RSB
Roundtable on
Sustainable Biomaterials
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Implementing successful public policies to shape the sustainable future of the aviation industry

A White Paper of the RSB SAF Policy Platform

September 2022

About RSB

The Roundtable on Sustainable Biomaterials (RSB) is a global, multi-stakeholder, independent organisation that drives the development of a bio-based and circular economy on a global scale through sustainability solutions, certification and collaborative partnerships.

With credible solutions, global expertise, partners across the spectrum from government to industry, academia, and NGOs, and an extremely robust approach to sustainability, RSB is the partner of choice for the aviation industry as it seeks to fulfil its global commitments to GHG reduction while also ensuring social development and environmental protection.

RSB is a member-led organisation that represents a worldwide movement of businesses, NGOs, academics, governments, and UN bodies that have demonstrated their commitment to the development of the bio-based and circular economy by working together to create our most-trusted Standard.

The RSB Standard is the strongest and most trusted of its kind, recognised as such by the World Wildlife Fund (WWF), International Union for Conservation of Nature (IUCN) and Natural Resources Defense Council (NRDC). RSB certification for SAF has been endorsed by aviation groups, such as the Aviation Transport Action Group (ATAG) and the International Coalition for Sustainable Aviation (ICSA).

This White Paper is an outcome of the RSB SAF Policy Platform. The platform is a place for RSB's members – from industry to civil society — to work together, discuss and provide recommendations on how to implement and ensure sustainable practices within the growing coverage of legislation to regulate Sustainable Aviation Fuel (SAF) production and use

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Introduction

It is time to reinvent ourselves. We have reached or exceeded several limits, such as the limit on the availability of natural resources, the limit on healthy human-nature interaction, and the limit on the generation of wealth decoupled from consumption and conscious production. The Anthropocene Epoch, marked by the extraordinary growth of our population and constant economic growth, has resulted in unprecedented rates of biodiversity loss, carbon accumulation in the atmosphere, and drastic changes to our climate. This reality urges us to review our trajectory and urgently answer the following question:

"*How can we sustain economic and social development, while decoupling ourselves from our fossil fixation and actively restoring our natural capital?"*

The notion of sustainability refers to maintaining the function of a system over time. A sustainable economic system thus implies the implementation of practices that allow an economy to remain functional. The only way for a system to be sustainable is to balance inputs and outputs. The economic system of the last decades is based on a linear economy that rewards extraction, production and consumption – quite different from any naturally sustainable system.

With a global population heading for 8 billion people, we require an economic system with high efficiency in its use of natural resources, which upholds the conservation of the processes involved in the production of these resources. Instead, we currently use about 1.6 times the Earth's capacity to produce resources. This means that even renewable resources, such as water and biomass, may reach a point where reserves will not be able to support future demands. To make our current production system sustainable, we require an economic system that minimises extraction and maximises efficiency, reusing and recycling instead of disposing waste materials, and consuming more thoughtfully. Ultimately, we must reduce our ecological footprint[1], making consumption compatible with Earth's biocapacity[2] while still providing a high Human Development Index (HDI). This is a challenge – and an opportunity.

The good news is that examples of sustainable systems already exist in the form of natural ecosystems – we just need to emulate them. Ecosystems rely on a renewable energy source (sunlight). Materials are then continually returned to the system through natural processes, and the flows are determined by feedbacks, so that the scarcity of a compound reduces the rate of the processes in which it participates. These are the principles of a sustainable system and should be the guiding principles of our economy: cycles of high productivity fuelled by renewable resources. Learning from nature is not only wise, but as

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[1] The impact of a person or community on the environment, expressed as the amount of land required to sustain their use of natural resources.

[2] The ability of ecosystems to provide natural resources and absorb the waste produced by humans.

dedicated and forward-thinking organisations are beginning to show, is also both possible and profitable (Figure 1).

