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GERMANY'S SUSTAİNABİLİTY STRATEGY İN THE CONTEXT OF THE UN GREEN ECONOMY APPROACH

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Abstract

The United Nations declared at the Rio+20 Conference in 2012 that a "green economy in the context of sustainable development" is a chance for poverty eradication and economic development in the institutional framework of sustainable development (United Nations, 2012). The German Government supports the UN approach for a green economy (BMBF and BMU, 2012) and declared that on the basis of a comprehensive understanding of the connection between the economy, finance and politics, and recognizing ecological boundaries and limits, environment-friendly qualitative and therefore sustainable growth should be achieved (BMBF and BMU, 2012). A green economy is now regarded as a solution for present and future social problems, and alluding to Dennis Meadows (Meadows, 2008), we can define it accordingly: A green economy is not the place you are going to. It is how you make the journey to sustainable development. We are now looking for a measuring framework for this journey. The question of the measurability of sustainability is the key to the implementation of sustainable development because as Hamilton and Atkinson clearly put it: "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)."

The Sustainability Gap Index (SGI), developed by the authors, calculates the degree to which sustainability is achieved in Germany. The index shows whether Germany is on a sustainable path according to the goals set by the German Government in its sustainability strategy (German Federal Government, 2012a, German Federal Government, 2012b). The index enables us to compare the normatively (politically) defined sustainability order of the German Government (goals) with the actual "behaviour" of German society and with the interpretation of science and policy. The index enables us to answer the question of whether Germany is "better off" in sustainable categories of the green economy. The calculations of the sustainable indicators help us to understand where political action is needed in the transition process of the green economy towards sustainable development of German society

Keywords: green economy, sustainable development, sustainability gap index

1. GREEN ECONOMY

1.1. Green economy in the context of sustainable development

The International Energy Agency (IEA) stated in the World Energy Outlook 2008 that "the world's energy system is at a crossroads. Current global trends in energy supply and consumption are patently unsustainable — environmentally, economically, socially. But that can — and must — be altered (IEA, 2008)." The United Nations responded to this development and at the Rio+20 Conference in 2012 declared that the green economy should take place "in the institutional framework of sustainable development (United Nations, 2012)," and "is an approach to achieving sustainable development (United Nations, 2011)." The green economy is now seen as a process for achieving sustainable socio-economic development. The German Institute for International and Security Affairs interprets the green economy as a global concept that "has the potential to function as a central implementation strategy of the guiding principle of sustainable development (Simon and Dröge, 2011a)."

The UNEP supports this model and defined green economy in contrast to the old fossil-fuel-based brown economy (UNEP, 2011) "as a strategic economic policy agenda for achieving sustainable development (UNEP, 2011)." The UNEP green economy concept is mainly built on the weak sustainability concept and the fundamental work of Pearce (Pearce and Atkinson, 1992, Pearce and Barbier, 2000), Pezzey and Dasgupta (Pezzey, 1989, Dasgupta, 2008).

In 2011, UNEP stressed that a green economy does not only focus on current environmental and economic problems but also has to address inter- and intragenerational issues (UNEP, 2011). Another important aspect of the green economy in the view of UNEP is replacing the current brown technologies by new green technologies, which means "setting thresholds and altering technologies are important for achieving a green economy (UNEP, 2011)." Hence, the energy sector is at the centre of this technological transition from the brown to the green economy (Rifkin, 2012, UNEP, 2011), as Rifkin stated by supporting the view of UNEP and IEA: "Our industrial civilization is at a crossroads. Oil and the other fossil fuel energies that make up the industrial way of life are sunsetting (Rifkin, 2012)." Rifkin also explained his view of a third industrial revolution to Chancellor Merkel in Berlin in the following way: The "industrial induced CO2 emissions are threatening the viability of life on Earth, [he sees] a sustainable post-carbon future [and] finding that new vision requires an understanding of the technological forces that precipitate the profound transformations in society (Rifkin, 2012)." Germany is now trying to find its way to the green economy to implement a sustainable development of German society supported by the German ministries (German Federal Ministry of Education and Research, 2012).

