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RESEARCH ARTICLE

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Resource efficiency and green economic sustainability transition evaluation of green growth productivity gap and governance challenges in Cambodia

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Abstract

This study provides an analysis of Cambodian socio-economic and environmental development. The analysis applies the Sustainable Society Index—database and uses Sustainability Window analyses linked to the green growth strategy in Cambodia. The novel analyses provide criteria for weak and strong sustainability and are further developed to evaluate the green growth productivity gap.

We have carried out empirical analyses using indicators of the different dimensions of sustainability—economic, social, and environmental. The Sustainability Window defines the minimum economic development for social sustainability and the maximum economic development for environmental criterion for sustainability.

This study demonstrates methodological usefulness of the Sustainability Window analysis in the fields of development studies and green growth. The methodological novelty of this study is to use Sustainability Window approach and to provide a novel empirical testbed for strong and weak sustainability analyses as well as for the analysis of the green growth resource use productivity gap.

KEYWORDS

Cambodia, green growth, indicators, productivity, sustainability, transition

1 | INTRODUCTION

Current trends in global development are far from sustainable, and the integrity of life support systems is under an increasing threat. These unsustainable tendencies in the coevolution of human and natural systems have stimulated a search for new approaches and methodologies to understanding complex problems of the environment and development. One of such new methodologies is Sustainability Window (SuWi) analysis (Luukkanen, Kaivo-oja, Vehmas, Panula-Ontto, & Häyhä, 2015) described in this article.

SuWi analysis is a tool for assessing simultaneously the sustainability of development in all of its three dimensions (environmental, economic, and social) as defined by the Brundtland Commission in 1987. SuWi analysis is related to the green growth discussions and the three pillars of sustainability, but as green growth connects closely with the economic and environmental pillars of sustainable development while paying less attention to the sociocultural pillar (Lyytimäki et al., 2018), SuWi method tries to overcome this deficiency by integrating the social dimension in the sustainability analysis. The method provides information of the maximum and minimum economic development that is required to maintain the direction of social and environmental development towards more sustainable targets. In this sense, it is linked to the discussion of the Doughnut Economy (Raworth, 2017) that sees the environmental limits (planetary boundaries) as environmental ceiling of resource use, limiting the economic development and the social foundation of resource use, below that lie unacceptable human deprivation. SuWi can be used for the quantitative assessment of the Doughnut Economy.

The SuWi method focuses especially on the concept of needs, in particular the essential needs of the world's poor, to which overriding priority should be given.

There has been lot of discussion of the governance of sustainability transition, especially Geels has proposed three-level model of transition management (Geels & Schot, 2016). We can say that there are three systemic challenges of sustainability governance: (a) global landscape processes impacting sustainability, (b) macro level of sociotechnical systems, and (c) microsystems, local niche level. Our analysis focuses on the national macro level analysis of the sustainability transition, but it is possible to analyse links to global and micro systems if needed. SuWi analysis provides one promising approach to analyse sustainability transitions in developing economies. In this article, we demonstrate the SuWi approach with Cambodian data. The tool can be used not only at national level but also at regional of local levels if data are available. One example of the use of the method is fishery sustainability study in the South China sea (Peranging-angin, Sulistiono, Kurnia, Fahrudin, & Suman, 2018).

The SuWi method facilitates the ready analysis of the sustainability of societies by using different indicators and different time periods for comparative analyses. The new method also makes it possible to analyse the dynamics of sustainability and the changes over time in the width of the window. This provides a new perspective for analysing the trends of sustainability and the impacts of underlying sustainability policies.

SuWi analysis (Luukkanen et al., 2015) indicates the minimum and maximum economic growth rates in order to guarantee that the development leads towards more sustainable social and environmental development in the context of economic development. The analysis does not refer to the absolute level of sustainability (which usually cannot be determined) but determines whether the direction of change is towards more sustainable state. The requirement for strong sustainability in the environmental dimension, meaning that emissions should not increase, may be seen as ethically justifiable in the case of the least developed countries. In countries such as Cambodia where the relative environmental loading (e.g., greenhouse gas [GHG] emissions) is very low, we are running into dilemmas of development equity. Therefore, using the weak sustainability criteria in the analysis reflecting economic growth for human development is also necessary.

In this article, we develop the concepts of the strong SuWi and the weak SuWi, referring to the concepts of strong and weak sustainability (see,e.g., Kaivo-oja, Luukkanen, & Malaska, 2001; Kaivo-oja, Panula-Ontto, Luukkanen, & Vehmas, 2014; Neumayer, 2013; and Vehmas, Luukkanen, & Kaivo-oja, 2007). The SuWi tool also provides information if the SuWi does not exist at all, which is a critical information for decision makers. It is also important for policy planning to find out how large the SuWi is and whether it is widening or getting narrower. This kind of information assuredly increases the transparency of sustainability policy and discussion.

