Energy Flow Accounts of Germany: Compilation - Application

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Contents

1. Compilation issues
2. Energy efficiency Indicators (AG EB)
3. „Energiewende“ Monitoring (BMWi, BMU)
4. EEA analysis

1. Compilation issues

- **Physical Energy Flow Accounts for 34 energy sources and 72 industries ("KAUs": el. generation one sector!)**
- **Monetary Energy Flow Accounts not integrated! (Exchange)**
- **Statistical base data:**
  - **energy balance (AG EB), energy statistics for manufacturing and power plants, data from refineries (Mineralöldaten), BAFA (crude oil, natural gas), Research institutes (services, households)**
- **Additional compilations for private households:**
  - **Fuel consumption of vehicles by industry, Energy consumption of households by hh-size and application area, temperature adj.**
- **eeIOA: hybrid I/O model for energy and CO_2 (cf. slide 20)**

1. Selected compilation issues:

- Electricity and gas:
  net accounting (acc. to NA.) – monetary accounts: adjustment of traded energy (“Fremdbezug”);
  full coverage of electricity generation.
- Concentration on the presentation of the use side!
- Classification: more detail for selected energy-intensive sectors (disaggregation of CPA 19,23,24,35,49)
  aggregation of service sectors (58-63,64-66,69-75,77-82,90-98)
- Bunkering: detailed calculations for road transport, aviation and inland navigation, water sea transport: ???)

2. Selected Indicators on Energy Efficiency based on the energy balance

No.	Indicators	Variables	Remarks
	Primary energy		
1.1	Overview. Energy intensity for Germany	PEV, BIP, Pop, electr.	BIP: chained volume, adj. for prices
1.2	Energy productivity economy-wide	PEV, BIP, Pop	+PEV adjusted for temp. & stocks
1.3	Energy efficiency (intensity) economy-wide	PEV, BIP, Pop	
1.4	Energy efficiency (intensity) economy-wide (adj.)	PEV, BIP, Pop	+PEV adjusted for temp. & stocks
	For electricity:		
1.5	Energy efficiency (intensity) economy-wide	El.CON, BIP, Pop	
1.6	Energy productivity economy-wide	El.CON, BIP	
	Electricity generation		
2.1	Efficiency (transformation ratio) & specific fuel cons.	El. output, fuel inputs	incl. Renewable energy
2.2	Efficiency & specific fuel cons. (fossile fuels)	fossile fuels	
	Final energy (FE)		
3.1	Energy efficiency (intensity) economy-wide	FE, BIP, Pop	FE: actual values
3.2	Energy efficiency (intensity) economy-wide (adjusted)	FE, BIP, Pop	FE adjusted for temp. & stocks
	Analysis for sectors:		
4	Energy efficiency (intensity) for manufacturing	FE, Fuels, EL, gr. output	
5	Energy efficiency (intensity) for manuf.,trade, services	FE, Fuels, EL, GVA	GVA: adjusted for price
6.1	Energy efficiency of private households	FE, Fuels, EL, living area	
6.2	Energy efficiency of private households (adjusted)	FE, Fuels, EL, living area	EN cons. adjusted for temp. & stocks
7	Energy efficiency for transport	FE, Fuels, EL, transp. perf.	Transport performance: persons-km (1 tons-km = 10 persons-km)

Source: AG Energiebilanzen, Ausgewählte Effizienzindikatoren zur Energiebilanz Deutschland.

Ed. from Sept. 2013: data for 1990 to 2012.

PEV: Consumption of primary energy (IEA: TPES); FE: Final energy; BIP: GDP; GVA: Gross value added.

3. Indicators for the Monitoring of the "Energiewende" in Germany - TOPICS

A	Energy supply	6
B	Energy efficiency	3
C	Renewable energy	5
D	Power plants	5
E	Electricity grids	6
F	Buildings	6
G	Transport	4
H	Greenhouse emissions	4
I	Energy prices and costs	7
J	Effects on the economy	3
		49

Indicators for the Monitoring of the "Energiewende" in Germany – TOPICS cont.

A	Energy supply	Targets	Source
1	Total primary energy supply by energy sources	X	EB
2	Final energy consumption by energy sources	X	EB
3	Final energy consumption by sectors		EB
4	Gross final energy consumption		(EB)
5	Gross electricity production by energy sources		EB, oth.
6	Electricity consumption by sectors	X	EB
B	Energy efficiency for …		
7	Economy-wide	X	EB, NA
8	Sector "manufacturing"		EB, NA
9	Sector "manufacturing (sme), trade, services"		EB, NA

EB: energy balance.

Indicators for the Monitoring of the "Energiewende" in Germany – TOPICS cont.

