

# The Plastics Responsible Society – Re-thinking plastics in a sustainable circular economy (PlastLIFE)

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The global production of virgin plastics has increased 20-fold since the 1960s. Despite the many benefits of plastics, they cause major environmental and health problems. There is an urgent need for global transition into a safe and sustainable circular economy of plastics. The PlastLIFE SIP project tackles the plastic challenge by implementing the four objectives of the Plastic Roadmap for Finland: reduce littering and other negative impacts caused by plastics, refuse from unnecessary consumption of plastics, increase recycling of all types of plastics and replace fossil plastics with bio-based materials and/or other solutions.

These objectives are achieved through nine work packages designed to directly respond to the measures proposed by the Plastic Roadmap for Finland. PlastLIFE will identify and implement safe and sustainable solutions for plastic production, consumption and recycling, and develop policy tools and reliable indicators sustaining and up-scaling the results beyond the project.

The 17 project beneficiaries and stakeholder networks bring together all the most relevant actors needed for the change. Together with the complementary measures, PlastLIFE aims at the full implementation of the Plastic Roadmap for Finland in all geographical regions of Finland by 2035. The project has set ambitious quantitative targets for increasing recycling, reducing littering and demand for primary fossil-based plastic, mobilising funding as well as achieving a measurable change in the mind-set of the Finnish public, industry and decision-making. The PlastLIFE project and the Plastic Roadmap for Finland implement the EU and global plastics and circular economy strategies, action plans and targets. The project supports the targets of the LIFE programme by facilitating the transition into sustainable, circular, toxic-free, energy efficient and climate-resilient economy and by helping to improve the quality of the environment and natural resources such as soil and water that are increasingly polluted and harmed by plastics.

In this presentation the project will be introduced. The presentation will highlight the activities, goals, tasks and proposed outcomes of the project.

PlastLIFE project focuses its work on e.g. littering. In activities dedicated to **reducing littering and avoiding unnecessary consumption**, PlastLIFE strives to increase public awareness and citizen engagement by educational methods in schools, scouts and with beach clean-up activities with children. The amount of collected litter on beaches is measured, a communication campaign is launched in urban areas using stickers in storm water drains and decorations in litter bins. A mobile app will be launched to accumulate citizen science as a science and art festival. Innovative means are used to reduce the use of primary plastics and improve recyclability with consumer-based redesign, explorative prototypes and 3D-modelling. A database on the research on harmful effects of different types of plastic litter will be initiated, the amount of plastic construction waste on beaches will be monitored, citizen and business surveys and a citizen barometer are launched to monitor behaviour and awareness and a citizen panel gathered to increase knowledge on how to better manage the littering and plastic problem.

PlastLIFE will also be **reducing the health and environmental impacts of plastics**, knowledge will be built on added and accumulated harmful substances in different plastic waste and recycled plastic fractions and chemical identification and risk assessment of hazardous substances will be developed to support safe recycling of plastic waste. The safe development of biodegradable plastics will be studied by elucidating the environmental and health impacts of biodegradability of biodegradable plastic materials in northern water bodies. And polymeric materials will be studied as absorbents for harmful substances in industrial and mining wastewaters.

The project has work focused on **recovery and processing of plastics waste for recycling** and the project will have results in promoting and intensifying the sorting, separation, collection and recovery of plastics waste originating from different sources (from consumers, plastics companies, agriculture and horticulture as well as construction and demolition), finding solutions that allow the circulation of materials currently difficult for recycling (i.e. bio-based materials) and developing applications for recycled and bio-based plastics to improve the overall circulation of plastics.

Additionally, focus will be specifically given to **plastics in construction and demolition and agriculture and horticulture**. The work will promote safe recycling of construction and demolition waste plastics, enhance identification of construction plastics, facilitate better access to information on plastics and best practices in construction, separate collection and recycling systems. The most significant infrastructure construction plastic flows will be mapped and the phases of planning and construction will be identified where these flows can be affected within a municipal operators responsibility, the potential will be analyzed and alternatives for introducing circular economy solutions for plastics into various phases of construction processes will be found (design, materials, construction), the personnel of the capital city of Finland and also the biggest employer of Finland (Helsinki) will be trained and innovative procurements to develop new procurement criteria in Helsinki will be piloted, such as reducing the use of plastic, using