2 | METHODOLOGICAL APPROACH: SUWI METHODOLOGY LINKED TO THE SUSTAINABLE SOCIETY INDEX SYSTEM

The SuWi approach is a useful tool in transdisciplinary sustainability science, because it makes "key transition paths visible for decision-makers and stakeholders" (see Brandt et al., 2013; Kajikawa, 2008; Komiyama & Takeuchi, 2006). The analyses can be seen as governance tools for transition management (see Kemp & Parto, 2005; Loorbach, 2002; Loorbach, 2007). There is a clear value added in making transition and backcasting scenarios in sustainability science. With the SuWi method, both transition scenarios and realistic backcasting scenarios can be built, because the transition paths and associated backcasting targets can be identified (see Sondeijker, Geurts, Rotmans, & Tukker, 2006). Reflective evaluations of sustainable development can be developed by SuWi approach (see Quental, Lourenço, & da Silva, 2011; Voss, Bauknecht, & Kemp, 2006).We carried out SuWi analysis to assess Cambodian development with respect to three pillars of the Green Economy: (a) low carbon development, (b) resource efficiency, and (c) social inclusion. We have utilized different indicators in the analysis in order to compare their ease of use in analysis as well as to provide a broader view of the Green Economy development.

Several different sustainability indicator sets have been developed by international organisations, research centers, and statistical offices (see comparison by (Schoenaker, Hoekstra, & Smits, 2015). In this research, the Sustainable Society Index (SSI; van de Kerk & Manuel, 2014) has been used as a basic data source for the analysis. The SSI integrates human well-being, environmental well-being, and the economic well-being indicators. The SSI is also based on the previously elaborated Brundtland definition for sustainability. However, a third sentence is added to make it explicitly clear that both human well-being and environmental well-being are included (van de Kerk & Manuel, 2014):

A sustainable society is a society

- that meets the needs of the present generation,
- that does not compromise the ability of future generations to meet their own needs,
- in which each human being has the opportunity to develop itself in freedom, within a well-balanced society and in harmony with its surroundings.

The data used in the analysis cover years 2006–2014 for which the SSI data are available. In addition to the SSI database, we have also used the World Bank database for the indicator of "social inclusion" CPIA (Country Policy and Institutional Analysis) database in order to explicitly include this dimension in the analysis (World Bank 2016). World Bank data are also used for the "forest rent" indicator (World Bank 2016). For the SuWi analyses, we have indexed the indicators from SSI database and the World Bank database to have the value 1 for the base year 2006 of the analysis. The indicators used in the analysis are shown in Table 1.

TABLE 1 Indicators used as examples for Sustainability Window analysis

Economic	Social	Environmental
GDP	Healthy life years	GHG emissions (strong)
	Food sufficiency	GHG emission intensity (weak)
	Social inclusion	Consumption of global hectares (strong)
	Cereal production	Global hectares consumption intensity (weak)
		Unsafe sanitation
		Forest rent

Note. The indicators are indexed for the analysis. The indicators are from SSI database (van de Kerk & Manuel, 2014) and World Bank database (World Bank, 2016; World Bank Group, 2016). GHG: greenhouse gas.

In the case of Cambodia, the first SuWi analysis has been carried out on GHG emissions (environmental dimension of low carbon development) and healthy life years (social dimension of social inclusion) in the context of economic development (GDP). The strong criterion for environmental sustainability is defined as where GHG emissions do not grow (see discussion on strong sustainability in Vehmas et al., 2007, and in Kaivo-oja, Panula-Ontto, et al., 2014; Kaivo-oja, Vehmas, & Luukkanen, 2014). This is, in practice, too strong criterion for a country such as Cambodia, where CO_2 emissions per capita were 0.2 ton of CO_2eq in the reference year 2006. On the contrary, the global average was approximately 4 tons of CO_2eq in the same year. That is why we utilize, in this analysis, the weak sustainability criterion for the CO_2 emissions, which states that the emissions produced per GDP should not increase. The criterion for social sustainability in this analysis is that the "healthy life years" should increase.

The analysis of SuWi is presented in Figure 1 (for more details of the method, see Luukkanen et al., 2015). In the figure, the SuWi is presented as the space on the x-axis between the minimum sustainable economic growth (defined by social sustainability) and maximum sustainable economic growth (defined by environmental sustainability). On the y-axis, we have variables describing the social development and the environmental development. These variables are approximated by different indicators. All the indicators used in the analysis—economic, social, and environmental—are indexed to have value 1 in the base year of the analysis (in this case, 2006, which is the first year of SSI data). The development of the variables as a function of time is presented on the xy-plot, and in this case, the last year value (2014) of the indexed indicators is used for analysis. It is also possible to analyse the development of the SuWi as a function of time (see Luukkanen et al., 2015).

The indexed "healthy life years" are indicated with the blue line for the years 2006–2014 starting from Point A and ending at Point B. The indexed GHG emissions divided by GDP (weak sustainability) are indicated by green line for the same time period starting from A and ending at C.

The Line r1 indicates the indexed GDP productivity for both the "Healthy life years" (how much indexed healthy life years are produced per unit of GDP) and GHG emissions (how much GHG emission are produced per unit of GDP) for the reference year 2006. The Line r2 indicates the "healthy life years" productivity of GDP in 2014, and the Line r3 indicates GHG productivity of GDP in 2014.

In order to achieve social sustainability in 2014 in relation to 2006, the "healthy life years" should not decrease (development towards more sustainable direction). With the r2 productivity, the minimum GDP in order to have the same level of "healthy life years" (point D) is marked with GDP_{min}. This determines the minimum level of economic output in order to prevent a decrease in healthy life years. In the analysis, this determines the lower limit of the SuWi, GDP_{min}.