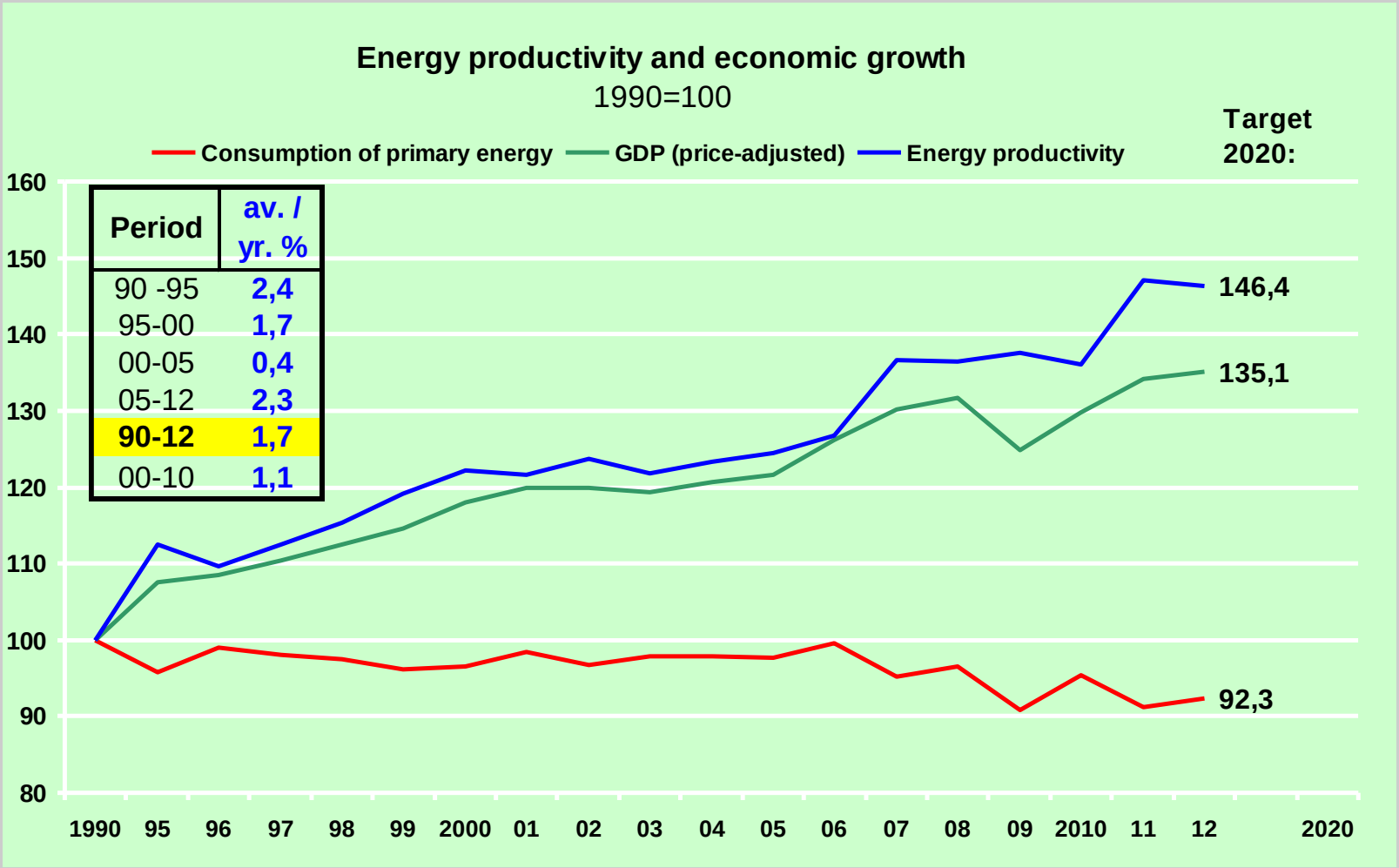
F	Buildings	Targets	Source
26	Primary energy consumption	X	AG EB
27	Final energy for heating	X	EB, EEA
28	Renovation rate	X	Est., KfW
29	Final energy consumption buildings		AG EB
30	Areas		StBa, oth.
31	Investments		StBa, DIW
G	**Transport**		
32	Final energy of sector "transport"	X	EB
33	Stocks of e-vehicles	X	KBA
34	Fuel consumption of new cars		KBA
35	Transport performance		DIW, KBA

KBA: Kraftfahrtbundesamt; DIW: Deutsches Institut für Wirtschaftsforschung;
KfW: Kreditanstalt für Wiederaufbau; StBa: Statistisches Bundesamt; EEA: Environmental Economic Accounts.

Indicators for the Monitoring of the "Energiewende" in Germany – TOPICS cont.

J	Effects on the economy	Targets	Source
47	Costs and benefits		
	Costs for primary energy sources		BMWI, EB
	Expenditures of central government for research on energy topics		BMWI
	Fortschrittsbericht 2014 ! (Modeling)		
48	Investments for renewable energy		BMU
49	Employment		
	conventionel energy sector		StBa
	employed linked with investments in renewables		BMU

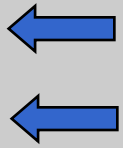
4. EEA: Energy productivity: economy wide



Period	av. / yr. %
90 -95	2,4
95-00	1,7
00-05	0,4
05-12	2,3
90-12	**1,7**
00-10	1,1