1.2. Germanys green economy approach

After the Rio+20 conference, the German Federal Ministry of Education and Research and the German Federal Ministry of the Environment presented their model for a green German economy. The two ministries also regard the concept of the green economy as a tool for the implementation of sustainable development in Germany (German Federal Ministry of Education and Research, 2012). The OECD calls Germany a laboratory for green growth (OECD, 2012).[1]

A central aspect of this transition project is the realization of a sustainable energy system (German Federal Ministry of Economics and Technology (BMWi), 2012). The German government sees its current energy transition programme as an instrument that "boosts green innovations, creates jobs, and helps Germany position itself as exporter of green technologies (The Heinrich Böll Foundation, 2012, German Federal Ministry of Economics and Technology (BMWi), 2012)[2]." The German Federal Ministry of Economics and Technology will spend €3.5 billion up to 2014 "to support research and development into sustainable energy technologies (German Federal Ministry of Economics and Technology (BMWi), 2012)." The German government argues that the realization of the green economy requires sustainable production and consumption patterns to ensure prosperity for coming generations (German Federal Ministry of Education and Research, 2012).

The competitiveness and the resilience of German society should be sustained by the 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 (German Federal Ministry of Education and Research, 2012).

With its new green economy approach, the German government is building a bridge from the concept of weak sustainability to the strong sustainability concept by considering both the weak sustainability of the UNEP and also taking into account the findings of the Holling sustainability concept: the resilience of systems and the importance of the planetary boundaries.

Holling argues that "resilience, …, determines how vulnerable the system is to unexpected disturbances and surprises that can exceed or break that control (Holling, 2001)." Perrings developed a concept of resilience based on the work of Holling and Pimm:

1. "The concept of resilience has two main variants. One is concerned with the time taken for a disturbed system to return to some initial state and is due to Pimm (1984) (Pimm, 1984).

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1 http://www.oecd.org/newsroom/environmentgermanyalaboratoryforgreengrowth.htm
2 http://energytransition.de/

2. A second is concerned with the magnitude of disturbance that can be absorbed before a system flips from one state to another and is due to Holling (1973) (Holling, 1973).

Both variants deal with aspects of the stability of system equilibria, offering alternative measures of the capacity of a system to retain productivity following disturbance (Perrings, 1998)."

The German government is now transferring these characterizations of the sustainability of ecological systems to the socio-economic system to characterize the new framework of the green economy. The green economy is, based on the considerations of Pearce and Markandya (Pearce et al., 1992), an instrument to stabilize the development of the German socio-economic system with respect to the distortions of the globalized world economy. Green economy is seen as an instrument to enhance the resilience of German society.

A green economy is now regarded as a solution for present and future social problems, and alluding to Dennis Meadows (Meadows, 2008), we can define it accordingly: A green economy is not the place you are going to. It is how you make the social and energy journey to sustainable development. The green economy delivers the instruments to achieve sustainable development (Pearce et al., 1992).

We are now looking for a measuring framework for this journey to inform the public about the status of the implementation of the green economy and to avoid the impression "that the current broad international approval [of green economy] constitutes little more than lip service (Simon and Dröge, 2011b)." The question of measurability is a central issue for the implementation of a sustainable development of society and the energy sector (Schlör et al., 2013) because as, Hamilton and Atkinson clearly put it: "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)."

The sustainability gap index, developed by the authors, calculates the degree to which sustainability has been achieved on the basis of the German sustainability strategy and delivers information about the development of Meadows' journey in the German energy sector and German society.

We are looking now for a sustainability concept and a suitable database for our measuring concept.

2. INDICATORS FOR MEASURING THE PROCESS OF THE GERMAN GREEN ECONOMY

Based on the UN Sustainability Strategy (United Nations, 2001), the German Federal Government defined a quantitative sustainable development strategy for Germany (German Federal Government, 2002a, German Federal

Government, 2002b) in preparation for the Rio+10 Conference in Johannesburg in 2002 (United Nations, 2002).

This sustainable strategy was the first attempt by the German Federal Government to define a normative quantitative sustainable order for Germany (Schlör et al., 2004). The real sustainability order of a society can be observed by the social actions of households (Schlör et al., 2013), and reveals the households' preferences for sustainable development, thereby showing the real meaning of sustainability for society.

