Overview

Economic models

Social and Economic Impacts of Response Measures

Marek Harsdorff
Economist, ILO

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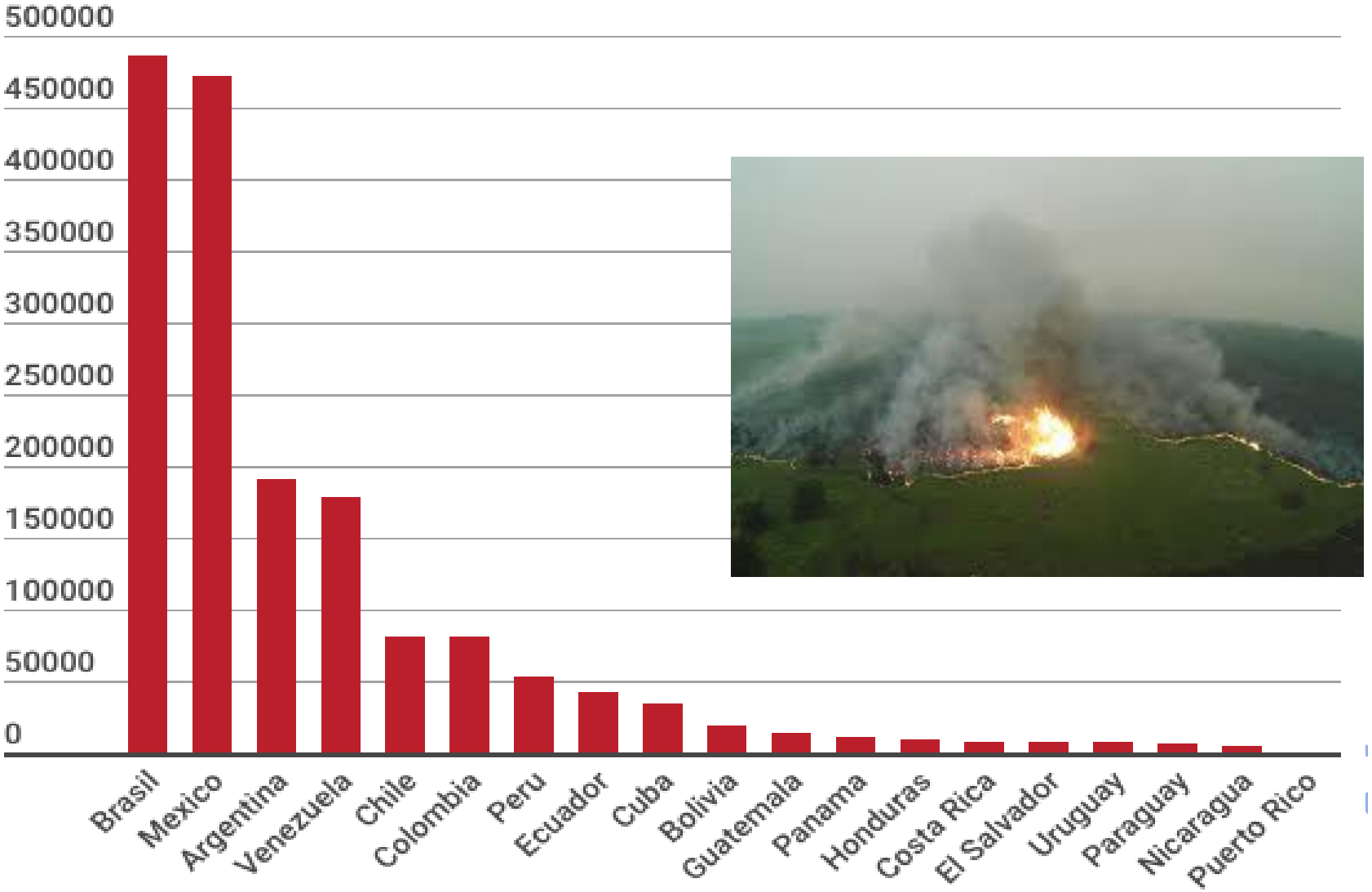
Outline

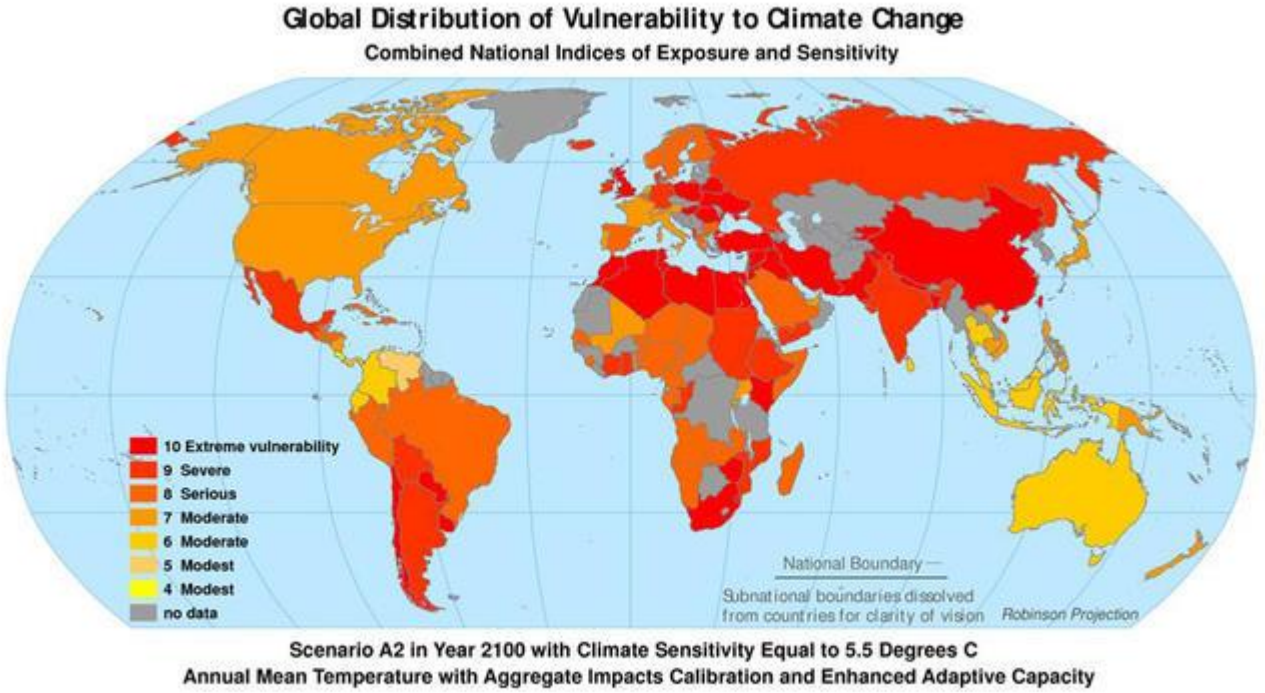
1. What is it we want to know?
2. Which model helps us to answer what we want to know?
3. How can modelling support policy making?
4. Do we have an example?