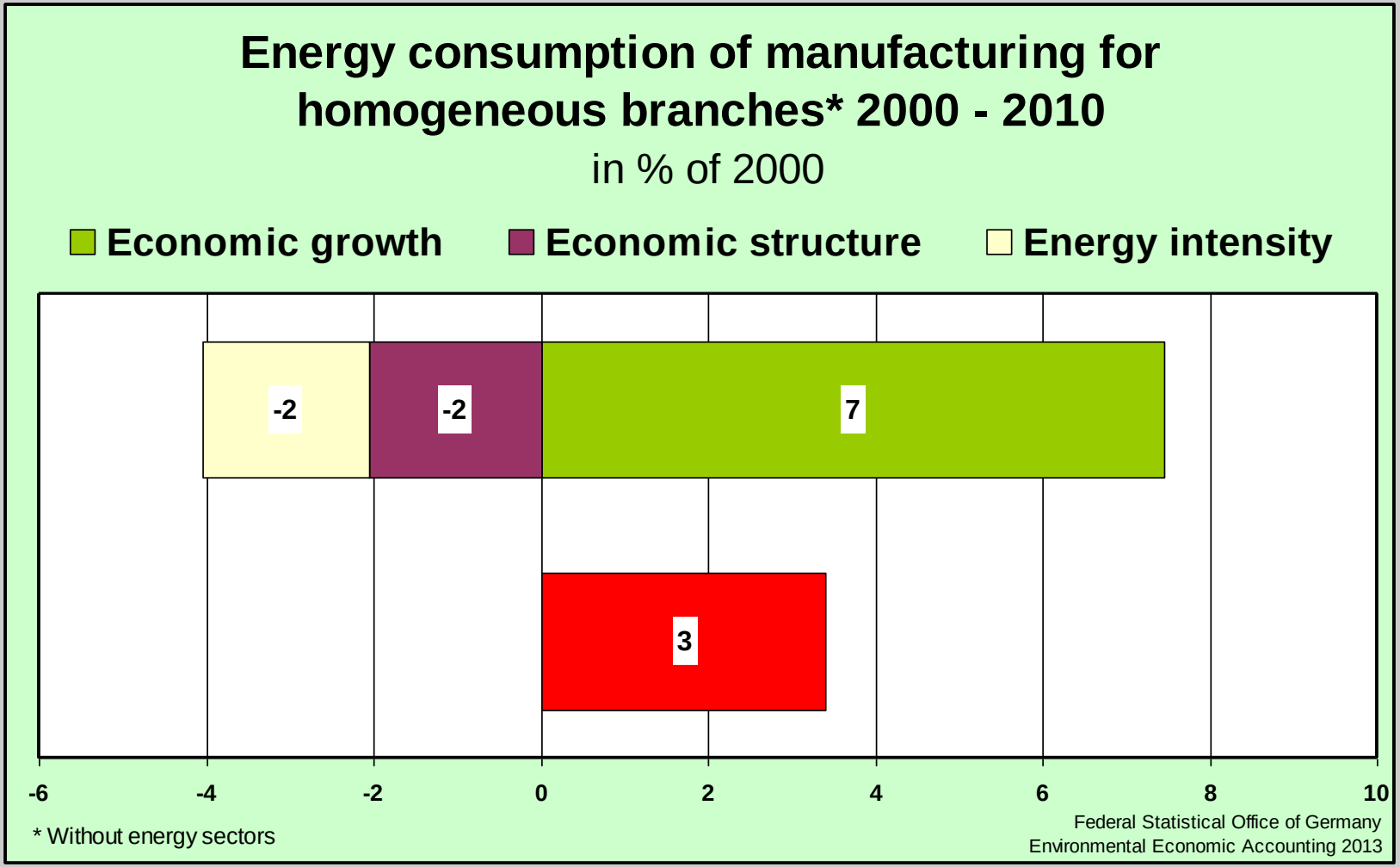
Energy consumption 2000 - 2011 by sectors (source: energy balance)

	2000	2010	2011	2012
	Petajoule			
TPES	14.401	14.217	13.599	13.757
Final energy consumption	9.234	9.310	8.881	8.998
Households	2.584	2.676	2.333	2.431
Manuf. *), trade, services	1.478	1.483	1.346	1.397
Manufacturing	2.421	2.592	2.634	2.599
Transport	2.751	2.559	2.568	2.571
	2000 = 100			
TPES	100	98,7	94,4	95,5
Final energy consumption	100	100,8	96,2	97,4
Households	100	103,5	90,3	94,1
Manuf. *), trade, services	100	100,3	91,1	94,5
Manufacturing	100	107,1	108,8	107,3
Transport	100	93,0	93,3	93,5



*) Small units.

a) Energy consumption/productivity in manufacturing



Decomposition analysis on energy consumption of manufacturing industries in Germany 2000 - 2010

Effects	2010 to 2000	2010 to 2005	2005 to 2000	2010 to 2000
	Petajoule			%
Total energy	118	-15	134	3,4
Economic growth	259	152	107	7,5
Economic structure	-71	-204	133	-2,0
Energy intensity	-70	36	-106	-2,0

Gross value added in manufacturing 2000, 2010

CPA	Industries	GVA [1] 2000	GVA [1] 2010	GVA [1] change
20	Chemical industry	6,4	6,9	0,5
23	Glass, ceramics	4,2	3,0	-1,2
24	Steel , non-iron ind.	4,1	3,7	-0,4
28	Machinery & equipment	14,6	16,1	1,5
29	Motor vehicles	9,9	13,0	3,1
	Sum [2]	**39,3**	**42,7**	**3,4**
	Total manufacturing [2]	100	100	

