storebrand

Responsible Consumption and Production

Whitepaper

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Executive Summary

The 2030 Agenda for Sustainable Development, a set of 17 Sustainable Development Goals (SDGs), creates an opportunity for investors to allocate capital to help accelerate a more sustainable development.

There is broad global consensus that we need a fundamental shift in the way goods and services are produced and consumed. Our current consumption of resources exceeds the planet's capacity for generation, and by 2050, waste production will outpace population growth by more than double. It is estimated that approximately 30 percent of all food produced worldwide is wasted along the supply chain which means that all the energy and resources in producing, processing, packaging, and transporting are wasted as well.

Responsible consumption and production (RCP) is not a new concept, it has evolved over time and is defined in a number of ways. It is about improving life quality without compromising resource needs of future generations, decoupling economic growth from environmental degradation, applying a life-cycle approach and avoid increasing consumption because of efficiency gains.

Studies show that consumer demand for sustainable products is increasing, as is the willingness to pay for them. With growing customer awareness and demand in addition to global, regional, and local legislation pushing companies to change, there will be a market for suppliers of key technologies and components that enable sustainable products development and sustainable consumer behaviour.

This whitepaper focuses on three central three sub-themes that lay the foundation for successful responsible consumption and production: circular economy, production, and food systems. It introduces the sub-themes' connection to the SDG targets and EU Taxonomy on Sustainable Finance.

Circular Economy

A circular economy aims to redefine growth, by designing waste out of the system, ensure continual use of products and materials, and regenerate natural systems In a circular system, products are reused, repaired, shared or recycled, hence products get a longer lifespan, minimising the use of resources, waste generation, pollution and carbon emissions.

Many of the products we use every day are disposable products, made of materials that will take years to degrade. To solve this problem, we need companies that can address the global take-make-dispose economy and adopt a circular approach. Moreover, platforms where companies offer services that build upon sharing our resources is also a key enabler to transition towards a circular economy.

Production

Consumption per capita is expected to grow in the coming years. However, consumers are reading product information and are increasingly aware of their power in influencing the market. Some companies are finding new ways to ensure traceability to provide customers with relevant information, making it easier to navigate the myriad of over 400 environmental labels in the world. Moreover, biomaterials have the potential to replace a wide range of components originally using fossil resources in a vast range of products. The market for bio-based and bio-gradable materials is still considered small on a global scale. However, innovation in sustainable products are evolving constantly. Companies that are first-movers or well positioned in the delivery of sustainable products and solutions, are well placed for long term profitability.

Food Systems

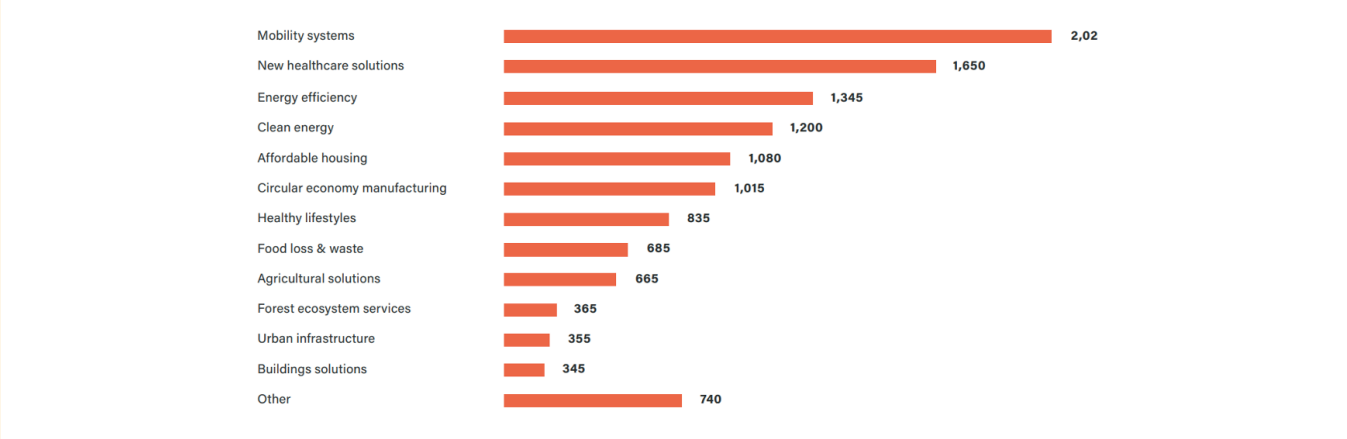
Global food production must increase 60 percent by 2050 to meet the demands of our growing population. It is estimated that about 30-40 percent of global food is lost after harvest, which means that approximately 30 percent of the land, water, chemicals and GHG emissions from production is unnecessary. To close the food, land and GHG mitigation gaps we need to reduce growth in demand for food and other agricultural products by reducing food loss and waste, shifting to healthier, more sustainable diets, and avoid competition from bioenergy for food crops and land. Food production must be increased without expanding agricultural land, and it is vital to protect and restore natural ecosystems. By improving wild fisheries in addition to the productivity and environmental performance of aquaculture, sustainable fish supply can be achieved. New technologies can reduce GHG emissions from agricultural production, and by eating more sustainable foods, plant-rich and plant-based, emissions from meat and dairy agriculture can be reduced even further.

The SDGs as an Investment Theme

The UN Sustainable Development Goals (SDGs) were adopted by all United Nations member states in 2015. The SDGs represent a shared blueprint for global peace and prosperity towards 2030. The 17 goals highlight how ending poverty and conflicts can be realized alongside strategies that improve health and education, reduce inequality, contribute to economic growth while safeguarding natural habitats, oceans and tackling climate change[1]. With the global effort to transition to sustainable societal development comes investment opportunities when new solutions need to be financed. The World Business Council for Sustainable Development (WBCSD) has identified SDG investment opportunities across four economic systems: food and agriculture; cities; energy and materials; health and well-being. The economic gains of SDG investments can be significant. Predictions by the Copenhagen Consensus show that 19 of the 169 SDG targets can deliver more than $15 of good for society, environment and economy for every $1 spent[2].

The SDGs provide a common target and language of action to achieve sustainable development. This facilitates business opportunities when finance flows towards sustainable projects. The UN Roadmap for SDG investing calls on the financial industry to disclose and incorporate long-term risk into investment decision making, implement sustainable investing strategies, scale up green financial instruments, as well as measuring and reporting on impact3. Estimates show that a USD 12 trillion market value could be opened up by 2030 if the SDGs are realized, creating 380 million jobs in the process4. An estimate by WBCSD of the distribution of these investment themes is found in the figure below.

