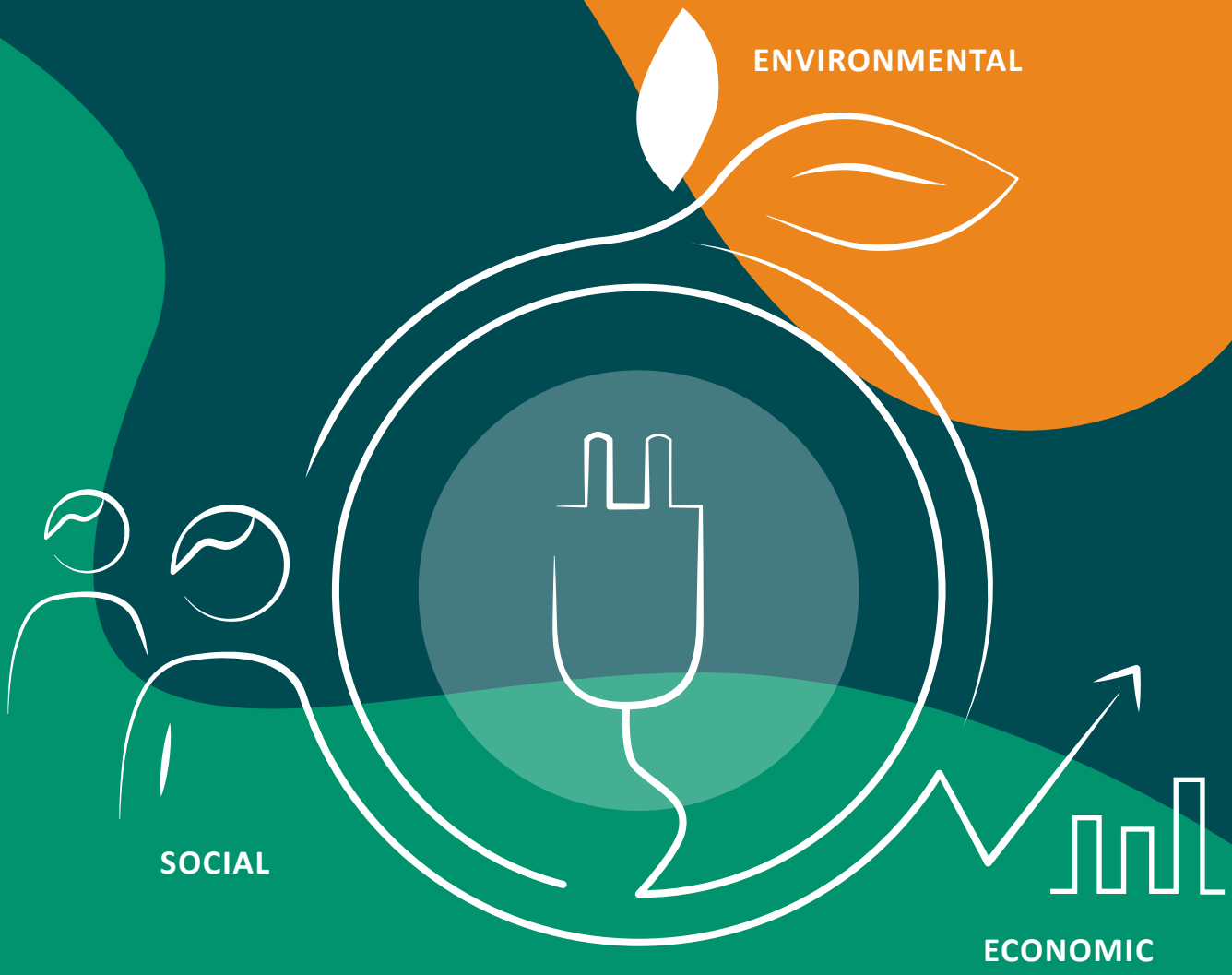
The GBEP Sustainability Indicators for Bioenergy