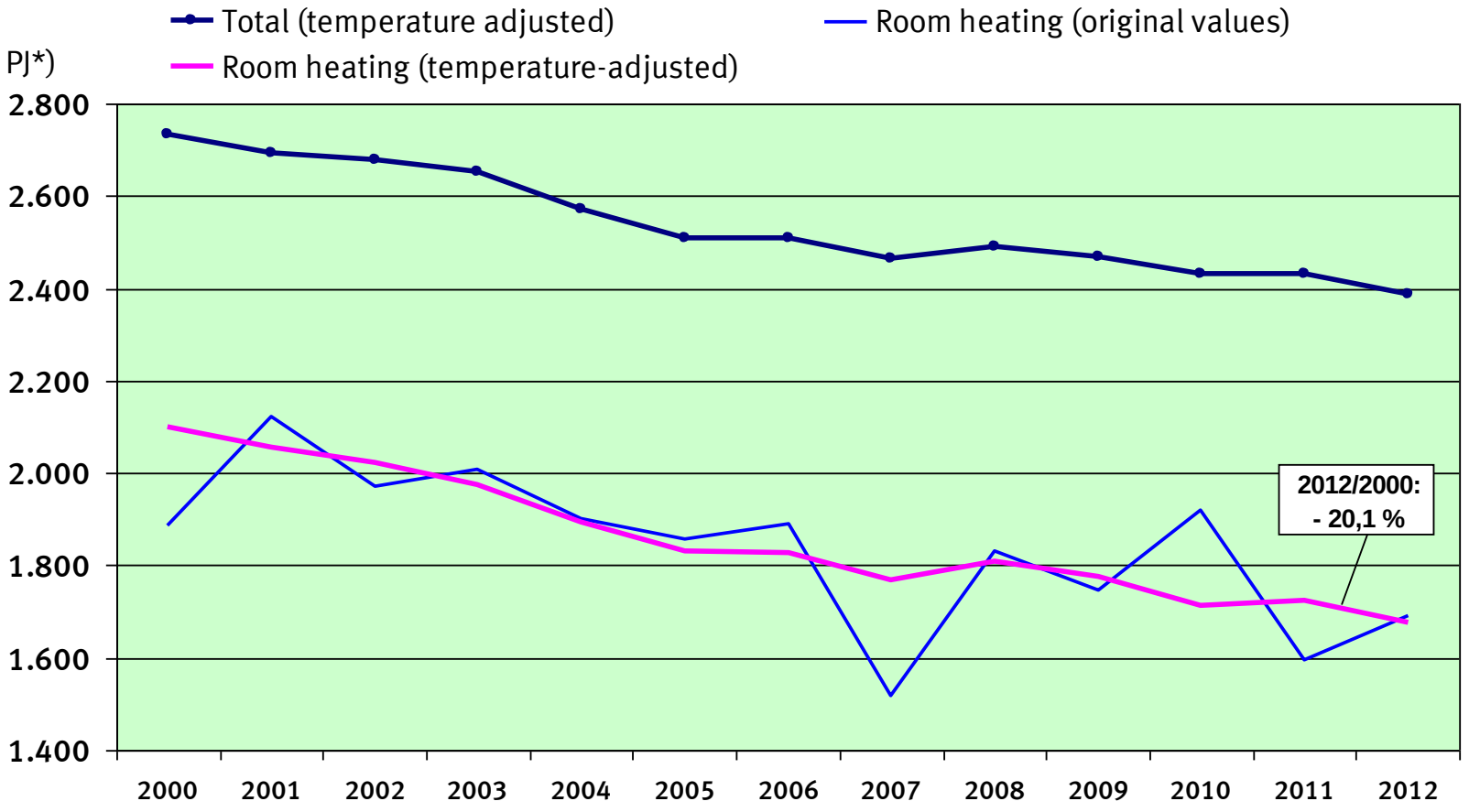
1) Gross value added price-adjusted (unit deflator).

2) Excl. Energy producing industries.

b) Energy consumption of private households by areas of application

	2000	2010	2011	2012	12/00
	Petajoule				%
Final energy (energy balance)	2.584	2.676	2.333	2.431	-5,9
adjustments	149	-245	97	-45	
Final energy (temp. & stocks adj.)	2.734	2.431	2.431	2.386	-12,7
Room heating	**2.099**	**1.714**	**1.723**	**1.678**	**-20,1**
Warm water	278	305	305	304	9,4
Cooking, washing etc.	129	150	147	148	14,7
Electrical equipment	186	215	211	211	13,9
Lighting	42	46	45	45	8,5
	percentage of final energy				**%-pts.**