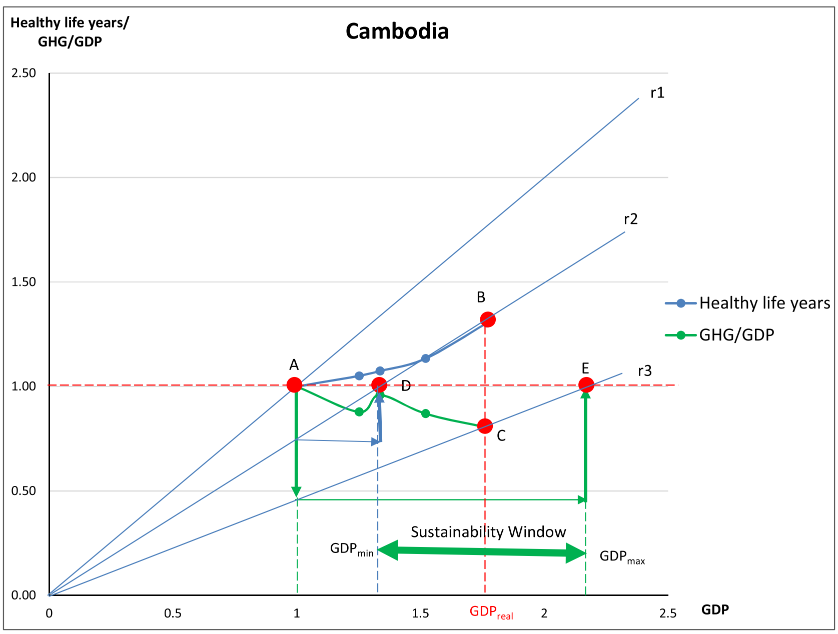

FIGURE 1 Weak Sustainability Window for Cambodia using "healthy life years" as social indicator, "GHG intensity of GDP" (GHG/GDP) as the environmental indicator (weak sustainability), and GDP as the economic indicator. "Healthy life years" productivity of GDP (Line r2) determines the minimum economic growth (GDP_{min}) in order to fulfil the social sustainability criterion ("healthy life years" should not decrease) in Point D. The "GHG intensity of GDP" should not increase, and the Line r3 (GDP productivity of the emissions) determines the maximum GDP growth (GDP_{max}) in point E in order not to increase the productivity. The real GDP growth (Points B and C) is within the weak SuWi (GDP_{min} < GDP_{real} < GDP_{max}) [Colour figure can be viewed at wileyonlinelibrary.com]

In relation to environmental sustainability, the Line r3 determines the maximum GDP to keep the growth of GHG/GDP below the value of the reference year (development towards a more sustainable direction). At Point E in the figure, the weak environmental sustainability criterion is fulfilled, and this determines the upper limit, the maximum economic growth, GDP_{max}, for the SuWi.

In this practical case, Cambodian economic development seems to be within the SuWi for the years 2006–2014. According to the analysis, the maximum sustainable economic growth (GDP_{max}) could have been about 15% higher between 2006 and 2014 than the real economic growth (GDP_{real}; difference between E and C in the figure).

Another SuWi analysis has been carried out using "food sufficiency" indicated by the blue line in Figure 2 as the indicator for the social dimension by social inclusion, and "consumption of global hectares" indicated by the green line, as an indicator of the environmental dimensions through resource efficiency. Sufficient food is defined in SSI as the availability of at least the minimum level of dietary energy for each person, which is seen as one of the very basic conditions of human development. It is calculated by using the figure for the undernourished percentage of the population. The "consumption of global hectares" is measured by SSI using ecological footprint minus carbon footprint, because the carbon footprint is already included in the CO_2 emissions per capita.

This analysis indicates (see Figure 2) that there exists a SuWi for Cambodia (green arrow). The minimum economic development is defined by the social development criterion to be at the level of GDP_{min} (Point D determined by food sufficiency productivity Line r2, the number of undernourished people should not increase). The maximum economic development GDP_{max} defined by the environmental criterion (Point C determined by global hectares productivity Line r3, the consumption of global hectares should not increase). The economic growth has exceeded the maximum sustainable level when these indicators are used. This means that the strong sustainability