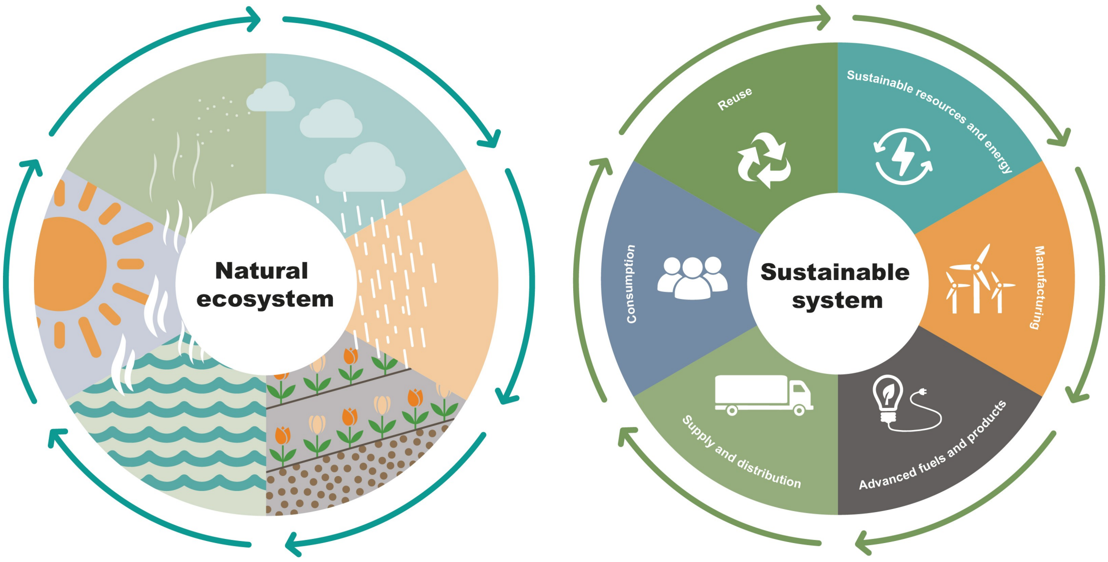

Figure 1: Learning from nature – sustainable systems should emulate the material flows, efficiency and productivity of natural systems

Now is the time to commit to a new path towards sustainability that involves instilling, promoting and investing in a bio-based and circular economy. As part of this bio-based transition, unsustainable practices that depend on the use of non-renewable resources are gradually replaced with renewable resources, materials and by-products are optimised for reuse instead of being a source of pollution, natural processes and environmental services are valued and combined in the search for more equitable development, and human dignity is ensured. With the right research, investment and public policy, it is possible to develop an economy based on renewables and sustainable, bio-based and recycled carbon, characterised by:

- *Sustainable carbon cycles,*
- *Resource efficiency,*
- *Inclusive and sustainable economic growth,*
- *Nature conservation,*
- *Inclusive governance,*
- *Social development and resilience, and*
- *Sustainable consumption.*

In this context, the aviation industry can play a leading role, especially in tackling the threat of climate change. By 2050, the aviation sector has pledged to lower its net CO_2 emissions by half (a total 325 million tons of CO_2). Switching from fossil fuels to sustainable aviation fuels (SAF) is considered one of the most efficient way to achieve the decarbonisation target within the required timeframe. The SAF industry can also go beyond decarbonisation to stimulate the development of a bio-based and circular economy – advancing the use of new feedstocks and novel supply chains that nurture and develop new technologies, as well as protect and enhance rural livelihoods, communities and ecosystems.

However, the current availability of SAF is far too low, corresponding to less than 0.01% of all jet fuel produced in the world. SAF production must be rapidly scaled-up to achieve the volumes and pricing needed to be competitive. As with other renewable fuels, such as ethanol and biodiesel, this rapid scaling is doable, but a nurturing policy environment is key. Fortunately, many countries are already adopting or proposing mandates to increase SAF use, but it is vital that these policies have principles of social and environmental sustainability at their core.

Key sustainability issues

Unintended consequences, as with any transformation, can have a negative impact on what this bio-based transition for the aviation sector means in practice, as well as jeopardise the critical support that is required from government, business, non-governmental organisations (NGOs) and individuals. The early days of the bioeconomy showed that, without an embedded model of sustainability, there is a risk of increased greenhouse gases (GHG) emissions, deforestation and infractions on human and labour rights, which could lead to decreased support from policy makers and civil society. Ensuring that a renewed commitment to the bio-based and circular economy avoids these negative consequences, and amplifies positive impacts, requires the identification of key sustainability issues, opportunities and the development of a robust approach to sustainability.

Therefore, in order to accelerate the development of the SAF industry and create positive impacts on its social and environmental dimensions, it is critical to understand the main sustainability issues around SAF production and use, and to develop effective mitigations measures. The main sustainability issues for the SAF sector are described below, as well as the Roundtable on Sustainable Biomaterials (RSB) Principles & Criteria (P&C) related to each sustainability issue. Please see Figure 3 on page 13 for the description of the RSB P&Cs.

