

## SHORT TERM SCIENTIFIC MISSION (STSM) SCIENTIFIC REPORT

This report is submitted for approval by the STSM applicant to the STSM coordinator

**Action number: CA17133**

**STSM title: Analysis of polymer waste streams for mechanical recycling allowing for high quality recyclates**

**STSM start and end date: 01/09/2021 to 30/09/2021**

**Grantee name: Moritz Mager**

### PURPOSE OF THE STSM:

The European Union has declared its targets for packaging waste recycling rates, which are at 50 % in 2025 and 55 % in 2030. Due to close relations between Iceland and the European Union, these targets are equally applied to Iceland, necessitating significant improvements in the recycling value chain. Currently, the state-of-the-art waste system in Iceland does not feature domestic plastic recycling at large scale as plastic waste streams are simply too small due to the size of the population. Yet, plastic waste is collected and sent abroad for recycling or energy recovery. The value of exported polymer waste may be enhanced by improved conditioning and pre-sorting according to polymer types and quality. Here, the potential of mechanical plastics recycling is to be analyzed by identification, quantification, and qualification of polymer waste streams. During the STSM, all components of the plastics value chain have to be evaluated, which goes from production to end of service life management of plastic products. This STSM mainly contributes to working group three, which is resource recovery, but also to others, since plastics are also part of agriculture or water management.

### DESCRIPTION OF WORK CARRIED OUT DURING THE STSM

The STSM was carried out in Reykjavik, Iceland, within a one-month time span. Prior to that, extensive literature and online research were carried out in order to gain knowledge on the Icelandic plastic value chain. The research was based on stakeholder interviews, for which potential interviewees were selected from relevant stakeholder groups such as researchers, politicians, and companies. With a population of only 360,000, the potential interviewees were scarcer. As certain interviewees were also of interest for two other participants of this COST action, joint interview requests were sent out. In total, nine interviews were arranged during the STSM. The group of politicians was underrepresented, as there were general elections in Iceland during the STSM and the potential interviewees were occupied otherwise. Then, the interviews were semi-structured and the interviewees were able to talk freely with only some guiding questions being asked. Accordingly, questions could be adapted to each interviewee based on their position and knowledge, but they all featured core questions that each interviewee had to answer. Five interviews were held online and four were held in person. Interviews in person tended to be longer as the interviewee seemed more talkative. The interviews were started with an introduction of ourselves, the STSM, and the specific research topics. The duration of the interviews ranged from 40 minutes to two hours. All interviews were audio-recorded and later transcribed to facilitate information processing. In the end, interviewees were asked to introduce other relevant persons to our research team, which were more likely to accept the interview request.

### **DESCRIPTION OF THE MAIN RESULTS OBTAINED**

Currently, an extended producer's responsibility scheme is implemented by the Icelandic recycling fund. Due to the nature of Iceland being an isolated island, monitoring of import and export of plastic products is facilitated and the producers or importers have to pay a tax to the recycling fund according to the amount of plastics they introduce to the market. Apart from PET bottles, which are part of the deposit system and which result in recycling rates of 90 %, mixed consumer plastics are collected by waste management companies. In Iceland, little to no sorting is done for the mixed plastics stream, and the waste is sent abroad for sorting and subsequently either recycling or incineration. Since there is a gate fee on most unsorted plastic waste fractions, the recycling fund provides an incentive and covers the expenses. Here, domestic pre-sorting would improve the quality and therefore add value. Yet, most of the interviewees were convinced, that the size of the domestic waste streams is too small to install a recycling or sorting plant, nevertheless, there is one recycling company operating in Iceland. This company is mostly focused on clean streams of agricultural film and rigid plastics, and they are able to make a profit with recycling. In their opinion, investments in sorting and recycling technology should be made, but most of the waste management companies oppose these views and continue their policy on exporting plastic waste to other European countries. Roughly 50 % of the exported mixed plastic is suitable for recycling, which is why a change in product design is heavily demanded. Instead of multi-material packaging, homogenous solutions are required, which are suitable for recycling. One tool to solve this issue is an upcoming change in the taxation of plastic products. While at the moment only the weight of imported plastic is decisive for the amount that has to be paid to the recycling fund, the recyclability will be taken into account according to European directive in 2023. Therefore, environmentally friendly design will be rewarded by lower fees.

However, the population also plays an important role in waste management, as they have great influence on the composition of the waste streams. People can select to dispose their plastic waste in drop-off areas, at recycling centers, or in recycling bins at home. Yet, the collection rate of plastics is only 28 %, which requires major improvements in order to reach the target of 50 % in 2025. Even though the awareness on environmental issues is rising and more people are willing to participate in the system, less than half of the households have a recycling bin. Without a recycling bin all waste goes into one bin and the recyclables are lost. Other than that, the diversity of waste disposal systems throughout Iceland is somewhat confusing and it needs to be homogenized to get more people involved. The current left-green government makes great efforts to develop Iceland towards carbon neutrality and laws that make recycling or waste separation mandatory are conceivable. To summarize, the conducted research points out problems and possible solutions throughout the Icelandic plastics value chain, which will be continuously improved in the following years.

### **FUTURE COLLABORATIONS**

A domestic recycling company provided material samples, which are analyzed at the facilities of the JKU. Here, material tests are conducted to determine the quality and mechanical properties of these recyclates, which can then be compared to other commercial recyclates or virgin materials. Moreover, interviewees were interested in the outcome of the conducted research and therefore, a copy of the report will be sent to them. It remains to be seen, if any of our interviewees are interested in future collaborations.