Value of Incremental Opportunities in 2030 US$ billions: 2015 values*



*Based on estimated savings or project market sizings in each area. Rounded to nearest US$ billion. Source: Literature search; AlphaBeta analysis

Figure 1: The 12 largest business themes in world economy heading for the SDGs

Solutions Theme: Responsible Consumption and Production

The last few decades have brought economic progress and prosperity to a rapidly growing population. However, these changes have come at a cost. The world faces an unprecedented challenge when it comes to resource depletion, pollution, environmental degradation, and climate change. Our current consumption of resources exceeds the planet's capacity for generation. It is estimated that by 2050, we will need three planets to provide the natural resources needed to support our current lifestyle[5]. There is broad global consensus that we need a fundamental shift in the way goods and services are produced and consumed[6]. Responsible consumption and production (RCP) is not a new concept, it has evolved over time and is defined in a number of ways. Key principles are[7]:

- Improving life quality without compromising resource needs of future generations
- Decoupling economic growth from environmental degradation
- Applying a life-cycle approach
- Guarding against the re-bound effect which means not increasing consumption as a result of efficiency gains

80 percent of products' environmental impacts are determined at the design phase, yet the linear pattern of "take-make-use -dispose" does not provide producers with sufficient incentives to make their products more circular. Today, many products are broken too quickly, and are not built to be easily reused, repaired, or recycled, at the same time many of these products are made for single use only. The single market provides a critical mass enabling the EU to set global standards in product sustainability and to influence product design and value chain management worldwide[8].

It is estimated that approximately 30 percent of all food produced worldwide is wasted along the supply chain. This means that all the energy and resources in producing, processing, packaging, and transporting are wasted as well. The further down the supply chain the food gets before it is wasted, the more resources are wasted. By improving storage and transport systems, generating public awareness, and changing consumer behavior both waste and carbon emissions could be substantially reduced[9].

This whitepaper explores interesting investment cases for the responsible consumption and production theme. More specifically, how companies can contribute to a circular economy, how we can feed the world's growing population and how products and components made of sustainable materials fits into the concept of RCP.

While there was broad consensus of the crucial importance of Responsible Consumption and Production, the choice between a standalone goal or crosscutting theme across different goals was debated at length in the working group proposing the SDGs, given the complex and overarching character of the theme. The result was a standalone goal, but at the same time targets with direct relevance to the theme were included in many other goals. The UN Environment Programme (UNEP) and The International Institute for Sustainable Development (IISD) identify 13 RCP-related targets under 12 goals besides SDG 12[13]. SDG 12 is an extremely broad goal, and whereas most other SDGs have been achieved more or less satisfactory in at least some jurisdictions, RCP patterns have achieved some progress, but significant gaps remain[14].

Facts and Figures

18 trillions

More than eighteen trillion pounds of plastic has been produced to date, and eighteen billion pounds of plastic flows into the ocean every year[10]

242 million

In 2016, the world generated 242 million tonnes of plastic waste[11]

5%

About 5 percent of global greenhouse gas emissions were generated from solid waste management (2016)[11]

Double by 2050

The world is on the trajectory where waste generation will drastically outpace population growth by more than double by 2050[11]

30%

The food sector accounts for around 30 percent of the world's total energy consumption[5]

$501.3bn

Approximately 24% of greenhouse gas emissions stem from food, land use, and agricultural practices[9]

$2.6 trillion

The global economic, environmental, and social cost of food wastage is estimated at $2.6 trillion, which is nearly equal to the GDP of France[9]

1 in 10

people fall ill after eating contaminated food worldwide[1]

Main SDGs Linked to Solutions Theme

Responsible consumption and production is relevant for several SDG targets. All these issues are interdependent, so it is difficult to achieve one without the other. In this paper we are highlighting SDG 2, 12, and 14 not because they are more important than others, but because they have easily identifiable targets that we as an investor can use in our decision-making process. There are many linkages to other SDGs, which will be described in the subsequent sub-categories. Other relevant SDGs crossovers will be described in other thematic whitepapers.

SDG 2: Zero Hunger

Hunger and malnutrition pose significant barriers to human wellbeing and economic development, with nearly one in eight people and one in four children suffering from chronic malnutrition. These pressures threaten to increase with intensifying pressures on natural resources, while impacts from climate change will also frustrate food systems. Further, farmers around the world, making up a large share of employment in developing countries, struggle to make a livelihood from agricultural activities.

SDG 12: Responsible Consumption and Production

Ensure sustainable consumption and production patterns. Sustainable consumption and production is about promoting resource and energy efficiency, sustainable infrastructure, and providing access to basic services, green and decent jobs and a better quality of life for all.

SDG 14: Life Below Water

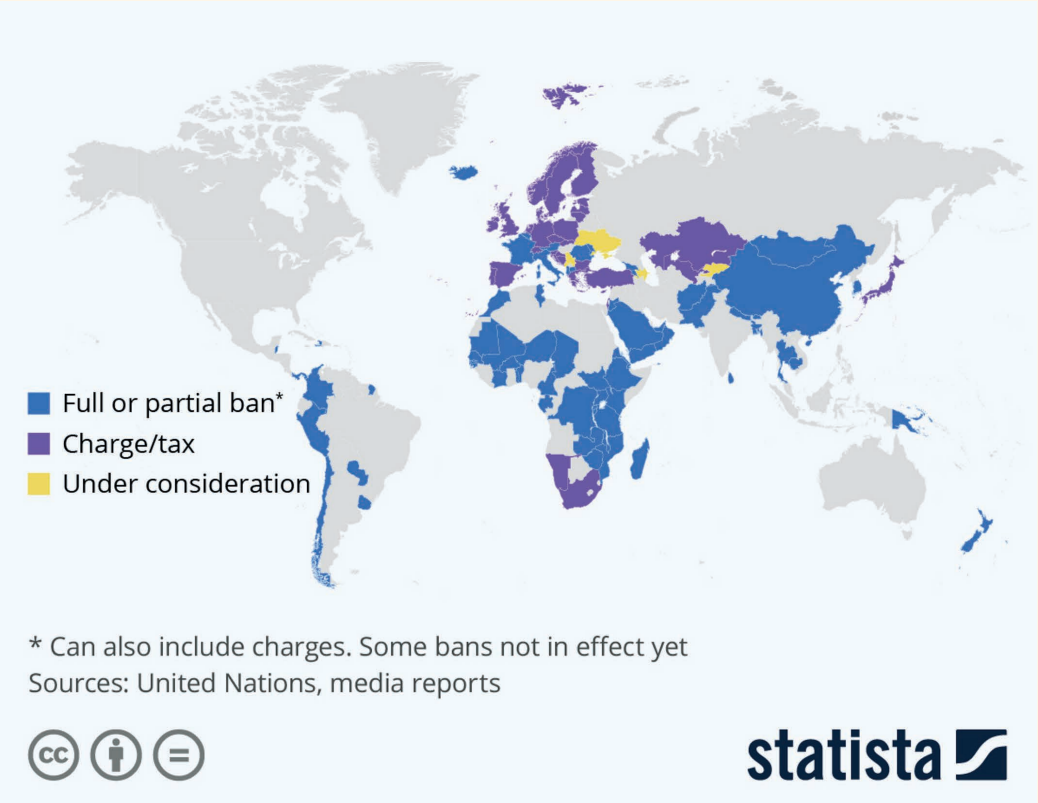
Healthy oceans are critical for life on earth through their regulation of global climate and water systems, and through sustaining the natural resources that provide 17 percent of the global population's animal protein intake. The earth's oceans are under ever increasing pressure from direct pollution and eutrophication, climate change, and fishing and aquaculture. Ocean plastic and debris are increasing rapidly and at this rate, it is estimated that there will be more plastic debris than fish in the world's oceans by 2050, presenting a huge risk to ocean and human life.

