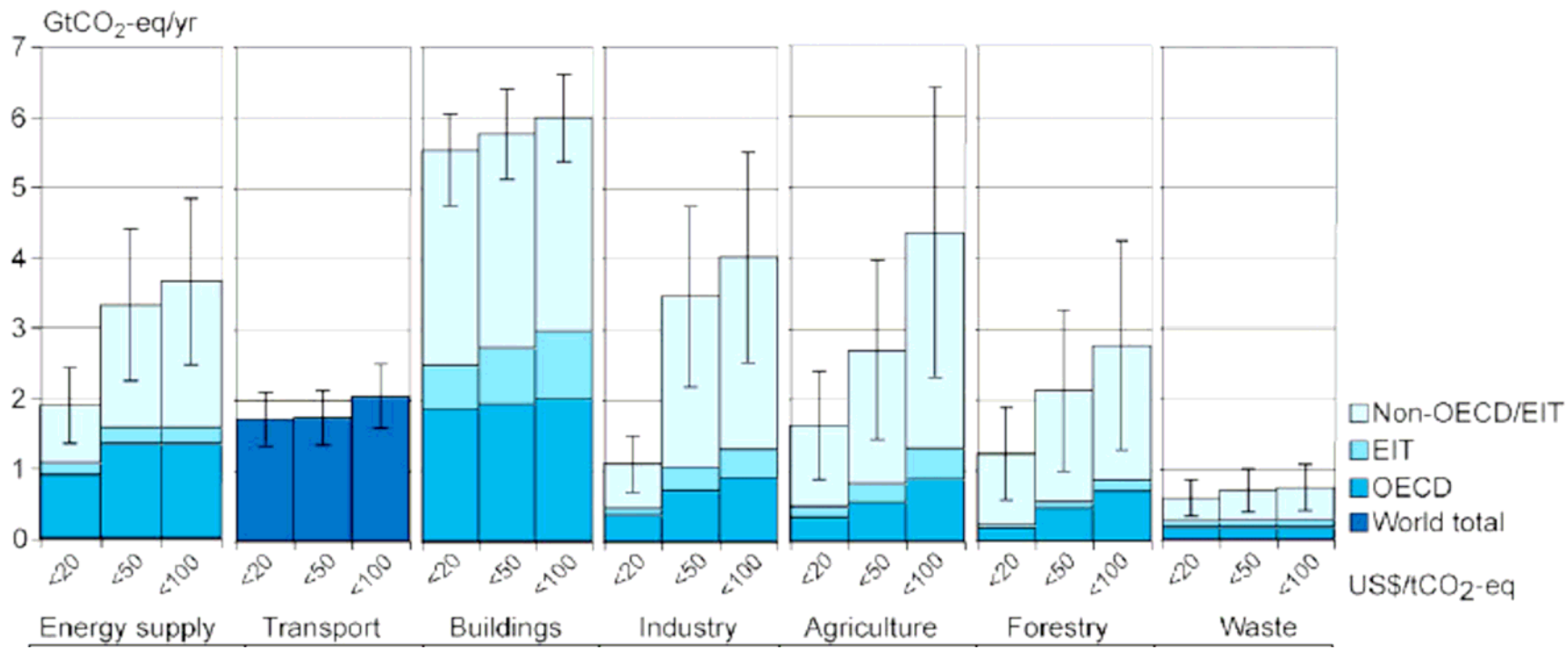
Source: IPCC AR4 WGIII

Mitigation potential



IPCC sectoral economic mitigation potential



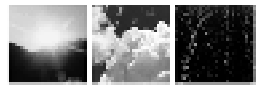


Conservative estimates because:

- Changes in lifestyle or behavioural aspects have not been considered
- Few studies have been undertaken for high carbon prices
- Some mitigation options were not analyzed (10% to 15%)

Source: IPCC AR4 WGIII SPM

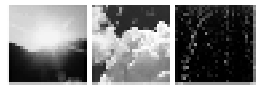
Summary



Source of estimate		2020 (% change compared to 1990)	2030 (% change compared to 1990)	2050 (% change compared to 1990)
National communications by some Annex I Parties: estimated effect of 'additional measures' on GHG emissions		57 to -45		
1. IPCC: required reductions for Annex I Parties based on allocation rules (before trading)	450 ppmv CO_2 eq	-25 to -40		-80 to -95
	550 ppmv CO_2 eq	-10 to -30		-40 to -90
	650 ppmv CO_2 eq	0 to -25		-30 to -80
2. IPCC: indication of possible reductions by Annex I Parties relative to scenarios A1B and B2, based on different levels for carbon price	USD 100		A1B: -22 to -39 B2: -18 to -34	
	USD 50		A1B: -27 B2: -23	
	USD 20		A1B: -19 B2: -15	