A TOOL FOR POLICY-MAKERS



GBEP
Global Bioenergy Partnership

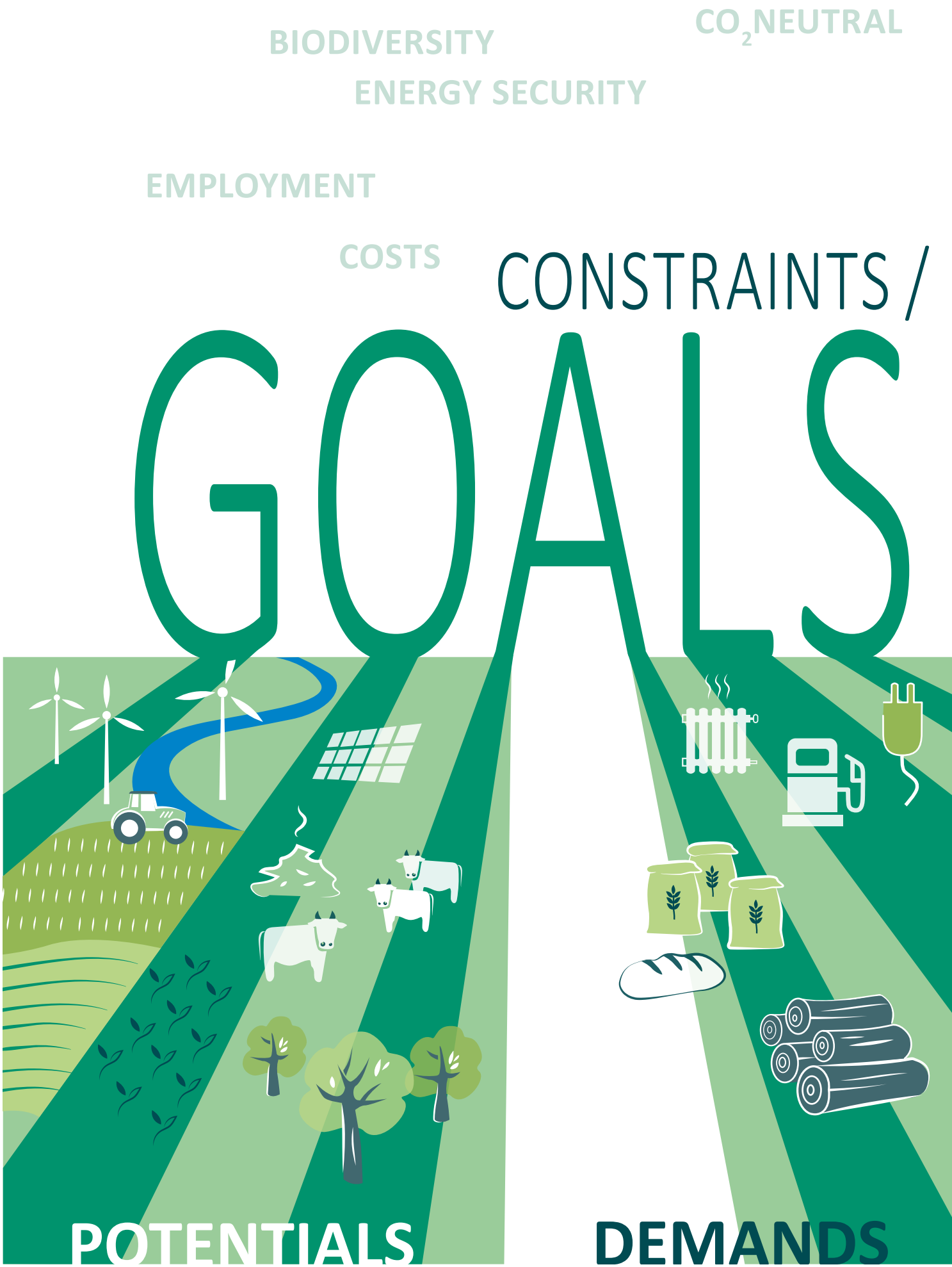
CONTENT

ACKNOWLEDGEMENTS

This brochure presents the Sustainability Indicators for Bioenergy developed by the Global Bioenergy Partnership (GBEP), and key elements of the respective Implementation Guide prepared by the GBEP Task Force on Sustainability under the able chairmanship of Kwabena Ampadu Otu-Danquah (Ghana), Takashi Hayashi (Japan), Annalisa Zezza (Italy) and Ahmed Abdelati Ahmed (Egypt), with the support of the GBEP Secretariat (Maria Michela Morese, Constance Miller, Tiziana Pirelli, Marco Colangeli, Lorenzo Traverso and Emily Olsson), and with the valuable contribution of the TFS sub-group leaders – Environmental sub-group led by Germany (Uwe Fritsche); Social sub-group co-led by Argentina (Miguel Almada and María Rosa Murmis) and FAO (Olivier Dubois and Andrea Rossi); and Economic sub-group co-led by Italy (Annalisa Zezza) and Japan (Takashi Hayashi).

The authors would also like to thank the German government, represented by the Federal Ministry for Agriculture and Food (BMEL) through the Agency for Renewable Resources (FNR), for the generous support in preparing this brochure.

DISCLAIMER


BIODIVERSITY
CO_2NEUTRAL
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GOALS
POTENTIALS
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BIOENERGY? IS IT REALLY GREEN?

Modern bioenergy presents great opportunities for sustainable development and climate change mitigation, but it brings challenges too, some of international relevance. In light of this, international cooperation is essential for building consensus on how to measure success in bioenergy and building capacity to help implement successful solutions.

In developing countries

In developing countries, switching from traditional to modern bioenergy can reduce death and disease from indoor air pollution, free women and children from collecting fuelwood and reduce deforestation. It can also cut dependence on imported fossil fuels, improving countries' foreign exchange balances and energy security (Souza et al. 2018). Furthermore, bioenergy can expand access to modern energy services, improve nutrient quality of food by allowing for longer cooking, create new source of income along the various steps of the value chain, from farmers to energy producers, thus alleviating poverty. In urban centers, using biofuels in transport and households can improve air quality.

In developed countries

For developed countries, where the focus is on mitigating climate change, bioenergy can stimulate a green recovery, generating more jobs and fewer greenhouse gas emissions than fossil fuels (IEA 2017). It can breathe life into rural economies and diversify energy supply.

However, if not sustainably produced, bioenergy can place extra pressure on biodiversity, scarce water resources and food security. If land use is not well planned and enforced, increased deforestation, loss of peatlands and land degradation can occur and lead to an overall negative impact on climate change. Where land tenure is insecure, communities can be displaced and lose access to land and other natural resources (IRENA, IEA Bioenergy & FAO 2017).

Figure 1:
Sustainability challenges of bioenergy

GBEP: A GLOBAL PARTNERSHIP BACKED BY THE G7 AND G20

The Global Bioenergy Partnership (GBEP)[1] brings together public decision-makers, representatives of the private sector and civil society as well as international agencies with expertise in bioenergy. After initial agreement during the 2005 Gleneagles Summit, it was launched during the 14th session of the Commission on Sustainable Development in New York in May 2006.

It has 23 countries and 15 international organizations as partners, and further 31 countries and 12 international organizations and institutions as observers.