In order to measure sustainable development, the sustainability order of society has to be compared with the political targets of the German sustainability strategy (Schlör et al., 2008). These targets define the normative sustainability order of the German government. The sustainability indicators enable us to measure the sustainability gap (Ekins, 2001, Ekins and Simon, 1999) - the difference between these two orders, determining the degree to which the development of society is (un)sustainable (Schlör et al., 2013).

The government defines 4 key issues, 21 subthemes with 37 indicators to measure sustainable development in Germany (German Federal Government, 2002a, German Federal Government, 2012a) and reveal the current status of the process of the German green economy.

Theme: Intergenerational equity (IE)

15 subthemes: energy productivity, primary energy consumption, raw material productivity, GHG emissions, renewable primary energy consumption, renewable final energy consumption, renewable electricity production, land consumption, biodiversity, federal public deficit, investment, innovation, education, university education, university starters.

Theme: Quality of life (QL)

14 subthemes: GDP/capita, kilometre tonnage, passenger kilometres, share of shipping in freight transport service, share of rail in freight transport service, nitrogen, ecological agriculture, air quality, health men, health women, share of young smokers, share of smokers in total population, share of total population with obesity, number of criminal acts.

Theme: Social cohesion (SC)

6 subthemes: employment total (15-64 age), employment (55-64 age), day care children 0-2 age, day care children 3-5 age, equal opportunities for women, integration.

Theme: International responsibility (IR)

Two subthemes describe IR: development cooperation and open markets.

The government has set up indicators and sustainability targets for these key issues to avoid the impression that its strategy is merely a list of good intensions.[3] The government uses its targets to define its understanding of the sustainable development of German society. Although there have been three changes of government in the meantime, the 2002 sustainability strategy still remains valid and was updated in 2012 in preparation for the Rio+20 conference 2012 (German Federal Government, 2012a, German Federal Government, 2012b).

3. MONITORING THE GREEN ECONOMY PROCESS BY SUSTAINABLE INDICATORS

We developed our index to aggregate the indicators of the German sustainability strategy to one index (Schlör et al., 2008): the sustainability gap index. Our sustainability measuring concept is based on the indicator and index definitions and the aggregation methodology of the OECD and UNDESA (OECD Working Group on Environmental Information and Outlooks, 2002, United Nations Department of Economic and Social Affairs, 2000).

3.1. The sustainability gap index (SGI)

Whether sustainable development has been achieved in the German energy sector can be determined by an analysis of all quantifiable indicators of the German sustainability strategy. The sustainability gap index measures the way society has to go to meet all the sustainability goals of the German society and of the German energy sector.

The indicator is derived in the following way. The single indicators are calculated:

$$I_{y,j}(n) = \left(\frac{F_y(n)}{SD_y(n)} \right)_{\substack{\text{base} \\ \text{year=100}}} \quad \text{, y=year, j=compensation method, n=indicator} \tag{1}$$

$$I_{y,j}(n) = \frac{\text{actual result (F) of the indicator (n) in the analysed year (y), compensation method (j)}}{\text{sustainability strategy target (SD) of the indicator (n) at the target year (y), j}} \tag{2}$$

[3] *The indicators and its specific targets can be found in the progress report of the German government GERMAN FEDERAL GOVERNMENT 2012a. National sustainable strategy. Progress report 2012, released cabinet paper, (published in German: Nationale Nachhaltigkeitsstrategie. Fortschrittsbericht 2012 (released cabinet paper). Berlin (Germany): Deutsche Bundesregierung.*

The single indicators $I_{y,j}(n)$ will be aggregated to a superordinate index, which enables us to measure the sustainability system in one single index (Schlör et al., 2008, Schlör et al., 2013).

$$ISD(n)_{y,j} = \frac{1}{N}\left(\sum_{n=1}^{N} AF_n \cdot I_{y,j}(n)\right), \text{ n=1,..., N, AF=1, j=SSC, SSSC, y=year} \quad (3)$$

$I_y(n)$ = activity indicator (n) (i.e. energy productivity in 2010), N= total number of indicators, AF= weighting factor.