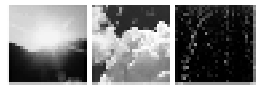
Source: IPCC AR4 SPM WGIII

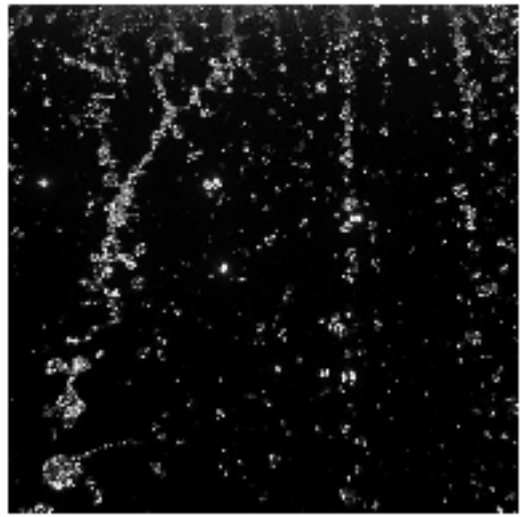
Options to obtain further information



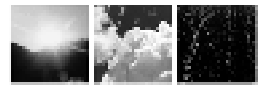
1. Comprehensive study with one model by an independent entity, using information provided by Parties
2. Further disaggregate the mitigation potential of the AR4
3. Assessment of mitigation potential per country by national experts

Thank you!