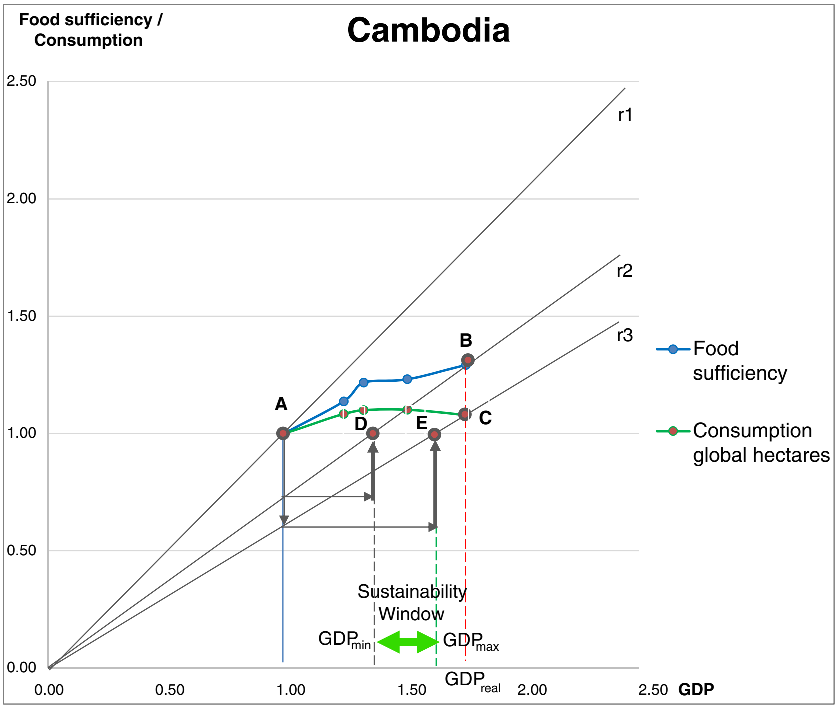

FIGURE 2 Strong Sustainability Window for Cambodia using "food sufficiency" as social indicator (1/undernourished people) and "consumption of global hectares" as the environmental indicator. The actual GDP growth (Points B and C) is higher than the maximum strong sustainability growth (Point E) defined by the consumption intensity Line r3 [Colour figure can be viewed at wileyonlinelibrary.com]

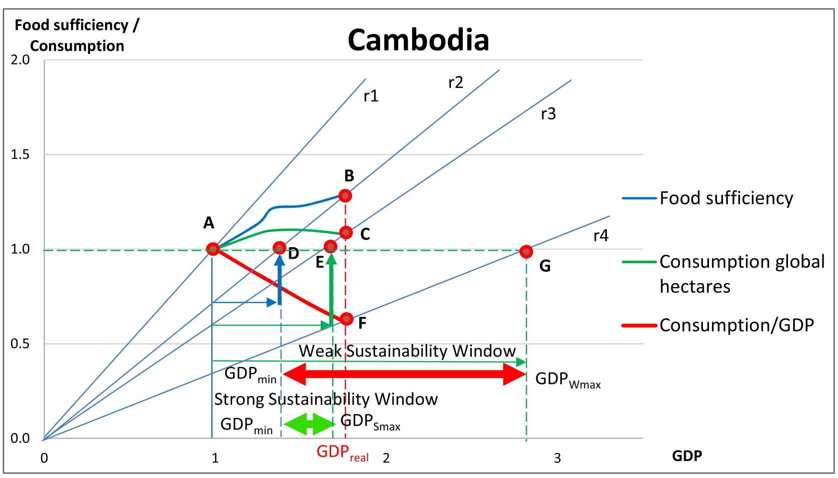

FIGURE 3 Weak (red arrow) and strong Sustainability Windows (green arrow) for Cambodia using "food sufficiency" as social indicator (1/undernourished people) and "consumption of global hectares" as the environmental indicator for strong sustainability and "GDP intensity of consumption of global hectares" as the environmental indicator for weak sustainability. The actual GDP growth (Points B and C) is higher than the maximum strong sustainable growth (Point E) defined by productivity Line r3, whereas it is lower than the weak sustainable growth (Point G) defined by the productivity Line r4 [Colour figure can be viewed at wileyonlinelibrary.com]

criteria for the consumption of global hectares is not fulfilled in the Cambodian case.

The use of the weak sustainability criteria for the environmental dimension (consumption of global hectares/GDP) indicates that economic growth is within the weak sustainability limits. This can be seen in Figure 3, where the strong SuWi is indicated with red colour and the weak SuWi with green colour.

We have carried out another SuWi analysis using "social inclusion" as an indicator for the social dimension and "unsafe sanitation" as the environmental indicator as presented in Figure 4. The indicator for "social inclusion" from the World Bank database is indexed to have a value of 1 in the base year. In the World Bank database, the policies for social inclusion and equity cluster includes gender equality, equity of public resource use, building human resources, social protection and labour, and policies and institutions for environmental sustainability (World Bank, 2016, CPIA database [http://www.worldbank.org/ida]). In this analysis, the social inclusion should not decrease (social sustainability) and the number of people having unsafe sanitation should not increase (environmental sustainability). The analysis shows that using these indicators there exists a SuWi for Cambodia and the real GDP growth is within this window. In this case, the real GDP_{real} growth is higher than GDP_{min} (Point D defined by the social inclusion productivity Line r2) and also smaller than GDP_{max} (Point E defined by the environmental criterion of unsafe sanitation productivity Line r3).