The sustainability gap can be calculated for the single indicators:

$$SD-Gap(n)_{y,j} = \left(\left(I_{y,j}(n)\right)-1\right) \quad (4)$$

For the single theme:

$$SD-Gap^{i}_{y,j} = \frac{\sum_{n=1}^{M} SD-Gap^{i}_{y,j}(n)}{M}, \quad (5)$$

m = indicators of the single theme, i=theme, y=year,j=compensation method.

And for all indicators, we calculate the index:

$$SD-Gap_{y,j} = \frac{\sum_{i=1}^{4} SD-Gap_{y,j}(i)}{4} \quad (6)$$

We determine the SD gap by the equal theme method in allusion to the equal-pillar method (Schlör et al., 2013).

In the equal-theme method, it is assumed that the four themes are treated equally however many indicators the theme may have. Therefore, the parallel equivalence of the indicators and the four themes can only be reached if the number of indicators is the same in each of the four theme pillars. If the indicators are not equally distributed, this leads to a different weighting of the indicators. The first theme “intergenerational equity” of the sustainability strategy covers 15 indicators, the second theme “quality of life” 14 indicators, the third theme “social cohesion” 6 indicators and the fourth theme “intergenerational equity” 2 indicators. Hence, in our measuring concept the themes are treated equally but the indicators are not.

The $SD-Gap$ just measures the sustainability gap, i.e. the difference between the targets of a specific year set by the government in its sustainability

strategy and the actual value of the indicator. The sustainability gap determines the distance the German society has to cover to attain sustainable development.

Every indicator I_n therefore documents an aspect which is, according to the German sustainability strategy, important for the sustainable development of society. We also introduce a weighting factor of AF=1, which enable us to treat the single indicators differently by summing up the indicators to one index. However, we make the assumption that all indicators are equal, because the German government did not mention any other procedure for dealing with the indicators. Hence, any weighting factor other than 1 would be our own interpretation and would not be covered by the sustainability strategy of the German administration (Schlör et al., 2008, Schlör et al., 2011, Schlör et al., 2013).

The sustainability gap index (SGI) developed by the authors calculates the degree to which sustainable development has been achieved or not. If the SGI is negative, then development is not sustainable. If $(SGI \geq 0)$, then development is sustainable according to the targets set by the German government.

We can therefore summarize that the sustainability indicators of the German sustainability strategy and its targets are instruments to analyse, using the sustainability gap index, whether German society and its sectors are on the way to sustainable development. The index delivers information on how Germany is managing the green economy process.

In this context, the question has to be answered of how an overfulfilment of sustainability goals should be interpreted. The sustainability concept of the Federal Government does not offer a method for solving this problem. In the following section, we offer two interpretations of how this area could be treated: sustainability surplus compensation (SSC) and sine sustainability surplus compensation (SSSC) (Schlör et al., 2013).

3.2. Sine sustainability surplus compensation (SSSC)

Sine sustainability surplus compensation 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 (Schlör et al., 2013).

With the assumption of sine sustainability surplus compensation, we obtain the following equation:

$$x_n = \frac{F(n)}{SD_G(n)} = \frac{\text{actual results}}{\text{sustainability goal}} \; ; \; x_n \geq 1 \rightarrow x_n = 1; \; \text{n=1,..., N.} \qquad (7)$$

This means that all indicator values above 1 are interpreted as 1: The indicator thus meets its sustainability target.

3.3. Sustainability surplus compensation (SSC)

By contrast, sustainability surplus compensation means that overfulfilment can compensate the underfulfilment of any other indicator. In the best case, sustainability losses can be completely compensated by a sustainability surplus (surpluses) (Schlör et al., 2013).

This concept can be described by the following equation:

$$x_n = \frac{F(n)}{SD_G(n)} \; ; \quad x_n \geq 1 \rightarrow x_n \geq 1, \; \text{n=1,..., N.} \tag{8}$$

Thus, both compensation methods (SSSC, SSC) define the framework and the degrees of freedom a system has on the way to sustainable development (Schlör et al., 2013).

We will concentrate our analysis not only on German society but also on the German energy sector, because the energy sector is at the centre of the transition process to a green German economy.

4. THE SUSTAINABILITY GAP IN THE GERMAN GREEN ECONOMY

4.1. Sustainability gap

Table 1 shows the current status of the sustainable development of German society and of the German energy sector according to the targets set in the German sustainability strategy.

