Recycllux

SDG 14: Life below Water 	**Recycllux's mission and initiatives align closely with the goals of SDG 14.** Covering 70% of our blue planet, **marine environments are essential to our existence**. They are home to up to 80% of all life in the world and we rely them for food, energy and water. **Plastics are the largest, most harmful and most persistent fraction of marine pollution**, accounting for at least 85% of total marine litter. Plastic materials represent between 60% and 80% of the waste present in the marine environment and 90% of the waste floating on the seas and oceans. Plastic has been found as far as 11km deep, contaminating the most remote places on Earth. Many plastics – including polypropylene, polyethylene, nylon, polystyrene, polycarbonate and polyvinyl chloride (PVC) – are very durable; some are predicted to persist in the marine environment for up to 600 years. 165 million tons of plastic currently circulates in Earth's marine environments. If no urgent action is taken, the approximately **12 million tons of plastic that currently enter the marine waters each year** will triple over the next 20 years. This means that approximately 36 million tons will enter the marine waters each year in 2040. In a business-as-usual scenario, the ocean is expected to contain 1 tonne of plastic for every 3 tons of fish by 2025, and by 2050, more plastics than fish (by weight). **Habitat Destruction and Biodiversity Loss.** The scourge of plastic pollution poses a grave threat to aquatic life and marine biodiversity. Marine animals, in particular, bear the brunt of this crisis, with **over 1.5 million marine creatures perishing each year due to plastic-related causes**, including entanglement, suffocation, starvation, and fatal injuries. An alarming statistic reveals that **90% of marine species are impacted by plastic pollution**: from plankton to large predators (3800 species in total). Marine wildlife such as seabirds, whales, fish and turtles mistake plastic waste for prey; most then die of starvation as their stomachs become filled with plastic. They also suffer from lacerations, infections, reduced ability to swim, and internal injuries. In addition, floating plastics also help transport invasive marine species, thereby threatening marine biodiversity. As debris accumulates, habitat structure may be modified. Abandoned fishing gear (or "ghost gear"), including nets and lines, can settle on coral reefs as currents and waves transport them to shallow habitats. It can entangle branching species of corals resulting in fragmentation and abrasion, potentially reducing habitat heterogeneity and providing open substrate for macroalgal colonisation but also continues to capture and kill marine life long after it is abandoned. **Endangering Resource Sustenance.** Marine plastic waste imperils the availability and quality of vital resources, jeopardising both the sustenance of marine life and the livelihoods of coastal communities dependent on these resources. For example, the coastal communities around the world depend on fishing as a primary source of livelihood and sustenance. Pollution can contaminate the water and harm fish populations, making it more difficult to maintain sustainable catches. Reduced fish stocks due to pollution can lead to economic losses for fishermen, fisheries and coastal communities. **Causing Economic Loss. Affecting the Blue Economy.** The fishing and maritime industries suffer substantial economic losses due to reduced catch quality and efficiency, resulting from plastic pollution's adverse effects on marine ecosystems. The cost of plastic pollution to the tourism and fishing industries is estimated at €13 billion each year. According to research, the yearly economic costs of plastic in the ocean are estimated to be between €5.6-17.75 billion. These costs are given by its impact on tourism, fisheries and aquaculture, and (governmental) cleanups. This can have far-reaching economic implications for communities dependent on tourism revenue. Reduced fish stocks due to plastic pollution can lead to economic hardship for coastal communities, contributing to poverty and food insecurity. Plastic pollution can interfere with many other industries, such as shipping, aquaculture, and seaweed farming, which depend on healthy marine ecosystems. A 1% to 5% decline in the provision of marine ecosystem services (= all the economic value of the services provided by the sea) due to plastic pollution is equivalent to an annual loss of €500 billion to €2.5 trillion .

Beyond fishing, plastic pollution can interfere with many other industries (e.g., shipping, aquaculture, and seaweed farming, etc) that depend on healthy marine ecosystems by clogging ship propellers, damaging aquaculture equipment, and affecting water quality for seaweed farming. Disruption of these industries can result in financial losses, reduced job opportunities, and economic instability in coastal regions.