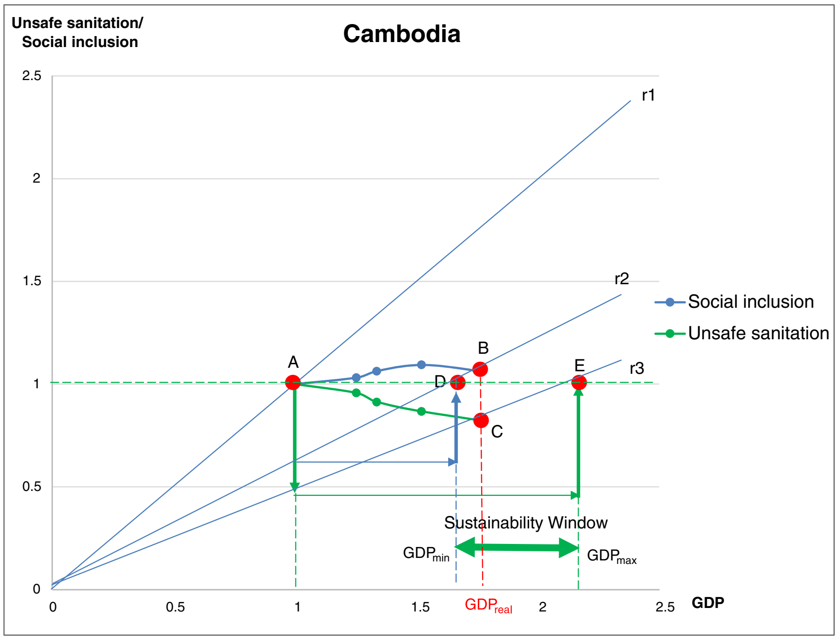

FIGURE 4 Sustainability Window for Cambodia using "unsafe sanitation" as the environmental indicator, "social inclusion" as the social indicator, and GDP as the economic indicator for the analysis of sustainability. The real GDP growth (Points B and C) is within the Sustainability Window defined by GDP productivity of "social inclusion" (Line r2, Point D) and the GDP productivity of unsafe sanitation (Line r3, Point E) [Colour figure can be viewed at wileyonlinelibrary.com]

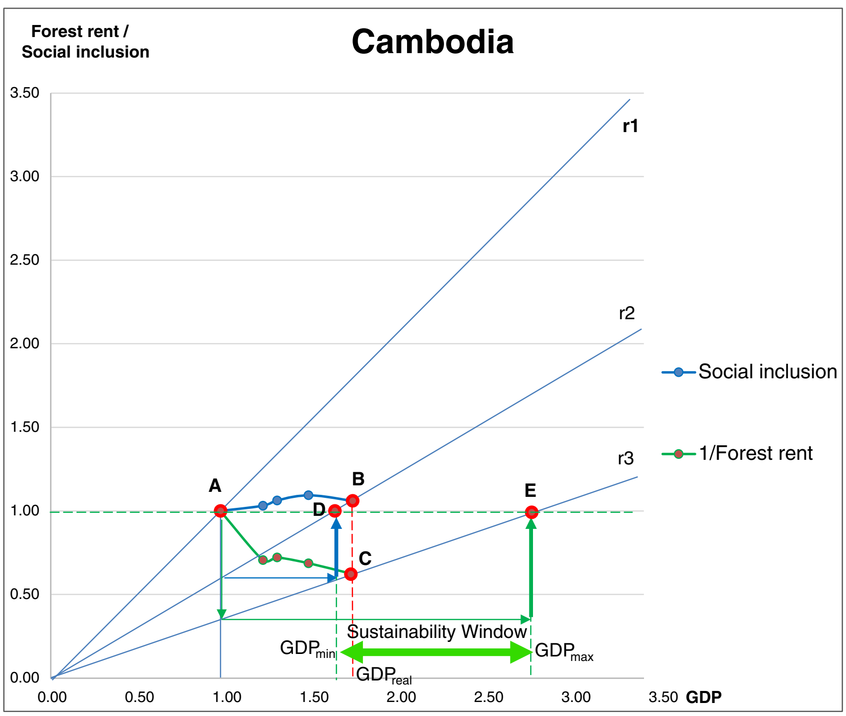

FIGURE 5 Sustainability Window for Cambodia using "social inclusion" as social indicator and "forest rent" as the environmental indicator and GDP as the economic indicator for the analysis of sustainability. The GDP productivity of "social inclusion" (Line r2) determines the minimum economic growth (Point D). The "forest rent" should increase, so we get the maximum economic growth using 1/"forest rent" as the environmental indicator (Point E, Line r3) [Colour figure can be viewed at wileyonlinelibrary.com]

In Figure 5, the SuWi analysis is carried out using "social inclusion" as the social indicator, "forest rent" as the environmental indicator (see World Bank Group, 2016), and GDP as the economic indicator. Minimum economic development, GDP_{min}, is determined by Point D defined by the social inclusion productivity Line r2. Because the forest rent should increase, we have used "1/forest rent" as the environmental indicator in the analysis (which should not decrease). This determines the maximum economic growth (GDP_{max} Point E defined by "1/forest rent" productivity Line r3).

For another analysis of SuWi, we have used "cereal production" as the social indicator that should increase (GDP_{min} in Point D defined by the cereal productivity Line r2), the "GHG intensity of GDP" (GHG/GDP) as the environmental indicator (weak sustainability, GDP_{max} in Point E determined by the GHG intensity productivity Line r3), and GDP as the economic indicator. The results of this analysis are shown in Figure 6, which show that the development in Cambodia is within the weak SuWi when we use these indicators.

