PLASTIC POLLUTION OF RIVERS IN THE DANUBE REGION

BEST PRACTICES TOWARDS REDUCTION OF PLASTIC POLLUTION

Interreg
EUROPEAN UNION
Danube Transnational Programme

DANUBE REGION strategy
Water Quality

Photo: www.danube-region.eu

CONTENT

1. FOREWORD

The water quality priority area of the EU Strategy for the Danube Region (EUSDR PA4) aims to ensure integrated water management towards reaching the good quality of waters in the Danube River Basin. Hungary, together with Slovakia has been assigned to coordinate the water quality issues (Priority Area 4).

The present study was developed in the frame of the DTP PAC1 PA4 project (PA04 Water Quality), as the topic of the plastic pollution has become more and more highlighted during recent years with also impacting water quality measures.

Besides its destructive aesthetic look, different plastic items, as results of fragmentation process, turn into microplastics, which can enter into the food-chain, and in long term can have a negative impact on the ecosystem and may also influence human health. Research and studies show that wastewater treatment plants and tyre abrasion are also significant sources of microplastics in river catchments.

Currently research programs are ongoing to find out how microplastic affects the ecosystem and the human-health.

As an important challenge the reduction of plastic waste is already highlighted both in Danube and Tisza river (sub-basin) wide scale. Two of the EUSDR PA4 related projects, the DTP-JOINTISZA project (running since January 2017) and the Tidy-up project (submitted in the DTP 2019 call with Letter of Recommendation from EUSDR PA4) are aiming at to find solutions to reduce this pressure.

Following the review of the current situation of the plastic pollution, the present document introduces best practices to show what kind of steps have been already taken to overcome this emerging problem. From the side of the EUSDR Hungarian coordination, we hope that following both our international workshop and the global promotion of the Plastic Cup in 2018, this brochure will provide a clear overview about the current challenges of plastic pollution in the Danube catchment area and raise awareness of the public.

Dr. Viktor Oroszi, Hungarian National Coordinator of the EU Strategy for the Danube Region

2. INTRODUCTION

Plastics are useful and great materials, yet they are now causing one of the most serious environmental crises of our time. Chemical industry has developed a variety of materials that allows to tailor our stuff and to make them more durable and lightweight at the same time. However, human comfort, greed and laziness have destined a large fraction of this material to a useful lifetime of a few minutes and significant leakage into the nature with jeopardizing our waters and wildlife. With living in a closed ecosystem, now plastic pollution means also a threat to human health.

Research by Schmidt et al. has shown that 80% of the plastic pollution of oceans is delivered by rivers from inside of the continents. Though the most affected and polluted rivers are found in Asia and Africa, rivers in Europe are also delivering litter. This also applies for the Danube, considered as the most international river of the world. The Danube River Basin extending into the territories of 19 countries covering more than 800 000 km^2. This prompted to establish the EU Strategy for the Danube Region in 2010 (EUSDR was adopted and endorsed under the Hungarian EU Presidency in June 2011). The Danube Region has a population of 115 million people living in diverse settings from highly industrialized urban areas to underdeveloped poor rural locations, implying also diverse and transboundary impacts on nature and water quality. Due to this, one of the 12 Priority Area is the Water Quality Priority Area (PA4) that aims to learn and prepare to new kinds of pollution such as plastic and microplastic.

In 2018, the word of the year by Collins Dictionary was "single-use" which may tell everything about the story. But how did we make so far? How does the situation affect the Danube region and what can we do to tackle it?

This short study aims to answer these questions.

References used thorough this study are listed in Chapter 10.

Floating rubbish on Tisza Lake near the Kisköre hydropower dam, Hungary

Photo: Miklós Gyalai-Korpos

3. PLASTIC POLLUTION OF WATERS – FACTS AND FIGURES

HOW MUCH PLASTIC HAVE HUMANITY PRODUCED AND WHAT HAPPENED TO THEM?

By 2015, humanity had produced 8.3 billion tonnes of plastic and approximately 6.3 billion tonnes of it has became waste. Of this waste, only around 9% had been recycled, 12% was incinerated, and 79% was accumulated in landfills or the natural environment. This means that most of the plastics produced is still with us though discarded long time ago as it takes more than 400 years to degrade.

WHAT FOR IS THAT PLASTIC USED?

More than one-third of the plastic is used in packaging indicating a short lifetime. Plastic bottles are part of this segment of which a million pieces are bought globally every minute. Forecasts say that the number will jump another 20% by 2021.

Packaging is followed by buildings and constructions, and textile industry. These combined consume around two-thirds of the plastics, while the rest is used for electronics and transportation, as well as other consumer and industrial products.

WHAT IS THE ANNUAL PRODUCTION OF PLASTIC?

Global annual plastic production exceeds 300 million tonnes and rising. Underpinning the aforementioned low ratio of recycling, most of the production is based on virgin feedstock. Analysts of McKinsey[1] prepared the global flows of plastics showcasing the concerning figure of 19% for "unmanaged dumps or leaks". This means that annually near 50 million tonnes of plastic go out of sight of the waste management system but still remain with humanity for centuries.

Types of plastic and they uses

Symbol	Polymer type	Examples
1 PETE	**PET** Polyethylene Terepthalate	Bottles: Fizzy drinks, cooking oil, squashes and water
2 HDPE	**HDPE** High Density Polyethylene	Milk bottles Juice bottles Washing up liquid Bath & shower bottles
3 V	**PVC** Polyvinyl Chloride	Cable, pipes and, occasionally, bottles
4 LDPE	**LDPE** Low Density Polyethylene	Carrier bags Bin liners Packaging films
5 PP	**PP** Polypropylene	Margarine tubs, microwave meal trays
6 PS	**PS** Polystyrene	Yoghurt pots
7 OTHER	**OTHER** All other resins and multimaterials	Any other plastics

Credit: Ealing Council with permission to use

[1] *McKinsey & Company is an American worldwide management consulting firm. McKinsey publishes across a variety of platforms, and the great majority of our external content is available here on McKinsey.com. This includes articles, white papers, reports, videos, and podcasts.*

HOW MUCH PLASTIC WASTE DOES END UP IN THE OCEANS?

The United Nations estimates that more than 8 million tonnes of waste end up in the oceans each year. 80% of that is plastic. Note, that this figure is significantly lower than McKinsey estimates, thus there are large, unmanaged and risky accumulations of plastic waste also elsewhere in the nature.

WHY IS PLASTIC WASTE IMPORTANT FOR THE DANUBE BASIN WITH MANY LANDLOCKED COUNTRIES?

80% of all pollution in seas and oceans comes from land-based activities, rivers deliver a significant portion of plastic pollution. Research indicates that only 10 rivers (8 in Asia and 2 in Africa) are responsible for the transport of 88–95% of the global plastic load into the sea.

While Danube is luckily not part of them, researches and expeditions show that plastic pollution is present there, too.