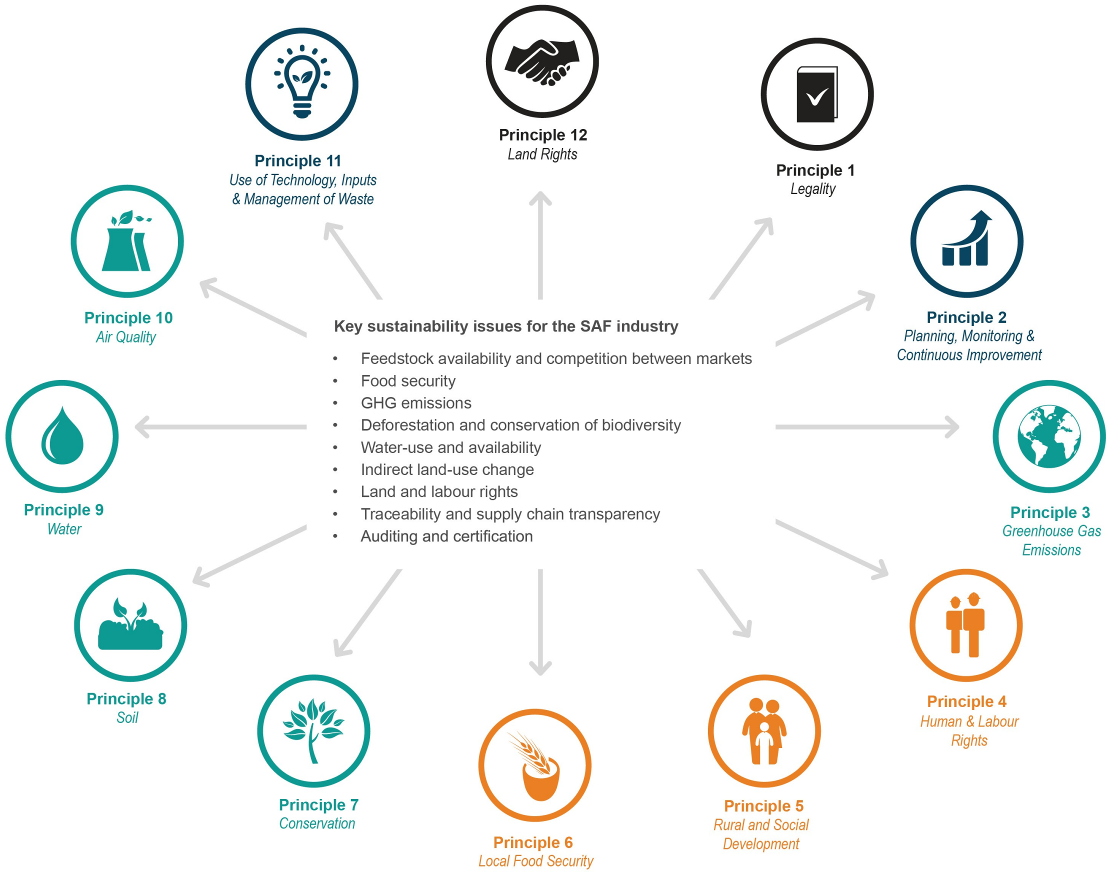

Figure 2: The RSB P&Cs can address the sustainability issues for the SAF industry

Feedstock availability and competition between markets

The production of SAF is determined by two major factors: the feedstock used, and the technology deployed to convert the feedstock into hydrocarbons. Both factors have an impact on the economic viability of production, and as a result, the supply and price of SAF on the market.

Despite the preference for using waste and residues, these feedstocks are limited, requiring the development and improvement of new technologies to expand the production of non-food crop alternative fuels. Furthermore, different regions have different aptitudes and feedstock availability. Similarly, different SAF producers use different technologies to produce the fuel. Prioritising a single type of feedstock or technology comes with risks for both the sourcing region and the supply chain. The demand for alternative fuels is expected to rise by 28% over the next five years [1]. This high demand and competitive pressure for feedstock among the various sectors (road, aviation, marine and chemical sectors, for instance)can lead to supply instability and tends to raise feedstock prices. This implies serious risks to SAF production, such as soaring prices that are incompatible with the market and its fossil equivalent; and can also lead to food insecurity due to rising feedstock prices and competition with food production.