Investment Potential in Responsible Consumption and Production Towards 2030

Several studies show that consumers demand for sustainable products are increasing, as is the willingness to pay for them. Research show that 50 percent of consumer-packaged goods (CPG) growth from 2013 to 2018 came from sustainability -marketed products[15]. A study conducted by Unilever with 20,000 participants found that consumers are now reading product information carefully, and are increasingly aware of their power in influencing the market. 21 percent of those surveyed would actively choose brands with clearer sustainability credentials on the packaging, and Unilever concludes that it represents a potential untapped opportunity of €966 billion[16].

In addition to consumer demand, regulations are also putting pressure on companies to change. In fact, 170 countries have pledged to "significantly reduce" the use of plastics by 2030[17]. Rwanda not only has a complete ban on plastic, but search vehicles entering the country for any plastic bags or packaging. Moreover, Taiwan has had a ban on plastic bags, straws, utensils and cups since 2018[18], and the European Parliament has approved a new law that bans single-use plastic items such as plates, cutlery, straws and cotton buds sticks in the EU by 2021[19] . The regulations are fuelling the growth of new markets, and the market research company IMARC expect the biodegradable cutlery market to grow at a Compound Annual Growth Rate (CAGR) of around 5% during 2020-2025[20].

The Countries Banning Plastic Bags National-level regulation to ban/limit the use of plastic bags (2020)



Several countries around the world are taking measures to reduce single-use plastics[21].

The EU is also working on empowering consumers to participate in the circular economy, through providing better information on products e.g. via tagging8. This is positive because although consumers prefer sustainable products it can be though to orient themselves in a myriad of information and labels, as there are currently over 400 environmental labels worldwide[22].

Some companies are finding new ways to ensure traceability to provide customers with relevant information. Aditya Birla Fashion and Retail Ltd, who have innovated on making viscose fibre using recycled cotton fabric waste, have pioneered a unique block chain traceability system where customer brands have visibility of their supply chain from forest to retail. The company have several partnerships across their value chain to make their entire process sustainable[23].

In order to produce 50 percent more food, eliminate malnutrition for 2.5 billion people and cut 13 gigatonnes (Gt) of greenhouse gas emissions by 2050, a transformation of the global agri-food system is needed over the next 30 years[24]. In a circular economy for food, waste does not exist but is simply used as feedstock for another cycle. If organic resources such as those from food by-products, are free from contaminants and can safely be returned to the soil in the form of organic fertiliser, a circular food system is possible. Some of these by-products can even provide additional value by creating new foods, fabrics, or as sources of bioenergy[25]. "Farm to Fork" is a major strategy included in EU's Green Deal 2050 plan. This is because there are major challenges linked to food systems in the world today, such as the inextricable links between healthy people, healthy societies and a healthy planet. A shift to sustainable food systems can bring environmental, health and social benefits, offer economic gains and ensure that the recovery from the crisis puts us onto a sustainable trajectory. The global pandemic has shown us that food systems needs to be robust and resilient, function in all circumstances, and capable in ensuring access to a sufficient supply of affordable food for all global citizens[26].

Supporting Laws and Regulation

Regulations and strategies

The European Green Deal aims to shape the world's first climate neutral continent. There are several actions plans implemented and more to come to reach this goal:

- **EU Sustainable Finance Action Plan:** See box below.
- **Circular Economy Action Plan:** The new Circular Economy Action Plan from EU, one of the main building blocks of the European Green Deal, presents measures to make sustainable products the norm in the EU. The Commission will propose legislation on Sustainable Product Policy, to ensure that products placed on the EU market are designed to last longer, are easier to reuse, repair and recycle, and incorporate as much as possible recycled material instead of primary raw material[8]. The legislative proposal itself is expected to be presented in the fourth quarter of 2021[29].
- **Farm to Fork Strategy:** The strategy is considered at the heart of the European Green Deal and outlines both regulatory and non-regulatory initiatives, with common agricultural and fisheries policies as key tools to support a just transition[26]. A legislative proposal for a sustainable food system framework will be put forward before the end of 2023, and a contingency plan will be developed by the end of 2021 for ensuring food supply and food security in times of crisis[30].

There are several measures and regulations already implemented globally to be more conscious of consumptions and production patterns. China has a set a goal to be climate neutral by 2060 which will contribute immensely to the eduction of GHG emissions globally. China is also implementing regulations and targets to move to a more circular economy:

- **China National Sword Policy:** In July 2017, China announced that they will implement a stricter new regulation on imports of solid waste raw materials. The policy bans 24 types of solid waste, including various plastic, and unsorted mixed papers. The regulation was implemented January 1, 2018. This posed an immediate challenge on the global waste management and recycling industry as China processes 55 percent of global scrap paper and is the leading destination for other recyclable materials. However, it creates many opportunities such as domestic sorting and recycling businesses gaining competitive advantage, and design and implementation of new breakthrough technologies, which will continue to ensure less material in landfills, less mining of primary resources and less environmental pollution[31].
- **China's Five Year Plan:** In 2009, the Circular Economy Promotion Law of the People's Republic of China was enacted, including circular economy programmes and initiatives. A circular Chinese economy is considered a fundamental pillar and a national policy in China's 13th Five-Year Plan (2016-2020)32.

EU Green Deal - Finance and Industry Reforms

The European Commission established a Technical Expert Group (TEG) on sustainable finance in 2018 to make a guide for financing sustainable growth. In December 2019, the European Commission presented the European Green Deal, a framework and action plan to transform the European economy. The TEG's recommendations are designed to support the development of climate change mitigation and climate change adaptation. The result is the EU Taxonomy on Sustainable Finance, which is a classification system for approved sustainable business activities. The regulation is expected to be implemented by autumn 2020 and required to be disclosed by companies and investors by 2022[34].

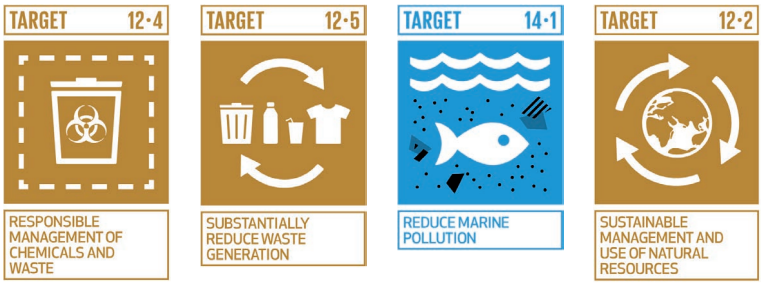
Finance Reform	Economic Reform
• Sustainable Europe Investment Plan • Renewed Strategy on Sustainable Finance	• Rapid decarbonization of energy systems • Innovation in sustainable industry • Large-scale renovation of existing buildings • Development of cleaner public and private transport • Progress towards sustainable food systems

Sub Themes

This whitepaper focuses on three central sub-themes that lay the foundation for successful Responsible Consumption and production: Circular economy, Production and Food systems. This section will introduce the sub-themes' connection to the SDG targets and EU Taxonomy on Sustainable Finance.