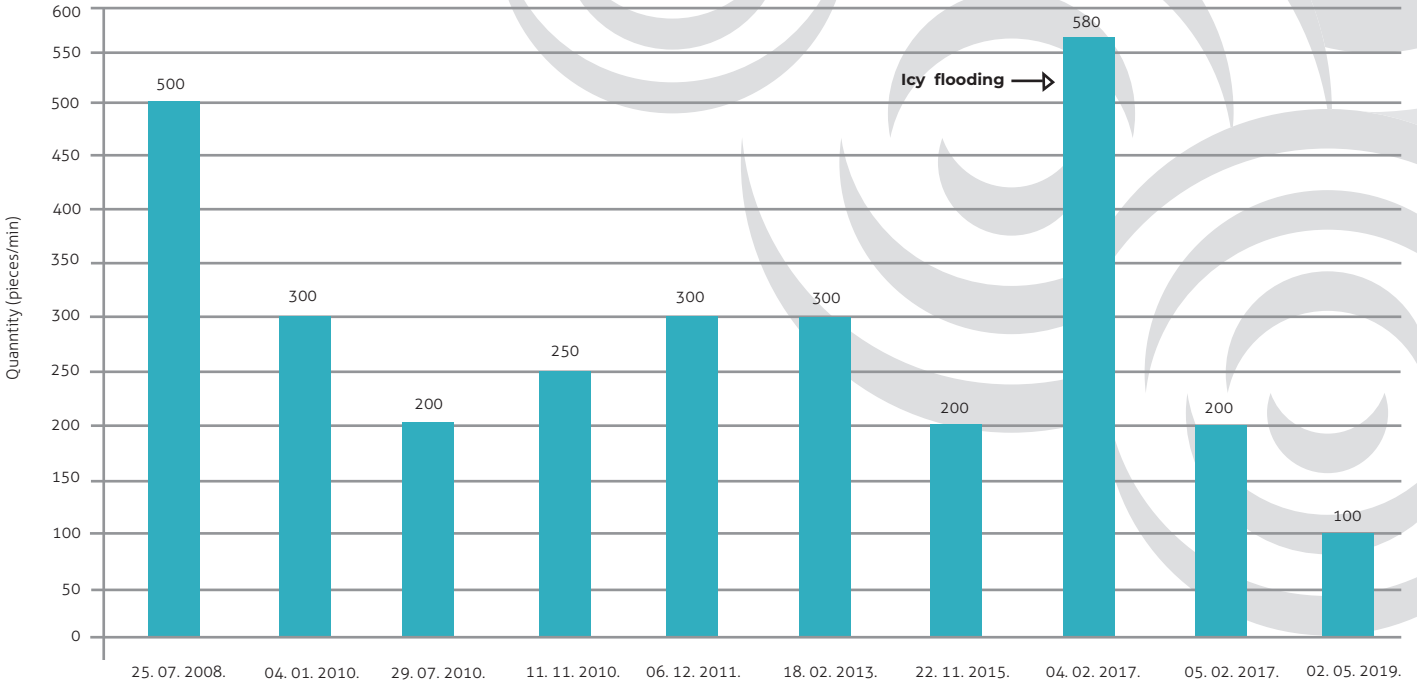
HOW IS THE FUTURE LOOKING?

Forecasts indicate a further increase of plastic production. If current production and waste management trends continue, roughly 12 billion tonnes of plastic waste will be in landfills or in the natural environment by 2050. According to some estimates, at the rate we are dumping items such as plastic bottles, bags and cups after a single use, by 2050 oceans will carry more plastic mass than fish, and an estimated 99% of seabirds will have ingested plastic.

MICROPLASTICS

Microplastics are tiny pieces of plastics ranging from 5 millimetres down to 100 nanometres in diameter.While mostly reported in relation to marine species and lifeforms, microplastics can be found anywhere – from the deepest ocean to the air – and their origin is not necessarily associated to plastic pollution of water. IUCN investigated the source of microplastics based on two categories. Primary microplastics are plastics directly released into the environment in the form of small particulates. 98% of primary microplastics is generated from land-based activities, and only 2% is generated from activities at sea. The largest proportion of these particles stem from the laundering of synthetic textiles and from the abrasion of tires while driving. The main pathways of these plastics into the ocean are through road runoff (66%), wastewater treatment systems (25%) and wind transfer (7%). IUCN estimates that annually 1.5 million tonnes of primary microplastic are released into the oceans. Secondary microplastics are microplastics originating from the degradation of larger plastic items into smaller plastic fragments once exposed to the marine environment. This happens through photodegradation and other weathering processes of mismanaged waste such as discarded plastic bags or from unintentional losses such as fishing nets.

Municipal waste pollution (PET bottle) in the Upper Tisza. Top 10 measured values for number of PET bottles per minutes out of 180 total measurements during floods between 2004-2019.



UpperTisza Water Directorate (FETIVIZIG)

RECAP

Plastic is a great material for which our society developed a real addiction. We don't respect plastic but rather use it in a wasteful and irresponsible manner. While it is easier to blame plastics, please look into your lifestyle first, as the root of the above problem is not a type of material but our consumption habits affecting a series of timescales:

The route of the plastics spans on multiple timescales:

1. Millions of years until fossils of old creatures matured to oil.
2. Time and energy efforts to extract, transport, refine and produce plastic items.
3. A few minutes of use until you drink or eat the content of the single-use plastic container.
4. In case of recycling, time and energy efforts to collect, separate, recycle and reproduce.
5. In case of mismanagement of waste, up to years of unwanted travel (unless picked by a clean-up action) through the rivers to the sea.
6. Hundreds of years to disappear with continuously degrading and emitting microplastics particles in the nature or under controlled environment of the landfill.

4. POLICIES: CIRCULAR ECONOMY, THE LONG-TERM SOLUTION

The European Union has enacted a series of pieces of legislation in order to reduce plastic leakage and pollution, as well as to convert to a circular economy.

From the point of the EU Strategy for the Danube Region and the water quality priority area (EUSDR PA4), the emphasis is on the water quality impacts and policy measures of plastic pollution. In Europe, the main measure and indicator set to define water quality is in the Water Framework Directive, which aims to achieve good ecological status of waters. The Marine Strategy Framework Directive is the only EU legal instrument to date tackling marine litter explicitly and directly. In the Marine Strategy, "marine litter" is one of the 11 indicators of good environmental status.

Linking plastic pollution to water quality measures is also hindered by the lack of widely accepted and officially referred thresholds, as well as sampling and measurement standards. Thus, unlike other compounds, it is not defined which concentration of microplastics sampled and measured in a specific way can risk good ecological status of waters. These could be basis for legal action and also for comparison of different sources and locations. As shown by IUCN, and other researches, wastewater treatment is a significant source of microplastics in river catchments. The sector is well regulated in the EU through the Urban Wastewater Treatment Directive that defines threshold values for a set of compounds which currently excludes microplastics. Non-point sources of microplastics, such as abrasion of tires, can only be managed by improved product design and labelling.

Nevertheless, plastic pollution is high on the policy agenda not only in Europe but many places of the world, thus the above legislation gaps may be filled soon, some of them already foreseen and scheduled. The EU Action Plan for the Circular Economy from 2015 and the European strategy for Plastics in a Circular Economy, as part of the Circular Economy Package from 2018 make the management of plastic streams a priority.

Bags with collected plastic waste on the shore of Upper Tisza, Hungary

Photo: József Bankó, courtesy of Plastic Cup

Baled, color separated, floodplain collected brown PET bottles ready for recycling *Photo:* Miklós Konyha

This dedicated plastic strategy aims that by transforming the way plastics and plastics products are designed, produced, used and recycled, all plastics packaging will be recyclable by 2030. The evaluation of the Urban Waste Water Treatment Directive is also included in order to assess the options for microplastic capture and removal. Nevertheless, the focus is still on marine litter and sea-based sources of plastics while rivers delivering the waste get limited attention though these are intervention points close to the sources.

In the 2019 implementation report[2] of the Water Framework Directive (2000/60/EC) and the Floods Directive (2007/60/EC) overviewing the Second River Basin Management Plans and First Flood Risk Management Plans of the Member States, the European Commission notes that attention will be paid to new emerging pollutants, e.g. microplastics and pharmaceuticals.