Over 3 billion individuals rely on the marine environments (oceans and seas) for their sustenance and income. Some of these jobs include working with fisheries, aquaculture, renewable energy, water sports, and marine science. The FAO estimates that around 58.5 million people are employed worldwide in primary fish production alone. When considering subsistence and secondary-sector workers, as well as their dependents, an estimated 600 million livelihoods are linked to fisheries and aquaculture. Nearly half a billion people are partially reliant on small-scale fisheries, which constitute 90 percent of global fisheries employment.

Plastic waste in coastal areas can lead to environmental degradation, affecting the overall quality of life in coastal cities and communities, and reduce the attractiveness of coastal areas for tourism and recreation. The presence of plastic pollution on coastlines can deter visitors from tourist hotspots. This can result in a reduction in revenues for the tourism industry as visitor numbers fall, particularly when plastic litter is present during the peak tourist season Coastal cities often rely on tourism as a significant source of revenue. Thus, by affecting tourism, the plastic pollution leads to economic losses for businesses and governments.

Annual ecosystem services provided by marine ecosystems are estimated to be worth €60 trillion and include the various goods people can obtain from marine habitats, including aquatic food in the form of farmed or wild capture fish, invertebrates, and seaweeds.

Marine ecosystem experts conservatively assume that the reduction of marine ecosystem services because of marine plastic pollution is likely to be between 1-5%. Economic costs in the form of GDP reductions are estimated at up to €7 billion.

It is estimated that each tonne of plastic that enters the ocean incurs a €200-400k cost over its lifetime.

Quantifying the Impact:

Recycllux's solution is at the forefront of combating marine plastic pollution, one of the most pressing threats to ocean life. By efficiently collecting and recycling marine plastic waste, we actively contribute to **reducing the pollution that endangers marine ecosystems**. This, in turn, helps **protect and preserve the diverse life forms** that inhabit the world's oceans and **directly supports the Blue Economy**.

Targets:
14.1 By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution
Custom Indicator:

- **Volume of marine plastic waste removed from marine environments.**

Goal: Reduction in plastic pollution levels in marine ecosystems. Reach in 2030 a reduction of 10% of the 500,000 tons of plastic waste /year dumped in the EU seas = 50,000 tons of plastic waste = 5000 interventions. Through its Marine Strategy Framework Directive and Zero Pollution Action Plan, the EU aims to reduce sea-based plastic litter by at least 50%.

14.2 By 2025, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans
Custom Indicator:

- **Number of collaboration with local governments, NGOs, and other stakeholders to address plastic pollution challenges.**

Recycllux generates economic impact by creating a sustainable business model around marine plastic waste management. It offers a platform for businesses to participate in eco-friendly initiatives, potentially reducing the costs associated with environmental compliance and plastic pollution. Furthermore, by involving the fishing community, for example, we're not just creating an additional income source for them but also optimising existing resources (excess capacity of fishing boats during their periods of inactivity).