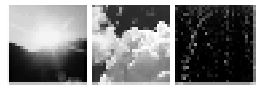


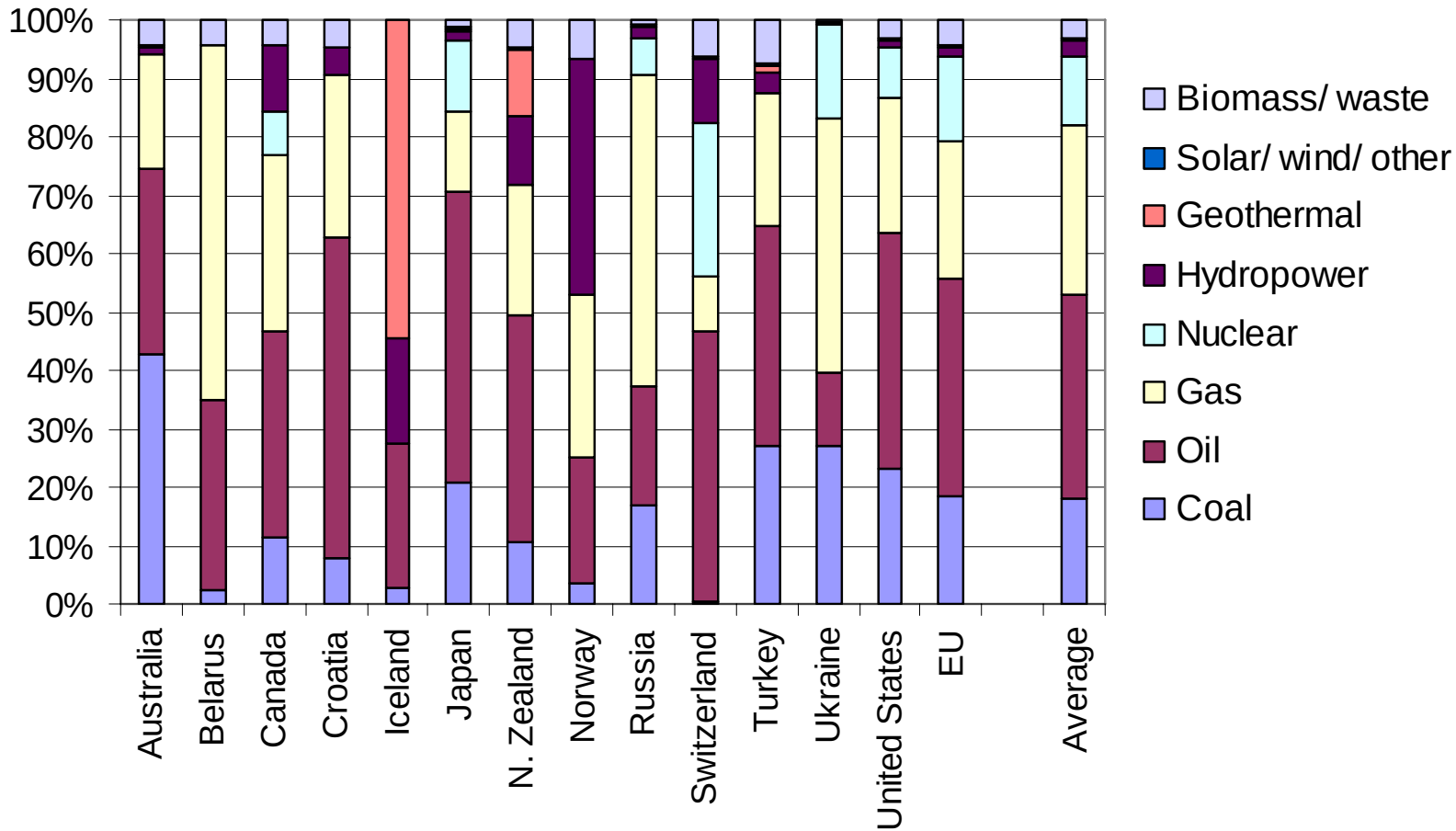


Backup slides



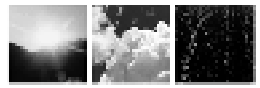
Energy mix





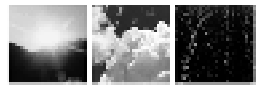
- Large contribution of fossil fuels
- Renewables: CAN, ICE, NZL, NOR, CHE
- Share of renewables (without hydro) usually below 5%