Shredded, color separated bottle caps ready for reborn *Photo:* Miklós Konyha

The Action Plan (The EU Action Plan for the Circular Economy from 2015) includes a common EU target for reducing landfilling to no more than 10% by 2030 and recycling 70% of packaging waste by 2030 with a recycling target for plastic of 55% (among other materials also mentioned in the Action Plan). The current value for plastic recycling is less than 30%.

[2] *COM/2019/95 final*

[3] *Industrial symbiosis is a form of brokering to bring companies together in innovative collaborations, finding ways to use the waste from one as raw materials for another. The word "symbiosis" is usually associated with relationships in nature, where two or more species exchange materials, energy, or information in a mutually beneficial manner. Local or wider co-operation in industrial symbiosis can reduce the need for virgin raw material and waste disposal, thereby closing the material loop – a fundamental feature of the circular economy and a driver for green growth and eco-innovative solutions. It can also reduce emissions and energy use and create new revenue streams. (definition by FISSAC, https://fissacproject.eu/en/what-is-industrial-symbiosis/)*

[4] *The European Commission adopted on 1 February 2018 a proposal for a revised drinking water directive to improve the quality of drinking water and provide greater access and information to citizens. The proposal for modernizing the 20 year old drinking water directive (98/83/EC) comes as a result of the REFIT evaluation, the implementation of the Commission's response to the European Citizens' Initiative 'Right2Water' and as a contribution to meeting the targets of the Sustainable Development Goals. (https://ec.europa.eu/environment/water/water-drink/review_en.html http://www.europarl.europa.eu/thinktank/en/document.html?reference=EPRS_BRI(2018)625179)*

The Package also includes a ban on landfilling of separately collected waste, and at the same time it proposes concrete measures to promote re-use and stimulate industrial symbiosis[3] .

In the recent, ongoing revision of the Drinking Water Directive[4] started in 2018, the European Commission promotes access to tap water for EU citizens in order to reduce packaging needs for bottled water. At the same time, the proposal includes an obligation to monitor the presence of microplastics in drinking water when there is a risk and to take remedial actions in case of potential danger for human health.

At the end of March 2019, the European legislation made a huge leap forward plastic waste reduction and leakage, as the European Parliament approved a new law banning single-use plastic items such as plates, cutlery, straws, as well as cotton buds and plastic balloon sticks. These products will be banned in the EU by 2021. Moreover, the law obliges Member States to achieve 90% collection target for plastic bottles by 2029, and plastic bottles will have to contain at least 25% of recycled content by 2025 and 30% by 2030.

HISTORY OF PLASTIC

Plastics are synthetic polymers, in most case made of oil and natural gas. Polymers are long chains of molecules with repetitive sequences, widely found in nature such as cellulose or starch, however, even our DNA is a polymer. Such as natural polymers, synthetic polymers show a wide variety yielding a multiple spectrum of fields of application. The original meaning of plastic is "pliable and easily shaped" applies especially to the classical types of plastic that are thermoplastic or thermosetting polymers of high molecular weight and that can be made into objects, films, or filaments (as per part of the definition by Merriam-Webster dictionary). Interesting enough, the first synthetic polymer, invented in 1869, saved the elephants as developed for a call to replace ivory. It was celluloid made from the natural polymer cellulose, the main element of cotton fibre. It has opened up the door for humanity to create new materials and tailor those to their needs. The first fully synthetic plastic was Bakelite invented in 1907 by Leo Baekeland. Bakelite was not only a good insulator; it was also durable, heat resistant, and, unlike celluloid, ideally suited for mechanical mass production. Marketed as "the material of a thousand uses," Bakelite could be shaped or molded into almost anything, providing endless possibilities. And the path was followed by the major types of plastics, even widely used nowadays, arrived in the next timeline: polystyrene in 1929, polyester in 1930, polyvinylchloride (PVC) and polythene in 1933, nylon in 1935. Petrochemical companies ramped up mass production after the second World War and the surge is even lasting today with always increasing production volume of plastic. Nevertheless, environmental and waste management concerns have also been noticed as early as the 1960's. It is reported to find plastic items of many decades old on the ocean shores after a journey no one tracked. But not only in the oceans, last year due to the exceptional low water of Danube, a milk container with an age of around 40 years was found in Hungary. In turn, plastic industry itself offered recycling in the 1980's with far from being the perfect solution. This is the quick history of our Janus-faced, at the same time wonderfully flexible but also hated plastic.

5. IMPACT OF PLASTIC POLLUTION

Photo: András Kristóf Málnás

Dumping around 8 million tonnes of plastic waste into the oceans annually, plus the many illegal and untracked landfills around the world, are making impact on the ecosystem. And hereby, we do not only mean the ugly sight of plastic dumps.

The importance of policies limiting single use plastics items and encouraging recycling, can be understood better in the view of the impact of plastic pollution on different elements of nature. Though, there is no formal link to water quality by means of threshold and standards, it is clear that plastic, especially microplastic, is impacting the environment and wildlife, thus suspected to have negative effect on water quality. The most impacted field is the wildlife of seas and oceans both in noticeable and unseen ways, whereas through the consumption of water and seafood the impact of microplastics on human health is though not proven but likely.

WILDLIFE

Plastic bags, ghost fishing nets, balloons with ropes and different plastic rings are killing the wildlife by trapping them making them unable to move and grow. Moreover, small pieces of plastics, even if covered by a film of microorganism, can mislead seabirds that eat them and also feed their chicks with plastics. However, plastics provide insufficient nutrition, thus making them starve despite the full stomach. Reported by the BBC initiative called Plastics Watch, in the remote Lord Howe Island, chicks can have up to 90 pieces of plastic in their stomach, while there were 200-250 pieces of plastic found in dead birds. This example is sadly not unique, 90% of seabirds globally are estimated to have plastic in their stomach. The study predicts that plastics ingestion is increasing in seabirds: it will reach 99% of all species by 2050.

Though not only seabirds are affected, there are, for example, frequent reports in the media about dead whales found on shore with stomach full of plastics. The frequency of reporting is in line with the finding of a study: feeding on plastics by whales and dolphins is getting a regular practice leading to a painful and slow death. A UN study estimates that marine debris is negatively affecting more than 800 animal species and causing serious losses to many countries' economies.

HUMAN HEALTH

Living in a closed ecosystem, all pollutions can impact human health and living. Though, humans will not ingest tiny pieces of plastic on purpose unless they are unseen. While believed to be stable and disappearing slowly, sun rays, mechanical impacts and changes in the temperature are causing plastics to fragment into tiny, unseen particles, referred as microplastic.

Now, reports indicate that microplastic is everywhere, even in multiple steps of the food chain, however, there is no evidence on the (long term) health risks of microplastics in

humans due to the novel threat of this material. However, considering the size and weight of microplastic, it can also travel large distances by the wind. Therefore, potential health impacts are associated with ingestion or inhalation.

Recent study by WWF indicates that in average a human consumes around 2 000 pieces, 5 grams of plastic each week equal to the weight of a bank card. Next to water (either tap or bottled), the most polluted foods are seafood (mainly shellfishes), beer and salt. While the long-term health impacts of microplastic consumption are not well understood due to the lack of effect studies, there are many studies investigating the microplastics content and intake via different food types, including the ones mentioned before. For example, the annual dietary exposure for European shellfish consumers can amount to 11 000 microplastics per year, as well as one kg of sea salt can contain up to 1 600 pieces of microplastics as found by the investigation of 28 sea salt brands.

Microplastic *Photo:* WESSLING Hungary Kft.