Room heating	76,8	70,5	70,9	70,3	-6,5

Energy consumption of private households 1995-2012



*) 1 PJ= 1 Petajoule= 10^{15} Joule

Federal Statistical Office of Germany
Environmental Economic Accounting 2013

Private Households and energy for heating 2000 and 2012

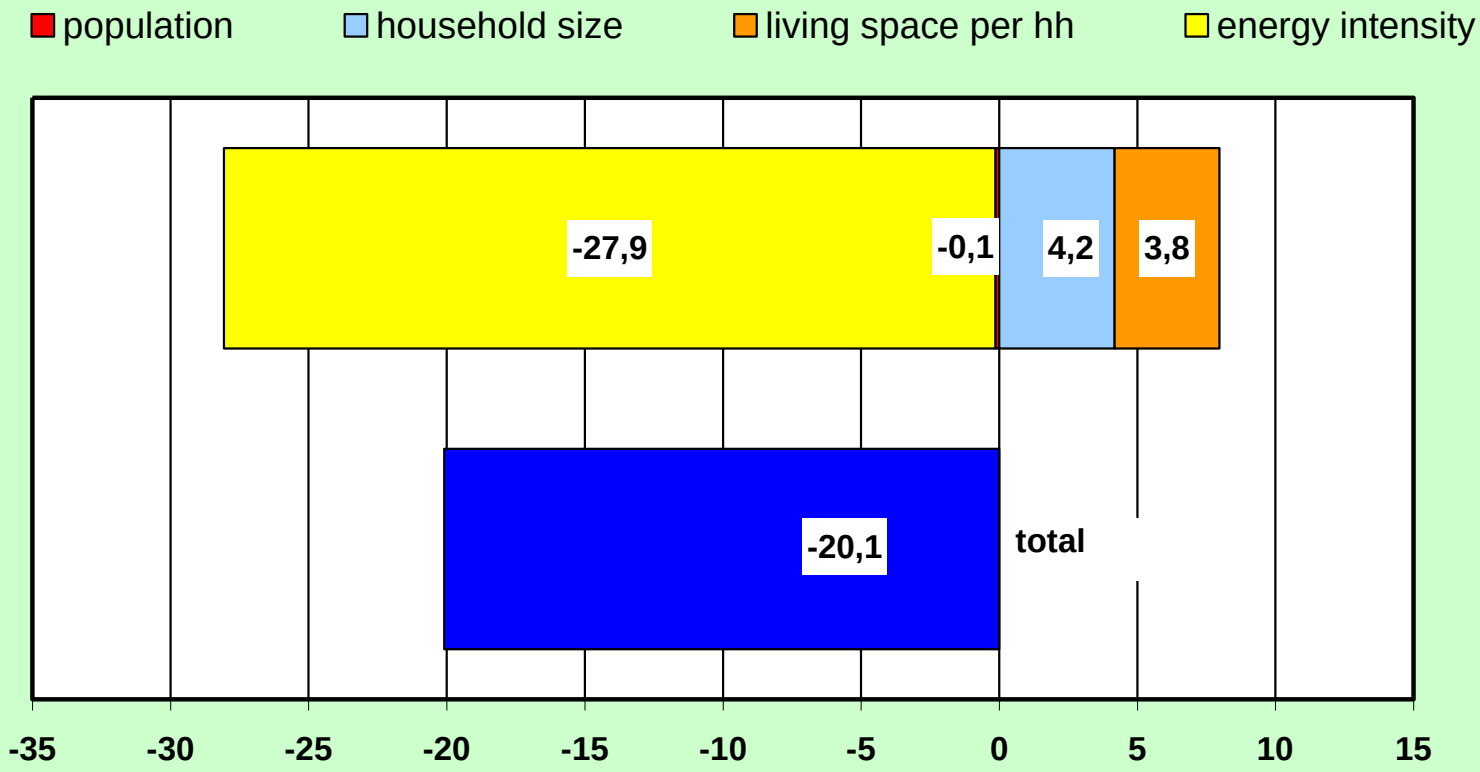
Characteristics	Unit	2000	2012	2012 / 2000 %
Population [1)]	ths.	81.539	81.361	-0,2
Households	ths.	37.711	40.657	7,8
Living space [2)]	mn. m^2	3.091	3.381	9,4
Av. living space per flat	m2	80,5	83,5	3,7
Heating energy	PJ	2.099	1.678	-20,1
Heating energy	bn. kWh	583	466	-20,1
Av. heating energy (per m^2)	kWh/m^2	189	138	-26,9