What is it we want to know?

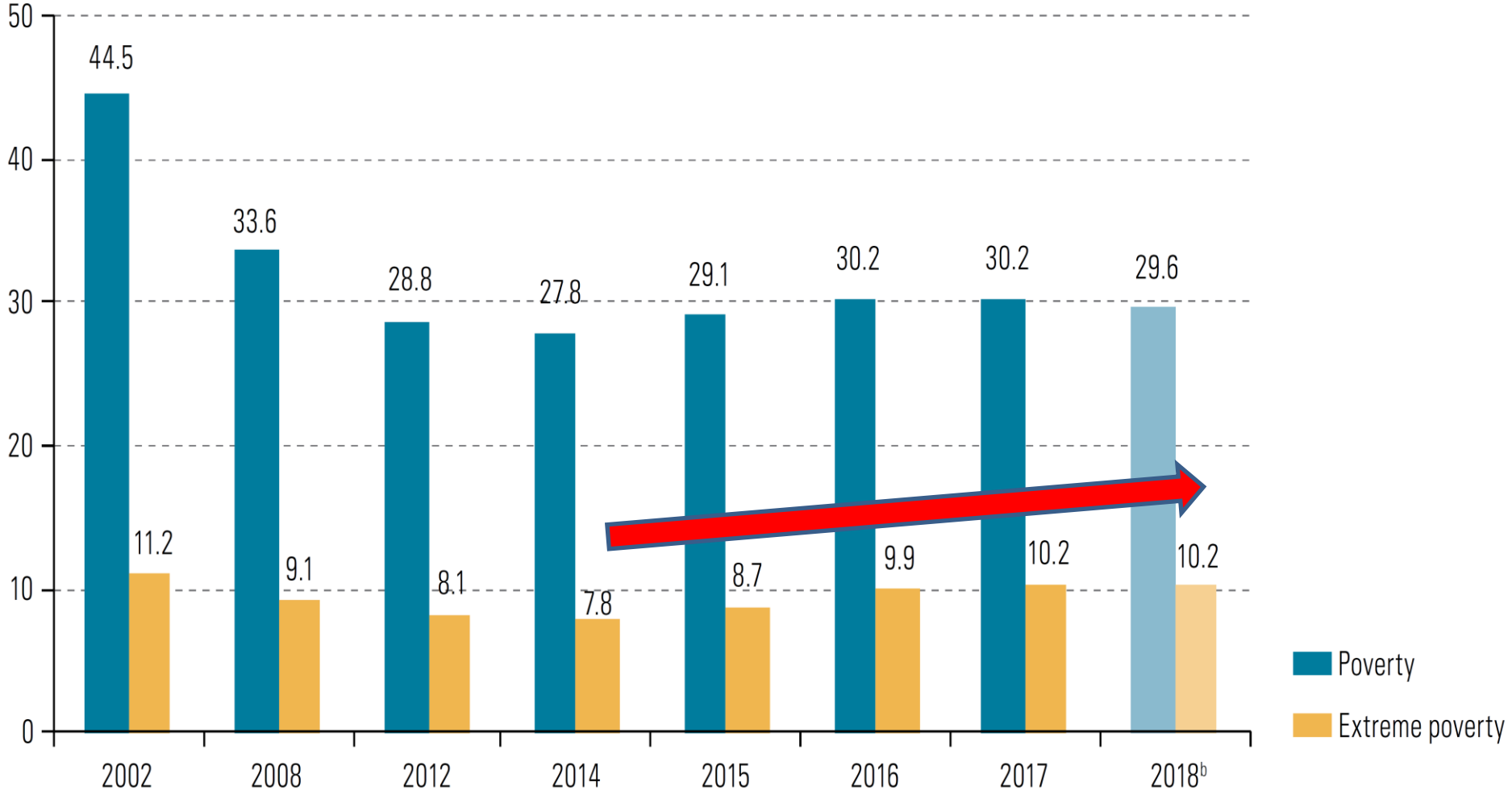
Total Energy Emissions Latin America and Caribbean (in tCO2)…