[1] www.globalbioenergy.org

PARTNERS

OBSERVERS

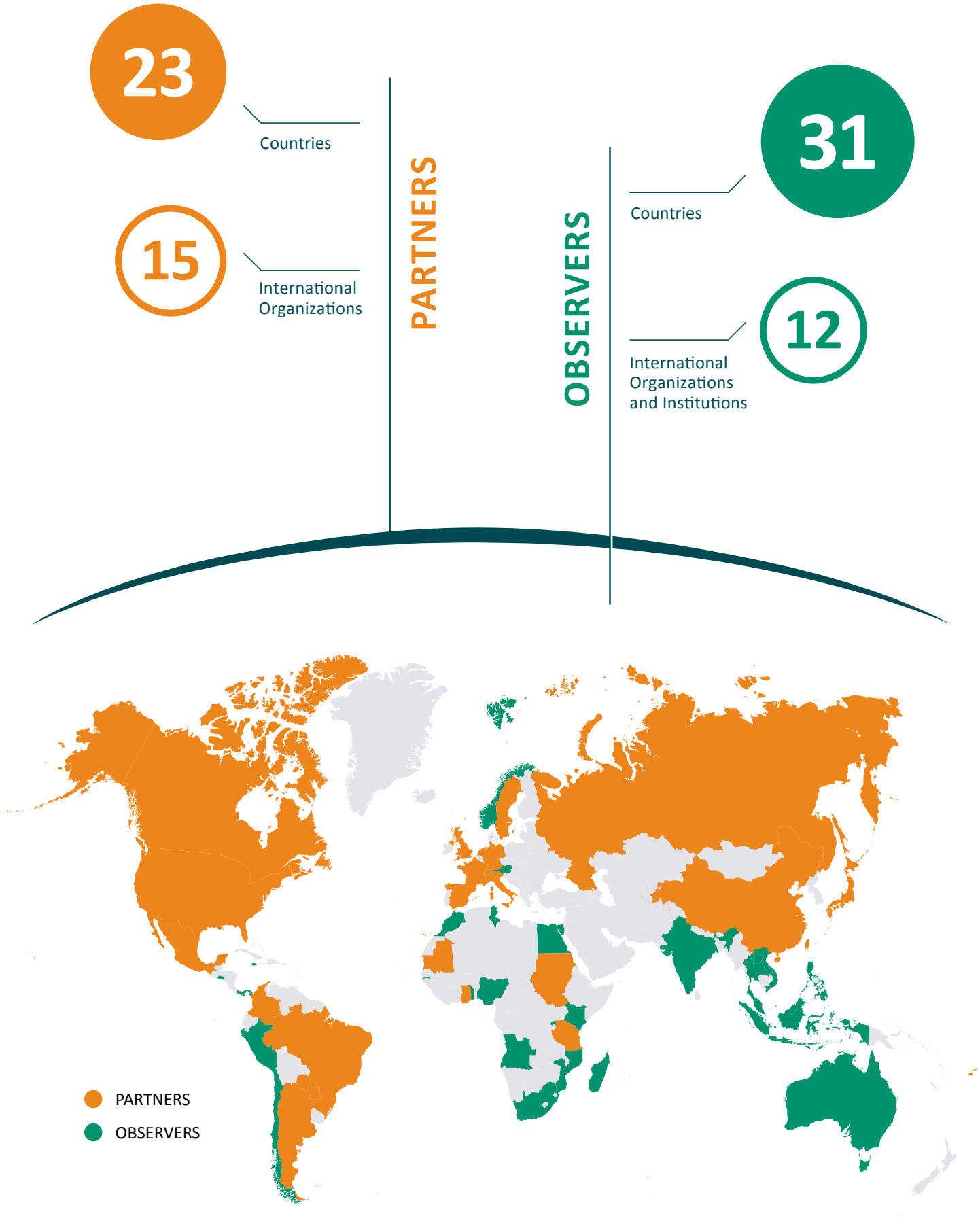


Figure 2:
GBEP Membership

1. THE GBEP SUSTAINABILITY INDICATORS FOR BIOENERGY

In 2009, GBEP set up the Task Force on Sustainability to develop a set of relevant, practical, voluntary and science-based sustainability indicators and methodologies to assess the environmental, social and economic impacts of bioenergy production and use. The result of the work are the 24 GBEP sustainability indicators (GSI) for bioenergy (see Table 1) which provide policy-makers and stakeholders with a tool to guide any analysis of bioenergy undertaken at the domestic level with a view to take informed policy-making that would facilitate the sustainable development of bioenergy. Measured over time, the indicators will show the effectiveness of national bioenergy policies and programmes taken to respond to environmental, social and economic impacts of their bioenergy production and use.

The GSI are an effective and practical tool to facilitate sustainable development, climate change mitigation, and food and energy security.

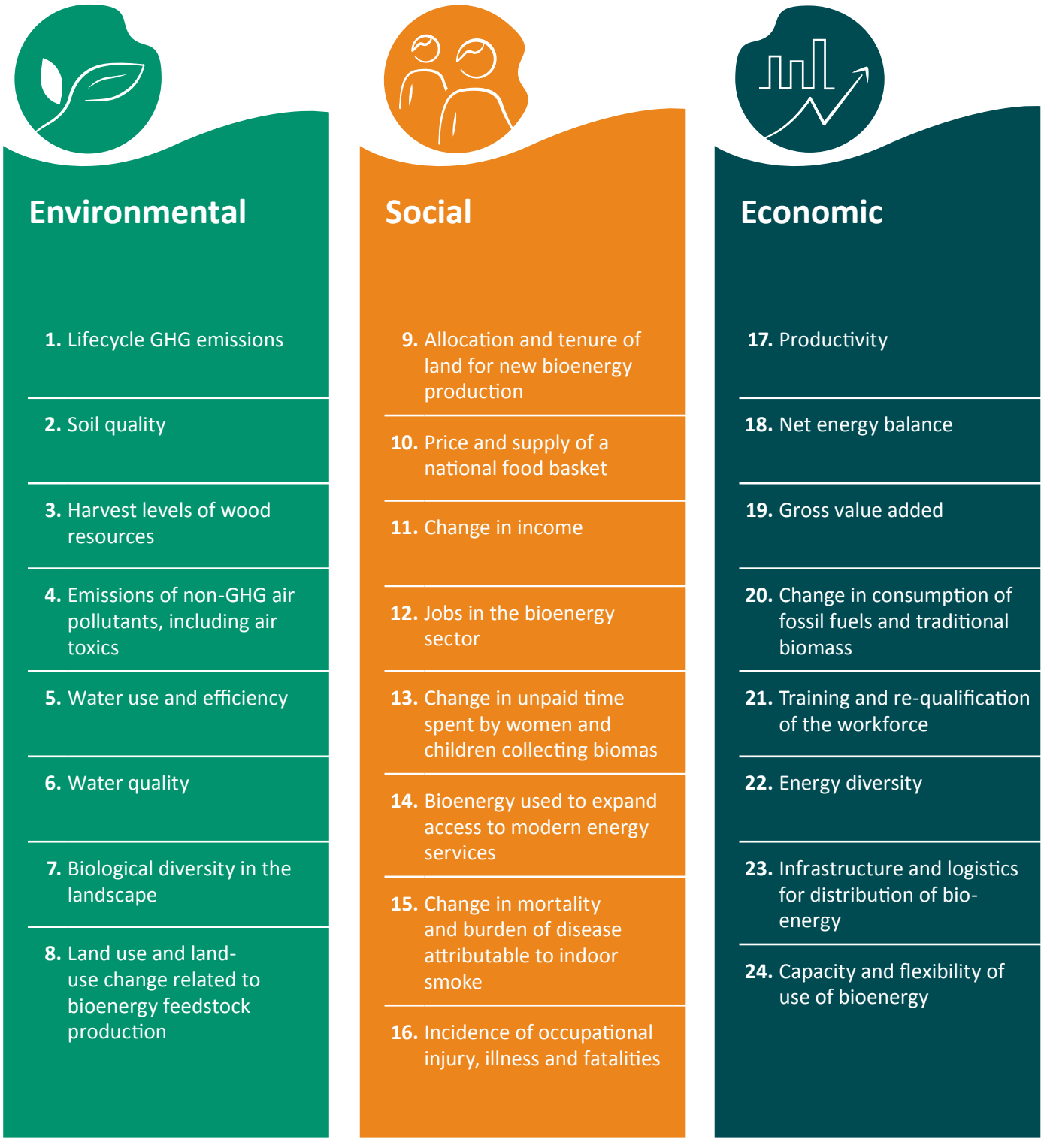


Figure 3: The GBEP Sustainability Indicators for Bioenergy

2. EXAMPLES: GSI IMPLEMENTATION IN COUNTRIES

Since the establishment of the TFS, fourteen countries have implemented the indicators and two more countries are in the process of implementing them. In particular, amongst the countries that completed their measurement, eleven countries have tested the indicators at the national level and another three countries have applied them at the local level. The following section briefly presents selected examples of the GSI implementation in countries around the world. [2]

In Latin America

Argentina, **Colombia**, **Jamaica** and **Paraguay** have implemented a comprehensive assessment of the GSI, whilst **Brazil** and **Uruguay** have initiated their work on it. Jamaica was the first country to develop a life cycle assessment tool for the GSIs.