As a result, it is critical to ensure that SAF production is sustainable – not by restricting feedstocks or technology, but by assessing the risks inherent in technological processes and implementing mitigation measures, and going beyond mitigation measures to look at positive impacts that can be achieved by investing in the bioeconomy. These positive impacts can be created through the use of a holistic sustainability framework that supports improved agricultural practices (for instance in soil or water management) that increase food security and advance conservation. In this way, the sector can have the flexibility to choose the type of raw materials to be used and sourcing region of feedstocks, while still having the capacity to develop new technologies for the production of advanced or first-generation fuels, depending on what is most efficient and sustainable. Here, all RSB Principles are relevant.

Food Security

According to the Food and Agriculture Organization (FAO) of the United Nations (UN), food security comprises of four distinct components: food availability, food access, food utilisation and food stability. The use of food crops to produce alternative fuels is one of the factors that can affect food security, especially as the alternative fuels market expands and the global population grows. However, it is now presumed that, given the right conditions based on a robust sustainability framework, alternative fuels can be an effective way to increase food security. The following are examples demonstrate how operations that produce alternative fuels can positively impact the food security [2]:

- *Improve food productivity and storage* – The operation can provide additional land for food production to the community, as well as make technical expertise and inputs more accessible. The operation can also contribute to technical transfer of knowledge on how to reduce the size and duration of food shortfalls through the introduction of new crops, or contribute to a better application of inputs, such as irrigation.

- *Stimulate local markets* – The operation itself can produce more food for sale or new demands from the operation can stimulate local farmers to produce more foodstuffs for sale.
- *Increase food access* – The operation can ensure that workers receive fair wages which allows them to purchase food to meet their nutritional needs. The operations improving the local infrastructure (e.g., roads), increasing the food accessibility.
- *Improve food utilisation* – The operation can improve the access to clean water for drinking and cooking, as well as improve the sanitation and storage facilities. The fuels produced can also be used as the energy source for improved cooking stoves, reducing smoke-related respiratory illness (a result of wood stove usage) and improving cooking efficiency.

Given that a business operating to produce an alternative fuel can affect food security, it is necessary to first assess the region of interest based on the four components described above. Next, an analysis of mitigation measures to counter the possible negative impacts from SAF production must be established. And measures to create positive impacts for food supply, access and utilisation should be adopted as well. Here, RSB Principles 5 and 6 relate the most.

Principle 5
Rural and Social Development

Principle 6
Local Food Security

GHG emissions

Aviation accounts for approximately 2% of global anthropogenic greenhouse gas (GHG) emissions, and while renewable SAF can significantly reduce aviation-related GHG emissions, it does not always have a smaller GHG footprint than fossil fuels during its lifecycle. Additionally, SAF's contribution to aviation's emission reduction goals is largely dependent on its market presence [3]. That is why it is vital to develop this industry with a clear public policy for SAF production and usage.

It is well established that the calculation of GHG emissions is highly dependent on many factors and assumptions that are significantly influenced by the system boundaries, methodological approach (particularly allocation methods) and spatiotemporal variability of data. Changes in carbon stocks in biomass, soil and landfills, as well as changes in land use, can all affect the emissions, resulting either in positive or negative impacts. As a result, a well-defined GHG Life-Cycle Assessment (LCA) approach is critical for achieving a credible, transparent and comparable GHG footprint, which drives positive climate action by reducing GHG emissions. Soils, for example, play a significant role in maintaining and balancing the global carbon cycle, accounting for approximately 75% of the carbon pool on land. Identifying crop soil carbon sequestration potential is a chance to increase global carbon storage and reduce the carbon footprint of crop-based fuels. Promotion and implementation of new technologies for carbon sequestration and storage, as well as the development of innovative solutions such as agricultural inputs (biofertilisers, bio-inoculants), high productive plant varieties, and others, can all help to reduce the carbon footprint [4].

In this regard, public policies are critical to driving GHG performance, with the goal of achieving a low carbon footprint; a primary factor for the SAF industry. Aside from defining thresholds for GHG savings, public policies play an important role in achieving better GHG performance by encouraging investment in research and innovation, promoting renewable electricity production, and defining incentives and rewards for sustainable SAF production and use, among other possibilities. Here, RSB Principles 3 and 10 relate the most.