Another study by Cox et al. estimates also volume of microplastics inhalation. Hereby, the annual microplastics consumption is reported to a range from 39 000 to 52 000 particles depending on age and sex. These estimates increase to 74 000 and 121 000 when inhalation is considered. Additionally, individuals who meet their recommended water intake through only bottled sources may be ingesting an additional 90000 microplastics annually, compared to 4 000 microplastics for those who consume only tap water.

Not only microplastics, but the leakage of additives from the products used during the plastics production to meet certain products features and requirements, causes health concerns. Bisphenol A, a ubiquitous endocrine-disrupting plastic additive also known as BPA, has been detected in landfill leachate, at levels exceeding acute toxicity benchmarks, a 2015 study of Norwegian waste-handling facilities found.

CLIMATE IMPACTS

Climate impacts of plastic products are not proportional with the product lifetime, in many cases, just a few minutes. Currently, the production and incineration of plastic products will make as many emissions as 189 coal power plants – 850 million metric tonnes of greenhouse gases. The projected increase of plastic production will reflect also on the emissions and thus contributing to the climate emergency situation. The study of CIEL estimates that by 2030, global related emissions could produce the emissions equivalent of more than 295 coal plants, further growing to 615 by 2050. Therefore, cutting back our plastic addiction can also help to tackle the climate crisis.

Drift wood mixed with plastic waste caught by the Kisköre hydropower dam, Hungary, spring 2019

Photo: Viktória Doró

6. PLASTIC POLLUTION OF RIVERS IN THE DANUBE REGION

While significant focus is provided to tackle the plastic pollution of seas, little attention is given to the rivers delivering a significant portion of the marine litter. Despite the advanced waste management in Europe and related ambitious recycling objectives, studies and observations indicate the presence of plastic and microplastic pollution in the Danube and its tributaries. Though, the data are scattered and fragmented, there are two main sources of the plastic pollution in the Danube basin: microplastic by everyday and industrial activities, and leakage of waste into the floodplain by mismanagement and illegal dumping.

The specific challenge, the Danube Region is facing, is the transboundary pollution of rivers, including plastic and also from outside the EU, e.g. on rivers of Bodrog and Tisza. Effective measures to tackle plastic pollution in the region are seriously hampered by the lack of consistent and long-term series of data.

DANUBE

The first documented study dealing with the plastic pollution of the Danube took place in 2010-12 at the Austrian part of the river, downstream Vienna. The aim of the survey was to categorize and to quantify drifting plastic items. This research conducted by the experts of the University of Vienna and BOKU-University of Natural Resources and Life Sciences Vienna found mean plastic abundance of more than 17 pieces per m^3, with mass per m^3 even higher in some samples than those of drifting larval fish. Industrial raw material (pellets, flakes and spherules) accounted for substantial parts (79.4%) of the plastic debris. The plastic input via the Danube into the Black Sea was estimated to 4.2 tonnes per day. This was the first report on plastic transport in a large river general, not only for the Danube.

Following this, in spring 2014, the Environment Agency Austria performed a survey with the aim to produce sound data on the transport of plastic particles at two sampling sites in Austria in order to determine the transport of plastic and microplastic in the Danube River. Based on the measurement, the annual load for microplastic is up to 17 tonnes at Hainburg and the total plastic load amounts up to 41 tonnes/year at the same site. Furthermore, the study revealed that addressing the whole waterbody is of major importance for sampling a river's cross section, since plastic particles have the properties of suspended particles rather than floating particles.

Driftwood mixed with plastic waste on the bank of the Danube in Budapest, Hungary

Photo: Miklós Gyalai-Korpos

Around 10% of the particles found in the Danube River were identified as pellets, which unambiguously were attributed to industrial activities such as production processes, conversion and transport. The catchment of the Austrian stretch of the Danube River accommodates three plastic production sites and approximately 560 plastic converters. Some 90% of the plastic particles in the Danube River, however, are emitted by diffuse sources, these being littering, fragmentation and transport by wind, run-off from sealed surfaces (roads, parking spaces and residential areas), inappropriate use of products, use of cosmetics, construction activities and so forth.

Around the sampling site of Hainburg, 30 fish specimens were caught and their digestive tracts analysed for plastic particles. No plastic particles could be identified in any of them. For comparison, another study carried out in the Danube River in Upper Austria investigated 840 individual fish specimens and could only identify two plastic particles in them.

In the framework of the Tiny Plastic Puzzle project by Wessling Hungary Ltd. microplastic was measured at Budapest in a concentration at the Megyeri Bridge (in the north) of 45 particles per cubic meter, measurably lower than the 55 particles per cubic meter found at the Csepel Freeport (in the south). These results mean that the capital, with its large population, surface runoff and sewage treatment plants, is a source of microplastic pollution. Moreover, the project contributed to the development of a more improved sampling method for microplastics with expanding the lower size limits of the sampling and measurement.

More recently, the running Interreg Austria-Slovakia founded "PlasticFreeDanube" focuses on macro plastic waste (> 5 mm) in and along the Danube river and parts of its riparian area. The overall aim of the project is to establish a scientifically sound knowledge base as well as a methodological approach on plastic waste in and along the river in terms of entrance points, quantities, transport patterns, and environmental threats.

While the project's main results are expected for 2020, there are some interesting preliminary results. The analysis of collected waste in the time between September 2017 to June 2018 shows that a large proportion of the plastic waste found, consists of PET bottles and other packaging material (about 30-55%). Furthermore, foamed plastics (such as polystyrene), as well as household waste and waste from sports and leisure activities, account for a big share.

By 2020, this project will indicate what kind of plastics in Danube´s section spanning from Vienna to Gabčíkovo are the most common in the river. Another objective of the project is to identify the source of the pollution.