The SuWi framework can be utilized for the analysis of the Efficiency Gap if the development is not within the SuWi. Figure 7 shows

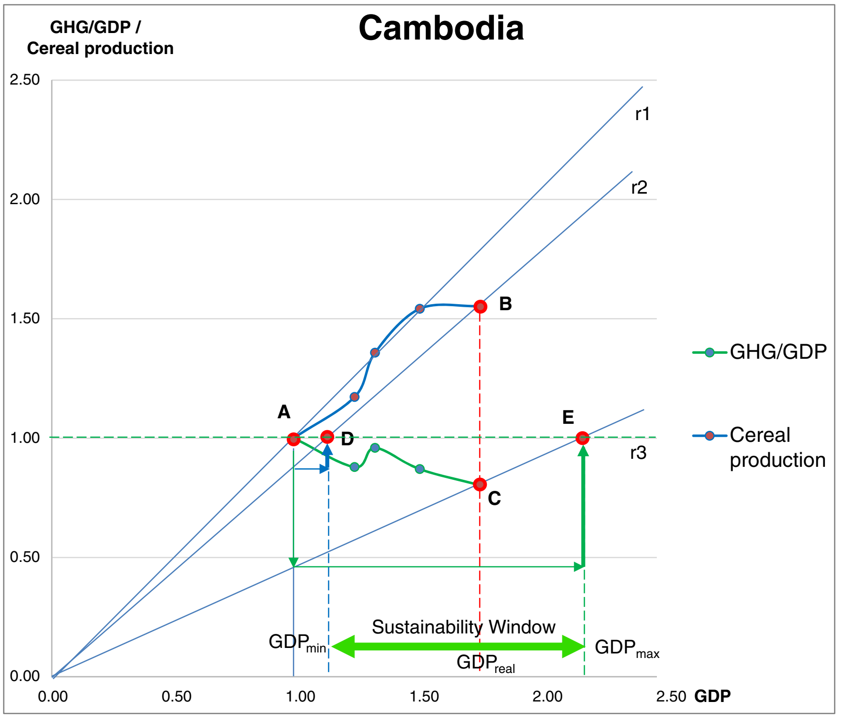

FIGURE 6 Weak Sustainability Window for Cambodia using "cereal production" as the social indicator, the "GHG intensity of GDP" (GHG/GDP) as the environmental indicator (weak sustainability) and GDP as the economic indicator. The GDP productivity of "cereal production" (Line r2) determines the minimum economic growth (Point D) where the production does not decrease. The GDP productivity of GHG intensity (Line r3) determines the maximum economic growth (Point E) in order to decrease the intensity [Colour figure can be viewed at wileyonlinelibrary.com]

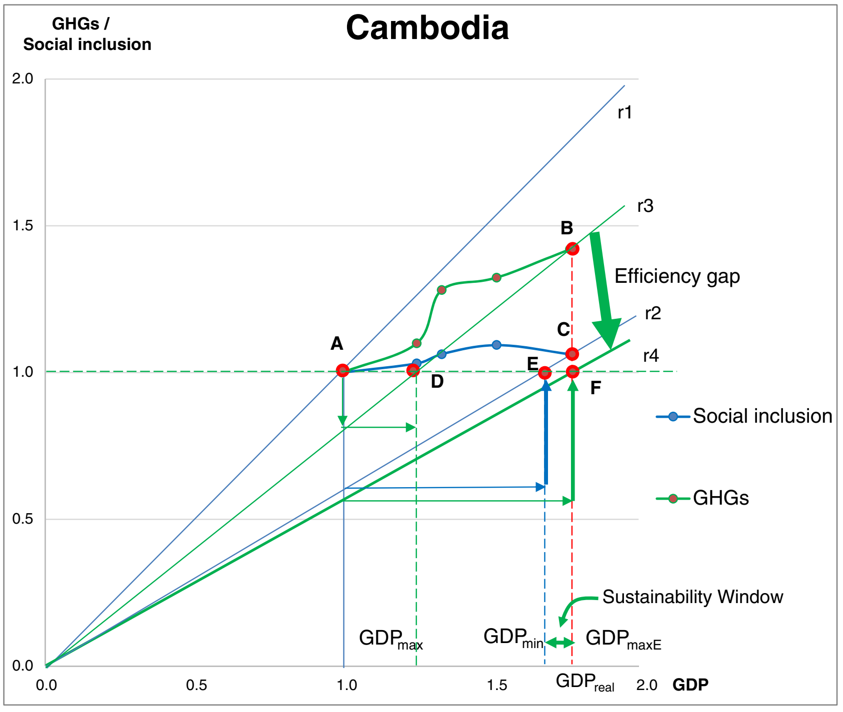

FIGURE 7 Efficiency Gap analysis for strong sustainability using greenhouse gas (GHG) emissions as the environmental indicator, "social inclusion" as the social indicator, and GDP as the economic indicator. The GHG emission intensity for 2014 indicated with r3 should improve to r4 in order to avoid increase in GHG emissions. This would mean the reduction of GHG emissions from B to F [Colour figure can be viewed at wileyonlinelibrary.com]

an example of this novel Efficiency Gap analysis using GHG emissions as the environmental indicator, "social inclusion" as the social indicator, and GDP as the economic indicator.