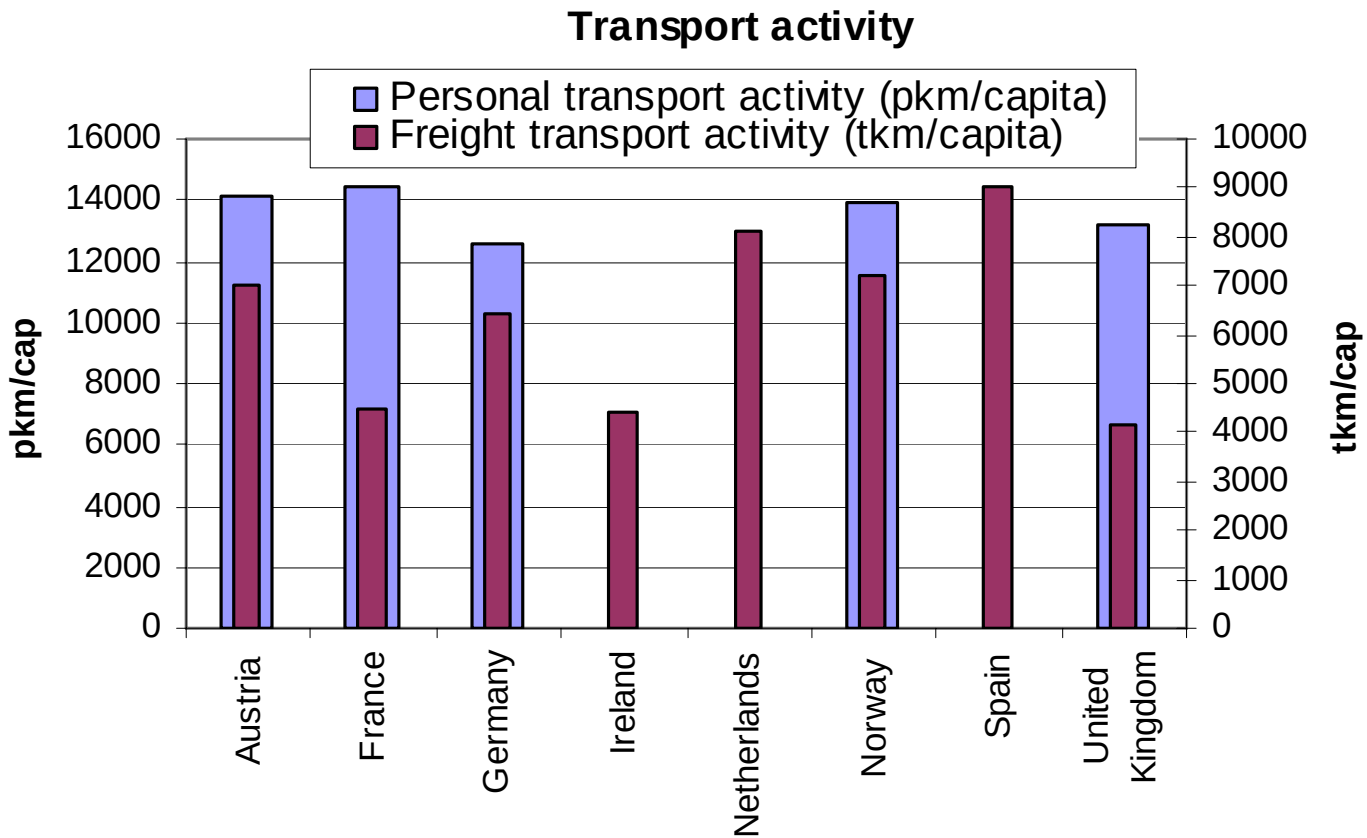
Split of sectors



Sector	IPCC source category
Energy industries and fugitive	1A1 Energy Industries 1B Fugitive emissions from fuels
Industry	1A2 Manufacturing industries and construction 2 Industrial processes 3 Solvents
Transport	1A3 Transport
Households and services	1A4 Other sectors 1A5 Other
Agriculture	4 Agriculture
Land-use change and forestry	5 Land-use change and forestry
Waste	6 Waste
International transport	1A3a,i Transport civil aviation international 1A3d,i Transport navigation international

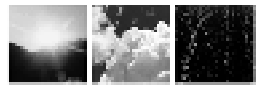
Transport

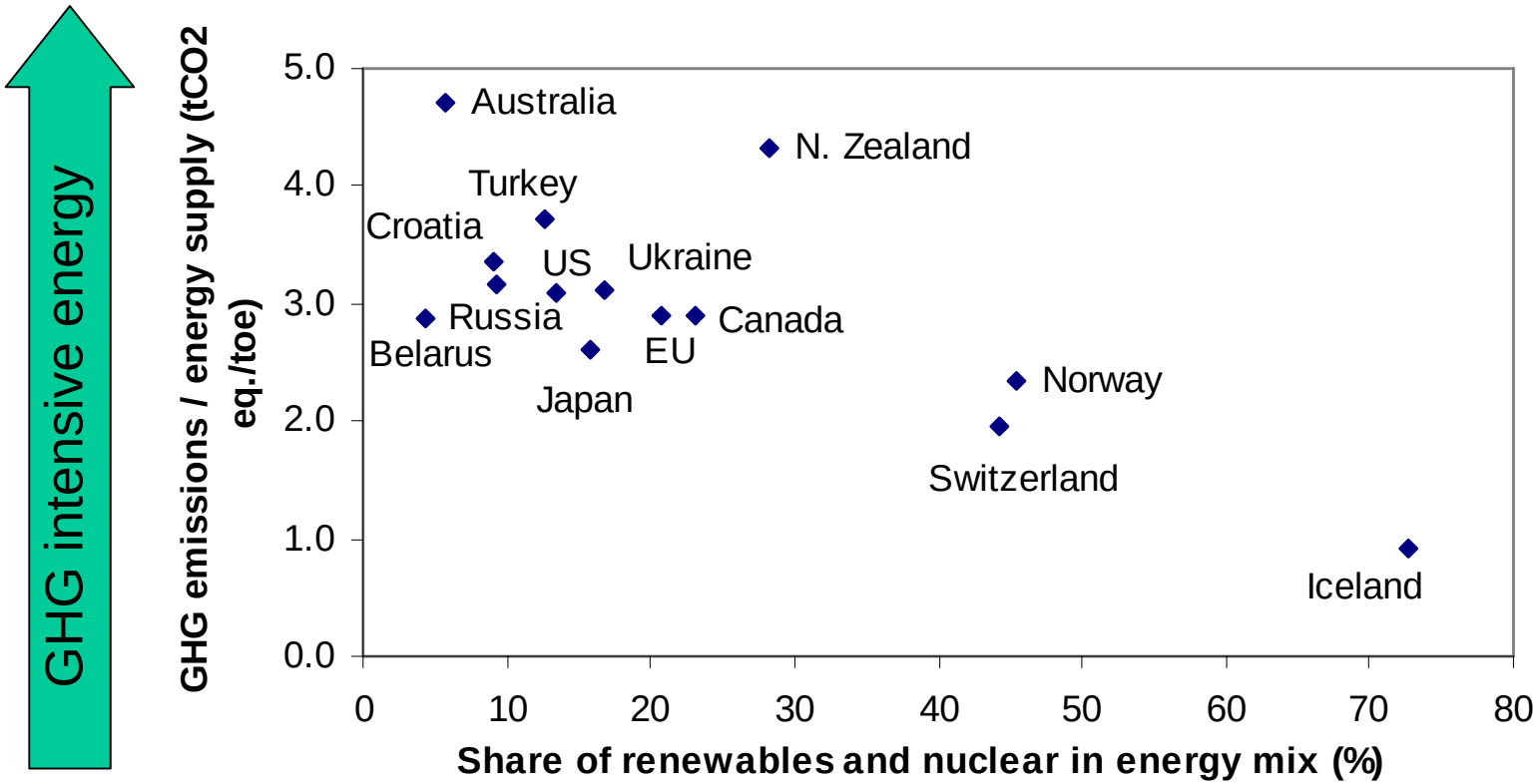




- Emissions vary substantially due to practices and geography
- Transport activity not readily available