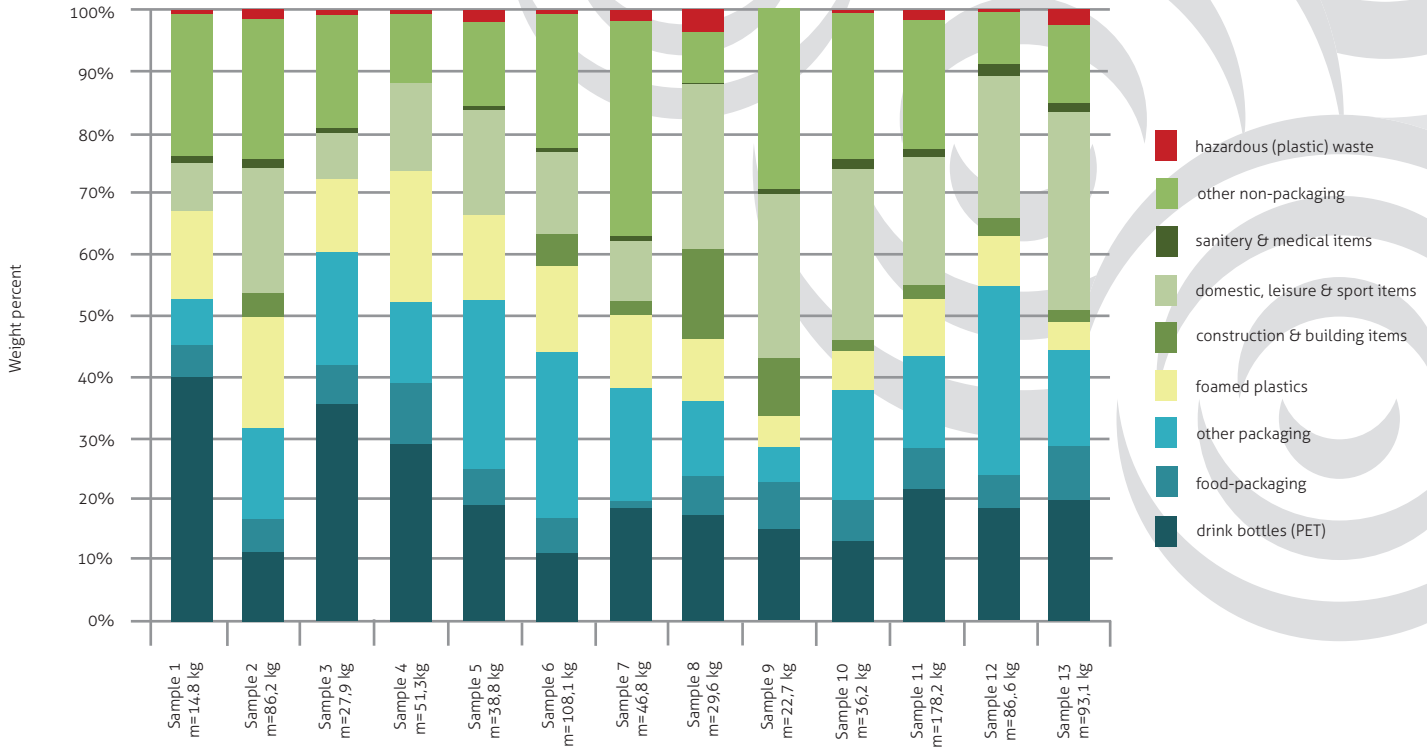
TISZA

As the above shows, there are researches and project activities for the study of plastic pollution of the Danube, however, knowledge about the other tributaries are lagging behind.

This would be, however, important. The mismanaged and illegally dumped household waste is a significant threat for one of the major tributaries of the Danube, the Tisza. The 2019 update of the Tisza River Basin Management Plan recognizes *that the floodplain stores deposited waste until floods take it away. Plastic bottles, bags and other garbage swept away by floods, turn the Tisza River into a dump covering the whole surface of the river. This problem is a constant topic of every Ukrainian-Hungarian transboundary water-related meetings. Upper and the Middle Tisza District Water Directorates in Hungary are in charge – as the responsible water directorates of the area –to abolish the impacts of plastic pollution in the river. There is compensation from Ukraine that partly covers Hungarian costs, while negotiations to solve the situation are continuous.*

The Hungarian initiative Plastic Cup has done significant work in tackling and raising attention to the plastic pollution of the Tisza. Plastic Cup is a non-profit, non-governmental

Results of sorting analyses: composition of plastic waste from volunteer's collection campaigns in the Donau-Auen Nationalpark, Austria



Source: InterregPlasticFreeDanube,Mayerhofer, 2018

initiative, that was created to eliminate the problem of waste pollution of the Tisza River. Due to the systematic mapping work of the volunteers of Plastic Cup, there is now good knowledge on the location and types of waste dumps along the Tisza River. Those dumps are carried downstream by the river in times of flood, spread in the floodplain and fed by the illegal landfill sites upstream the river, mostly in Ukraine where the basic waste collection and management infrastructures are missing. Based on the 7 years of activity of the Plastic Cup and the removed more than 48 tonnes of waste, around 70% of the waste is still recyclable after sorting composed of mainly PET bottles and with small portion of other types of plastic, glass and metal. Another result of the seven years is a creation of an international network of players, including water authorities, municipalities, NGOs and waste management companies, committed to tackle the plastic pollution of Tisza.

Measurement of the water directorates indicate that larger floods can bring up to multiple thousands of tonnes of waste, with a significant part spread along the floodplain forests in Hungary.

Work of the Plastic Cup has identified and cleaned up forests with plastic accumulation of 1 tonne per hectare in cooperation with the water authority. A barrier for the plastic flood is the hydroelectric dam of Kisköre at the Mid-Tisza.

Recently, the floods of May 2019 brought a never before seen amount of floating waste mixed with drift wood trapped by the dam. Experts of the water directorate estimate the total amount to around 3 000 tonnes of which 5-10% can be municipal waste.

The activities of the Plastic Cup also reach to Ukraine to stop the pollution at the source, as well as on the Bodrog river, tributary of the Tisza with involvement of the relevant water directorate and with shaping local partnership.

The first ever microplastic measurement of the Tisza was carried out in 2017 at the fifth Plastic Cup by Wessling Hungary Ltd. The results are shocking as indicate comparable, even larger concentration of microplastics than measured in industrialized parts of the Danube and Rheine. The sample from Dombrád contained 4.9 plastic particles larger than 300 µm per m^3, while 23.1 particles per m^3 larger than 100 µm. Most common types of plastic particles were polyethylene, polypropylene and polystyrene.

OTHER PARTS OF THE BASIN

Sadly, there are no scientifically and regularly reported cases about plastic pollution of other rivers of the Danube Basin. However, based on social media and sporadic reports, there are other seriously contaminated areas in the basin, mostly affecting even smaller, local water flows which, however, at the end will deliver their waste into the Danube.

Recently, as reported by the New York Post, at the Drina River, which flows between Montenegro, Serbia and Bosnia, tonnes of garbage are stuck near a key hydroelectric power

Driftwood and communal waste trapped by the Tiszalök dam, Hungary, spring 2019

Photo: North-Hungarian Water Conservancy Directorate (EMVIZIG)

plant, forming huge garbage islands that float on the surface. Locals say as much as 800 000 tonnes of garbage are pulled out of the Drina each year. Nevertheless, apart from this reported example, there could be other hotspots in different countries of the region facing the same problem and contributing to the plastic load of the Danube by thousands of tonnes of waste.

As for microplastics, Wessling Hungary Ltd. measured microplastics also from the Ipoly and Rába. The Ipoly, as flowing mainly through national park (without industrial and urban influences) and ending in the Danube at the Slovakian-Hungarian border contained low concentration of microplastics: 1.7 particles per m^3 were detected. Contrarily, Rába surrounded by industrial sites in Hungary and Austria was higher, at 12.1 particles per m^3 with composed of mainly speciality plastics not the common ones used in household products.

FINISH OF THE JOURNEY: THE BLACK SEA

The Bucharest Convention is the basic legal framework for regional cooperation to protect the coastal and marine environment of the Black Sea with the basic objective to prevent, reduce and control the pollution. It was signed in 1992 and ratified in 1994. The Black Sea Commission is the intergovernmental implementing body of the Bucharest Convention.

Despite this, there was no concrete legal instruments dedicated specifically to the management of marine litter till October, 2018. That time, the Regional Action Plan on Marine Litter in the Black Sea was adopted by the Black Sea Convention and tasked to further elaborate on Marine Litter Monitoring Guidelines.

Marine litter monitoring in the Black Sea has been ongoing with support from the European Union as part of a series of projects: "Improving Environmental Monitoring in the Black Sea" (EMBLAS, EMBLAS-II and EMBLAS+), implemented by the United Nations Development Programme. The litter flowing into the Black Sea comes from four major rivers: the Danube, the Dniester, the Don and finally the Rioni, which flows through Georgia. The EMBLAS projects found that every hour, each of the rivers flowing into the Black Sea, including the Danube, brings between 6 and 50 pieces of litter into the sea of which 20% are plastic bottles, while plastic bags and containers, two other key polluters, account for 10% and 9% respectively. On average, some 85% of the litter found in the Black Sea is plastic meaning that the coastline is also heavily polluted. As in case of other seas, the gyres at the Black Sea form large islands of waste far away from coast, whereas resulting microplastic threatens the wildlife.

Keeping the focus on the Danube Region (with not forgetting the many other actions around the Black Sea), there are regular clean-ups on the coastal areas of Romania and Bulgaria.