The table shows that German society is described by 37 indicators and 31 quantifiable indicators. The analysis reveals that two indicators (GHG emissions and university starters) already met or exceeded their sustainability targets in 2010. In the field of ecological agriculture, German society has to bridge the biggest gap (-0.71) to reach its sustainability target. Hence, we obtain only small differences between the two compensations methods. The sustainability gap for the whole of German society is -0.252 in the case of sustainability surplus compensation and -0.254 in the case of sine surplus compensation. Hence, we can summarize that German society has on average met 75% of its 2020 targets, but efforts in coming years will have to be ambitious to meet all the targets in 2020.

Table 1

Sustainability Gap/Surplus of the German Green Economy

Themes	Number of Indicators	Indicators, target year	SD-Gap/*SD-Surplus* SSC	SSSC
Intergenerational Equity	1	Energy productivity, 2020	-0.31	-0.31
	2	Primary energy consumption, 2020	-0.19	-0.19
	3	Raw material productivity, 2020	-0.27	-0.27
	4	GHG emissions, 2010	*0.06*	*0.00*
	5	Renewable primary energy consumption, 2020	-0.25	-0.25
	6	Renewable final energy consumption, 2020	-0.39	-0.39
	7	Renewable electricity production, 2020	-0.51	-0.51
	8	Land consumption, 2020	-0.66	-0.66
	9	Biodiversity, 2015	-0.33	-0.33
	10	Federal public deficit, no target year	no goal	
	11	Investment, no target year	no goal	
	12	Innovation, 220	-0.07	-0.07
	13	Education, 2020	-0.16	-0.16
	14	University education, 2020	-0.02	-0.02
	15	University starters (freshman share), 2010	*0.01*	*0.00*
Qualtiy of Life	16	GDP/capita	no goal	
	17	Kilometre tonnage, 2020	-0.14	-0.14
	18	Passenger kilometres, 2020	-0.05	-0.05
	19	Share of shipping in freight transport service, 2015	-0.25	-0.25
	20	Share of rail in freight transport service, 2015	-0.28	-0.28
	21	Nitrogen, 2010	-0.08	-0.08
	22	Ecological agriculture, no target year	-0.71	-0.71
	23	Air quality, 2010	-0.31	-0.31
	24	Health men, 2015	-0.19	-0.19
	25	Health women, 2015	-0.16	-0.16
	26	Share of young smokers (12-17 age), 2015	-0.08	-0.08
	27	Share of smokers in total population, 2015	-0.15	-0.15
	28	Share of population with obesity, no target year	no goal	
	29	Number of criminal acts, 2020	-0.03	-0.03
Social Cohesion	30	Employment total (15-64 age), 2020	-0.03	-0.03
	31	Employment (55-64 age), 2020	-0.08	-0.08
	32	Day care children 0-2 age, 2020	-0.71	-0.71
	33	Day care children 3-5 age, 2020	-0.47	-0.47
	34	Equal opportunities for women, 2020	-0.57	-0.57
	35	Integration, 2009	no goal	
International Responsibility	36	Public development cooperation, 2015	-0.44	-0.44
	37	Open markets, 2010	no goal	

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

Based on the results of the single indicators, we obtain the following values for the sustainability gap index of Germany and of the energy sector.

4.1.1. Sustainability gap index Germany

The data of table 2 shows that the four themes are not developing in the same way but that all indices are negative. The current development of Germany is not sustainable irrespective of the chosen compensation method. The data reveals that the compensation method only reduces the index by about 0.01 from -0.314 to -0.313. The compensation method only influences the theme of intergenerational equity, because both indicators with positive sustainable development belong to this theme.

The results reveal that the theme quality of life has the smallest distance to cover for sustainable development. The theme of intergenerational equity has to bridge a slightly greater distance to achieve sustainable development. Social cohesion and international responsibility have a significantly greater distance to cover to reach sustainable development for their themes.