	It's a win-win for both environmental conservation and economic sustainability. This engagement not only helps reduce inequalities but also enhances the livelihoods of those involved. 14.3 Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels **Indicator that we can measure at a later state (after hundreds of interventions):** • **Average marine acidity (pH) measured at agreed suite of representative sampling stations** Research has found that pollution from plastic waste dumped into the marine environment is correlated with ocean acidification, which occurs when the water's chemistry is altered as CO2 is absorbed by seawater. This process reduces water PH levels and vital minerals like calcium carbonate, a key building block for many marine skeletons and shells. Increased ocean acidity is also caused by CO2 emissions being absorbed into the sea. Ocean acidity has increased by 26% since 1850, 10 times faster than any period within the last 55 million years. pH decreases due to plastic degradation could reach up to ~0.5 units.
SDG 13: Climate action 	Recycllux's work is intrinsically linked to the goals of SDG 13. Marine ecosystems, recognized as **vital 'carbon sinks'**, play a pivotal role in sequestering carbon and, thus, represent an **integral part of the solution in our battle against climate change**. They generate 50% of the oxygen we need, absorb 25% of all carbon dioxide emissions, and capture 90% of the excess heat generated by these emissions. We now emit over 35 billion tons of CO2 each year. Plastic is contributing to the climate crisis on two fronts, by emitting CO2 and by limiting the ability of the ocean to remove this CO2, exacerbating the impact of the emissions. **Disrupting Carbon Capture.** Marine ecosystems, such as mangroves and seagrass beds absorb and store vast amounts of carbon dioxide. This biological carbon pump sequesters up to 12 billion metric tons of carbon each year. Without the biological carbon pump, atmospheric CO_2 concentrations could be up to 250 parts per million higher. Organic compounds produced by organisms can accumulate in the sea-surface microlayer. Plastics in the ocean undergo mechanical and photochemical fragmentation processes accelerated by factors like waves and sunlight, resulting in the formation of microplastic particles. The microplastics are ingested by marine organisms, hindering the ocean's capacity to capture carbon dioxide. MPs increase the production and enrichment of carbohydrate-like and proteinaceous gel-like compounds in the, thereby, directly and indirectly, influencing the absorption of CO2 in the ocean carbon cycle. For example, marine plastics can affect the photosynthesis and growth of phytoplankton, impact the marine biological pump, influence the storage of oceanic carbon, and affect the gas exchange and cycling of CO2 in the ocean, potentially impacting GHG emissions. **Emitting CO2 and other GHG gasses.** The sea surface microlayer serves as the oceanic boundary layer that controls the exchange of atmospheric gases. Currently, the ocean stores approximately 3.8 × 10^16 metric tons of carbon (equivalent to around 1.4 × 10^17 metric tons of CO2). MPs affect carbon sources, CO2 emissions, and carbon transformation processes, primarily by influencing plant and animal activities, altering gene abundance, enzyme activity, etc. Moreover, UV radiation induces the photodegradation of MPs, leading to the gradual release of soluble organic carbon and, to a lesser extent, the leaching of CO2, carbon monoxide, CH4, and other hydrocarbon gases. Research indicates that UV radiation has already degraded 7% to 22% of all floating plastics released into the ocean. Also, exposure to microplastics have negative impacts on zooplankton growth and reproduction, such as exposure to polystyrene beads that resulted in ingestion of 11% fewer algal cells and 40% less carbon biomass, with a reduction in the size of algae consumed. These fragments of plastic material, decomposed into microparticles in suspension in the water column, or deposited in sediments, slow down or prevent the vertical transfer of oxygen. The marine microalgae, influenced by MPs, release Volatile Halocarbons as a protective mechanism to prevent oxidative stress and the toxic effects caused by MPs. Volatile Halocarbons are trace GHG that can contribute to ozone layer depletion.

	Furthermore, when plastic litter is exposed to solar radiation and degrades, it can release potent greenhouse gases like methane. The production of methane at the seabed is known to be significant. For instance, marine seepages emit up to 65 teragrams of methane per year globally at seabed level. On a 100-year timescale, methane has 28 times greater global warming potential than carbon dioxide and is 84 times more potent on a 20-year timescale, making this mitigation crucial for combating climate change. **Quantifying the Impact:** Recycllux's initiatives directly contribute to the preservation of these ecosystems by **removing plastic pollution, preventing the release of stored carbon, and enhancing the seas and oceans' ability to sequester CO2**. Targets: 13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries **Indicators:** • Total greenhouse gas emissions per year • Number of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies Microplastics interfere with the ability of marine microorganisms to absorb CO_2. These microorganisms play a crucial role, sequestering 30-50% of atmospheric carbon (around 15-25 billion tons of CO_2 annually). However, when they ingest microplastics, the marine ecosystem's capacity to remove CO_2 from the atmosphere diminishes. With 33% of the global marine ecosystem now affected by microplastic ingestion, this **limits the absorption of an estimated 8.25 billion tons of CO_2 each year**. An independent assessment done by Impact Forecast, commissioned by EIT Climate KIC highlights that there is a clear correlation between plastic waste removal and CO2 reduction. This saving is directly linked to enhancing the seas and oceans' ability to sequester CO2. And we quote from the report "it is expected that following projects will achieve the avoidance of more than 5 million tons of CO2eq per year becoming a significant impact." A **single intervention to collect 1 ton of plastic waste** from the sea results in a **687.5 tons of CO2 savings**.
SDG 3: Good health 	Maintaining proper health and well-being is of utmost importance in our lives. However, it's imperative to recognize the dire consequences of plastic pollution on marine ecosystems: **Contamination of marine food chains**. Fish, shellfish, and seaweed harvested from the wild and farmed, are essential food sources. The United Nations reports that fisheries livelihoods sustain approximately 10% of the global population, with 4.3 billion people depending on fish for their animal protein intake. Ensuring the sustainability of these resources is of paramount importance. Microplastic particles, capable of infiltrating our bodies, pose a significant health risk. A study reveals that 100% of sea turtles have plastic waste in their digestive systems. The same is true for 59% of whales, 36% of sea lions and 40% of birds. Another recent study provides conclusive evidence of MPs contamination in a wide range of commercially available canned seafood products. For all the types of canned seafood analysed (octopus, chub mackerel, and mussels), 45 % of the cans contained MPs, with an average of 3.5 ± 5.2 MPs/can. The current findings indicate an estimated maximum intake of 226 MPs per capita per year. **Disruptions in the water cycle**. The ocean holds 97% of the total water on the planet. Thus, it plays a key role in this vital cycle of water. The freshwater comes from the ocean, as rain comes from the water cycle. Pollution in the ocean can damage marine biodiversity and disrupt the balance of marine ecosystems, affecting the ocean's ability to regulate the water cycle. In addition, pollutants from the ocean can enter freshwater sources through