The National Institute for Marine Research and Development 'Grigore Antipa' Constanta, actively involved in marine litter related activities, introduced the Marine Litter Watch Mobile Application for monitoring and beach clean-ups along the Romanian coastline. The app was developed by the European Environment Agency and combines citizen engagement and modern technology to help tackle marine litter. Marine Litter Watch offers tools to collect and share comparable data on marine litter on beaches.

7. OUTLOOK TO OTHER MACRO REGIONS OF THE EU

Plastic pollution of waters is an issue also investigated in other EU Macro Regions but mostly in context of the seas which is no wonder as two of the 4 Macro Regions are centred around seas. Plastic pollution even gains attention on high level policy event, just as the 2018 Annual Forum of the EU Strategy for the Baltic Sea Region.

A study initiated by the EU Strategy for the Danube Region, Priority Area 4 (water quality) aimed to identify joint issues and themes in order to foster co-operation among the EU strategy regions. The initiative came from the recognition that the four EU strategy regions share similar professional, institutional and financial challenges, perform similar activities and, in the same time, considerable experiences were gathered. This study already indicated that contamination of waters with hazardous substances (e.g. plastics and pharmaceuticals) is among the common challenges that are usually ones that arise from general processes that impact all regions. Thus, initiatives tackling the plastic pollution issue may have importance not only in the own region but also cross-regional role.

The implementation of the EU Strategy for the Baltic Sea Region (EUSBSR) is based on three overall objectives, and one of them is "Save the sea". Within this objective, the Policy Area Hazards' actions concentrate on reducing the use and preventing emissions of hazardous substances by developing and implementing primarily non-regulatory measures and Baltic Sea Region-wide policies, as well as mitigating and remediating historic contamination still causing negative effect on the Baltic ecosystem.

The Baltic's catchment is highly urbanized with significant human impacts, particularly from maritime transport and touristic activity. Furthermore, it has a long water exchange (30 years) that favours accumulation of pollutants in the area.

The BLASTIC project (2016-18), an EUSBSR Flagship under Policy Area Hazards, aimed to reduce plastic waste and, thereby, the inflow of hazardous substances into the Baltic Sea by mapping and monitoring the amounts of litter in the aquatic environment. Flagships are projects and processes demonstrating the progress of the EUSBSR and may serve as pilot examples for desired change.

A Slovenian fisherman at his daily activities *Photo:* Uroš Robič

"BLASTIC is by all means a frontrunner project on the issue of plastics and marine litter and the Baltic Sea region again serves as model cooperation for the whole of Europe. This is why we as Policy Area Coordinator see BLASTIC as a true flagship in the EU Strategy for the Baltic Sea region." said Maxi Nachtigall, Policy Area Hazards Coordinator, Swedish Environmental Protection Agency.

Furthermore, a current project aims to understand more about microplastics, evaluate technologies to reduce their presence in the Baltic Sea, and develop policy recommendations to address the issue. This ERDF-funded 'FanpLESStic' project (2019-21), led by the Sweden Water Research company will investigate the origins and movements of microplastics; evaluate technologies which aim to reduce them or their leakage; and raise awareness of the issue among decision-makers by proposing cost-effective reduction methods for the leakage of microplastics into the environment.

Even though no official links fund to the EU Strategy for the Adriatic and Ionian Region, there have been activities to monitor and tackle the plastic pollution of the Adriatic and Ionian Seas. The IPA-Adriatic funded DeFishGear was a 3-year long project piloting coordinated and harmonized actions on the science-policy-society interface for litter-free Adriatic and Ionian Seas. This was the first effort to-date aiming to assess the amounts, composition and to the extent possible, the sources of marine litter in all marine matrices (beaches, sea surface, seafloor, biota) of the Adriatic and Ionian Seas. This was, in fact, the first of its kind marine litter assessment – at European and European Regional Seas level – which is based on comparable field data obtained for all marine compartments within the same timeframe, through the application of harmonized monitoring protocols, thus providing also strategic input with regards to coordinating, harmonizing and even standardizing marine litter monitoring.

The average litter density for beaches was found to be 0.67 items/m^2; for coastal Adriatic waters 332 ± 749 items/km^2; and for the seafloor 510 ± 517 items/km^2. When comparing these results with other litter densities reported worldwide, it is evident that the Adriatic and Ionian Seas are impacted by marine litter.

Plastic debris from the Adrtiatix expedition on the beach of Croatia

Photo: Uroš Robič

EU MACRO REGIONAL STRATEGIES

A European Union macro-regional strategy is a policy framework which allows countries located in the same region to jointly tackle and find solutions to problems or to better use the potential they have in common (e.g. pollution, navigability, worldwide business competition, etc.). By doing so, they benefit from strengthened cooperation with the aim of making their policies more efficient than if they had addressed the issues in isolation. EU macro-regional strategies are initiated and requested by EU Member States concerned (and in some cases non-EU countries) located in the same geographical area via the European Council. To date, four EU macro-regional strategies have beenadopted:

- **the EU Strategy for the Baltic Sea Region (2009);**
- **the EU Strategy for the Danube Region (2010);**
- **the EU Strategy for the Adriatic and Ionian Region (2014);**
- **the EU Strategy for the Alpine Region (2015).**

Yearly clean up action of the Slovenian coast is attended also by the youngest volunteers

Photo: Uroš Robič

8. BEST PRACTICES IN THE DANUBE REGION

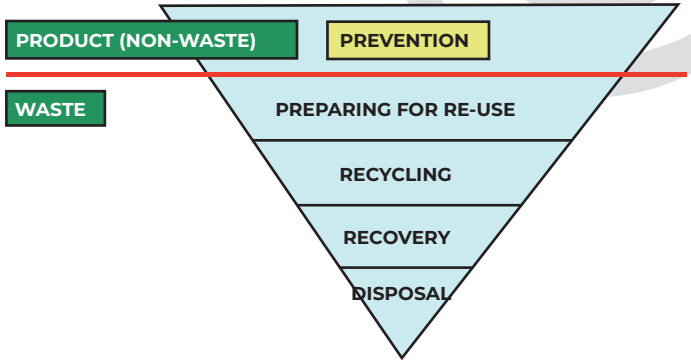
There are good practices in the Danube Region that are acting against the plastic pollution. By scaling up, spreading and connecting those initiatives more people could be involved leading to significant change both in the conditions of the environment and water, as well as in our consumption patterns. Making the people face the situation by own eyes can yield in life time changes and awareness.

Hereby, the good practices are introduced aligned the waste hierarchy that places the emphasis on prevention as the main way to avoid the generation of waste. Of course, this list is not reflecting a kind of ranking of the initiatives only reflecting the intervention points of the waste management and its priorities – if there is no waste, then there is no plastic pollution of waters.

Hope to see more stories like this coming, as there are alternatives over plastics and we need to keep our waters in the Danube Region plastic free. Nevertheless, it is worth to emphasize that plastic waste and pollution of waters are not merely a technical issue, at many steps of the waste hierarchy, it is a conscious decision of the consumer, as an individual. Thus, it is up to (y)our decisions and lifestyle if those best practices can make a difference, challenge the status quo and spread, or will fail with time due to lack of interest and support.