1) Population in households (N.A).

2) Living space actually used (N.A.).

Energy consumption of private households for heating*)

Change 2000 - 2012 by factors as a percentage of 2000



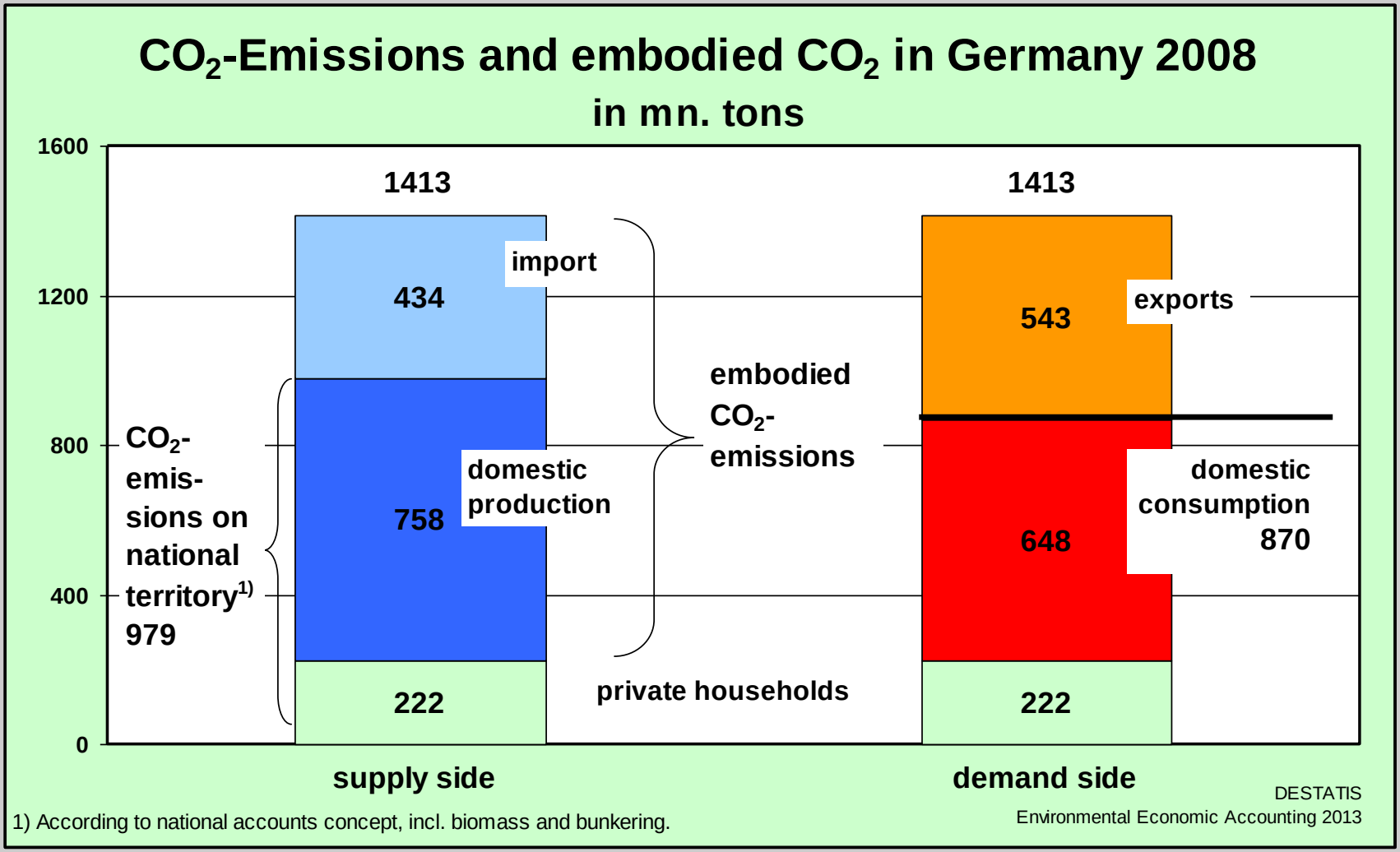
*) Temperature-adjusted

Federal Statistical Office of Germany
Environmental-Economic Accounting 2013

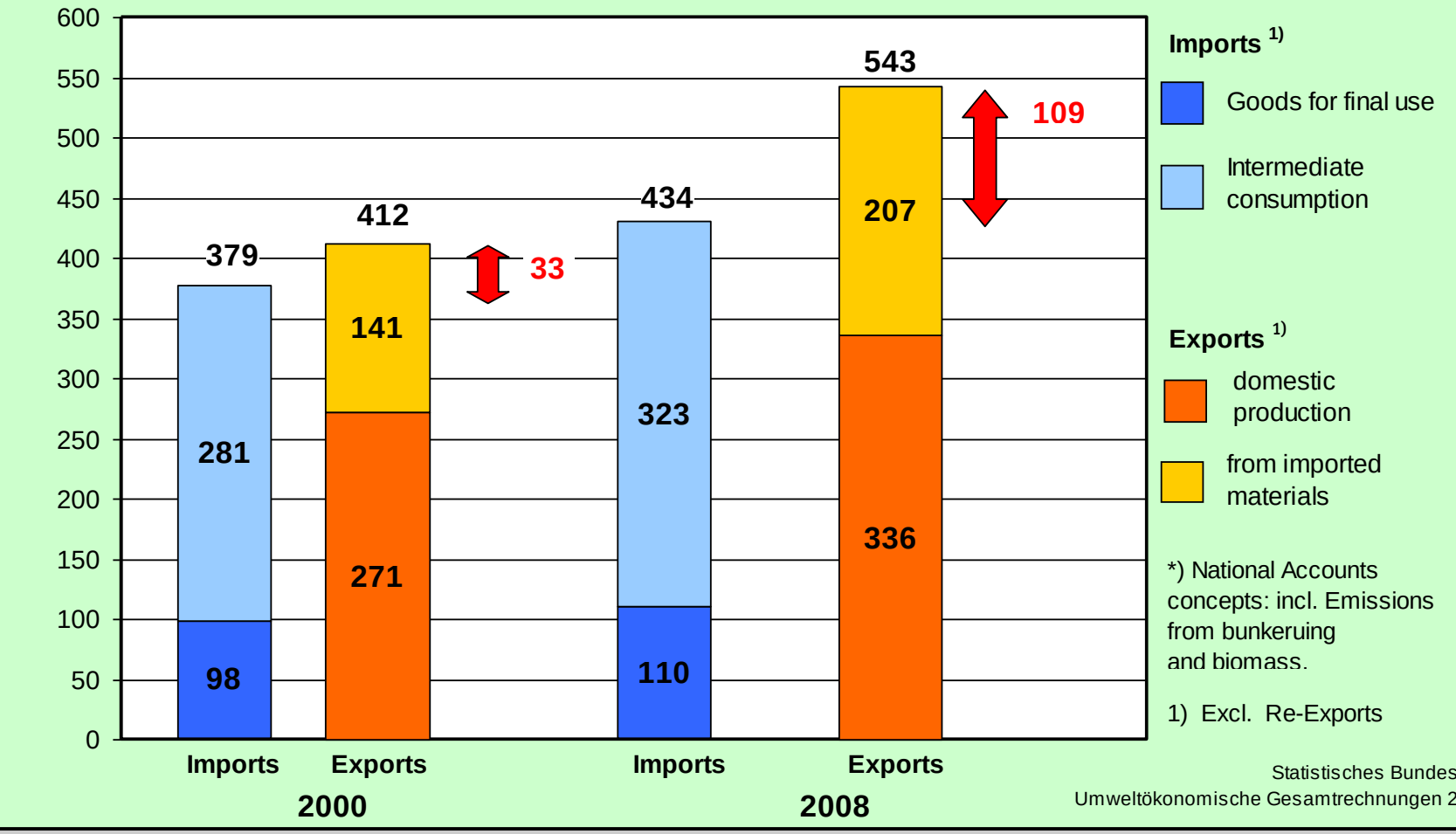
4. EEA analysis: eeIO-model for energy and CO_2

- **Hybrid model: physical energy flows**
- **Classification: 66 branches; 8 energy industries**
- **Disaggregation of IOT:**
  - **chemical industry: basic chemicals – oth.**
  - **metal ind.: aluminium ind.**
  - **land transport: railways – oth. land transport**
- **Regionalization: imports by 15 countries of origin**
  - **Energy inputs of energy branches (Eurostat balances, IEA)**
  - **Energy coefficients: special for energy branches, steel, alu**
  - **CO2-coefficients: EU (Eurostat); other: UNFCC, estimates**
- **Full details for Total Final Use, Private Cons., Exports**
- **Separate calculation of imported goods for final use & intermed. use**