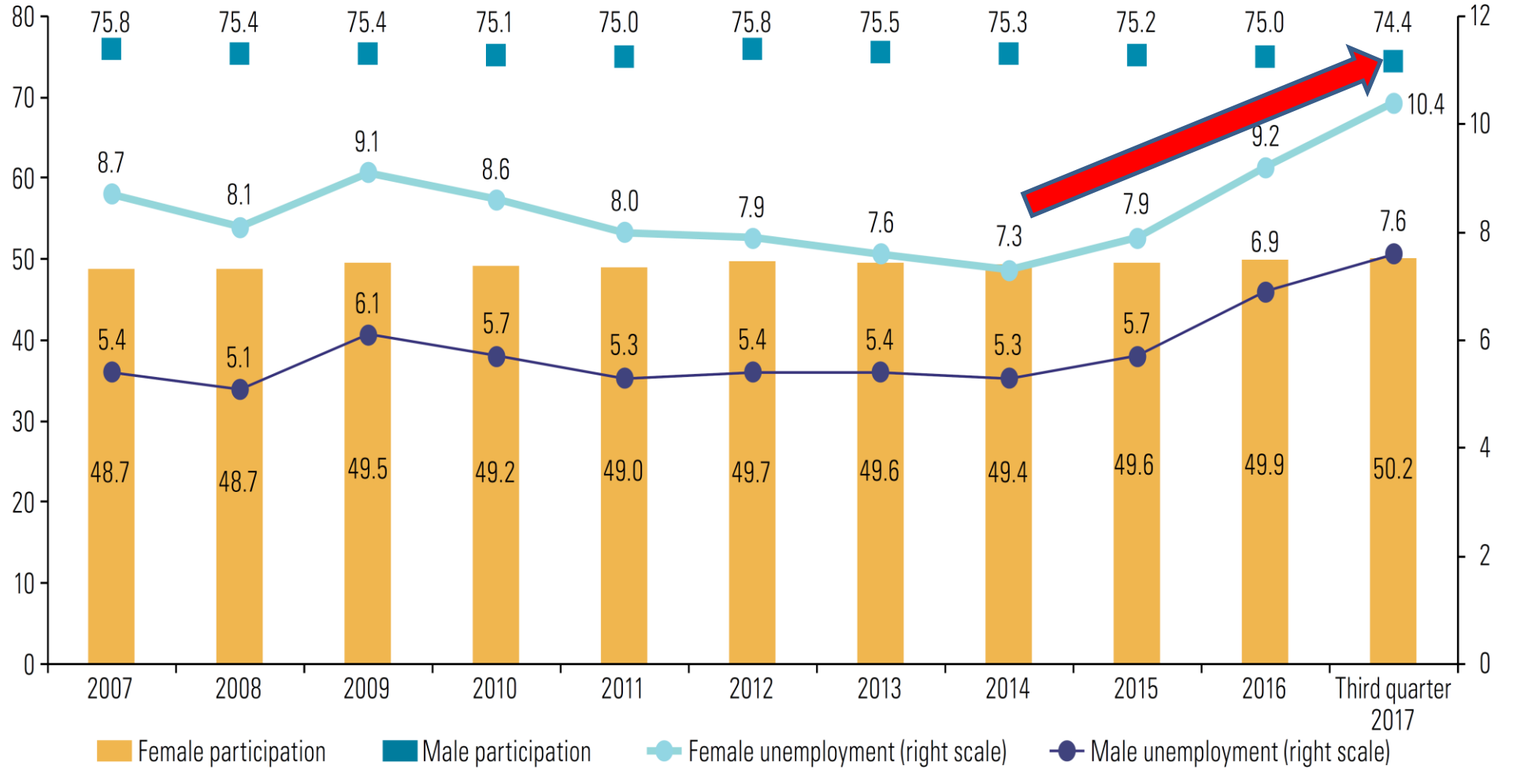
… causes the climate to change, we have to reduce emissions!



At same time, poverty, unemployment inequality…



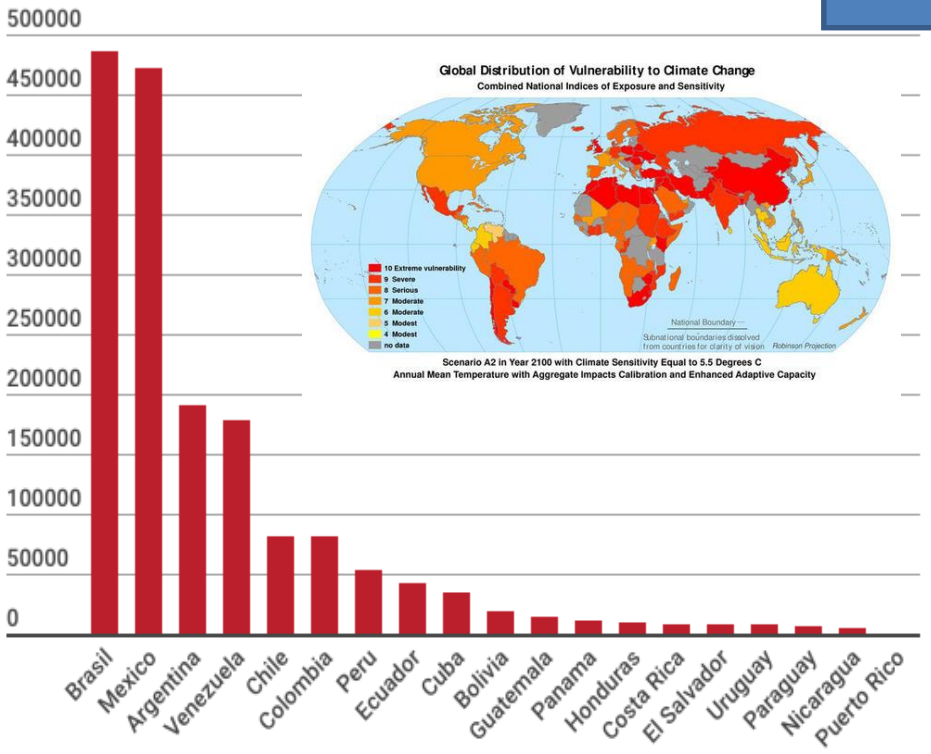
…need for labour and social inclusion!