In Europe

The Netherlands was among the first users of the GSI; they succeeded in developing a quick screening on the basis of nationally available data. **Italy** has carried out a detailed analysis on a specific biogas approach. **Germany** is the first country to have already measured the GSI twice. With the second report, a time series on the development of the indicators became available. It serves as an example of how the GSI are suitable for monitoring over a longer period of time.

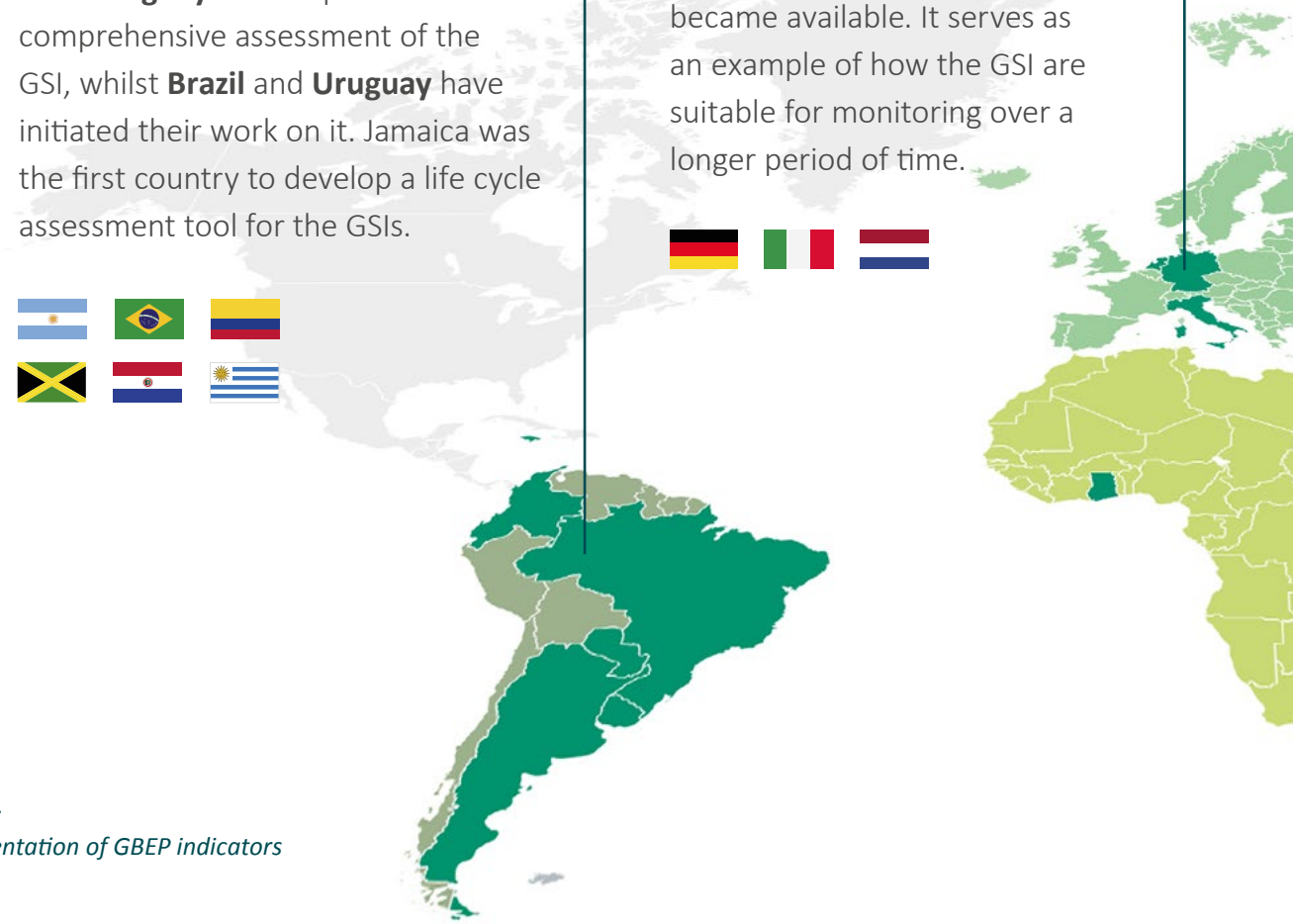


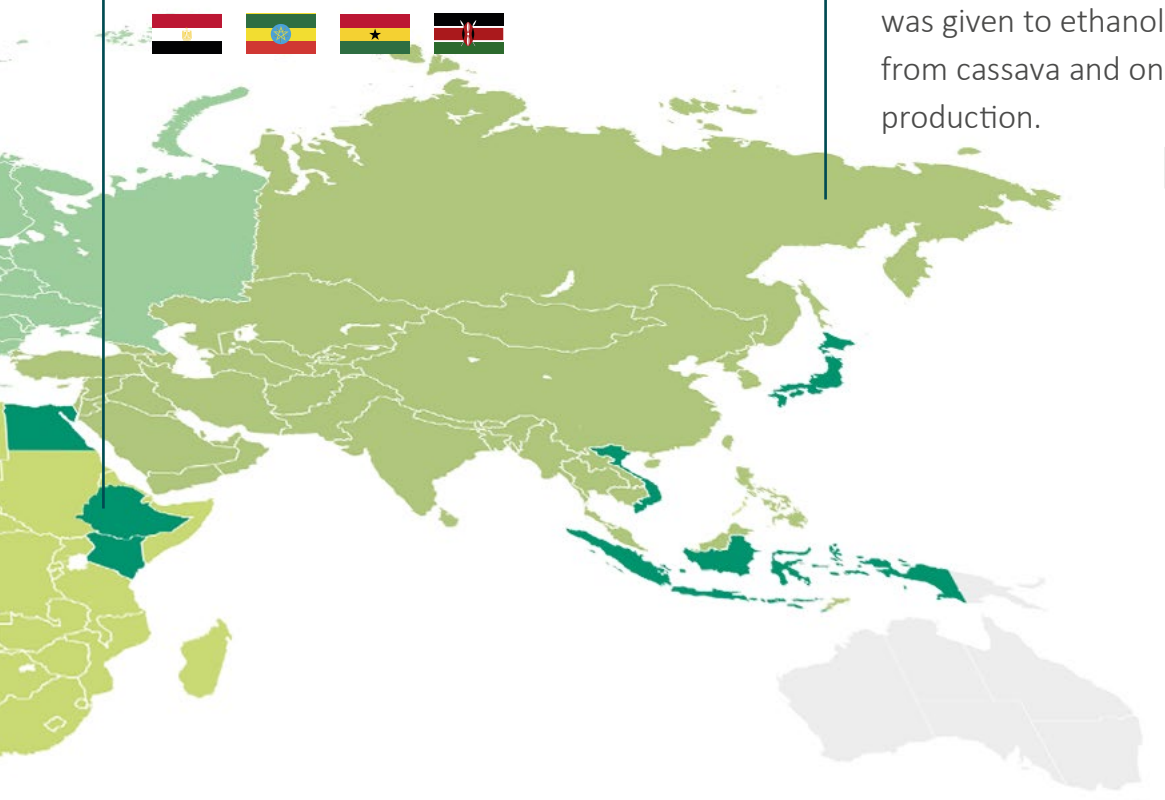
Figure 4:
Implementation of GBEP indicators