d) Embodied CO2 emissions – consumers view

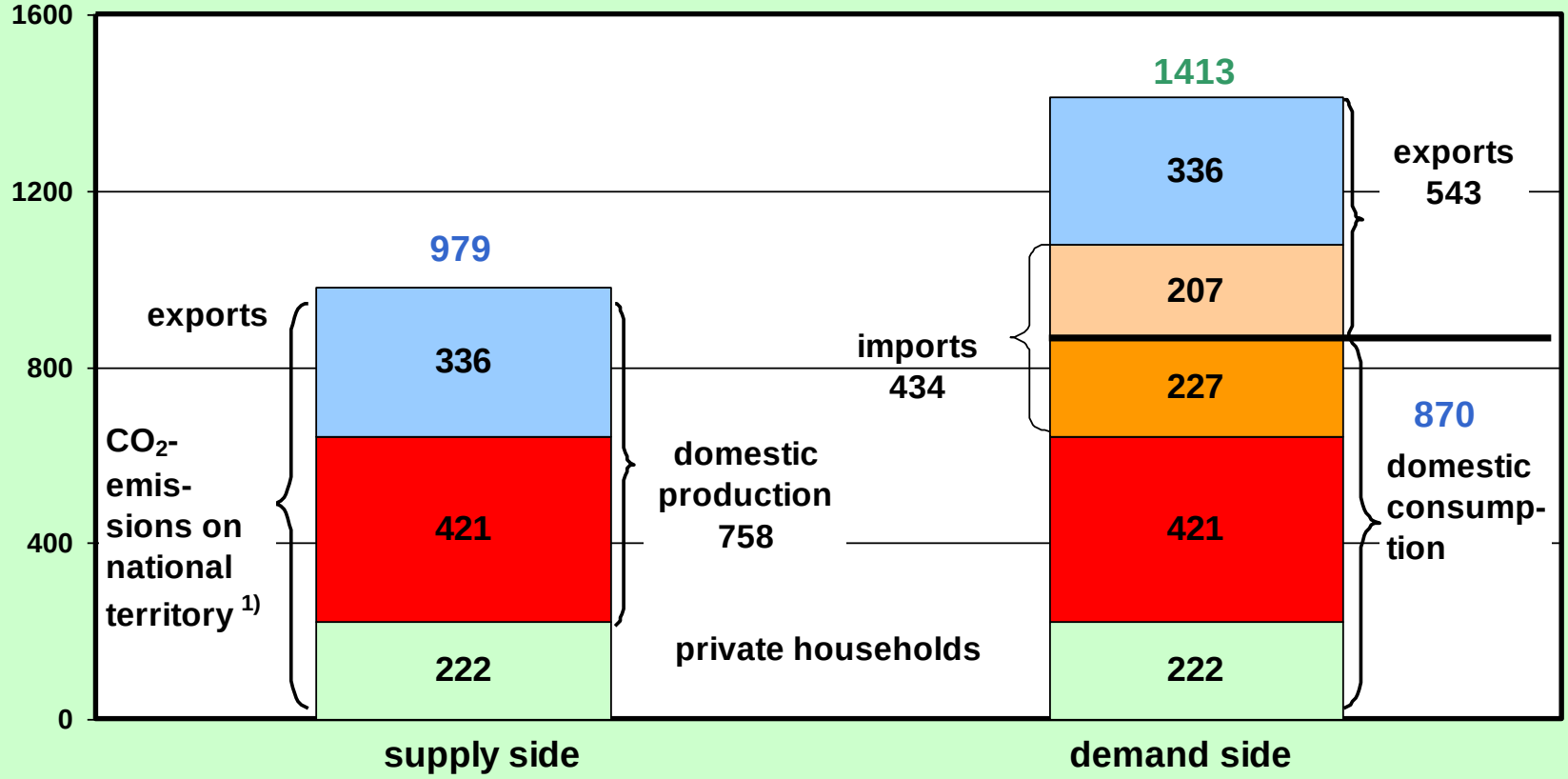


Embodied CO_2 emissions of imports and exports *



CO_2-Emissions and embodied CO_2 in Germany 2008

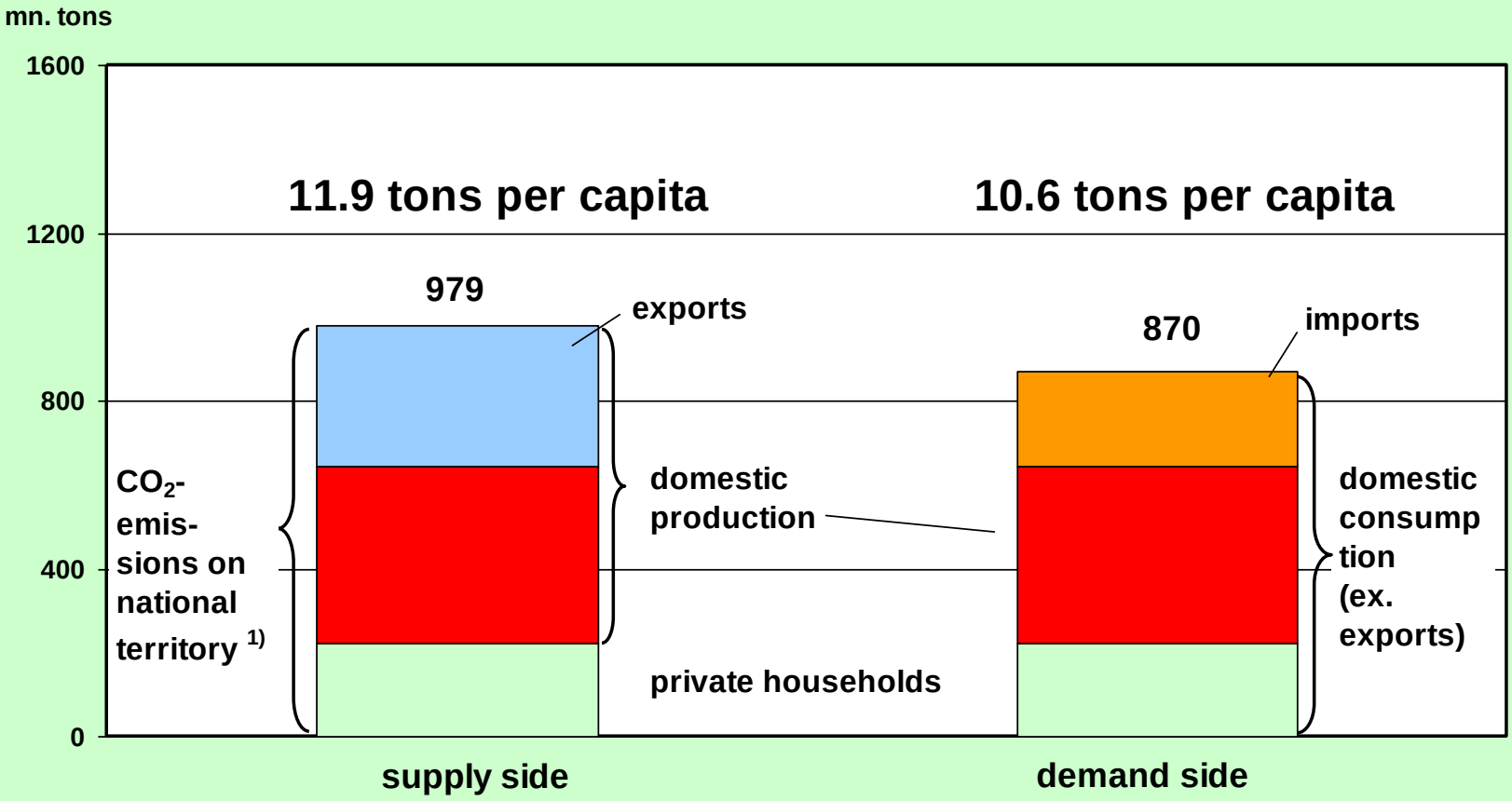
in mn. tons



1) according to national accounts concept, incl. biomass and bunkering.

DESTATIS
Environmental Economic Accounting 2013

CO_2-Emissions in Germany 2008



1) According to national accounts concept, incl. biomass and bunkering.

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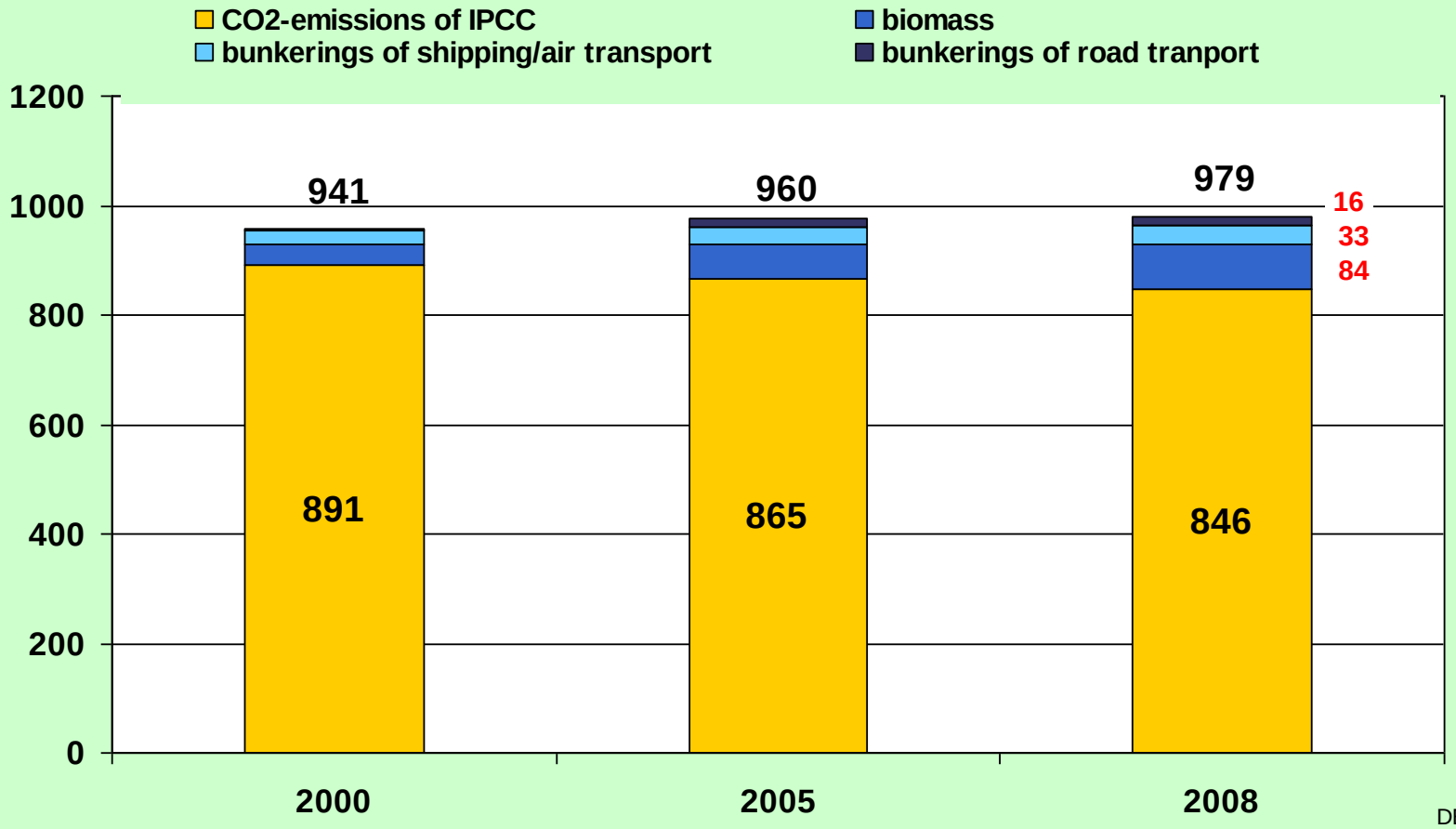
CO_2 emissions in Germany according IPCC and EEA

in Mill. tons



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Environmental Economic Accounts (EEA) 2013

For discussion

1. **Compilation issue: completeness in electricity generation (photovoltaics: own account production; CHP: own account production, allocation of fuels)**
2. **Physical & monetary use tables in parallel? Is that a realistic option? For which purpose? Priorities?**
3. **Which indicators from the energy accounts have an additional value in comparison to indicators derived from the energy balances?**
4. **Productivity measurement: which are the best reference values?**
5. **I/O-models: hybrid vs. monetary based. Which is the best option?**

Thank you for your attention!

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