Circular Economy

Examples of key SDG Targets



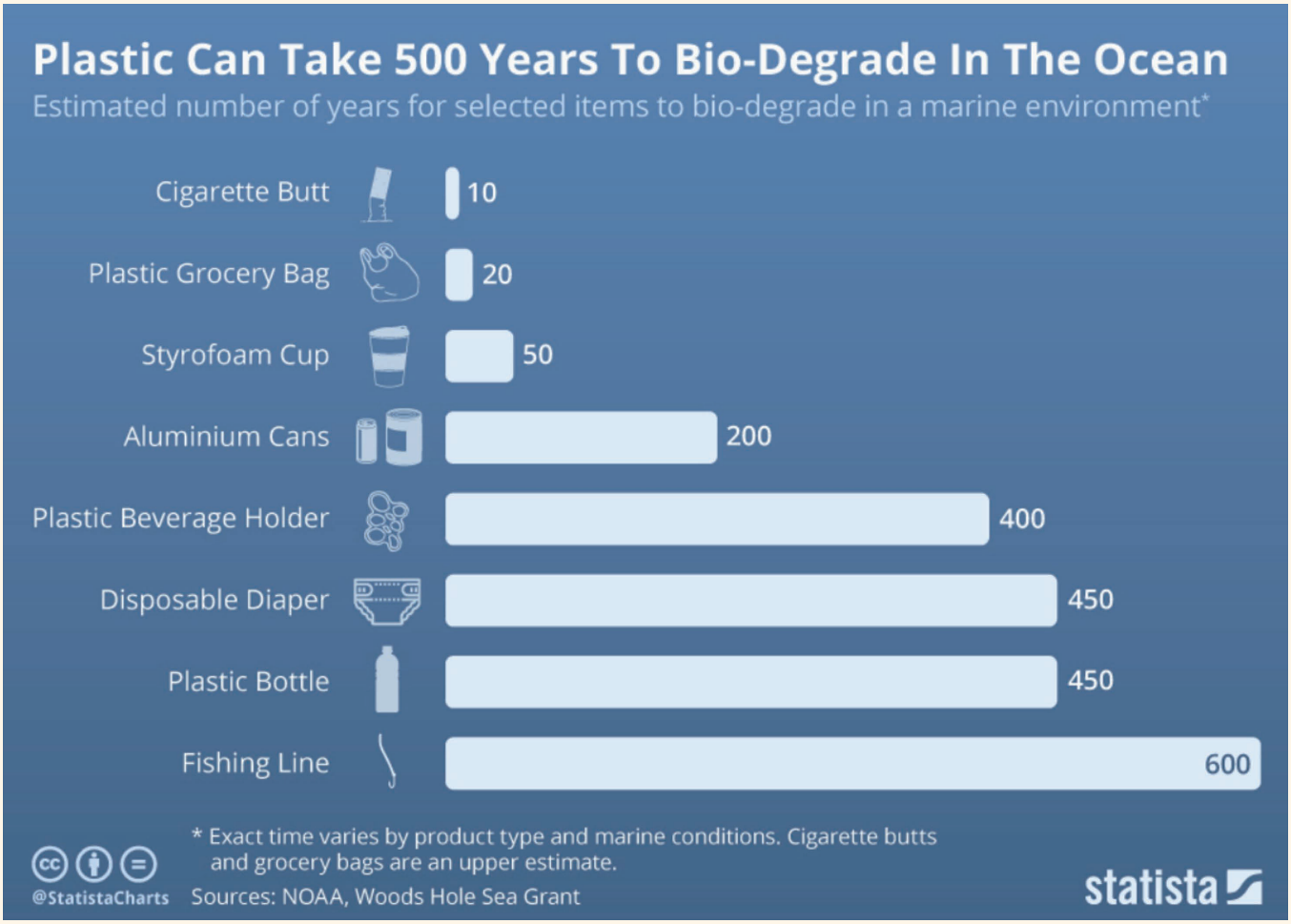
A circular economy aims to redefine growth, by designing waste out of the system, ensure continual use of products and materials, and regenerate natural systems. It entails Products that can be repaired, giving them a longer life-span, is important to move to a circular economy[8]. In this, information on products is essential as it empowers consumers to make environmentally friendly choices. In fact, evidence show that 57 percent of consumers are willing to change their purchasing habits if to help reduce negative environmental impact[35].

Recycling and Re-Use

Approximately eight million metric tonnes of indestructible plastics end up in the ocean every year. If business stay as usual it is expected that there will be more plastic than fish (by weight) by 205036. Most of the plastic in the ocean combined with other litter, such as fishing gear (known as marine debris) are floating around the world's oceans in garbage patches. They are formed by rotating ocean currents called "gyres". There are currently five gyres in the oceans today37. These patches are huge, and the largest garbage patch, called The Great Pacific Garbage Patch is floating between Hawaii and California and is estimated to be twice the size of Texas[38].

Many of the products we use every day are made out of plastic or materials that will take many years to degrade, and a lot of these products ends up in the ocean[36].

[1]Marine debris is classed by the NOAA as "any man-made object discarded, disposed of or abandoned that enters the coastal or marine envrionment



As seen from the chart, some products will take hundreds of years to degrade. This creates a problem for the marine life, as the debris can kill animals living below water[36].

In order to solve this problem we need companies that can address the global "take-make-dispose" economy and adopt a circular approach36. Tomra is one company that has innovated within this field. The company provides technology -led solutions that enable a more circular economy by producing advanced collection and sorting systems that optimize resource recovery and minimize waste in food, recycling and mining industries. Tomra's reverse vending machines collects more than 40 billion empty cans and bottles and in that way provides retailers an effective way of collecting, sorting and processing these containers[39].

As consumers are getting more and more conscious of what they are buying, what the products they buy are made of and where they come from, businesses can benefit from improving traceability, use recyclable materials and sell sustainable products. For more information on how companies are using recyclable materials to sell sustainable products see p. 14.

Waste Management

Decades of economic growth have caused unmanaged and improperly managed waste. Waste management is a universal issue as it affects every person in the world. The consequences of poorly managed waste are huge. It contaminates the world's oceans, clogs drains which causes flooding, transmits diseases, increase respiratory problems through airborne particles from burning waste, and harms animals eating waste unknowingly to name a few[11].

Waste generation is expected to outpace the population growth by 2050. Waste management effects everyone, and people living in vulnerable societies particularly. Poorly managed waste has huge repercussions such as housing being built on landslides of waste dumps and for people working in unsafe waste-picking conditions causing severe health problems[11].

To transition towards a circular economy, we need to invest in the recycling industry as the volume of waste cannot be stopped overnight. However, investment in recycling should not increase over time as the ultimate goal is to consume less and reduce waste[40] .

Technology Enabler

For many local communities, waste management can be the highest budget item. To plan, budget and handle waste management, data is critical. For accurate waste planning for communities, Governments need relevant technologies and consider appropriate partners, such as the private sector for service provision[11].

3D printing can contribute to solve several SDGs. The technology can be used to print body parts, reduce food waste, reduce logistics by having local production and it can help minimize the excess waste in production. 3D printing has a linear model, but by using 3D printing with recycled materials, it has the potential to reuse resources and materials. Using recycled materials in 3D printing is a disruptive and enabling technology with the potential to act as a catalyst for creativity, experimentation and develop new business models and products that challenge existing systems. Thus, 3D printing can be a key part of repair, remanufacture and recycle cascades which are all fundamental in a circular economy[41].