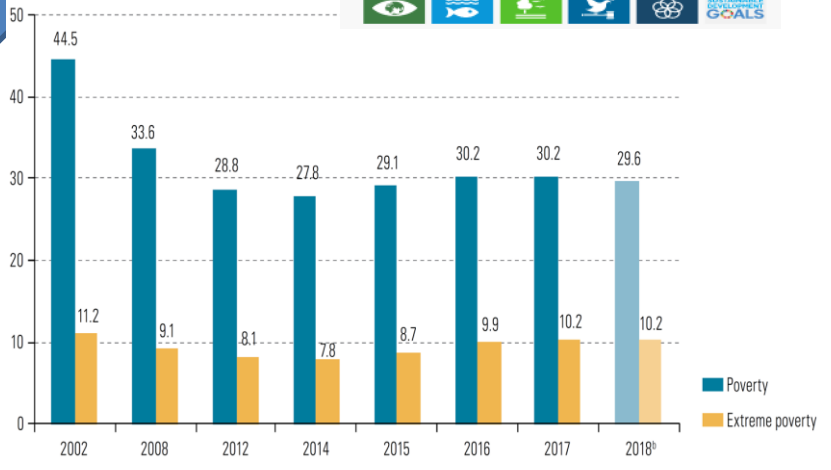


In short, we want to know:

How mitigation in countries and cross-border impacts on...

...jobs, poverty, inequality... SDGs



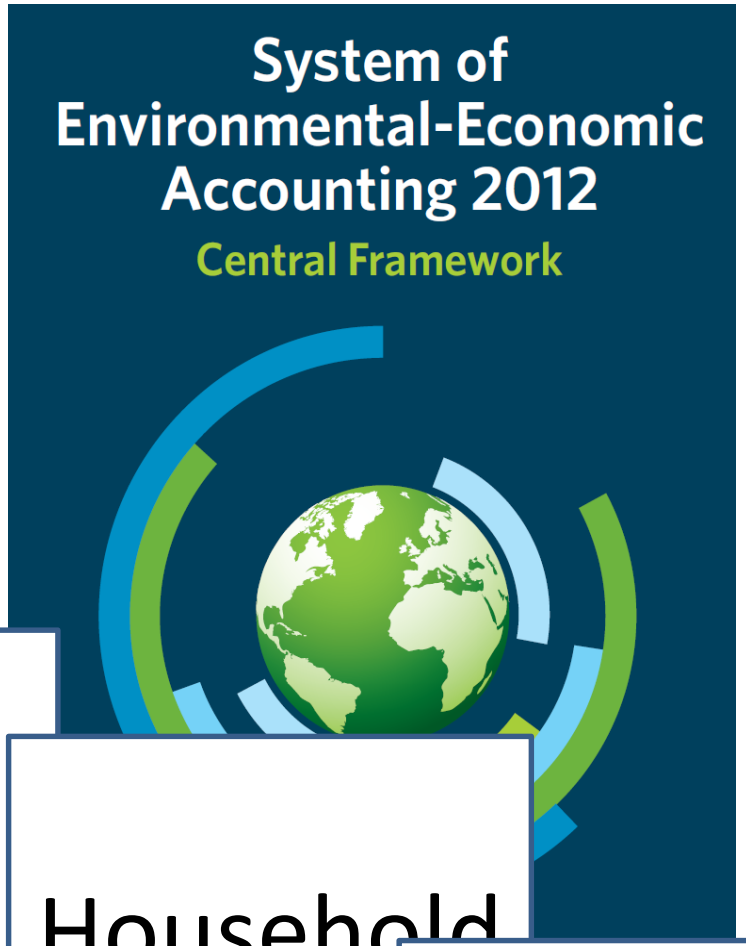


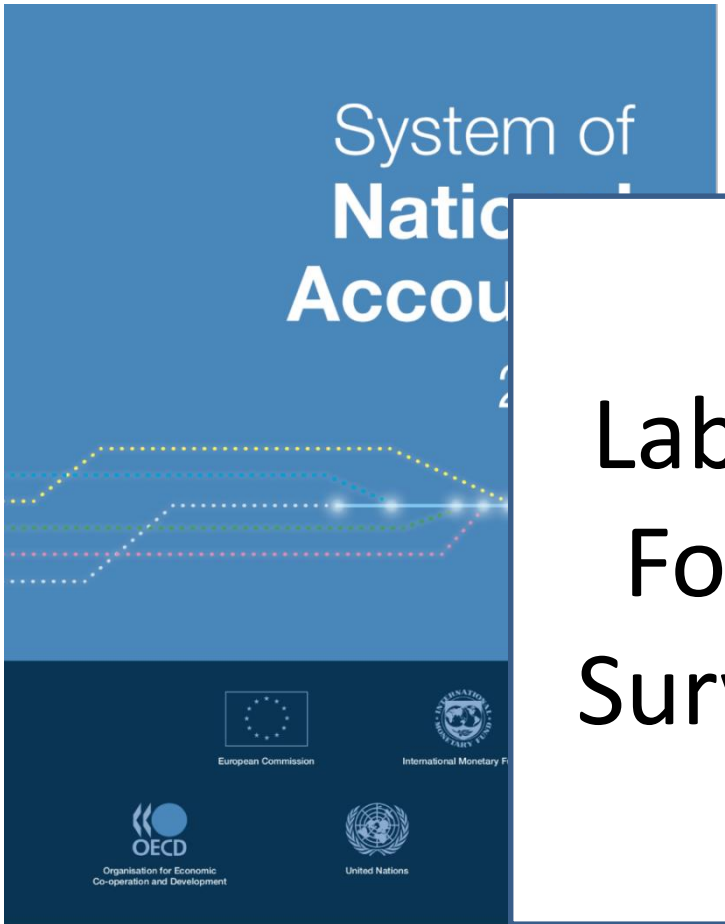
Minimize social & job loss, max gains!

Which model helps us to answer what we want to know?

All models start with statistics!