In Africa

Ghana was one of the first countries to pilot the GSI. In a way, it was an acid test, as the experience and capacities were built from scratch, and left many questions unanswered. This example was particularly instructive for all later applications in developing countries. After **Egypt**, the GSI were most recently implemented in **Ethiopia** and **Kenya**, primarily for solid biomass value chains. With the knowledge and lessons learnt from previous implementation, both countries were able to choose measurement approaches that suited their national contexts: while Kenya relied on a variety of research institutes, Ethiopia concentrated the work in the national environmental authority.

In Asia

Japan was the very first country to pilot the GSI. As a first trial of indicator measurement, they focused on the regional production of biodiesel from waste cooking oil. **Indonesia** concentrated the GSI application on the highly relevant complex of palm oil production, collecting primary data in collaboration with renowned research institutes and the FAO. The data collection on land use and land-use change is trailblazing. **Viet Nam** also collaborated with FAO and numerous university institutes for the GSI application. Here, special attention was given to ethanol production from cassava and on-farm biogas production.



[2] More information and details are given in respective publications (Chidiak et al. 2016; FAO 2018a+b; IINAS & ifeu 2019; UNEP 2019a+b). For a complete list of GSI applications see http://www.globalbioenergy.org/programmeofwork/working-group-on-capacity-building-for-sustainable-bioenergy/activity-group-2/fi/

3. GUIDANCE ON THE GSI USE

The AG2 has identified major practical and methodological challenges associated with the measurement of each of the 24 indicators.

The GBEP's Working Group on Capacity Building[3] has formed an activity group (AG) to exchange experiences on the indicator application, distill lessons learnt and share data. Additionally, the countries that carried out assessments using the indicators were asked to complete a template that included the key results, lessons learned and recommendations. This led to recommendations to further develop the methodological guidance and increase the practicality of the indicators[4].

In general, lack of data, skills and/or resources, particularly in developing countries, were identified as presenting some of the biggest challenges, which, consequently, is why capacity building was found to be relevant for almost all of the GSI.

The variations in data availability and methods used across the 14 country experiences also highlights the need for future users to be very clear when communicating how their results were achieved.

This resulted in the formulation of an "Implementation Guide" (GBEP 2020) to clarify issues of indicator measurement as well as enable future users to take advantage of relevant lessons learned.

In the development of the Implementation Guide, priority was given to those issues that affected the measurement of all or most of the indicators.

[3] For the scope of the WGCB see http://www.globalbioenergy.org/programmeofwork/working-group-on-capacity-building-for-sustainable-bioenergy/en/

[4] For results and updates on the ongoing work see http://www.globalbioenergy.org/programmeofwork/working-group-on-capacity-building-for-sustainable-bioenergy/activity-group-2/fi/

These cross-cutting issues were grouped into three categories:

- integration of definitions and methodologies;
- ensuring an effective implementation of the indicators; and
- enhancing the practicality of the indicators.

Once those were addressed, discussions related to the guidance to be provided for individual indicators took place under the TFS sub-groups (i.e. environmental, social and economic).

3 CATEGORIES OF CROSS-CUTTING ISSUES

4. CROSS-CUTTING ISSUES

Based on the cross-cutting issues identified, the Implementation Guide (GBEP 2020) provides the following guidance: definitions of modern bioenergy; attribution of the impacts to bioenergy production and consumption; relevant good practices and practical proxies; and a 'stepwise approach' for the effective implementation of a GSI project.

4.1 Definitions of modern bioenergy

There is no internationally-recognized definition of modern bioenergy. This discord between organizations and initiatives speaks to the complexity and politically sensitive nature of the issue. The guidance to users of the GSI is to clearly outline the definition of modern bioenergy being used and provide a solid justification for why that particular one was chosen. This will provide clarity for those wishing to interpret the findings of GSI measurement, as well as ensure consistency for future monitoring.

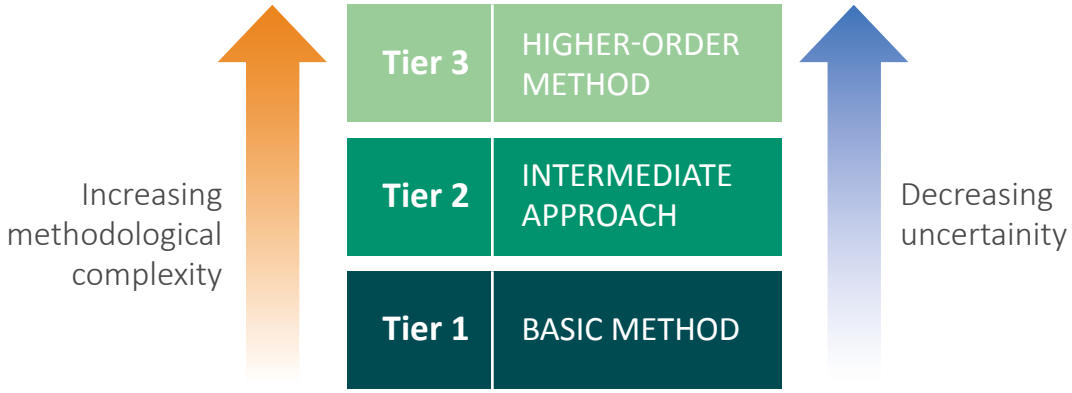


Figure 5 : Practical tier approach for attributing impacts to bioenergy

4.2 Attribution of the impacts to bioenergy

The production and use of bioenergy as a subsector cuts across multiple sectors and parts of the entire economy. The isolation of one subsector requires clearly defined procedures, rules and conventions about how to draw the line between the sector of interest and the remainder. The Implementation Guide provides guidance on how to attribute observed impacts to the bioenergy subsector. The guidance is constructed practically, providing a three-tier approach based on available data and resources.