Design is considered at the heart of a circular economy, as the circular economy requires us to redesign pretty much everything from products, business models, cities, to the linear model. Design is the creation of products, services and systems and determines how we shape the material environment around us. It is therefore crucial to incorporate the principles of a circular economy into design[42]. Autodesk software designs products so that resources loop back into a material cycle. The technology they use empowers people to design, collaborate, build, and fabricate in ways that improve productivity at the same time as reducing waste and saving money[43].

Sharing Economy

Consumer shopping habits have drastically changed over the last couple of years, even more so, as a result of the ongoing pandemic. Items that once were viewed as luxuries, such as cars and televisions are viewed as necessities today.

Platforms where companies offer services that build upon sharing our resources is a key enabler to transition towards a circular economy. The sharing economy is dependent on innovative business models and creating opportunities that makes the world's population want to move away from unsustainable overconsumption.

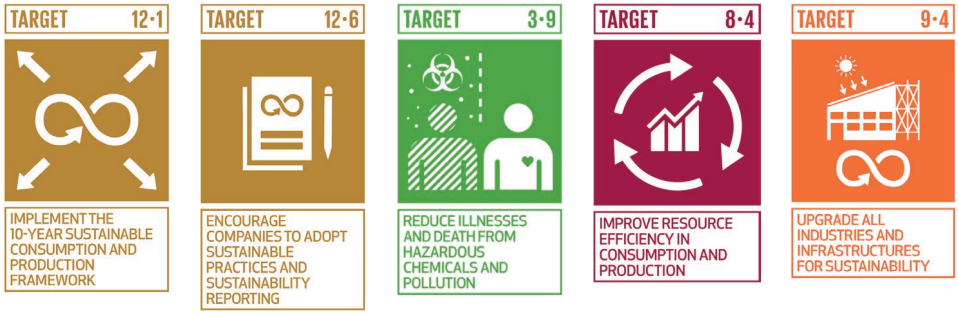
EU Taxonomy Technical Screening Criteria – Water, Sewerage, Waste and Remediation

Economic Activities that Contribute to Substantial Climate Change Mitigation and Adaptation	
Separate collection and transport of non-hazardouz waste in source segregated fractions	Net GHG emission reductions through reuse and high-quality recycling of waste, which are enabled by the separate collection and transport of source-segregated non-hazardous waste fractions. Reuse and recycling activities reduce GHG emissions by displacing alternative waste management options (e.g. landfilling and incineration) and alternative raw material sourcing options with higher GHG emission intensity.
Material recovery from non-hazardous waste	Net GHG emission reduction enabled through material recovery of separately collected non-hazardous waste streams thanks to the subsequent substitution of virgin materials with secondary raw materials having lower embedded GHG emissions.

EU TEG Taxonomy Report - Technical Annex[44]

Production

Examples of key SDG targets



With growing customer demand and legislation pushing companies to make sustainable products the norm, there will be a market for suppliers of key technologies and components that enable sustainable products. Bio-based materials have the potential to replace a wide range of consumer goods, and components originally using fossil resources. For example, computers, umbrellas, toys, paint and water bottles all have fossil elements that could be replaced with bio-based resources. The largest biorefinery in Norway, Borregaard produces bio-based material for paint, cosmetics, car batteries, and glasses amongst others. The market for bio-based and biodegradable materials is still considered small on a global scale, however it is still a billion-dollar market[45]. Bioplastic and biosurfactants are examples of bio-based material.

Packaged food is growing by 3 percent each year and demand is only expected to grow as urbanisation and increasing prosperity drives consumption in these types of products. Thus, producers and retailers of packaged food play an important role in transforming the agri-food system[24].

Innovations in sustainable products are evolving constantly. In this white paper we mention some of the products deemed sustainable today, but this white paper is not limited to other types of innovations within this field. We will continue to analyse this field to see what types of products we might see in the future ensuring a responsible consumption and production.

Chemistry and Enzymes

Biosurfactants: Surfactants – Surface active agents, are called the most versatile products of the chemical industry. In fact, without surfactants washing laundry would be difficult and many food products like mayonnaise and ice cream would not exist[46]. They are widely used in industries such as oil, mining, textile, printing, dyeing, pharmaceutical, environmental, food, cosmetics, rubber processing, metal processing and paper. In simple terms surfactants reduce the surface tension between oil and water, enabling both to either mix or separate. Surfactants are widely used in various field of the global economy and it will continue to expand its scope of application as consumption is increasing. However wastewater containing surfactants, discharged into the environment, can cause serious harm on ecosystems and endanger human health[47].

Surfactants can be made using raw materials derived from both natural (bio) or synthetic (petrochemical) feedstock, or a combination of the two. Since 2005 EU regulation only allows the use of readily biodegradable, completely degradable, surfactants48. In comparison with synthetic surfactants, biosurfactants are more biodegradable and less toxic[49].

In December 2019, Unilever, one of the world's leading suppliers of Beauty & Personal Care, Home Care, and Foods & Refreshment products, teamed up with Evonik, one of the world leaders in specialty chemicals, to be the first in the world to invest in industrial scale production of biosurfactant. Evonik's rhamnolipids which is a type of biosurfactants made via fermentation, provide Unilever with foam-forming properties and high-performance cleaning results. This solution offers the environmental benefits of being fully based on natural sugars and 100 percent biodegradable. Evonik call biosurfactants "a game changing technology in home care and beyond", and notes that they are one of the first movers and well positioned to capture future growth in the biosurfactant market[50].

In 2019, the Biosurfactants market size exceeded USD 1.5 billion globally, and is expected over 5.5 percent CAGR between 2020 and 2026, projecting a value of over USD 2.5 billion in 2026[51].

Bioplastics

Plastics provides various solutions and it is often difficult to find other materials that provide the same functionality[45]. Packaging made of plastics help ensure food safety and reduce food waste[52]. However, as a durable material, plastic provides a huge problem for the environment i.e. litter and micro-plastic in the marine environment. Bio-based and biodegradable plastics are alternatives to conventional plastic material that will reduce plastic litter and reliance on fossil fuel feedstocks[45].

Bioplastics is predicted over 15 percent CAGR from 2016 to 202653. Today, there are 10-15 major companies that produce bio-based and biodegradable plastics (e.g. Indorama, BASF, Braskem and Avantium). Most are produced in Asia, South America, India, America and Brazil[45], and with an increasing number of big brands using bioplastic solutions for their products, the market penetration is well on its way. Procter & Gamble, Danone, Puma, IKEA, Tetra Pak, Heinz and Toyota have already introduced large scale products in Europe[54].

Bioplastics are not just one single material; they comprise of a range of materials with different properties and applications. European Bioplastics define a plastic material as bioplastic if it is either biobased, biodegradable, or features both properties55. Bioplastics do not have to be 100 percent biobased, and there is no global agreement on the minimum amount of biobased content required for a product to be labelled as such[45].