With multiple soc-eco-envi policy questions sources need to be combined!





Labour Force Surveys

Household Budget Survey

Environment Assessment

Social & Decent Work statistics

1 – Employment-to-population ratio

2 – Unemployment rate

3 – Youth not in education or employment

4 – Informal employment

5 – Working poverty rate

Based on international labour standards:

GUIDELINES FOR PRODUCERS AND USERS OF STATISTICAL AND LEGAL FRAMEWORK INDICATORS, ILO MANUAL , Sept.2013

available at http://www.ilo.org/wcmsp5/groups/public/---dgreports/---stat/documents/publication/wcms_223121.pdf

6 – Low pay rate (below 2/3 of average hourly earnings)

7 – Excessive hours (more than 48 hours per week)

8 – Incidence of children in child labour

9 – Precarious employment rate

10 – Occupational segregation by sex

11 – Female share of employment in ISCO-08 sub-major groups 11,12 and 13

12 – Occupational injury rate, fatal

13 – Share of population above a specified age benefiting from a pension

14 – Public social security expenditure (% of GDP)

15 – Union density rate

16 – Enterprises belonging to employer organization [rate]

17 – Collective bargaining coverage rate

18 – Indicator for Fundamental Principles and Rights at Work (to be developed)

Environment statistics

1. production, employment and expenditure relating to environmental activities (e.g. contribution of environmental activities to GDP, share of government expenditure on environmental protection)

2. resource intensity/CO2 per unit GDP of the economy (e.g. water and energy productivity, waste and emission intensity)

3. environmental taxes, environmental subsidies and similar transfers (e.g. total environmental taxes to GDP)

4. environmental assets and their role in the economy (e.g., changes in stocks of natural resources, depletion adjusted value added for extractive industries).

The Input-Output table provide an integrated data framework to combine data in a systematic way

		Sector			Final demand (f)			Total output
		Agricul-ture	Industry	Services	Household consump-tion	Invest-ment	Govern-ment consump-tion	
Sector	Agric.	z_{11}	z_{12}	z_{13}	C_1	I_1	G_1	x_1
	Industry	z_{21}	z_{22}	z_{23}	C_2	I_2	G_2	x_2
	Services	z_{31}	z_{32}	z_{33}	C_3	I_3	G_3	x_3
Value added	Wages	w_{L1}	w_{L2}	w_{L3}				
	Profits	w_{K1}	w_{K2}	w_{K3}				
Net taxes on prod.		t_1	t_2	t_3				
Total output		x_1	x_2	x_3				
Employment		*emp 1*	*emp 2*	*emp 3*				
CO2 Emissions		*e 1*	*e 2*	*e 3*				

From statistics to simple model?

Direct and indirect multipliers of emission & employment

(14)

- Additional 11 indirect jobs in mining, manufacturing, retail etc **(1)**
- And 1 ton indirect CO2

(22)

- Requires 21 direct jobs in construction
- Generates 11 tons CO2 **(2)**

Value of (USD) 10,000

Mexico

8 most affected Subsectors (selected out of 86)	Employment	Output (1,000 peso)	Output multiplier (per 1m peso)	Employment Multiplier (per 1m peso)
Agriculture	5,100,460	244,020,699	1.25	22
Organic Agriculture	290,026	5,266,653	1.26	57
Forestry	123,178	22,185,749	1.20	6
Livestock y fisheries	1,555,795	110,933,285	1.75	19
Extraction of oil and gas	354,558	1,038,839,692	1.23	1
Conventional electric energy	64,441	106,230,778	2.19	(22,360) 2.6
Renewable electric energy	67,071	69,983,023	1.84	(+24,080) = +1720 2.8
Water and gas	139,951	22,986,995	1.57	8
Construction	5,212,546	804,604,071	1.67	9
Sustainable construction	572,496	60,561,597	1.67	12
Manufacturing (food & textile)	1,845,010	627,446,259	1.74	8
Green Manufact. (food&textile)	138,872	26,143,594	1.74	10
Manufacturing (raw materials)	935,913	271,529,729	1.58	5
Green Manufact. (raw material)	70,445	11,313,739	1.57	8
Manufact. petroleum/coal	66,732	129,538,130	1.97	1
Chemical Industry	240,987	181,294,044	1.81	3
Manufacturing (equipment)	1,885,374	730,689,547	1.33	4
Green Manufact. (equipment)	141,910	30,445,398	1.33	6
Commerce	9,389,055	2,001,147,745	1.36	6
Transportation	1,560,233	531,221,505	1.52	4
Public Transport	953,573	291,778,132	1.46	4
Waste management	11,928	3,395,351	1.73	5
Education	2,058,941	554,208,187	1.14	4
Sustainable Tourism	4,422	2,224,985	1.48	3
TOTAL (all sectors)	44,151,091	11,863,314,346	11,863,314,346	