	runoff, contaminating rivers, lakes, and groundwater. This can lead to a decrease in the quality of drinking water, making it unsafe for consumption. **Quantifying the Impact:** Recycllux's dedicated efforts to remove plastic waste directly contribute to cleaner marine environments, reducing the prevalence of microplastics in marine food chains. In addition, healthy oceans contribute to a balanced and **efficient water cycle**, ensuring the **sustainability of freshwater resources**. This contributes to the preservation of **clean and safe drinking water sources**. Thus, Recycllux helps **safeguard human health by limiting exposure to harmful microplastic** linked to a myriad of health problems. Targets: 3.9 By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination **Indicators:** • Mortality rate attributed to unsafe water, unsafe sanitation and lack of hygiene (exposure to unsafe Water, Sanitation and Hygiene for All (WASH) services) • Mortality rate attributed to poisoning of the marine food chain with harmful microplastic While **we don't have an exact quantification of the potential impacts of 1 ton of marine plastic pollution**, it's clear that microplastics pose risks to human health. Researchers from the fields of healthcare, ocean science, and social science have collaborated to quantify plastic's considerable risks to all life on Earth. The primary pathway of human exposure to MPs has been identified as gastrointestinal ingestion (mainly seafood for the general population), pulmonary inhalation, and dermal infiltration. MPs may pollute drinking water, accumulate in the food chain, and release toxic chemicals that may cause disease. Shockingly, an adult human could ingest up to 121,000 of these plastic microparticles each year. The potential health repercussions resulting from daily exposure to hormone-disrupting substances found in plastic are alarmingly diverse. They encompass a range of afflictions such as cancer, infertility, asthma, and disorders in embryo development, among others.
SDG 12: Responsible consumption and production 	Irresponsible use of resources is the main reason we are now facing biodiversity, climate, and pollution crises. Plastic waste makes up 85% of all marine pollution and around 12 million metric tons of plastic end up in the ocean each year. Instead of being recycled or properly disposed of, plastics accumulate in marine ecosystems, contributing to the environmental degradation and climate change. **Quantifying the Impact:** Recycllux's cleanup and recycling efforts embody sustainable practices. Our platform encourages **responsible practices in marine plastic waste management** by promoting seamless linkages between companies, fishing ships, local NGOs, and recycling companies, and **optimum use of resources** (e.g., using the excess capacity of the fishing ships). Besides ensuring a comprehensive and efficient response to the marine waste challenge, Recycllux contributes to the development of a **circular economy for plastics** by recycling collected materials and reintroducing them into the production cycle. Targets: 12.5 By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse **Indicator:** Tons of marine plastic waste recycled / included into co-processing practices 12.6 Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle **Indicator:** Number of companies publishing sustainability reports