4.3 Good practices and practical proxies

The suggested methods for calculating the GSIs are rigorous. Most indicators have large data requirements that can be difficult to meet. When indicators cannot be measured due to a lack of data, skills and/or resources, and when appropriate as a complement to the measurement of the current quantitative indicators, practical proxies might help countries to implement the GSI and to propose bioenergy actions that would likely prove sustainable. The Implementation Guide provides suggestions on potential proxies and best practices for this purpose.

4.4 Ensuring effective implementation of the indicators – the Stepwise Approach

In an effort to provide practical guidance on the steps for carrying out a project on the implementation of the GSI, a 'stepwise approach' for the implementation of the GBEP indicators was developed. It is based on the experiences of FAO in Colombia, Indonesia, Vietnam and Paraguay, as well as experiences from other countries that have also implemented the GSIs.

It includes nine working packages (WPs). For each WP, the project results chain, the details of the activities and the actors involved are stated. It is estimated that the project duration is approximately 24 months, from presentation of the project to dissemination of results. An overview can be seen Figure 6.

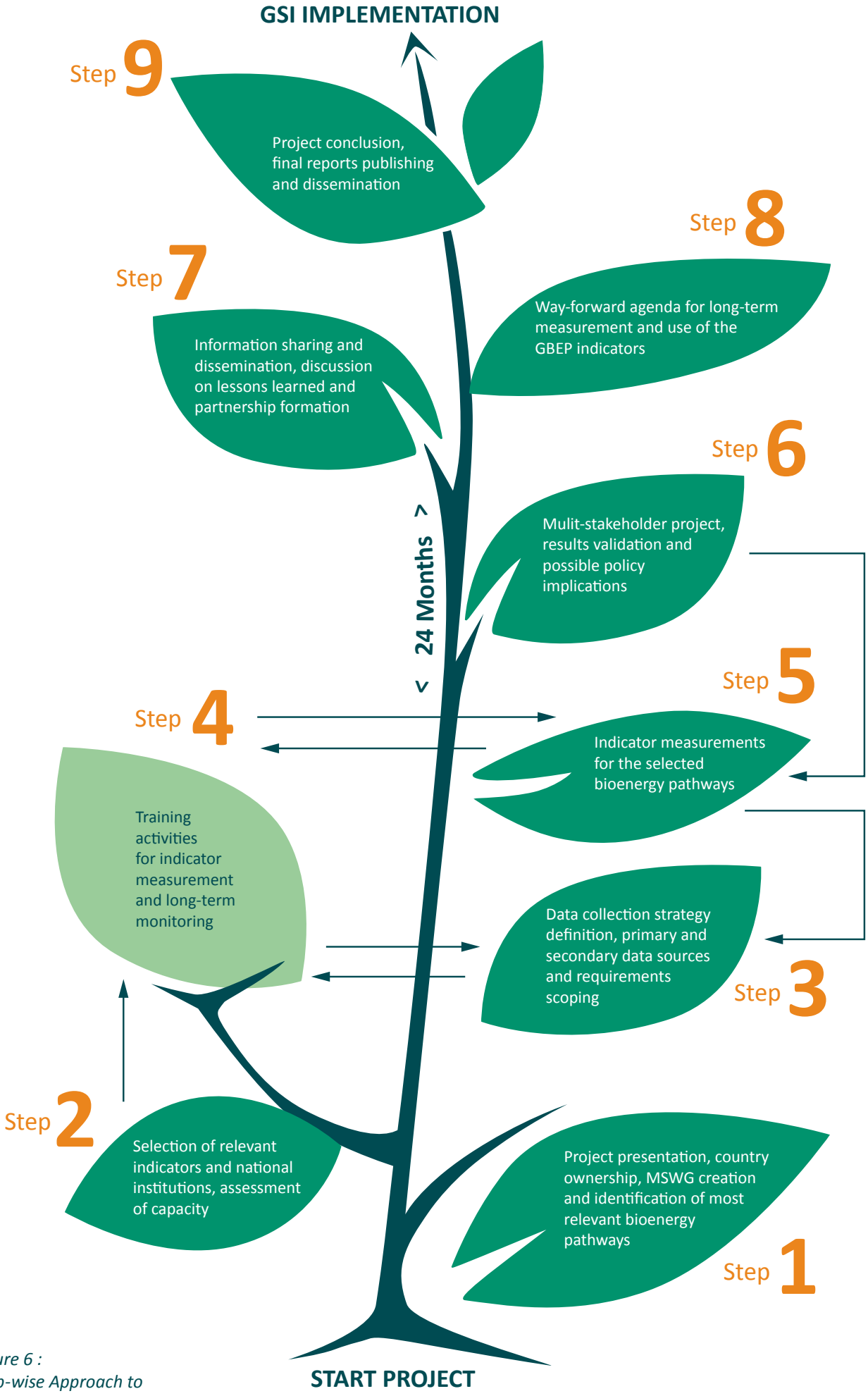


Figure 6 :
Step-wise Approach to GSI Implementation

Stakeholder Map

A stakeholder map, such as the one in Figure 7, should be treated as a starting point for any indicator work.

The stakeholder map is crucial for obtaining efficient representativeness and maximum inclusiveness of the experts to be involved in the project. The Multi-Stakeholder Working Group created through this process works throughout the GSI measurement – selecting and describing bioenergy value chains, monitoring, evaluating and validating measurements, and ensuring the proper interpretation and use of results – and is integral for effective implementation.