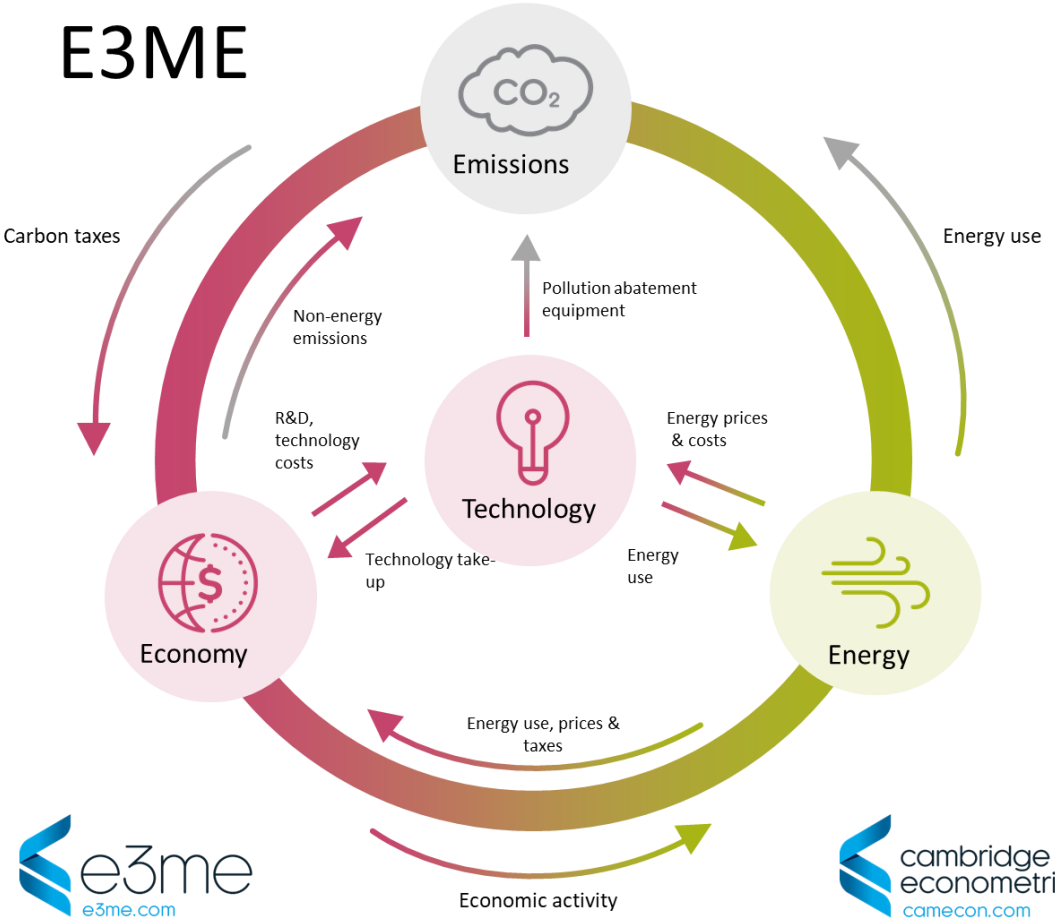
Ex. NDC to reduce CO2 per unit GDP (in construction)

IF GDP in construction grows by 10 million peso:

- In green 120 Jobs created and 4.3 tCO2
- In conventional 90 Jobs created and 13.4 tCO2

- CO2 intensity of GDP (in million peso) decreases from 1.3 to 0.4
- If transition & labour market policy: Then jobs can be created for unemployed, disadvantaged and poor

IO based Structural Simulation Model

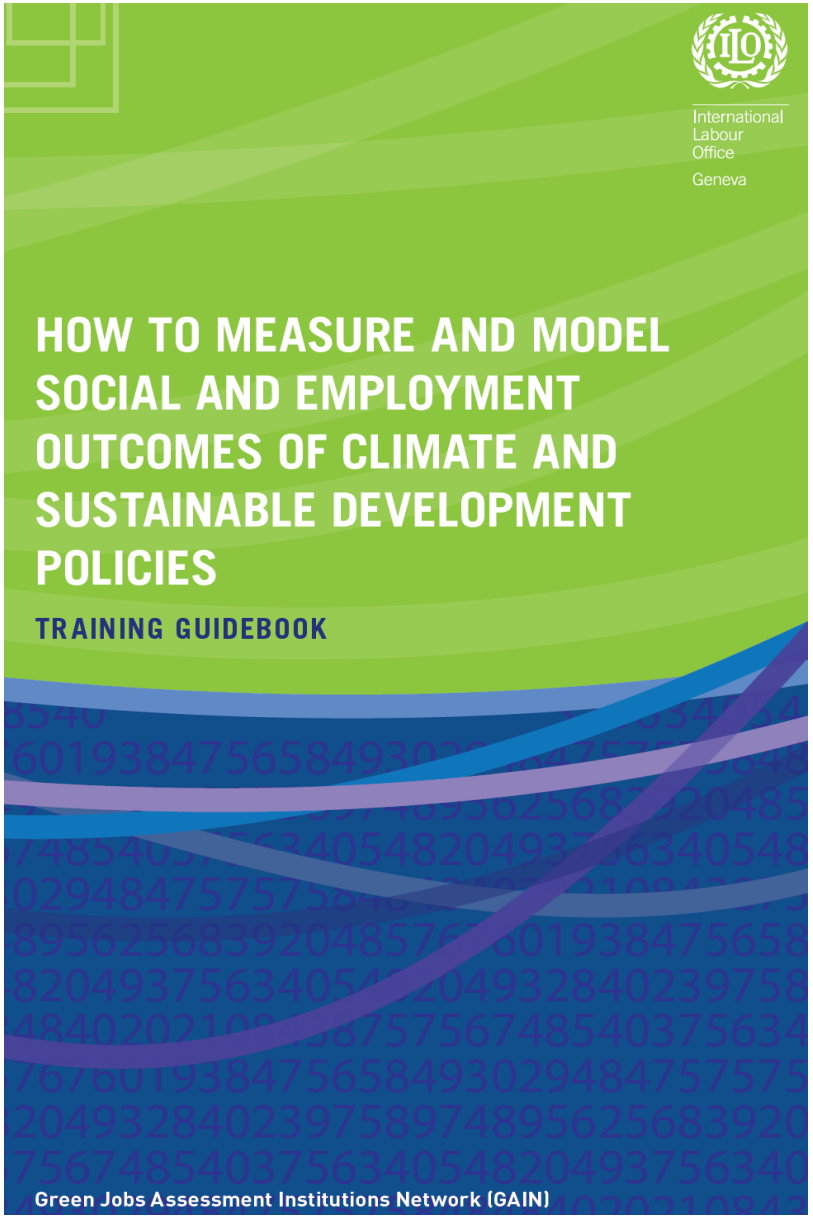


How can the modelling support policy making?