Table 2

Sustainability gap index of Germany and of the German energy sector

	Germany		Energy		Energy sine GHG emissions	
Themes	SSC	SSSC	SSC	SSSC	SSC	SSSC
Intergenerational equity	-0.237	-0.243	-0.266	-0.236	-0.320	-0.320
Quality of life	-0.202	-0.202	-0.206	-0.206	-0.206	-0.206
Social cohesion	-0.372	-0.372	no energy indicators		no energy indicators	
International responsibility	-0.440	-0.440	no energy indicators		no energy indicators	
All themes	-0.313	-0.314	-0.236	-0.240	-0.263	-0.263

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

4.1.2. Sustainability gap index of the German energy sector

When we analyse the energy sector, we see that the energy sector is described by 12 indicators in the German sustainability strategy and the energy sector covers one third of all indicators, which shows the importance that the energy sector has for sustainable development and for the green economy. With GHG emissions the energy sector also has one indicator which has already exceeded the sustainability target of the sustainability strategy. This good result is mainly caused by the closure of industrial plants in eastern Germany after 1989 (Fleischer, 1997).

The overall sustainability gap of the energy sector is -0.236 in the case of sustainability surplus compensation and -0.240 in the case of sine sustainability surplus compensation the gap. The gap is smaller than in the overall system of the whole of German society. If GHG emissions are excluded from the energy sector, the sustainability gap of the energy sector is greater than in German society.

We can conclude that German society has to invest more in the German energy sector to meet the sustainability targets. The German government is taking up this challenge in its new energy policy concept (German Federal Ministry of Economics and Technology (BMWi), 2012).

4.1.3. Summary

The analysis of the single indicators reveals the heterogeneity of the development of the indicators. To obtain a more comprehensive picture of the development of the indicators, we calculate the standard deviation of the indicators of the four key themes.

Table 2

Standard deviation of the sustainability indicators

Key themes	Germany		Energy sector		Energy sine GHG	
	SSC	SSSC	SSC	SSSC	SSC	SSSC
Intergenerational equity	0.200	0.193	0.164	0.147	0.104	0.104
Quality of life	0.175	0.175	0.096	0.096	0.096	0.096
Social cohesion	0.270	0.270	no energy indicators			
International responsibility	0	0	no energy indicators			

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

In the case of Germany, the standard deviation of the indicators reveals the distance of the values of the indicators from their arithmetic mean in the specific theme. The standard deviation of the theme of social cohesion is greater than of the other themes. The standard deviation of the theme of international responsibility is zero, because this theme contains only one measurable indicator.

The standard deviation also shows that the values are higher in the case of the sustainability compensation method than in the case of the sine sustainability compensation method, because permitting overfulfilment of the indicators (i.e. GHG emissions) in the case of sustainability surplus compensation enlarges the distance between the indicators.

In the energy sector, we see a slightly different picture of the development of the energy indicators. The development of the standard deviation of the energy sector shows that the average distance of the single indicators from the arithmetic mean is smaller than in the overall system of German society. The measured values of the single indicators of the energy sector are closer to the arithmetic mean than the other indicators. The energy indicators are developing in more or less the same way. This development can be revealed more clearly if we exclude the GHG emissions from the energy sector. The standard deviation thus becomes smaller. The development of the remaining energy indicators follows an even more similar development.

The results show that the standard deviation is significantly lower in the energy sector than for the indicators of the whole of society. The energy sector is developing in more homogeneous manner towards sustainability than the indicators for the whole of society. In the case of the sine surplus sustainability compensation method (SSSC), we also detect that the indicators for Germany and for the energy sector are developing in a more probable way, because in that compensation method the values of the indicators which are greater than 1 are interpreted as 1. This reduces the distance between the indicators.

5. CONCLUSION

Our analysis has shown that the German government interprets the green economy as a process for the realization of sustainable development. The German

green economy concept represents the adoption of the UN Green Economy approach approved by the Rio+20 conference. We have also shown that the German green economy approach is building a bridge between the weak and strong sustainability concepts to establish a consensus view on sustainable development.

A central aspect of the green economy is the implementation of a sustainable energy system. Against this background, we developed the sustainability gap index (SGI) as a measuring framework for monitoring the transformation process of the energy system based on the German sustainability strategy and its measurable targets. The sustainability gap index (SGI) enables us to deliver data about the current status of the energy journey and inform the public about the progress of the German energy transition in the context of the German green economy. The index is an instrument for monitoring Meadows' journey.

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