Sustainable Products and Eco-Design

Sustainable products are key to progress on waste prevention[8]. The circular bioeconomy is estimated by the World Business Council for Sustainable Development to be a USD $7.7 trillion opportunity by 2030. It includes industries such as eco-fibres and bioplastics56. Other marked research agencies support the potential in these industries. For example, the global biodegradable plastic market was valued at $1.2 billion in 2018 and is projected to reach $6.0 billion by 2026, growing at a CAGR of 21.3 percent57. Innovation and development of new technologies are needed in many industries related to sustainable products, and companies that are first-movers or well positioned in the delivery of key products and solutions, are well placed for long term profitability.

As implementation of strict environmental regulations is increasing in Europe and North America, the global recycled carbon fibre market is growing with the demand for cost-efficient and high-performance materials. The market size is expected to grow from USD 109 million in 2020 to USD 193 million by 2025, at a CAGR of 12.0 percent during the forecast period[58].

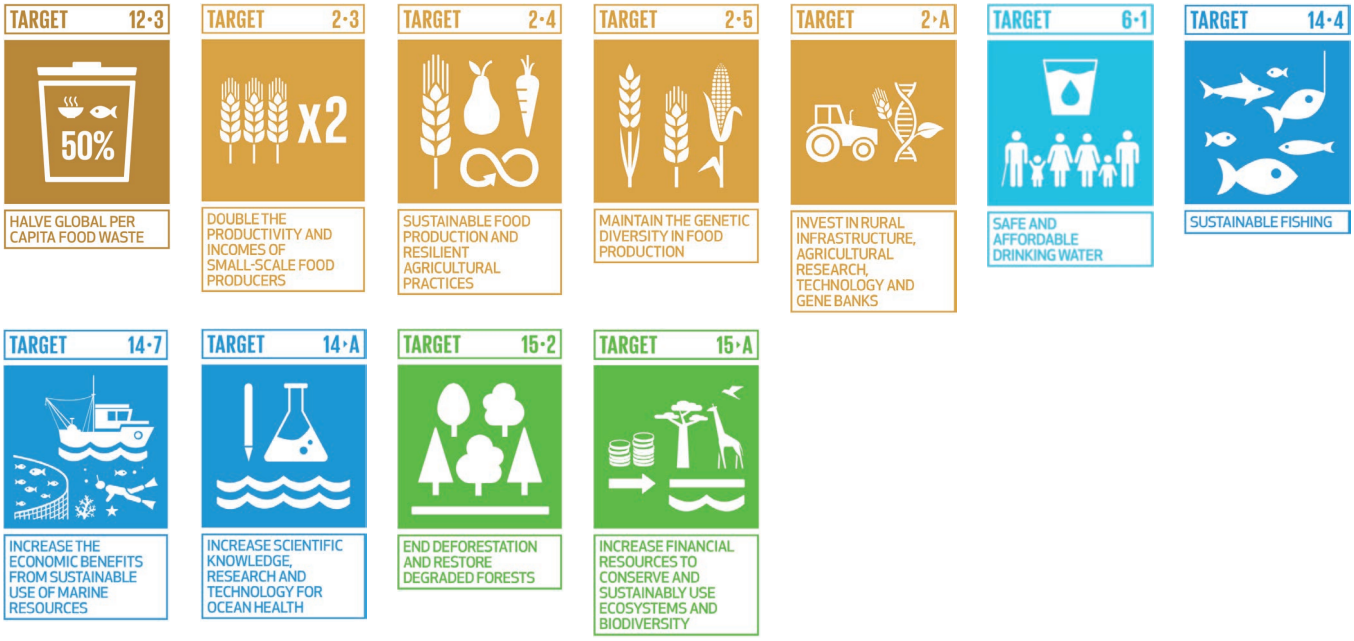
Fibre production has more than doubled in the last 20 years and is expected to increase to 145 million metric tonnes by 2030 if business as usual continues. The textile industry is producing large volumes of waste, in fact global production of all apparel and textile fibres amounted to more than 110 million tons annually59. Thus, it is important that producers are moving towards more sustainable solutions. The global eco-fibres market size is expected to reach USD 58.29 billion by 2027, expanding at a CAGR of 4.6 percent from 2020 to 2027. Rapidly growing online fashion retail and rising disposable income, are some of the key factors expected to the industry growth60. Lenzing is committed to using sustainable fibres in their textile production and contributing to circular economy. Their sustainable model of the circular economy is based on using cellulose as a raw material and when possible, process their raw materials in closed loop production cycles. The fibres they use in production are biodegradable at the end of their life cycle[61].

Companies such as Fitbit, Hard Rock, Patagonia and Quicksilver are using recycled polyester made by Unifi. Unifi is one of many companies that are turning waste into a business opportunity, both addressing the plastic problem, and profiting from it at the same time. Polyester is the most widely used fibre worldwide, and with an annual production of around 55 million megatonnes (mt), polyester had a share of around 52 percent of the global fibre production in 2018. Unifi is feeding this market with polyester made from recycled ocean waste. They source plastic bottles collected with in 50 kilometres of coastlines in developing countries or regions and transform them into polyester fibre[62].

EU Taxonomy Technical Screening Criteria – Manufacturing	
Economic Activities that Contribute to Substantial Climate Change Mitigation and Adaptation	
Manufacture of Alumnium	The manufacturing of aluminium is a highly energy intensive process. The CO_2 emissions related to the production of aluminium are primarily scope 2 emissions (i.e. from the generation of the electricity used). Aluminium manufacturing is eligible if relying on low carbon electricity and reduced direct emissions.
Manufacture of Iron and Steel	Manufacturing of iron and steel at the level of performance achieved by best performing plants is considered to make a substantial contribution to climate change mitigation.
Manufacturing of other organic basic chemicals	The manufacturing of organic chemicals is associated with significant CO2 emissions. Minimizing process emissions and promoting the manufacturing of organic chemicals with renewable feedstock can contribute to the mitigation objective.
Manufacture of plastics in primary form	The manufacturing of plastics is associated with significant life cycle CO2 emissions. There are many types of plastics which are used in the production of multiple end products. The Taxonomy seeks to avoid including manufacture of products that do not have a positive impact in mitigation. Disposable plastic products are highly energy inefficient and undermine efforts to contribute to mitigation. In this context, plastic manufacturing is only eligible when at least 90% of the final plastic is not used for single use consumer products and is not recycled. This needs to be confirmed from science-based research/studies etc.
EU TEG Taxonomy Report - Technical Annex[44]	

Food Systems

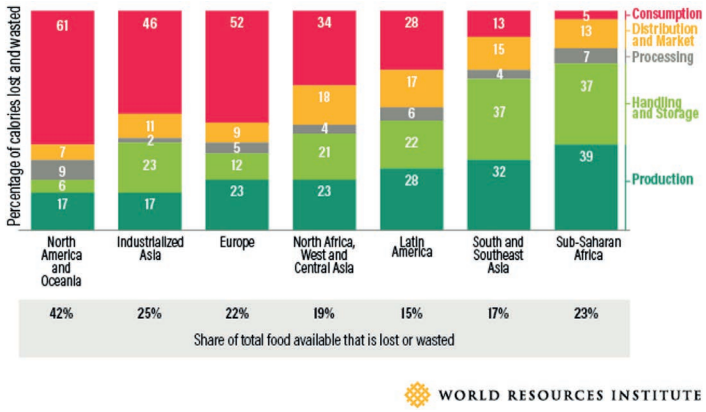
Examples of Key SDG Targets



According to World Resources Institute (WRI), there are five crucial main elements in order to close the food, land and GHG mitigation gaps:

