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Integrated assessment of climate impact, land, energy and water use in Germany against the background of the UN green economy model and Germany` s sustainability strategy

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JÜLICH
FORSCHUNGSZENTRUM

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IAEA's Coordinated Research Project (CRP): CLEWS

- The CLEWS project investigates the interdependencies and interactions among energy, water, land use and climate change.
- The project supports coherent policies for the development and management of these resources, and to develop an integrated assessment framework for evaluation of alternative strategies.
- The idea of the project is, that an integrated assessment leads to a more efficient resource management overall.

IEK-STE research approach

Integrated assessment of climate impact, land, energy and water use in Germany against the background of the UN green economy model and Germany's sustainability strategy.

Introduction UN Green Economy approach

- At the Rio+20 Conference in 2012, the United Nations declared that a “green economy in the context of sustainable development” is a chance for economic development in the framework of sustainable development.
- The UN declared that the green economy takes place “in the institutional framework of sustainable development,” and “is an approach to achieving sustainable development.”
- **The <u>green economy</u> is now seen as a <u>process</u> for achieving a sustainable socio-economic development**.

The German transition project

The German government argues that

> the realization of the green economy requires sustainable production and consumption patterns to ensure prosperity for coming generations. An important aspect of this transition project is the realization of a sustainable energy system.

The competitiveness and the resilience of German society should be sustained by a green economy,

because **only the preservation of natural resources and attention to the planetary boundaries will in the long run protect the social cohesion of society.**

Background of Germany‘s green economy approach

- The German government is building a bridge from the concept of weak sustainability to the strong sustainability concept by considering the findings of Hollings strong sustainability concept:
  - the resilience of systems and the
  - importance of the planetary boundaries.
- The resilience of the system is:
  - The magnitude of disturbance that can be absorbed before a system flips from one state to another.
- The green economy is an instrument to stabilize the development of the German socio-economic system and an instrument to enhance the resilience of German society.

German green economy - Summary

- The German Government supports the UN approach for a green economy.
- A green economy is now regarded as a solution for present and future social problems, and alluding to Dennis Meadows, we can define:

A green economy is not the place you are going to.

It is how you make the journey to sustainable development.

Integrated Assessment – measuring Meadows journey

- We are now looking for an integrated assessment framework to monitor and measure this journey. The question of the measurability of sustainability is the key to the implementation of sustainable development,
  - because: “If current systems of economic indicators do not clearly signal that the economy is on an unsustainable path, the policy errors will be made and perpetuated (Hamilton and Atkinson, 2006).”

Integrated Assessment

The integrated assessment society defines integrated assessment (IA):

- as a scientific discipline for social learning and decision making. IA is used to frame, study and solve issues such as: climate change, water and air quality, land and public health.
- To accomplish these targets, in the last decades a wide array of assessment tools has been developed (von Raggamby et al., 2007).

We have chosen the method of accounting tools such as indicator sets [Nordhaus & Tobin, 1973]

STE Integrated Assessment Approach

- The basis of our integrated assessment approach
  - is the green economy concept of the United Nations and the German sustainability strategy and its sustainability indicator set.
  - For issues which are not yet part of the German sustainability strategy but which are highly relevant for sustainability measurement in the CLEW systems (climate change, land, energy and water), we derived sustainability indicators and sustainability targets.

1. STE Integrated Assessment Assumptions

Sustainable Measurement

Normative versus the derived sustainability order

- The **sustainability order of a society** can be derived from the observable market and social actions of households, enterprises and institutions, and reveals their true preferences for sustainability. This is the **derived** societal sustainability **order**
- has to be compared with the **politically defined (normative) sustainability order** of, in our case, the sustainability strategy of the German Federal Government.
- The difference between these sustainable orders is the **sustainability gap,** determining the degree to which the development of society is (un)sustainable.

Sustainability Strategy of German Government

The German Sustainability Strategy is a theme-based sustainability strategy,

In 2002 the Government published its Sustainability Strategy "Perspectives for Germany" defining sustainable development on the basis of the following four key issues, 21 themes, 37 indicators:

1. Intergenerational equity
2. Quality of life
3. Social cohesion
4. International responsibility

21 Sustainability Themes plus One

9 CLEWS Themes

I. Intergenerational equity

1. Energy & raw materials productivity
2. Emissions of the six greenhouse gases
3. Proportions of energy consumption from renewable energy
4. Land use for housing and transport
5. Development of stocks of selected animals
6. Public finance deficit
7. Provision for future economic stability
8. Innovation
9. Education

Plus Water quality

II. Quality of life

10. Economic prosperity
11. Mobility
12. Nutrition
13. Air quality
14. Health
15. Crime

III. Social cohesion

16. Employment
17. Perspectives for families
18. Equal opportunities
19. Integration of foreign citizens

IV. International responsibility

20. Public development cooperation
21. Open markets

Indicators of the German Strategy and CLEWS

The government defines

- 4 key issues,
- 21 themes with
- 37 indicators to measure sustainable development in Germany
- and reveal the current status of the process of the German green economy.

- Plus 1 new theme: water quality
- Indicators: groundwater, source water, surface water (river, lakes)

New theme: Water Quality

Water policy is one of the priorities of the European Commission.

The Commission has specified its goals in the European Union Water Framework Directive (EU-WFD) [EU, 2000]. 26 articles and 11 appendices regulate the execution of the EU-WFD.

The European Union stated in the Directive "*water is not a commercial product like any other but, rather, a heritage which must be protected, defended and treated as such* [EU, 2000]."