WASTE HIERARCHY

The term is the basis of the Directive 2008/98/EC on waste (Waste Framework Directive) setting the framework for waste management within the European Union. The „waste hierarchy" sets the following priority order when shaping waste policy and managing waste at the operational level: prevention, (preparing for) reuse, recycling, recovery and, as the least preferred option, disposal (which includes landfilling and incineration without energy recovery). The waste hierarchy is a guiding principle for the Member States when designing and implementing waste management



PREVENTION (AND MAKING PEOPLE PREVENT)

1. While there are already countries that imposed ban on different single use plastic items, institutions and organizations can also show examples, especially if their role is related to sustainable development, awareness raising or environmental protection. These institutions need to show good example and not only to amuse but invisibly educate people, too. Situated in the Great Forest, the oldest conservation area in Hungary, the Debrecen Zoo and Amusement Park decided to preemptively adopt the EU's future regulation, banning the use of all disposable plastic straws, swizzle sticks, cups, plates, bags, and cutlery from the catering establishments of the zoo. With this measure the daily waste output of 3.5 million tonnes is foreseen to be significantly reduced as mostly made up of plastic. Places of education as being responsible

for teaching the future generations can also lead the way. Recently, the University of Pécs, Hungary decided to stop buying drinks packed in single-use PET bottles. The measure applicable from 1st of October, 2019 will not only favour purchase of multiple use glass packaging but the university will install 70 free to use water filling machines across the campus.

2. Packaging is responsible for large part of plastic waste, thus replacement of single use plastic items with own and multiple use alternatives is gaining attention quickly. More and more stores allow now to use own bags to carry and measure fruits and vegetables, as consumers start refusing single use bags. The ultimate solution is zero waste lifestyle supported now by package free stores, popping up in multiple cities of the Danube Region. Even if it is temporary, like with the Plastic Free July campaign, it can initiate change. Not yet in the Danube Region but large retailers have also started their transformation to use less packaging and recycle more. While it's a great momentum, the pace of transformation is up on us, consumer what we buy and demand.

3. Most of the people believe that they are not part of the problem as living far away from oceans, and facing clean urban environment with good waste management. Confrontation and creating emotional shock are good tools to show people the situation in their harsh reality in order to start acting. In the Tropicarium of Budapest, for a few weeks of awareness raising actions, floating plastic litter was displayed by holographic projection on the glass walls of the aquariums to the visitors. The annual Trash Art Hungary festival shows every year giant statues made of waste pointing to a specific challenge through the power of art. Everyone can nominate a statue and the shortlisted pieces are shown to the public at the annual International Nature Film Festival in Gödöllő. In 2019, the theme for the statues was water. This approach can work more effectively in case of children, thus, though not in the Danube Region, but in the UK some primary schools have swimming lessons (and pool clean-up) for pupils in pools with plastic litter.

REUSE AND RECYCLING

1. After you cannot prevent the generation of waste, it is important to make it sure that it ends up in the right place

"Unnecessary" a piece of trashart by István Kollár at the Trash Art Hungary 2019 exhibition

Photo: Miklós Gyalai-Korpos

and not leaked into the nature. City of Ljubljana has stepped up its waste management to encourage residents for waste management and ambitions plans to go zero waste, as the first capital in Europe. However, 15 years ago all the waste of the city was sent to landfill. First, in 2002 separate roadside containers were installed for paper, glass and packaging, and in 2006 the door to door collection of biodegradable waste started (which will be obligatory across Europe from 2023). In 2013, every doorstep in the city received bins for packaging and paper waste. However, it is not enough to offer people the option, sometimes you need to force them: scheduled collections of the residual waste were cut by half. The results: from a 29.3% recycling rate in 2008, now the city recycles 68% of its waste and sends 80% less to landfill. By 2025, the city aims to increase this to 75%. Recycling is not the only and first action, the prevention and reuse are also promoted. In order to encourage repair, there are workshops in the waste recycling centres teaching people how to fix things. Those centres also accept rubbish from residents and, if still usable, sold at discounted prices. Similar centres are also working now in Budapest, too.

2. National legislation to ban or charge single-use items can also reduce landfilling and make people interested to return packaging. In the Danube Region, Slovakia will launch its deposit return scheme for PET bottles and metal cans in 2022 as the new law approved by the parliament stipulates.

THE CASE OF BIOPLASTICS

Can bioplastic or any alternative feedstock based single use items be alternatives over plastic single use items? The ban on single-use plastic items does not ban the case of single use but the case of plastic as feedstock. Therefore, this ban can lead to an increasing demand of single use items produced from alternative feedstock that are compostable and made on biomass basis (let it be bioplastic or paper). Firstly, producing that amount of biomass in large volume (that can substitute the whole market of single use plastic) will also have environmental footprint and impact. Secondly, certain types of bioplastics will only decompose if composted properly under industrial conditions. Even if marked as biodegrade and/or compostable, it is not secured that it will decompose under any environmental conditions, as shown by a study. Thirdly, by chemical means bioplastics are not compatible with the current recycling system of traditional plastics, thus their separated collection and proper treatment are not solved. In case of mass introduction, those issues need to be answered and the waste management systems updated to be able to process novel materials.

RECOVERY[5]

1. There are several onetime clean-up actions organized in the framework of different projects, such as the clean-up of the Danube between Esztergom and Budapest by the LIFE Be Vispo project, and the 2nd Danube Volunteers day Danube-wide throughout the spring and summer of 2018 organized by the Danube River Network of Protected Areas. The main aim was to collect rubbish and cleaning the river dynamic habitats in 15 protected areas in 8 Danube countries. With the help of local school groups, universities, companies,

[5] *while recovery may have a different meaning in waste management, here we use it in a sense to recover waste from nature*

stakeholders, local NGO's and the general public, these days highlighted the importance of a clean river landscape and healthy habitats for its species.

2. The Plastic Cup - as also mentioned earlier - is an environmental action that contributes to clean river Tisza by organizing events, waste collection campaigns spanning several months, team-building activities, exhibitions and professional discussions throughout the year. It had succeeded to become an established brand with continuous operation focusing on not only clean-up actions but awareness raising for prevention, networking to bring together involved stakeholders, research on riverine plastic litter and stopping the pollution at the source. From the first clean-up race of plastic bottle boats on the Tisza with 20 participants in 2013 it has grown to an internationally recognized environmental initiative with having multiple clean-up actions a year moving hundreds of people. Volunteers separate the waste collected during the events of Plastic Cup, and thanks to it most of them can go back to the waste management system and get recycled. In 2018, the first international boat of the history of the Cup won the 6th Plastic Cup supported by the Interreg DTP financed JOINTISZA project aiming to update the Integrated Tisza River Basin Management Plan. Plastic Cup is a spin-off of Filmjungle.eu Society, established in 1996, it is nationally and internationally acclaimed for its multi-award winning nature and environmentalist films. By spring 2018, a one-hour documentary was prepared about the Plastic Cup and the plastic pollution of Tisza.

Dritfwood and communal waste floating downstream with the flood of spring 2019, near Tokaj on river Bodrog, Hungary

Photo: North-Hungarian Water Conservancy Directorate (EMVIZIG)

3. There are regular clean-ups on the coastal areas of Romania and Bulgaria as well. As an example, MaiMultVerde launched the Clean Waters (Cu apele curate) program, a call to getting involved in combating and preventing the plastic debris pollution of the Danube. The association held a volunteering camp, when 100 participants gathered some 5 tonnes of plastic debris from the special protection area of Sacalin Island – Zătoane of the Danube Delta. The program continued with cleaning up activities on the banks of the Danube, the development of the collection infrastructure, educational and community organizing activities.