- **Reduce growth in demand for food and other agricultural products** by reducing food loss and waste, shifting to healthier, more sustainable diets, avoid competition from bioenergy for food crops and land, and achieve replacement-level fertility rates.
- **Increase food production without expanding agricultural land** by increasing livestock and pasture productivity, improve crop breeding, improve soil and water management, plant existing cropland more frequently and adapt to climate change.
- **Protect and restore natural ecosystems and limit agricultural land-shifting** by linking productivity gains with protection of natural ecosystems, limit inevitable cropland expansion to lands with low environmental opportunity costs, reforest agricultural lands with little intensification potential and conserve and restore peatlands.
- **Increase fish supply** by improving wild fisheries management and improve productivity and environmental performance of aquaculture.
- **Reduce GHG emissions from agricultural production** by reducing enteric fermentation through new technologies, reduce emissions through improved manure management, reduce emissions from manure left on pasture, reducing emissions from fertilizers by increasing nitrogen use efficiency, adopt emissions-reducing rice management and varieties, increase agricultural energy efficiency and shift to non-fossil energy sources and implement realistic options to sequester carbon in soils[63].

Where Food Loss and Waste Occurs Along the Food Supply Chain



Source: WRI analysis based on FAQ (2011b).

Sustainable Agriculture

Emissions from agriculture have increased 8 percent per year in the last 10 years, of which 44 percent is from Asia. The largest emitters in agriculture are enteric fermentation, manure left on pasture, synthetic fertilizers, paddy rice, manure management and burning of savannahs64. To address some of these challenges sustainable technological solutions are needed.

It is estimated that about 30-40 percent of global food is lost after harvest, which means that approximately 30 percent of the land, water, chemicals and GHG emissions associated with production is unnecessary. Solutions to reduce food waste in production, targeting the most resource-intensive and polluting food items, especially red meat and dairy products, could cut the resource demand and environmental impacts of agriculture[9].

The use of fertilizers and crop protection is massively used in agriculture today. Fertilizers increase yields which reduces the need to cultivate new farmland, which indirectly reduces GHG emissions by limiting deforestation. Use of fertilizers, replenishes the soil and prevents nutrient loss, which improves soil quality. However, use of synthetic fertilizers also contributes to GHG emissions through the production, transportation and use of nitrogen-based fertilizers (particularly nitrous oxide and methane). Nitrogen is the most carbon-intensive fertilizer as it is produced using gas or coal-based ammonia. Globally, this type of fertilizer is the most used and represents approximately 56 percent of total production in 2018. The second largest type of fertilizer is phosphate (24 percent of global production), which include nitrogen-based ammonia, as well as sulphur from crude oil refining[24].

Synthetic fertilizers accounted for 13 percent of emissions from agriculture in 2018 and is expected to increase by a further 24 percent over the next 30 years. Two technologies emerging in this sector can significantly reduce the carbon intensity of synthetic fertilizers:

- Green ammonia: Ammonia is a gas used in the production of fertilizers. The use of green ammonia is 100 percent renewable and carbon-free and can be made using hydrogen and nitrogen separated from the air. Today, green ammonia is more commonly seen as a potential in low-carbon shipping fuel, but can also be used to produce carbon-neutral fertilizer products. Yara collaborates with Engie, Ørsted and NEL on three different green ammonia pilot projects.

- Biofertilizers: This is an alternative to synthetic fertilizer and can meet the growing demand for organic and sustainable products. Biofertilizers use live organisms to help crop nutrition and reduce pest population using natural enemies (microbiological such as bacteria, fungus and virus, and microbiological including other insects). Today, biopesticides is a $6 billion market globally and is expected to grow to $11 billion by 2025.

In the EU Taxonomy, there are specific criteria where the manufacture of nitric acid and ammonia would be eligible[24]. Still fertilizers can harm the natural habitat as excess amount of fertilizers are washed into the waterways and there it can alter habitats and damage marine life. Seaweed has the potential to absorb excess nutrients from fertilizers that get washed into rivers and oceans[65].

Crop protection products, including fungicides, herbicides and insecticides, are also a solution used in agriculture today to improve agricultural yields, however as fertilizers, it uses chemical pesticides. Approximately 7 percent of GHG emissions from the agricultural sector stem from crop yields. However, study show that for every kg of CO2 equivalent created from the manufacture and use of pesticides, at least 10kg of CO2 equivalent is removed from the atmosphere because of the higher yields created by that pesticide use[24].

A variety of agri-technology companies have recently emerged, using digital technologies to mitigate some of the challenges related to the efficiency of agriculture, including poor access to timely agronomic advice and underdeveloped value chain structures66. Precision agriculture can offer solutions to reduce the use of fertilizers and crop protection products, because it utilizes technology and data to optimize efficiency and productivity. This technology has received support from the EU and the Biden administration, and the market is expected to grow in the next decade[24].

Another innovation within the agricultural sector is vertical farming. This solution is pesticide free, it uses significantly less water than traditional farming and removes the uncertainties of converting remaining forests to agricultural land. It takes up 99 percent less space compared to conventional agriculture with a 300 times higher productivity than a traditional field farm. The scalability of this innovation is still limited as it is only suitable for high-value crops such as leafy greens and strawberries. And while the best solution would be to give up cattle farming altogether, the market is not expected to change as the demand for meat-based food is large65. Vertical farming is expected to have a CAGR of approximately 25 percent over 2020-2030 to a market of approximately $20 billion[24].

Innovation in seeds have significantly potential for reducing crop loss and optimizing the use of key resources such as nitrogen, land and water. This solution is highly scalable and can be used globally. In fact, it is expected to grow 5-7 percent annually to 2030, resulting in market revenue of about $100 billion[24]. Moreover, seeds are one of the most economic and efficient ways to improve crop production and productivity. Small-scale farmers, especially in developing countries, have the potential to increase agricultural production rapidly and hence reduce or eliminate dependence on food aid responses to famine when supplied with quality seeds. Climate change causes uncertainties in agricultural production. Thus, sustainable seed systems including access to quality seeds and planting materials of crop varieties should be systemized in order to meet the farmers changing needs[67].

Sustainable Aquaculture

Protein from fish have the potential to feed the growing population and at the same time meet the growing demand for high-quality protein. To meet these demands, the aquaculture industry must become more sustainable.

Most marine fisheries are either fully- or over-fished, so to meet the demand for fish globally, aquaculture solutions are needed. Not only is fish a source of healthy low-fat protein, it is also much less carbon-intensive to produce than beef. For the aquaculture industry to solve some of the challenges linked to food security, sustainable practices need to be adopted and prevent the escape of farm-raised fish. It is forecasted that the industry will have approximately 5 percent CAGR over the next decade to reach revenues of over $300 billion. Asia accounts for approximately 90 percent of global aquaculture production, of which China alone accounts for more than 60 percent. It is estimated that the supply of wild fish will decline with 10 percent by 2050, and therefore the aquaculture market would need to grow from 115Mt in 2018 to 140 Mt by 2050[24].