Water Quality – EU-Water Framework Directive

The EU-WFD contains the goal of a holistic framework for the European water sector.

The member states “shall protect, enhance and restore all bodies of groundwater, ensure a balance between extraction and recharge of groundwater, with **the aim of achieving good groundwater status at the latest 15 years** after the date of entry into force of this Directive” (EU-WFD, Article 4b, ii).

The EU-WFD defines the first targets for the water indicators.

Surface water quality in Germany

Ecological quality class		1995	2000	2009	2027
1	very good	4,50	7,30	10,00	100
2	good				
3	moderate			30	0
4	unsatisfactory			34	0
5	bad			23	0

Source: UBA, 2010

IEK-STE

2. STE Assumption
Compensation – SSC and SSSC

Sustainability surplus compensation (SSC)

- means that overfulfilment of one indicator can compensate the underfulfilment of any other indicator. In the best case, sustainability losses can be completely compensated by a sustainability surplus (surpluses).

Sine sustainability surplus compensation (SSSC)

- means that we interpret an overfulfilment of the sustainability goal as meeting the sustainability target, so that an overfulfilment of one sustainability indicator (surplus) cannot compensate for failing to reach a different sustainability target.

Sustainable Indicators of the German Sustainability Strategy – Indicators for the process of the green economy

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Sustainable Indicators of the German Sustainability Strategy

Indicators for the process of the green economy

Themes	Number of Indicators	Indicators, target year	Normative sustainability order, goal (2020)	Derived sustainability order, value (2010)	CLEW Sectors
Intergenerational Equity	1	Energy productivity, 2020	200,00	137,4	
	2	Primary energy consumption, 2020	76,30	94,2	Energy
	3	Raw material productivity, 2020	200,00	147	
	4	GHG emissions, 2010	79,00	74,7	Climate
	5	Renewable primary energy consumption, 2020	9,40	12,5	
	6	Renewable final energy consumption, 2020	10,90	18	Energy
	7	Renewable electricity production, 2020	17,00	35	
	8	Land consumption, 2020	30,00	87	Land
	9	Biodiversity, 2015	100,00	67	
	10	Federal public deficit, no target year	0,00	-4,3	
	11	Investment, no target year	no goal		
	12	Innovation, 220	3,00	2,8	
	13	Education, 2020	10,00	11,9	
	14	University education, 2020	42	41,3	
	15	University starters (freshman share), 2010	42	42,5	
	38	Water quality (EU Water Framework Directive, 2000/60/EC))*	2027	2009	Water
		surface water course			
	a	Groundwater			
	b	Surface water	100	10	
	c	Source water			
Quality of Life	16	GDP/capita	no goal		
	17	Kilometre tonnage, 2020	95	110,6	Energy
	18	Passenger kilometres, 2020	90	94,4	
	19	Share of shipping in freight transport service, 2015	10,5	14	
	20	Share of rail in freight transport service, 2015	25	18	
	21	Nitrogen, 2010	80	87	Land
	22	Ecological agriculture, no target year	20	5,9	
	23	Air quality, 2010	30	43,6	Energy
	24	Health men, 2015	190	234	
	25	Health women, 2015	115	137	
	26	Share of young smokers (12-17 age), 2015	12	13	
	27	Share of smokers on total population, 2015	22	26	
	28	Share of population with obesity, no target year	no goal		
	29	Number of criminal acts, 2020	7000	7253	
Social Cohesion	30	Employment total (15-64 age), 2020	73	71,1	
	31	Employment (55-64 age), 2020	60	55	
	32	Day care children 0-2 age, 2020	35	10,2	
	33	Day care children 3-5 age, 2020	60	32,1	
	34	Equal opportunities for women, 2020	10	23	
	35	Integration, 2009	no goal		
International Responsibility	36	Public development cooperation, 2015	0,7	0,39	
	37	Open markets, 2010	no goal		

Source: German Government, 2012, German Statistical Office 2012, and own calculations 2013

Sustainability Gap Index

Sustainability Gap Index
of Germany and German CLEW Systems

Themes	Germany		CLEWS	
	SSC	SSSC	SSC	SSSC
Intergenerational equity	-0.285	-0.290	-0.375	-0.381
Quality of life	-0.202	-0.202	-0.206	-0.206
Social cohesion	-0.372	-0.372	no clews indicators	
International responsibility	-0.440	-0.440	no clews indicators	
All themes	-0.325	-0.326	-0.290	-0.293
	Energy		Energy sine GHG emissions	
	SSC	SSSC	SSC	SSSC
Intergenerational equity	-0.266	-0.236	-0.320	-0.320
Quality of life	-0.206	-0.206	-0.206	-0.206
Social cohesion	no energy indicators		no energy indicators	
International responsibility	no energy indicators		no energy indicators	
All themes	-0.236	-0.240	-0.263	-0.263

Soucre: German Government 2012, German Statistical Office 2012, own calculation 2013

Conclusion

Our analysis has shown that the German government interprets the green economy as a process for the realization of sustainable development. A central aspect of the green economy is the implementation of a sustainable energy system.

Against this background, our indicator based integrated assessment approach based on the sustainability gap index (SGI) is a suitable measuring framework for monitoring the transformation process of Germany.

It enables us to deliver data about the current status of the Meadow journey of the CLEW systems.

CLEWS - STE Do To List

- Sustainability targets for disaggregated water indicators.
- Disaggregated analysis of the heterogeneity of the development of the indicators.
- Working on the integrated assessment methodology.

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Thank you very much for your attention