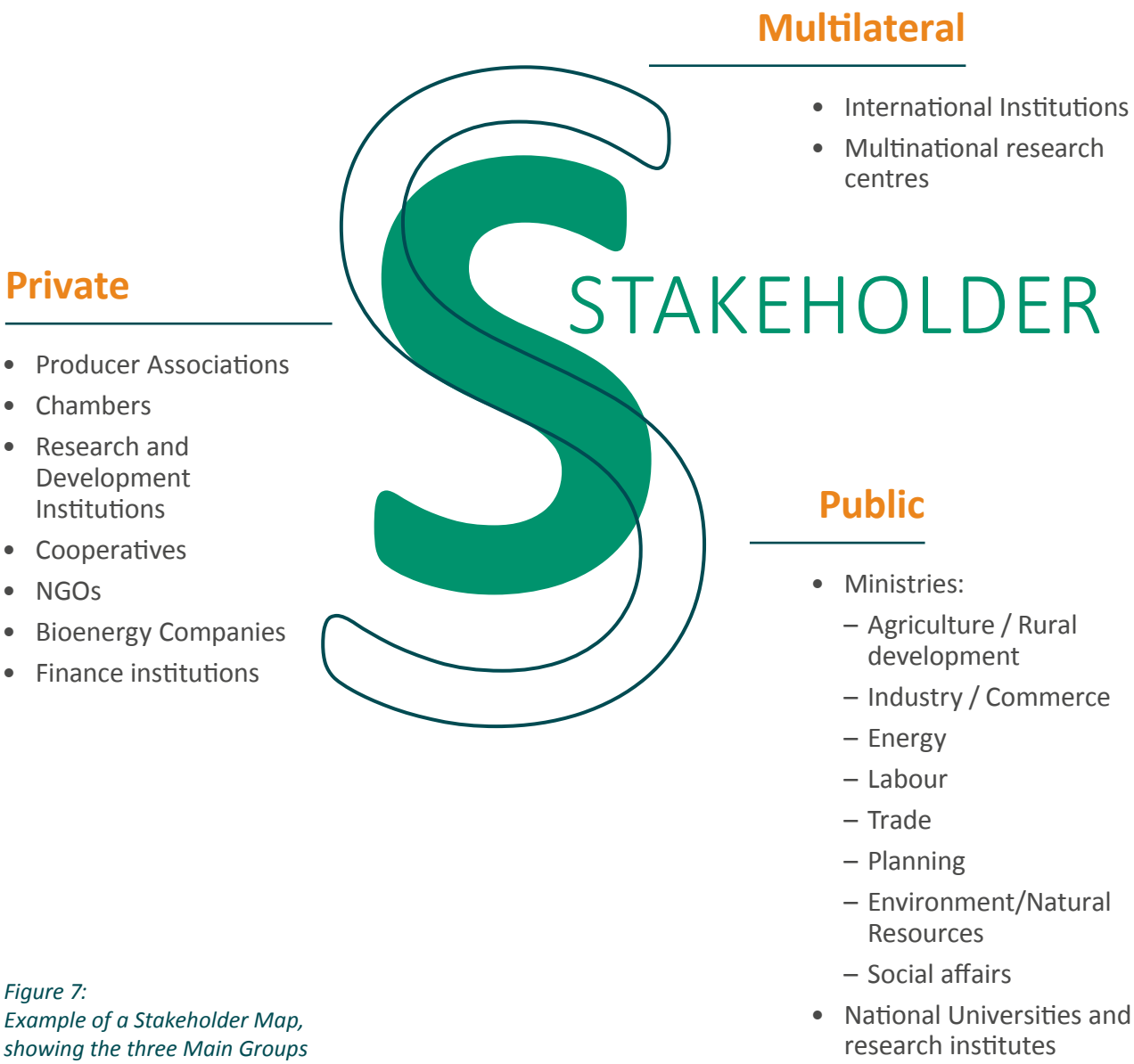


Figure 7:
Example of a Stakeholder Map, showing the three Main Groups

5. GUIDANCE ON INDIVIDUAL INDICATORS

The second part of the Implementation Guide provides advice on the methodology for each individual indicator under the three pillars (environmental, social and economic), addressing:

- clarifications to the original GSI report;
- suggestions for proxy approaches;
- data sources and collection; and
- guidance on attribution.

The guidance is tailored to each indicators and ranges from proxies for attributing health impacts to indoor smoke, and a gender-neutral approach to unpaid time spent collecting biomass, to measurement strategies for infrastructure and logistics. For details see GBEP (2020).

Figure 8:
Implementation Guide – Example of Individual indicator guidance

6. BIOENERGY SUSTAINABILITY WITHIN THE BROADER BIOECONOMY

Since the release of the 1st edition of the GBEP Sustainability Indicators for Bioenergy in 2011, there are several important developments to be considered for future work:
The emerging bioeconomy, and the Sustainable Development Goals (SDGs).

6.1 The Bioeconomy

As described by the Global Bioeconomy Summit 2015, the bioeconomy is the 'utilization of biological resources, biological processes and principles to sustainably provide goods and services across all economic sectors' (GBS 2015).

It includes food, feed, fuel, fiber and biochemicals, as well as – for some - the use of biotechnology. This is distinguished from the 'bio-based economy', which includes only "modern" bio-based materials and products, and bioenergy.