recycled plastics or materials replacing plastic. The availability and quality (including hazardous substances) of C&DW plastics will be mapped out alongside the potentials to utilise recycled plastics or materials replacing plastics in different phases/processes of construction as well as piloted the processing of C&DW plastics and testing their safety of use and assessing the environmental impacts of utilising C&DW plastics in various applications and various sorting, separation and processing alternatives. PlastLIFE also has work related to promoting the recycling of agro-plastics and re-designing the value chain. It will identify processes, methods and applications best suitable for recycling agro-plastics and pilot increased recycling regionally, identify problems impeding circulation of agro-plastics, improves guidelines and agree on joint measures to promote the recycling of agro-plastics in co-operation with different parties in the agro-plastic chain. Activities will also be related to developing bio-based and/or biodegradable alternatives for replacing the plastic mulching films and to increasing the knowledge of farmers and agricultural students on plastics used for covering the soil: producing organic liquid mulching material from under-utilised side streams, testing of weed control potential and biodegradation of the produced vs currently used mulching material in laboratory and/or pilot-scale setting. Training materials on circular economy, sustainable use of agricultural and horticultural plastics and on the alternative materials will be produced.

Additional focus will be given on **alternative solutions and knowledge networks** and to strengthening co-operation and networking between research, companies and administration necessary for the development and implementation of replacement materials: a New Plastics Center NPC network in Finland will be strengthened with new participants, new sustainable RDI processes and value chains are created and activated, and a “Sustainable Material Clinic” is established to disseminate information on bioplastics, novel materials and their properties, processing and utilisation possibilities in end-use applications. Development of sustainable innovation and business models for plastics recycling is carried out through analysing the innovation challenges in the plastics context, developing an innovation management toolkit with 1-2 case study companies, and refining and disseminating the toolkit in collaboration with the consortium partners. Work will be done on activities and measures to develop novel, alternative materials and assess their performance: Fibre-based materials originating from plant-based side-streams, fungal mycelium or other sustainably sourced and underutilised bio-based sources are produced, tested, processed and modified for improved technical properties (e.g., by utilising extrusion molding technology, technical surface modifications and bio-based coatings or films). Bio-based alternative for plastic films used in food packaging is developed from naturally biodegradable, non-fossil material originating from side streams of food production. Its performance is approved using laboratory methods and further tested in practical settings, in combination with the fiber-based packaging alternatives described above. Techno-economic feasibility analysis (TEA) is conducted to evaluate mass and energy balances and cost of production including raw materials and process utilities. Combined with holistic sustainability assessment TEA helps also to create the process development paths that fulfill desired ecological values and economic interest to be a successful production concept. **Creating recommendations for technical biodegradability criteria:** Recommendations for recycling biodegradable plastics are developed based on existing technical criteria and technical piloting and testing at laboratory and biogas plant. When developing the recommendations, the recyclability of biodegradable plastics from a legislative perspective is considered and dialogue with European operators is carried out to promote broader adoption of the recommendations. **Assessing and comparing holistically the environmental sustainability of different bio- and fossil-based materials and solutions which aim to replace plastics:** developing a science-based method and scoring approach to assess most essential environmental impacts and performance of food packaging and packaging systems (including the technical performance of solutions) in a reliable and comparable way. The assessment considers environmental sustainability and impacts. Open database on environmental impacts of studied materials will be created, environmental sustainability score concept for packaging developed and piloted to measure and communicate environmental performance of food packaging options to consumers, retailers and industry to make environmentally sound decisions. Assessing and piloting communication possibilities to integrate information on food packaging sustainability and food product environmental footprint.

Lastly, the project will focus on **the sustainability, replication and exploitation of project results as well as policy tools for the sustainable circular economy of plastics**. For example the project will produce new methods, data, and analyses for more impactful policy and informed consumer decisions and develop and define national indicators to monitor the development of the Plastics Roadmap for Finland and set relevant targets to enhance and evaluate the transition to a sustainable circular economy of plastics in Finland.

In a plastics responsible society, sustainable solutions and models of operations are formulated through dialogue and co-operation between all key stakeholders. PlastLIFE strives for a society in which each Finn takes responsibility for plastics and plastic littering. Through the work done in PlastLIFE, the Finnish society will have key results from several different pilots to showcase the path towards a plastics responsible society. Our mission is to have by 2035 the recycling of plastics packaging to increase from 42% to 55%, the recycling of all plastics waste to have doubled, coastal littering decreased by 50% and GHG emission related to plastics waste treatment to have decreased from 156 000 tons of CO<sub>2</sub> per year to 78 000 tons.

By 2035, a breakthrough of sustainable circular economy of plastics will have happened.