ILO Country assistance - GAIN

- ✓ Open source methodology Training Guide published
- ✓ Based on national data and needs

- ✓ Capacity building of Government & national institutions
- ✓ To build and run your own national model



Relevant modeling frameworks

1. Multiplier analysis based on Input Output (IOT) or Social Accounting Matrices (SAM).
2. Structural Multisectoral Simulation Models
   based on Input Output or Social Accounting Matrices
3. Computable General Equilibrium Models (CGE) based on Input Output or SAM
4. System Dynamics
   based on and combining multiple sources in long term feedback loops
5. Econometric

Desirable properties of Models

1. Include Economics, Environment and Social dimension, realistic features of the **labour market**.

2. Allow for **unemployment** or **underemployment formal and informal**

3. Social outcomes (inequality and distribution) need to feedback on demand **-> because this is reality.**

4. Country specific: Market adjustment tailored to the sectoral characteristics. Beyond multiplier analysis there is **no universal blueprint**.

GAIN members to support countries

33 Members, combining Research Institutes, Individual Researchers, and International Organisations

Binzagr Institute for Sustainable Prosperity
People. Planet. Prosperity.

cambridge econometrics
clarity from complexity

Global Green Growth Institute

GLIS

SINCE 1956
NCAER
QUALITY. RELEVANCE. IMPACT

Norwegian University of Science and Technology

ZIPAR
Zambia Institute for Policy Analysis & Research

IGES
Institute for Global Environmental Strategies

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

UNRISD
United Nations Research Institute for Social Development

United Nations
Framework Convention on
Climate Change

UNITED NATIONS UNIVERSITY
UNU-INRA
Institute for Natural Resources in Africa

In practice - stepwise approach

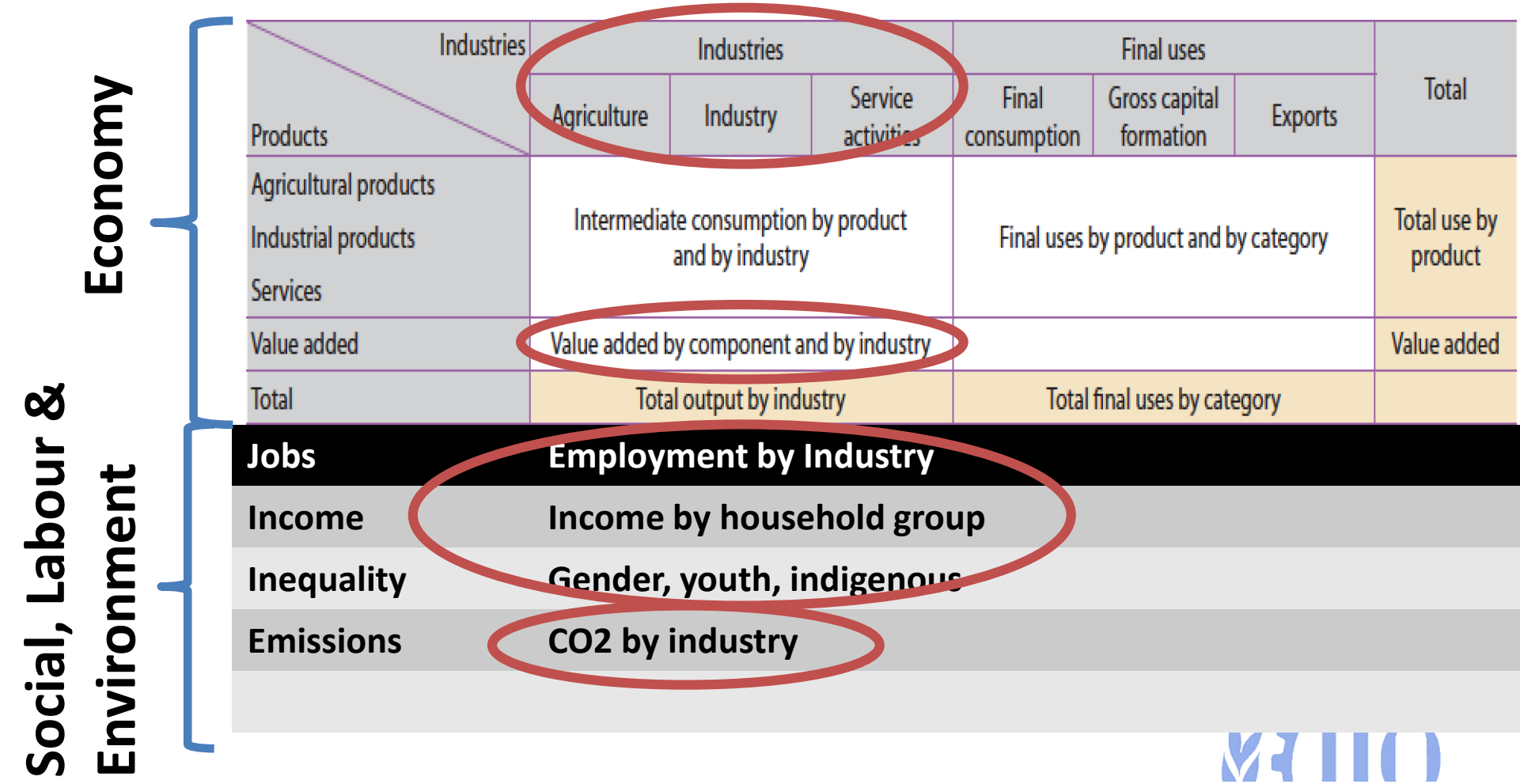
- ✓ Set-up of customized 2-3 year work programme
- ✓ Steering committee led by Government (statistic office, national economic research/university, social partners)
- ✓ Develop national capacity on statistics, economic model and policy making based on international guidelines
- ✓ Develop integrated data framework for public good and model for national development planning
- ✓ ILO experience in coordination with International Organizations (UN & Banks) and GAIN research partners
- ✓ Policy advice for better planning of social & job outcomes

Thank you!