Principle 3
Greenhouse Gas Emissions

Principle 10
Air Quality

Deforestation and conservation of biodiversity

Global deforestation and biodiversity loss have emerged as one of the most serious environmental problems of the 21st century. While urban and agricultural development have historically been the primary drivers of the expansion in critical areas, the recent increase of biofuel production and changes in land-use in many regions around the world have the potential to devastate ecosystems, and in addition, reverse any GHG benefit through the destruction of carbon sinks. It is critical to analyse the risks of deforestation and the associated implications on nature conservation, as well as to develop strategies that promote the production of SAF in harmony with nature and ensure zero deforestation.

By utilising native plants and agroforestry systems, the production of sustainable alternative fuels has the potential to stimulate rural development, recover damaged areas and restore biodiversity. Invasive alien biomass also holds huge promise for supplying the SAF market and, guided by public policies, can have a significant positive impact on biodiversity, water security and livelihoods. The removal of invasive alien plants is the first step toward restoring native biodiversity and providing additional ecosystem services such as improved soil quality and reduced wildfire severity. Regenerative agriculture – including conservation tillage, cover crops, crop rotation – also appears as a viable approach for producing feedstock biomass, while improving soil organic matter and restoring degraded soil biodiversity. This way the potential for soil carbon sequestration can be increased and water quality can be improved.

As a result, it is critical to analyse the risks of deforestation and the associated implications on nature conservation, as well as to develop strategies that promote the production of SAF in harmony with nature and ensure zero deforestation. Here, RSB Principles 1, 7 and 8 relate the most.

Principle 1 *Legality* | **Principle 7** *Conservation* | **Principle 8** *Soil*

Water use and availability

Water is becoming a growing point of concern for businesses all over the world, and for feedstock and alternative fuels production operations it is not different. This is due to increased competition for limited water supplies, deteriorating water quality in many areas, and growing local and global community concerns about the protection of water supplies and natural water systems. As a result, it is critical for both new and existing businesses, including those engaged in SAF production and use, to manage all conceivable water risks in order to ensure the business's long-term viability.

Water risks can be classified as physical, reputational, regulatory, or financial. The first two types of risks are particularly relevant in this context. Physical water risks are those associated with a lack of quality water availability as a result of, for example, water scarcity or poor water quality caused by drought, competing water uses, infrastructure failure, or poor water management. Reputational risk influences a business' social licence to operate. In recent years, this has become an increasingly important concept for businesses. To put it simply, a social licence to operate is reliant on the support of local, regional, or global communities for a business to operate in a specific region. The social licence to operate is granted by the consent of interested and affected communities, rather than by legal or formal authorities. Such consent must be obtained on multiple levels and must be consistent with corporate social responsibility principles.

Risks can have negative consequences if they are not mitigated. There are a large number of potential impacts to surface and groundwater associated with alternative fuels production, including but not limited to loss of aquatic habitat and biodiversity, decrease of stream flows and groundwater levels due to vegetation change, change in volumes of stream flow, flooding, loss of access to water, eutrophication, reduced water quality and increased salinity. To ensure that alternative aviation fuels are produced in a sustainable manner, it is critical that the entire supply chain, particularly agricultural production and industrial facilities, commit to a strong and trustworthy sustainability framework for water-use and management that includes ecological, economic, and social aspects of the entire river basin. Here, RSB Principle 9 relates the most.

Principle 9
Water

Indirect land-use change

One of the concerns related to the production of alternative fuels, such as SAF, is the negative impact of indirect land-use change (ILUC), which may occur when crops are used as feedstocks for biofuel production and then displace the existing agricultural production. Maintaining the original levels of agricultural production and supplying other uses, such as food and animal feed, could result in the conversion of natural lands to meet these needs. This additional need for land can impact nature conservation efforts and carbon stocks. However, the improvement of crop productivity, the cultivation of crops on previously degraded lands, as well as the use of wastes and residues as feedstocks, are examples of how it is possible to sustainably produce alternative fuels, thereby reducing the risk thereof ILUC.

The ILUC values are complex and difficult to model since an ILUC assessment should consider several components and assumptions. Nevertheless, existing public policies, such as the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), already include ILUC[3] values for GHG calculation and should be used as a basis for the development of future regulations. Here, RSB Principles 1, 3 and 7 relate the most.