New innovations within the industry of aquaculture include offshore and land-based solutions. Solutions such as these can meet the growing demand for high-quality animal protein and reduce the highly resource intensive livestock production.

Setting up an offshore aquaculture farm is expensive and risky[68]. Still offshore aquaculture has been identified as a more attractive alternative to inland aquaculture both in terms of productivity and sustainability[69]. Research has found that commercially scaled offshore aquaculture installation have the potential to produce a relatively small pollution footprint as only small amounts of nutrients are released from such farms[70].

Moreover, innovations in fish feeds are needed to ensure a sustainable aquaculture industry. These include algae production as the cultivation of macro- and microalgae requires limited space, grows 10 times the rate of terrestrial plants, matures quickly and results in comparatively higher yield. In addition, algae are high in nutrition which makes it suitable as a main ingredient in feeds. Today, large-scale production of algae is not commercially viable, but this is expected to change as advancement in biofuel production and refineries will make the cost of drying and compressing algae into pellet form to drop.

Sustainable Food

By eating a more plant-rich diet, agriculture emission could reduce the impacts of agriculture on the environment, especially by eating less red meat and dairy products[9].

Alternative meat burgers such as plant-based meat produce up to 90 percent lower GHG emissions and use 99 percent less water than that of traditional meat burgers. The industry is expected to grow approximately 16 percent per year which would result in approximately 3 percent of the global meat market coming from these alternatives by 2030. Moreover, an estimation of combined plant-based meat and milk could be worth more than $80 billion by 203024. Even though these types of foods are a sustainable food options, the meatless alternatives are highly processed and contain high saturated fats. From a health perspective these types of food are not recommended to be eaten on a regular basis or as a dietary supplement[71].

Another sustainable food option is insects. Insects as a food source is considered a sustainable option to other protein sources, due to its low environmental impact (needs limited arable land and water), low ecological cost and has high-quality protein[72].

Food Safety

Food safety refers to the preparing and storing of food in such a way that it reduces the risk of humans falling ill from foodborne illness. It covers a wide variety of areas and is closely linked to food security. Access to sufficient amounts of safe and nutritious food is key to a good and sustainable life. Globally around 600 million people fall ill after eating contaminated food each year. This has resulted in 420 000 deaths and the loss of 33 million healthy life years[12].

Animals and livestock are vulnerable to various diseases. Agri-food testing is expected to grow 5-7 percent over 2020-2030 to a market size of $52 billion[24].

EU Taxonomy Technical Screening Criteria – Agriculture	
Economic Activities that Contribute to Substantial Climate Change Mitigation and Adaptation	
Growing of perennial crops	Both of the principles set out here must be fulfilled: 1. Demonstrate substantial avoidance or reduction of GHG emissions from production and related practices; and 2. Maintain existing sinks and increase sequestration (up to saturation point) in above- and below-ground carbon stocks.
Growing of non-perennial crops	Both of the principles set out here must be fulfilled: 1. Demonstrate substantial avoidance or reduction of GHG emissions from production and related practices; and 2. Maintain existing sinks and increase sequestration (up to saturation point) in above- and below-ground carbon stocks.
Manufacturing of other organic basic chemicals	The manufacturing of organic chemicals is associated with significant CO2 emissions. Minimizing process emissions and promoting the manufacturing of organic chemicals with renewable feedstock can contribute to the mitigation objective.
Livestock production	1. Demonstrate substantial avoidance or reduction of GHG emissions from livestock production (including animal management, storage and processing of manure and slurry, and management of permanent grasslands) 2. Maintain existing sinks and increase sequestration (up to saturation point) of carbon in permanent grassland.
EU TEG Taxonomy Report - Technical Annex[44]	

Solutions Company Highlight

CHR HANSEN
Improving food & health

About

Chr. Hansen is a global, differentiated bioscience company that develops natural ingredient solutions such as cultures, enzymes, probiotics, and natural colors for the food, nutritional, pharmaceutical and agricultural industries. Chr. Hansen is a danish company who markets its products worldwide[73].

Sustainable food system

Chr. Hansen's natural solutions play a key role in creating a food system that is resilient and prepared to feed a growing population while also minimizing its adverse climate impact – ensuring greater sustainability from farm to fork. By pioneering microbial science and industrial fermentation, their technology /products enable food manufacturer and farmers to produce more with less, increase CO_2 efficiency and lower waste across their value chain[74].

Impact on the SDGs

Chr. Hansen's entire product portfolio containing of more than 3000 products are consumed by more than 1 billion people every day. A large-scale assessment done by PwC shows that 81% of their revenue contributes positively to realizing SDG 2 – No Hunger, SDG 3 – Good Health and Well-being and SDG 12 – Responsible Consumption and Production. The impact is assessed according to eight defined impact categories: Increase productivity and yield (SDG 2 or 12), Reduce waste (SDG 2 or 12), Substitute artificial ingredients (SDG 3 and 12), Increase food safety (SDG 3 and 12), Enhance animal welfare (SDG 2), Promote health and well-being (SDG 3), Reduce salt, sugar, fat and lactose (SDG 3) and Ensure access to affordable and available nutrition (SDG 2 and 12)[75].

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Appendix

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SDG Target Icons: Global Goals, available at https://www.globalgoals.org/resources
SDG Icon grid: UN, available at https://www.un.org/sustainabledevelopment/news/communications-material/

Team Solutions

Philip Ripman

- Portfolio Manager & Head of Solutions, *Storebrand Asset Management*
- MA in Chinese Studies, and MA in Politics

Philip Ripman specializes within the areas of politics, climate change, the commercialization of sustainability and how to integrate the Sustainable Development Goals as investment themes.

Philip has held numerous positions within the company including Group Head of Sustainability. Through his engagement with Sustainability he has advised several governments and institutions on topics ranging from coal exclusions, environmental impacts of human activities to policy requirements to achieve international climate agreement targets.

Sunniva Bratt Slette

- *Investment Analyst, Storebrand Asset Management*
- MSc in Industrial Economics and Technology Management (NTNU, 2016 and Ajou University, South Korea, 2014)

Sunniva joined Storebrand in 2017 as a Sustainability Analyst. In this role, her main focus areas were sustainability assessments related to the UN Sustainable Development Goals. She was responsible for the carbon footprint of investments and following up green bonds, and worked with the team on topics like corruption, human rights and environment. As an Investment Analyst for the Solutions team she focuses on research and portfolio construction of solution companies, companies with products and services that significantly contributes to the UN Sustainable Development Goals.

Ellen Grieg Andersen

- Investment Analyst, *Storebrand Asset Management*
- Master's degree in International Economics (Lund University, 2018) and a BSc in International Business in Asia from Copenhagen Business School (2017), including a semester at Fudan University in Shanghai (2016)

Ellen joined Storebrand Asset Management's funds team in 2019 as a Project Manager trainee. In this role, she was involved in the project planning of internal processes and communication of the company's sustainability work. She also participated in the graduate program "Future Impact". As Solutions team Investment analyst she focuses on research and portfolio construction of solution companies, which means companies with products and services that significantly contributes to the UN Sustainable Development Goals.

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Storebrand Asset Management