Please ask questions

www.ilo.org/greenjobs

The Input-Output table provide an integrated data framework to combine data in a systematic way



Ex. IO table Germany

INPUT-OUTPUT TABLE (Billions of Euro)

			PRODUCTS						FINAL USE					Total output at basic prices
									Final consumption		Gross fixed capital formation	Changes in inventories	Exports	
			Agriculture	Manufacturing	Construction	Trade, trans.and comm.	Finance and business service	Other services	Households	Governmnet				
No.	PRODUCTS		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1)	Agriculture	Domestic	3	20				1	9			3	5	42
(2)	Manufacturing	Domestic	7	394	48	56	11	30	250	7	95	- 58	611	1 451
(3)	Construction	Domestic	1	11	18	8	28	10	5		153		1	234
(4)	Trade, transport and comm.	Domestic	4	139	17	181	38	40	317	15	39	6	111	907
(5)	Finance and business services	Domestic	6	131	30	124	261	51	313	3	25		66	1 010
(6)	Other services	Domestic		18	3	12	17	47	147	472	2		2	721
(7)	Total at basic prices		21	713	116	382	355	179	1 041	497	314	- 49	795	4 365
(8)	Agriculture	Imported	1	11				1	8			1	2	23
(9)	Manufacturing	Imported	4	246	15	21	3	12	111	7	57	27	160	664
(10)	Construction	Imported							1			3	20	25
(11)	Trade, transport and comm.	Imported		9	1	31	4	2						47
(12)	Finance and business services	Imported		16	1	6	24	5	8	2	4		8	73
(13)	Other services	Imported						1						1
(14)	Imports		5	283	17	58	31	21	128	9	61	31	189	833
(15)	Taxes less subsidies on products		2	10	2	12	17	24	151	6	34			257
(16)	Total at purchasers' prices		27	1 007	135	452	402	224	1 319	513	409	- 18	984	5 455
(17)	Compensation of employees	Value add.	6	308	69	294	191	364						1 232
(18)	Other taxes less subsidies on production	Value add.	- 6	- 2		- 1	5	- 7						- 12
(19)	Consumption of fixed capital	Value add.	8	79	5	60	160	63						375
(20)	Net operating surplus/Net mixed income	Value add.	7	60	25	101	252	77						523
(21)	GVA		15	445	99	454	608	497						2 117
(22)	Total input at basic prices		42	1 451	234	907	1 010	721	1 319	513	409	- 18	984	

EMPLOYMENT (1,000 persons)											
(29)	Wage and salary earners	295	6 787	1 948	9 821	5 693	11 356				35 900
(30)	Self-employed	359	275	463	1 297	1 017	1 059				4 470
(31)	Total	654	7 062	2 411	11 118	6 710	12 415				40 370
ENERGY (Petajoule)											
(32)	Coal and coal products		1 714	1	1		6	17	- 41	40	1 738
(33)	Brown coals and lignite products		1 617				1	21	- 9	24	1 654
(34)	Crude oil		4 294						- 7	5	4 291
(35)	Gasolines	3	91	4	25	20	15	868	4	248	1 278
(36)	Diesel fuels	106	123	79	476	93	74	387		355	1 693
(37)	Jet fuels				434		4		10	176	624
(38)	Heating oil, light	25	188	14	87	26	85	514	13	100	1 052
(39)	Fuel oil, heavy		336		17				- 13	217	557
(40)	Other petroleum products	2	1 190	101	35	2	3	48	- 1	161	1 540
(41)	Natural gas and other gases	12	1 797	12	125	49	184	936	228	465	3 808
(42)	Renewable Energy	6	1 178	5	45	7	6	299	1	18	1 564
(43)	Electric power and other energy	23	2 641	14	289	76	197	678	127	198	4 242
(44)	Total	178	15 167	230	1 535	273	574	3 767	311	2 006	24 043
EMISSIONS (1,000 tons)											
(45)	Carbon dioxide (CO2)	9 260	550 893	9 162	80 990	12 077	24 173	222 268			908 823
(46)	Methane (CH4)	1 247	925	1	49	3	10	79			2 313
(47)	Nitrous oxide (N2O)	137	62		2			4			206
(48)	Nitrogen oxides (NOx)	153	538	46	398	33	45	314			1 526
(49)	Sulfur dioxide (SO2)	3	373	1	41	2	8	42			469
(50)	Organic compounds (NMVOC)	13	574	6	40	3	7	310			952
(51)	Ammonia (NH3)	541	16		2			20			579
(52)	Particulate matter (PM10)	47	42	7	43	2	3	48			192
(53)	Hydroflurocarbons (HFC)		12								12
(54)	Perflurorocarbons PFC										
(55)	Sulfur hexafluoride (SF6)										
(54)	Total	11 402	553 435	9 222	81 565	12 120	24 246	223 084			915 073
GLOBAL WARMING AND ACID DEPOSITION (1,000 tons)											
(55)	Greenhouse gases 1)	77 990	589 463	9 232	82 710	12 195	24 482	225 115			1 021 188
(56)	Acid deposition 2)	110	749	33	320	25	39	261			1 537
(57)	Tropospheric ozone formation 3)	1 413	2 036	52	487	38	61	703			4 792
WASTE, SEWAGE AND WATER											
(58)	Waste (1.000 tons)	804	122 849	194 098	4 945	5 510	3 931	36 033			368 171
(59)	Sewage (Mio. cbm)	21	26 970	38	173	193	137	3 118			30 650
(60)	Water from waterworks (Mio. cbm)	136	- 3 725	14	194	216	154	3 011			
(61)	Water from nature (Mio. cbm)	303	37 608	25	9	10	7	25			37 986