01.02.2016: Statement of Open-Bio partners to the UNEP (2015) report on "Biodegradable Plastics and Marine Litter. Misconceptions, concerns and impacts on marine environments." – Short version

Executive summary

While the Open-Bio consortium generally appreciates the UNEP report for its contributions to explaining and clarifying many aspects concerning the relation between different plastic materials and marine plastic litter, several aspects are criticized as well.

- Both the summary and the conclusion simplify matters too much, thus inviting confusion by the public and policy makers.
- Some of the final conclusions concerning the possible role of biodegradable plastics are not solution-oriented and remain rather pessimistic, whereas the main text offers several well-elaborated segments of the general topic, where solutions via market regulation, legislation, directed scientific research and industrial development could be achieved in relatively short time or may be readily adopted through political action.
- The statements on rate of biodegradation and impact made by the report are not differentiated enough. More research is clearly needed.
- In terms of communication and labelling, even more concise wording is needed and a strict distinction should be made between B2B communication and B2C communication in order to avoid litter.

The Open-Bio statement furthermore offers some corrections to technical mistakes of the UNEP report and preliminary results from the project's research.

The Open-Bio group concludes that biodegradable plastics are not a solution to littering. Littering must be opposed by means of prevention, waste management (that includes separate collection and organic recycling of biodegradable plastics), public awareness, etc. On the other hand, plastics that are shown to be truly biodegradable in the marine environment could be profitably used in those applications where dispersion in the sea is certain or highly probable (e.g. fishing gear, fish farming gear, beach gear, paint, etc.).

General considerations

It is certain that **littering needs to be avoided and reduced possibly to zero by all means** (prevention, cutting waste streams, raising public awareness, etc.). But for certain applications it is inevitable that plastic products will enter the oceans, via rivers or e.g. by loss of fishing gear or wear of tourist beach equipment. Wouldn't it be better if this litter was biodegradable? This is stated with always seeing that biodegradable litter is still litter, and should also be avoided at all means! However, it will at least not remain there forever, compared to non-biodegradable plastic litter.

Rate of biodegradation and its risk assessment

A point of critique concerns the frequently mentioned **rate of (bio)degradation** in the UNEP report. It is not differentiated between the inherent biodegradation rate of an industrial biodegradable material and the degradation rate of the item that finally ends up in the environment. The report states that biodegradable plastics do **degrade under marine conditions but are much slower than in industrial composting, and also when tested in gastrointestinal fluids of a turtles, and will therefore still harm** the marine environment. Most biodegradable plastics are not water-soluble. This means that the biodegradable plastic products will not immediately "disappear" when they reach the sea but persist in this environment for a given time (a residence time). By means of a risk assessment it is possible to characterize the magnitude of risks to ecological receptors (e.g. mammals, birds, fish, corals, microorganisms or even whole ecosystems) from the stressors, that may be present in the environment. Plastic items littered to the sea do have impact on several levels, some of which are well documented and some still lack scientific knowledge (GESAMP 2015, Bergmann et al. 2015).

Impacts

In **terms of impact to the marine environment,** little research has been completed comparing non-biodegradable and biodegradable plastics. There are scientific studies on the impacts of non-biodegradable litter and parts of the knowledge can be transferred to biodegradable litter, but not all of it. More research on the impact of biodegradable polymers is clearly needed. Therefore we think that the statement of the UNEP report is important, however a bit premature.

The global perspective

In the discussion we miss **the global view and also more options for developing countries**. Many have currently no (or insufficient) waste management infrastructures in place. But the plastic consumption in many of these countries (esp. China, Indonesia, India, etc.) are expected to rise tremendously in the coming years. In the case of mismanagement and the waste ending up in the ocean, it would not remain there forever when it is biodegradable under marine conditions.

Recycling

Biodegradable plastics do not hinder plastic recycling by being 'biodegradable' or 'compostable' (investigated by Open-Bio consortium, Task 6.4), but because recycling requires pure waste streams. Any contamination of a waste stream of a particular plastic (e.g. PE) with another type of polymer (whether it is biodegradable or not) requires good separation practices. Only so called 'oxo-degradable' plastics pose a threat to plastic recycling by compromising the quality of the final product.

Labelling

The labelling of 'oxo-degradable' plastics as 'biodegradable' or 'compostable' is not correct (see EN 13432:2000) because these materials simply fragment and do not biodegrade, no matter where their life cycle will end. Open-Bio confirms that a label or certification should be not misleading and should not lead to wrong behaviours. The information should preferably only be used at the industrial level to describe material properties to business partners, but not on a broad consumer level unless necessary. Based on the current state of knowledge we recommend also not to label a product for the general public unless necessary for the specific application, but to enforce by political means that those products which will certainly or probably end up in the marine environment need to be biodegradable in the specific marine environment of application. The Open-Bio team is currently working on an update of the standard methodology taking into account the current standards for marine biodegradation (see Open-Bio D5.5).

First results from Open-Bio and further research

First results from Open-Bio do confirm the statement of the report that degradation is slower under marine conditions than under composting conditions and that it depends on the material type and specific environmental conditions. The work within Open-Bio shows that the tested polymers do biodegrade under optimal laboratory conditions. Linking the lab data with the data we obtain from field and mesocosm experiments will allow us to validate the lab test. Further ecotoxicological tests should be added to the tests, which will provide more insight on the impact of biodegradation. The goal is to develop a test scheme and specifications (time and percentage of biodegradation, temperature range, etc.) for the biodegradation under marine conditions to be finalised by a standardisation organisation. That will provide policy makers and the industry with a **good instrument to implement biodegradable polymers where they can be part of a concept to mitigate unavoidable marine litter**.

Polymers that are proven to be biodegradable in the marine environment can thus improve the situation in case plastic is not to be replaced by other materials, in concert with all possible measures like prevention, waste management, public awareness, etc. Summarising the mentioned points, we think that the public, mass-media, industry and policy makers have a great potential and possibilities to support the protection of the environment here.