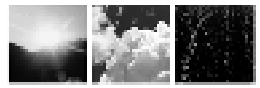
GHG and energy intensity

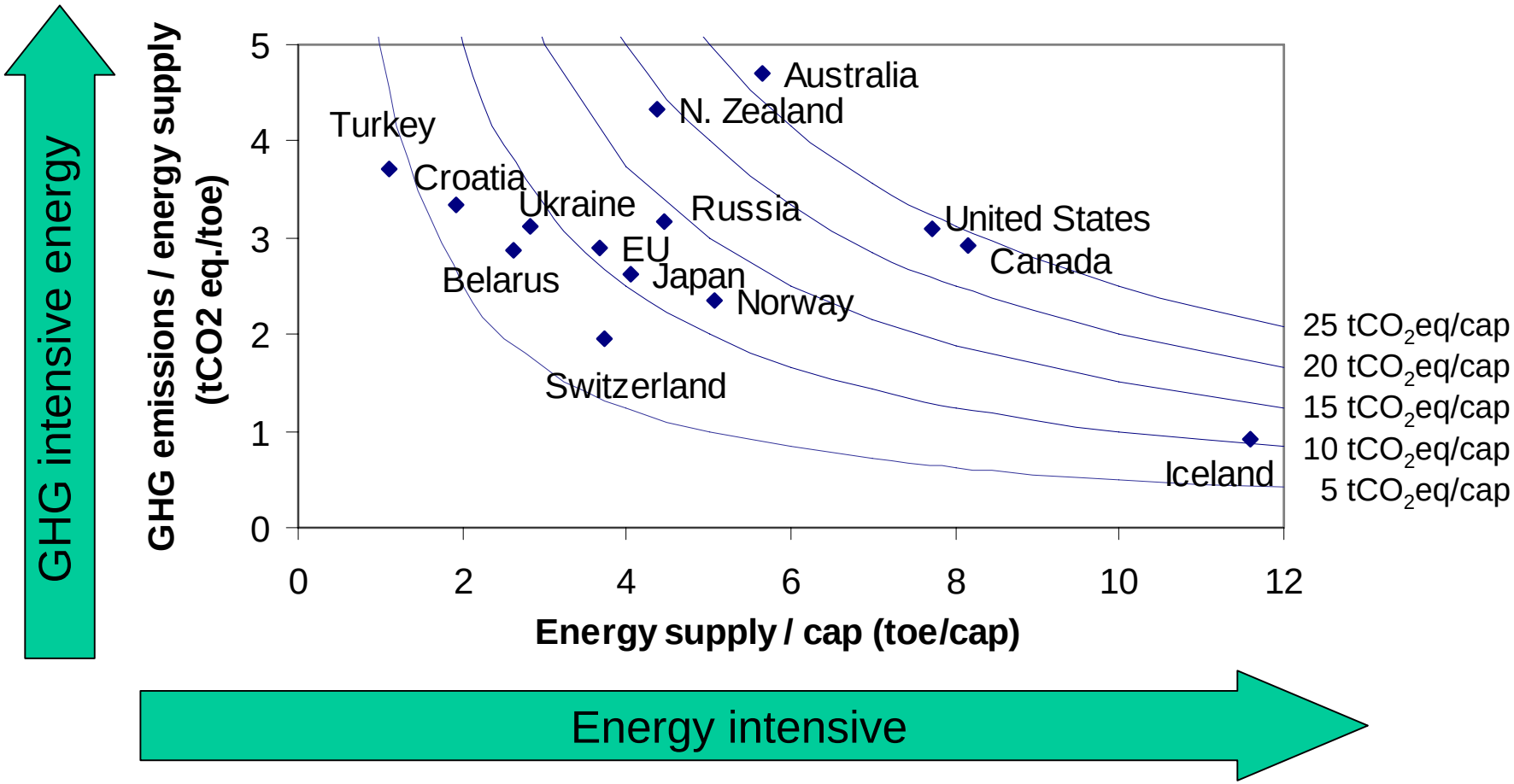




- With higher share of renewables and nuclear, the GHG intensity is lower
- GHG intensity also depends on share between coal and gas

GHG and energy intensity





- High per capita emissions occur in energy *and* GHG intensive economies

Global reductions