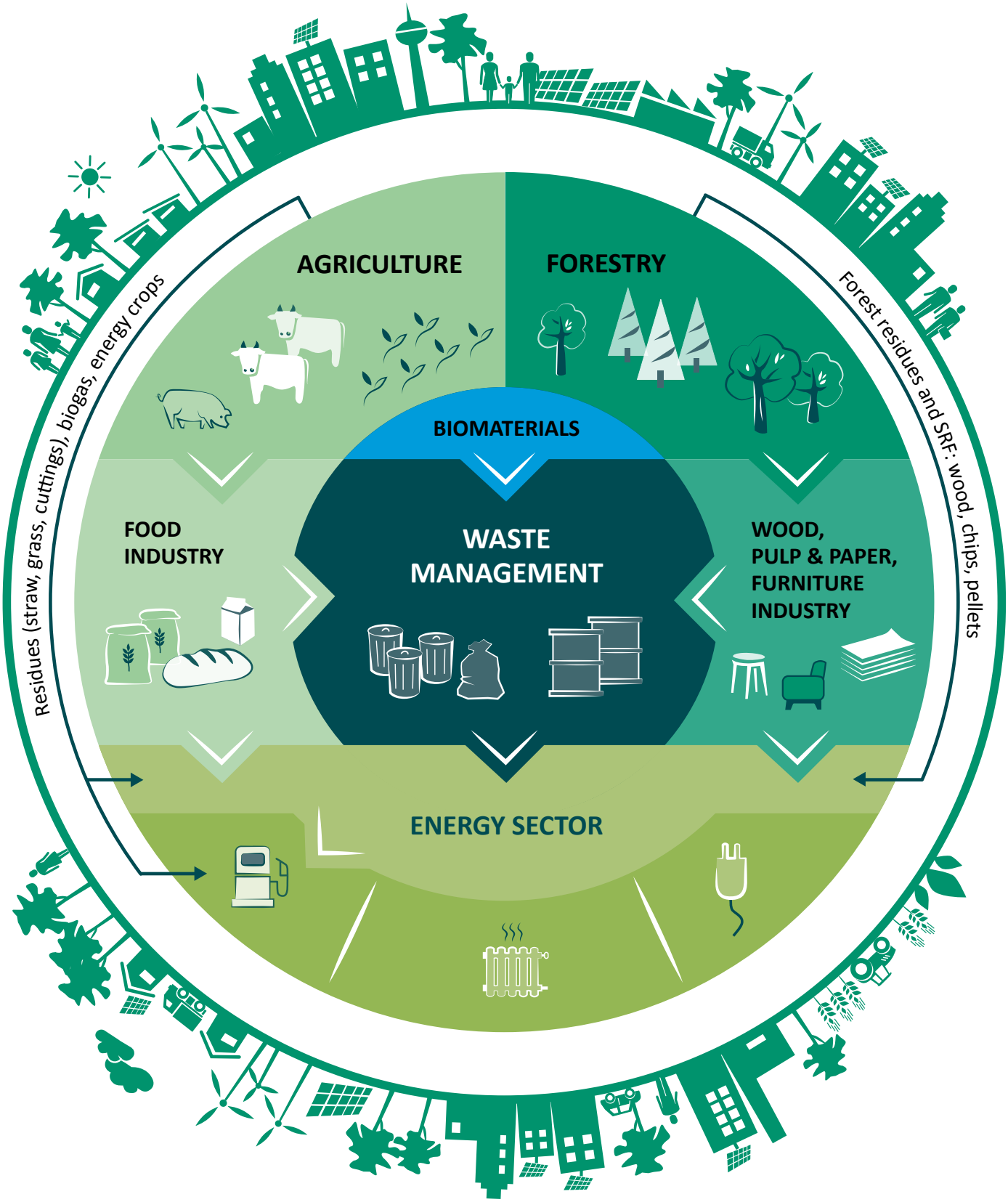


Figure 9:
Bioenergy within the broader bioeconomy

6.2 The Sustainable Development Goals

There has been growing interest in the bioeconomy and its sustainable development. As a term that extends over all facets of the global economy, concerns various land uses and respective social aspects, and the biosphere in its totality, it represents not only a challenge but may be an opportunity to tackle many societal issues concurrently. This is especially important also in the context of climate change: the circular bioeconomy is viewed as one of the solutions for low carbon development, but climate change is concurrently increasing the pressures on natural resources and ecosystem services, possibly restricting the potential role of biomass as a solution.

Bioenergy forms part of both the bioeconomy, and the global energy system. As with any system with a multitude of linkages, there are inevitably synergies and trade-offs between the components. On its own, bioenergy is identified as integral to the achievement of SDG 7, as well as GHG emissions targets under the Paris Agreement.

Figure 10:
Bioenergy, bioeconomy and the SDGs

The importance of the sustainable development of bioenergy production and use is internationally recognized and indicators allow for the measurement and monitoring of its sustainability over time (e.g. GSI).

However, the sustainability of bioenergy cannot be considered in an isolated manner given the multiple, competing uses of biomass within the wider bioeconomy. A GBEP technical paper identified linkages between the GBEP sustainability indicators for bioenergy and the indicators of the SDG targets (Fritsche et al. 2018), which are themselves considered as a suitable normative framework for the sustainable bioeconomy (Fritsche & Roesch 2020).

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE	10 REDUCED INEQUALITIES	11 SUSTAINABLE CITIES AND COMMUNITIES	12 RESPONSIBLE CONSUMPTION AND PRODUCTION	13 CLIMATE ACTION	14 LIFE BELOW WATER	15 LIFE ON LAND	16 PEACE, JUSTICE AND STRONG INSTITUTIONS	17 PARTNERSHIPS FOR THE GOALS
Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	Reduce inequality within and among countries	Make cities and human settlements inclusive, safe, resilient and sustainable	Ensure sustainable consumption and production patterns	Take urgent action to combat climate change and its impacts	Conserve and sustainably use the oceans, seas and marine resources for sustainable development	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels	Strengthen the means of implementation and revitalise the global partnership for sustainable development
(✓)	(✓)	✓ (✓)	✓	✓ ✓	(✓)	✓		(✓)

As the bioeconomy becomes increasingly important at all levels, many actors have expressed the importance of developing holistic guidelines for its sustainable development (e.g. FAO, EC, etc.).

The 2nd Global Bioeconomy Summit clearly called for increased international cooperation in addressing sustainability governance (GBS 2018), and IEA's "Technology Roadmap: Delivering Sustainable Bioenergy" sees a respective international accord as a key step towards future bioenergy development (IEA 2017).

In consequence, initiatives to foster overall sustainability of biomass should be cross-sectoral to be able to effectively take into account cumulative impacts of multiple sectors, whilst also taking advantage of potential synergistic biomass uses across sectors.

GBEP has the opportunity to have an important – and possibly even unique - role to play in facilitating exchange of views and dialogue, and promote joint understanding, considering "bioenergy within the bioeconomy" context towards future bioenergy development (IEA 2017).

In collaboration with IEA Bioenergy and others, GBEP will continue contributing to this discussion, and provide respective inputs to the 3rd Global Bioeconomy Summit (Nov 19-20, 2020 in Berlin)[5].

The TFS will prepare working papers to share knowledge and substantiate proposals regarding sustainability governance of "bioenergy within the broader bioeconomy", taking into account results from existing initiatives and projects.
GBEP Partners and Observers as well as other interested parties are invited to participate in this process, especially in future online webinars and physical workshops currently being planned.
In that, GBEP is seeking exchange and collaboration not only with IEA Bioenergy, but also FAO, IRENA, the UNCCD Secretariat, and UNEP, among others, to continue the dialogue process started in May 2019 in Utrecht[6].

[5] https://gbs2020.net/home/

[6] https://www.ieabioenergy.com/publications/ws24-governing-sustainability-in-biomass-supply-chains-for-the-bioeconomy/

7. FUTURE WORK TO IMPROVE THE PRACTICALITY OF THE INDICATORS

The following suggestions were put forth to further enhance the practicality of the indicators:

- An excel and/or web interface based on a computerized model could be developed to significantly reduce the time, skills and cost required to measure the GSI.
- Mechanisms to facilitate the systematic flow of data and information from the private sector to the organizations/ agencies measuring the GSI could be identified and exploited.
- Given the global nature of the GSI, the report containing the methodology sheets could be translated into other official languages of the UN. This would greatly facilitate the dissemination and implementation of the indicators in developing countries around the world.

The TFS has acknowledged these suggestions and work has already started on some of these actions; in particular, development of a data entry sheet is underway, which can be used by countries to systematize data collection and ensure data consistency. It is hoped that with adequate resources the other suggestions could also be taken up as future activities of the TFS (and GBEP as a whole).

Photo: GBEP family

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Page 10: Map, www.shutterstock.com: JeMisheo

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IMPRINT

Imprint

This brochure was prepared by **IINAS** in collaboration with **ifeu** and with contributions from the GBEP Secretariat (Maria Michela Morese, Constance Miller).

With support from

Federal Ministry of Food and Agriculture

by decision of the German Bundestag

Graphics and layout:
DIE NEUDENKER® Design.Code.Content.
dieneudenker.de

Berlin, Darmstadt, Heidelberg & Rome
April 2020