In this Efficiency Gap analysis, the strong sustainability requirement is that the GHG emissions should not increase. The actual change in the GHG emissions intensity from 2006 to 2014 is from r1 to r3. This improvement of the efficiency (decrease in intensity) is not enough to avoid the increase of GHG emissions that are grown to the level indicated by the Point B (on Line r3) in the Figure 7. The GHG intensity should decrease to r4 in order to avoid the increase in the emissions if the GDP reaches the 2014 level (GDP_{real} in the figure). This would reduce the emissions from B to F, which is the same level as in the base year. The difference between r3 and r4 shows the Efficiency Gap to reach the strong sustainability criterion of nonincreasing GHG emissions. The amount of the Efficiency Gap can be calculated as $(GHG_t - GHG_{t0})/GDP_t$, where t0 refers to the base year value. In relation to the GHG emissions, the Efficiency Gap in Cambodia is about 24%. This means that the GHG emission intensity of GDP should have been 24% lower in 2014 to fulfil the strong sustainability criterion. In relation to the

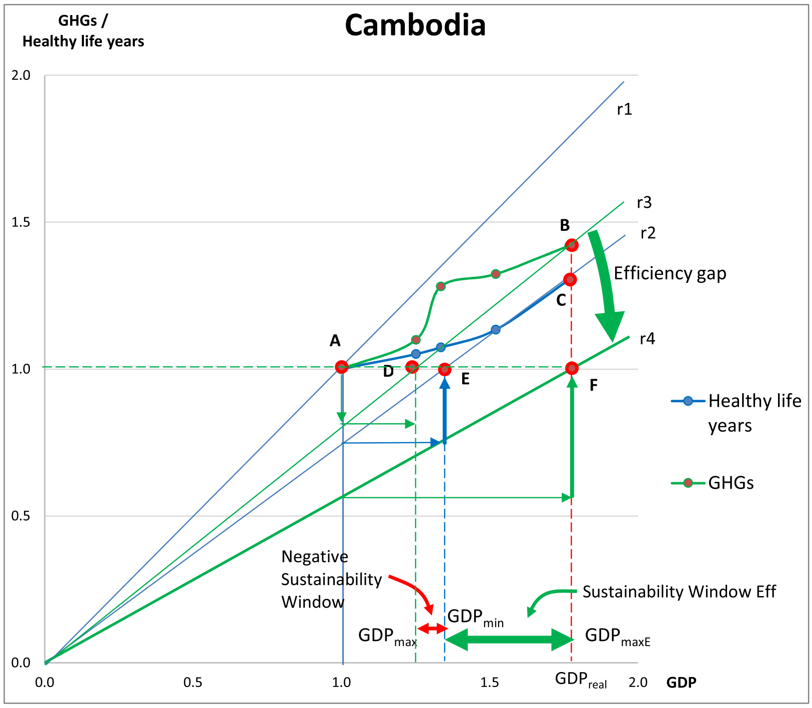

FIGURE 8 Efficiency Gap analysis for strong sustainability using "greenhouse gas emissions" as the environmental indicator, "healthy life years" as the social indicator, and GDP as the economic indicator. Negative SuWi means that the maximum growth defined by environmental criterion (Line r3, Point D) is lower than the minimum economic growth defined by the social criterion (Line r2, Point E). The GHG emission intensity for 2014 indicated with r3 should improve to r4 in order to avoid increase in GHG emissions (decrease from B to F) [Colour figure can be viewed at wileyonlinelibrary.com]

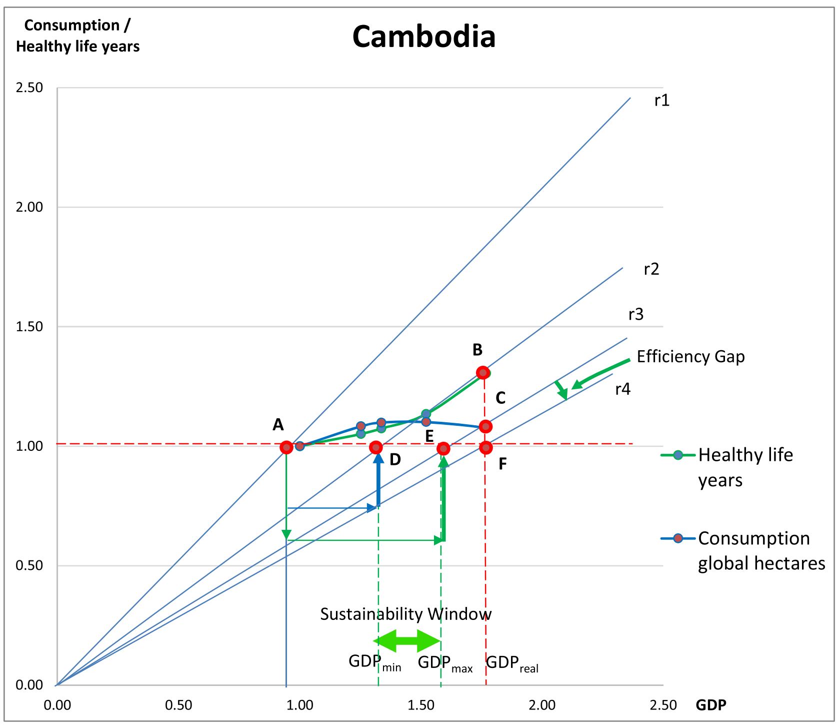

FIGURE 9 Efficiency Gap analysis for Strong Sustainability using "consumption of global hectares" as the environmental indicator, "healthy life years" as the social indicator, and GDP as the economic indicator. The consumption intensity for 2014 indicated with r3 should improve to r4 (decrease from C to F) in order to avoid increase in "consumption of global hectares" [Colour figure can be viewed at wileyonlinelibrary.com]

"consumption of global hectares" the Efficiency Gap is about 4% (see Figure 9).