Principle 1
Legality

Principle 3
Greenhouse Gas Emissions

Principle 7
Conservation

Land and labour rights

When biomass is grown as a commodity in countries with weak institutions and low human development indices, it is critical that the increase in demand for specific feedstocks for biofuel production does not have a negative impact on the communities where it is grown. Biomass and biofuel production, such as SAF, can and must be established to promote social and economic equity by including smallholders in sustainable supply chains and strengthening rural communities, making them more economically resilient and capable of thriving. Here, RSBPrinciples 1, 2, 4 and 12 relate the most.

Principle 1
Legality

Principle 2
Planning, Monitoring & Continuous Improvement

Principle 4
Human & Labour Rights

Principle 12
Land Rights

Traceability and supply chain transparency

With increased demand for sustainable biomass and alternative fuels, the risk of fraud increases. There have been multiple examples of virgin palm oils being labelled as used cooking oil, for example, to qualify for incentives or gain access to markets. As a result, SAF

[3] In the CORSIA context, the term ILUC stands for Induced Land Use, that comprises both direct and indirect land use change.

businesses must be able to see and check every step of their supply chains – from feedstocks to final fuel – and be able to trace where it came from and where it went. It is critical to be able to trace fuels back to its source to ensure sustainable production and the credibility of sustainability claims in environmental and social areas. Here, RSB Principles 1 and 2 relate the most.

Principle 1
Legality

Principle 2
Planning, Monitoring & Continuous Improvement

Auditing and certification

It is ineffective to develop strong public policies and regulations if no tools for implementation and verification are available. As a result, one of the critical points in achieving market and economic transformation for alternative fuels is the existence of sustainable systems and standards that define and implement responsible and best practices, as well as measure the long-term impacts. Sustainable systems are critical tools for translating and implementing the sustainability requirements defined by public policies, as well as demonstrating commitment to sustainability. It is also impossible to identify and mitigate the sustainability risk associated with the production and use of feedstocks and alternative fuels such as SAF without these systems. The primary tools used by sustainable systems to verify and ensure sustainable practices are auditing and sustainability certification.

To ensure the robust and comprehensive implementation of sustainability standards and regulations, a credible sustainable system must include auditing, certification, and accreditation. Regular audits should be performed by independent and competent certification bodies in accordance with the International Organization for Standardization (ISO) standards. A credible certification system must be universally recognised by different stakeholders, which helps to identify and mitigate the sustainability risks and provide trust and credibility to investors, stakeholders and customers. Here, RSB Principle 2 relates the most.

Principle 2
Planning, Monitoring & Continuous Improvement

Recommendations and Solutions

Given the sustainability risks associated with the production and use of SAF, and the need to establish a robust and long-term policy to strengthen the sector, the Roundtable on Sustainable Biomaterials (RSB) understands that the solution lies in a robust and credible sustainability framework based on a risk approach, which can be used to reduce sustainability risks and amplify positive results.

Figure 3 shows RSB's Principles & Criteria (P&C), which are based on a management and risk-oriented approach describe how to produce biomass, alternative fuels and biomaterials in an environmentally, socially and economically responsible way. Together with RSB's online tools (Screening Tool, Risk Assessment Tool, GHG LCA Tool) and related guidance documents [5], the RSB P&C help operators to identify and manage sustainability issues in a specific context, and therefore reduce risks for operators, brand owners and investors.

RSB's P&C can be embedded into public policies to guide the development of truly sustainable SAF. Alongside the use of RSB's add-on Low ILUC Risk Certification Module (Box 1), RSB's sustainability framework for SAF is able to demonstrate clearly that the fuel is achieving real climate benefits, while not contributing to negative impacts on society and the environment.

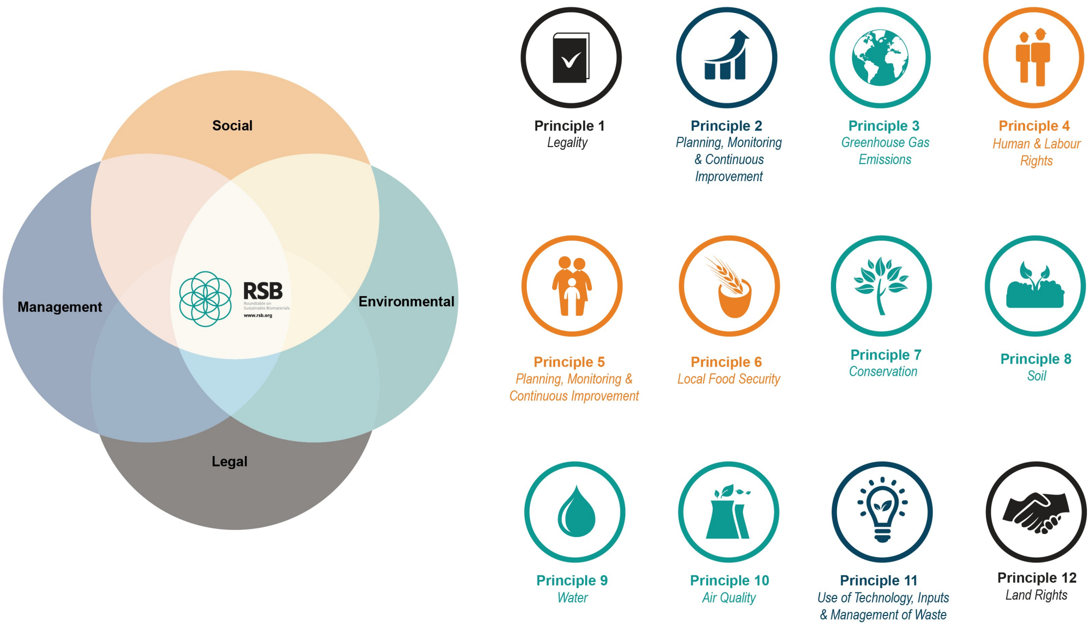

Figure 3: The RSB Principles and Criteria (P&C)

The P&C were developed by RSB's global membership community. Over 300 organisations, representing feedstock and fuel producers, end-users, brands, airlines, social and environmental organisations, academia, and international bodies such as the UN, have worked to build this sustainability framework. Today, it is globally recognised as the most credible and trusted approach to sustainability, and extremely practical for implementation in the real world.

RSB is a long-term and trusted partner of the aviation sector. It contributed to the development of the CORSIA mechanism for decarbonisation of the aviation industry, guiding the implementation of the sustainability criteria, convened SAF producers, traders and airlines in its multi-stakeholder membership, and has been widely recognised as the partner of choice for the industry.

Low ILUC Risk

Scientific studies undertaken with the goal of modelling the diversion of agricultural resources towards the production of biofuels and biomaterials demonstrate that there is a significant degree of uncertainty regarding the size of ILUC. Nonetheless, some legislative bodies recognise that when agricultural land or pasture previously destined for the food, feed, and fibre markets is used for biofuel production, non-fuel demand must be met either by intensifying current production or by bringing non-agricultural land into production elsewhere. This latter type of ILUC can result in large GHG when carbon-rich land is converted [6].

Given the difficulty around how to measure indirect effects, the RSB General Assembly decided in 2013 to focus on the role that those individual producers may play in reducing indirect effects and established a system to encourage production focused on reducing the risk of having harmful indirect effects. To reduce the likelihood of ILUC, the RSB developed a set of criteria and compliance indicators for economic operators willing to demonstrate that their operations have a low ILUC risk (i.e. are unlikely to cause any displacement of equivalent biomass production to another location). These criteria can also help policymakers and stakeholders design public policies that stress the importance of sustainability for new investments in bio and advanced fuels, especially for production expansion and scale-up. *RSB Low ILUC Risk Certification Module* and respective criteria can be accessed online here [7].

RSB Recognition

The RSB Standard is recognised by NGOs, companies and governments around the world as a uniquely robust and practical approach to sustainability in the bio-based and circular economy. Key studies include:

a. Blue Angel

A 2019 Blue Angel study [8] found that RSB is the only certification system that fulfils their own rigorous requirements for biomass - out of seven major sustainability certification schemes.

The report is available in German, with an English abstract on page 5, here [9].

A visual guide in slides, available here [10].

b. World Wildlife Fund (WWF)

WWF Germany acknowledges RSB as having best practice among sustainability standards for water stewardship in agricultural supply chains

The report is available here [11].

c. IUCN

Betting on Best Quality report finds that RSB "covers more sustainability criteria, with greater detail, and with more breadth in terms of level of assurance" than any of the other Voluntary sustainability schemes.

The report is available here [12].

Explore further studies here [13].

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