Another Efficiency Gap analysis is carried out in Figure 8 using "healthy life years" as the social indicator, GHG emissions as the environmental indicator, and GDP as the economic indicator. In this case, we have negative SuWi (indicated with the red arrow in the Figure 8) if we use the strong sustainability criterion. In this case, GDP_{max} is defined by Point D determined by GHG intensity Line r3, and GDP_{min} is defined by Point E determined by "healthy life years" productivity line r2. Negative SuWi means that the maximum sustainable economic growth determined by the environmental indicator is lower than the minimum sustainable economic growth determined by the social indicator. The Efficiency Gap between r3 and r4 in the Figure 8 indicates the needed decrease in emission intensity (increase in efficiency) to avoid emission growth.

The Efficiency Gap analysis using "consumption of global hectares" as the environmental indicator and "healthy life years" as social indicator is shown in Figure 9. The GDP intensity of the consumption (Line r3) should improve to r4 (reduction of consumption from C to F) in order not to increase the consumption. In this case, the Efficiency Gap for strong sustainability is quite small requiring only about 4% improvement in the efficiency to achieve the strong sustainability.

3 | CONCLUSIONS

A grand challenge of sustainability is to examine the range of plausible future pathways of combined social, economic, and environmental systems under conditions of uncertainty, surprise, human choice, and complexity of systems. This requires charting new scientific territory and expanding the current global change research agenda and developing new tools and methods for sustainability science. One of these methods is SuWi analysis, which helps stakeholders to analyse sustainability paths in societies. In best cases, these analyses increase the transparency of sustainability science and policy. They also aid stakeholders to understand sustainability transition processes in their societies. In this article, we have demonstrated these analyses in the case of Cambodia.

In this article, we have presented various SuWi analyses, which are linked to the key issues of the green growth strategy of Cambodia. The analyses cover the three pillars of Green Economy utilizing the SSI database indicators for the analysis. The article demonstrates the ways in which the indicators can be utilized in the SuWi framework for integrating the different dimensions of sustainability. The use of additional World Bank indicators widens the perspective of the analysis.

The developed framework for the weak and strong SuWi analysis provides novel possibilities to include the different dimensions of sustainability in a single integrated framework and to analyse the strong and weak sustainability simultaneously. This provides a basis for more comprehensive analysis especially, where new indicators and datasets such as SSI are available. The results obtained with the SuWi analysis naturally depend on the indicators used, and thus, the quality of the indicator data is essential to robust analysis.

Policy planning should be based on knowledge and information. SuWi analyses provide a solid basis for argumentative policymaking and decisions. Especially in the case where decision makers cannot identify SuWi, there is critical need for stricter policymaking. In a case of a wide SuWi related to the selected indicators, the tool provides possibilities for directing policy actions in areas where the SuWi is narrower or does not exist. The novel tool provides more comprehensive situation awareness for planners.

There is a lot of criticism related to the weak agency of sustainable development and Sustainable Development Goals (SDGs) because implementation enforcement for governments is very soft and there are no legal instruments to steer actions from business and consumers (Spangenberg, 2017). SuWi tool can offer one transparent source of information for more strict engagement of sustainability issues in the policy process and for targeting the actions in critical areas of sustainability.

The novel Efficiency Gap analysis developed in this article provides new information of the improvement needed in the efficiency of different production processes. In this article, we used the Efficiency Gap for the analysis of the improvement required in the GHG intensity of GDP and of the intensity of "consumption of global hectares." The Efficiency Gap analysis can be used for analysis of any environment-related development, when suitable indicators are available. The Efficiency Gap analysis provides important information for planners and policy makers of areas where policy intervention is required towards implementing a greener economy.

There has been lot of discussion about degrowth, zero growth, and positive growth (see e.g. Harangozo, Csutora, & Kocsis, 2018) and the limits of economic growth. SuWi provides a novel approach to deal with the limits in economic growth by integrating all the three sustainability dimensions in a same analytical framework and providing clear and transparent criteria for the development. In addition, the dynamics of the development pathways and their trends can be analysed, and it is possible to assess whether the development is widening the efficiency gap or not.

Aggregate national level indicators do not provide information of local level development but provide a view of the general development trends in society, and it is important that this is remembered when the results are interpreted. There can be large variations in regional development as well as variations between different income groups, gender differences, and so forth, and this type of national level analysis will not distinguish these variations. In addition, the qualitative aspects of development are not easily integrated into the quantitative indicators applied even though the indicators cover several aspects of development. This is a known limitation of all quantitative approaches to analysing development.

The developed SuWi tool can be used mainly in the analysis of the macro level of sociotechnical systems and their transformations. It provides basis for policy planning at this macro level and also possibilities for comparison for instance between the different ASEAN countries and for continuous policy learning and transfer of lessons learned (see Kaivo-oja et al., 2018). SuWi provides feedback mechanism of the functioning of the transition processes and gives valuable information for the investments of scarce resources in a most efficient way. The developed Efficiency Gap analysis is essential in this respect.

For a least developed country such as Cambodia, it is a challenge to further enhance and extend policy for sustainable development and to set up implementation plans for the various sectors. In this respect, SSI data-based knowledge about the actual level of sustainability is crucial. It is also of much relevance to understand the developments towards a sustainable society in the recent past. SuWi provides an efficient tool for identification of critical points for sustainability planning.

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