Boat of the Jointisza international team on the sixth Plastic Cup in 2018, as every boat in the Cup this one was also built of rubbish and used PET bottles

Photo: Miklós Konyha

9. RECOMMENDATIONS: ROLE OF INTERNATIONAL COOPERATION

The Danube is considered as the most international river of the world, with its basin extending into the territories of 19 countries covering more than 800 000 km^2. This indicates that pollutions of transboundary nature, such as pollution of rivers going downstream, needs international cooperation in order to tackle them. Plastic pollution is not an exception: plastic pollution coming from a country can easily endanger the prosperity of another region by, for example, decreasing its touristic attractiveness and biodiversity, and impacting human health and fishing stock.

Plastic collection by volunteers on the shore of the Danube, Austria

Photo: © ABF-BOKU

CURRENT PLATFORM FOR WATER QUALITY: A STRONG FOUNDATION

The current joint, international water quality status and priorities of the Danube river basin are set in the ICPDR's Danube River Basin Management Plan – Update 2015 which is valid until 2021. One of the four significant water management issues, identified by the plan, is hazardous substances with the vision of no risk or threat to human health or the aquatic ecosystem. Unlike the 2015 update of the Danube River Basin Management Plan, the very recent, 2019 version of the Updated Integrated Tisza River Basin Management Plan, prepared by the support of the Interreg DTP financed JOINTISZA project, explicitly addresses the plastic pollution topic for the Tisza river basin, where the illegal dumping and landfills are more pronounced challenges than at the Danube.

The ICPDR operates also other tools that could help to monitor and tackle the plastic pollution challenge. For example, an Accident Emergency Warning System is in place in the Danube river basin which is activated if a risk of transboundary water pollution exists and alerts downstream countries with warning messages in order to help national authorities to put safety measures timely into action. This is supported by the Trans-National Monitoring Network to provide an overview of the overall status and long-term changes of surface water in a basin-wide context with particular attention paid to the transboundary pollution load. This network is complemented by the Joint Danube Survey that aims to gather vital data on carefully selected elements of water quality across the entire length of the Danube River and its major tributaries. The survey harmonises water monitoring practices across the Danube countries. The Joint Danube Survey 4 was performed in 2019 of which outcomes will be used for the planned 2021 update of the Danube River Basin Management Plan. This years' Danube Survey measured microplastic concentration in order to fill the information gap, thus the survey could produce an information baseline on the occurrence of plastic particles for the whole Danube.

With using the above detailed strong, technical background and established platforms of cooperation in water quality, the topic about plastic pollution can be integrated into the agenda in line with the presence of the problem in the Danube River Basin and potential impacts on the ecosystem and human health.

Similar to other substances, the actual Danube Survey could help to develop and apply standardised method for microplastic monitoring and sampling, as well as more accurate and scientifically sound mapping via the whole

Danube, not only for microplastic but for macroplastic. This would not only include monitoring of illegal dumps but understanding the spread and movement of plastic waste on rivers to locate the floodplain coordinates with constant risk of waste accumulation after floods.

CROSS-SECTORIAL STRATEGIES: THE SOLUTION IS NOT (ONLY) ON THE WATER

Apart from microplastic that influences the water quality through the whole Danube Basin, cooperative and transboundary efforts need to be placed on to stop illegal dumping, monitor main landfills with related risk assessment and intensify stakeholder engagement, joint actions and awareness raising. The 2019 Update of the Integrated Tisza River Basin Management plan proposes measures ranging from education and awareness, river clean-up actions to installing collection and recycling facilities. For all of those measures, examples are available and lessons learned can be shared and replicated transboundary.

The solution requires not only transboundary but cross-sectorial thinking. The challenge affects everyone that benefits from the ecosystem services: water, environment, recreation, shipping and health authorities, local governments and enterprises, as well as different economic sectors including fisheries and tourism. Therefore, water authorities and directorates cannot solve alone the problem but need to cooperate in order to facilitate actions ranging along the whole plastic supply chain: prevention, monitoring, recovery actions and upcycling. The Plastic Cup has shown, that NGOs and civil organizations can be a good position to facilitate this collaboration as dedicated entities for tackling the problem. Only this type of cooperation will yield complex and long-term strategies that build on the waste hierarchy.

With knowledge sharing and international cooperation, even across macro regions due to the nature of the problem, the so far only sporadic, often project based onetime and segmented actions could be scaled up and spread.

Different forms of stakeholder meetings and round tables can facilitate the implementation of proper waste management system preventing the illegal landfills.

THE NOVEL COMPONENT: CITIZENS AND LOCAL ENTERPRISES AND MUNICIPALITIES

Even with a properly functioning waste management and recycling system, due to laziness and inattention there can be leakages in any country that can contribute to the plastic pollution of waters. Therefore, awareness raising to reach and empower citizens, as well as new business strategies to substitute single use items in catering and tourism are crucial elements of solving the problem. Local communities and enterprises can be assisted by developing zero waste strategies and showcasing alternatives over single-use products with emphasis on the potential legal and business impacts.

Local citizens can even become the core for voluntary clean-ups and catalyse further actions. Written guides and coordination with water and waste authorities can help the organization of local clean-ups in order to minimize risks and deliver impact. Therefore, knowledge sharing needs to move out of the scientific community and by the simple but strong language of photos and films need to engage the general public. Showing the collected waste even in forms of upcycled items or trash art in public places can lead to consideration of consumption habits. Already working and established platforms for international awareness raising, such as the annual Danube Day can also support this.

As shown, every member of the society can do something against the plastic pollution which is, despite many would

LEGAL FORMS OF WATER MANAGEMENT COOPERATION IN THE DANUBE RIVER BASIN

The Danube River Protection Convention

The need for river basin level cooperation was already formalized in 1994 by the signature of the Danube River Protection Convention that came into force in 1998. This is the legal instrument for cooperation and transboundary water management in the Danube River Basin. The main objective of the Convention is to ensure that surface waters and groundwater within the Danube River Basin are managed and used sustainably and equitably. The International Commission for the Protection of the Danube River (ICPDR) was established for the implementation of the Convention, and in 2000, by nomination of the contracting parties, the ICPDR became the platform for the implementation of all transboundary aspects of the EU Water Framework Directive. The implementation of the directive is based on the river basin approach confirming the transboundary nature of water management, including water quality issues of river basins. The Directive foresee that by latest 2027, EU Member States need to achieve good status in all bodies of surface water and groundwater. One vehicle of this process is the River Basin Management Plans that report on the achievements, set objectives and plans. A plan is valid for 6 years.

The EU Strategy for the Danube Region

The EU Strategy for the Danube Region (EUSDR) is a macro-regional strategy adopted by the European Commission in December 2010 and endorsed by the European Council in 2011. The Strategy was jointly developed by the Commission, together with the Danube Region countries and stakeholders, in order to address common challenges together. The Strategy seeks to create synergies and coordination between existing policies and initiatives taking place across the Danube Region.The Danube Region Strategy addresses a wide range of issues; these are divided among 4 pillars and 12 priority areas. Each priority area is managed by two countries as Priority Area Coordinators (PACs).One of the above mentioned 12 priority areas is the water quality priority area (PA4). The Water Quality Priority Area (PA4) has four major objectives to follow during its work. First, PA4 makes important steps to achieve the management objectives set out in the Danube River Basin Management Plan. Second, PA4 aims to reduce the nutrient levels in the Danube River to allow the recovery of the Black Sea ecosystems to conditions similar to 1960s. Third, PA4 elaborates a Danube Delta Analysis Report as a step towards completion of the Delta management Plan. And fourth Secure viable populations of Danube sturgeon species.

like to believe, not solely a problem of developing world and the oceans far away from us, rooting in our everyday actions. While the plastic pollution is a serious threat to our water and land ecosystems, it is also a motivation for cooperation and acting together, let it be your decision in the store, participating in a clean-up or even organizing a larger action with collaboration of the authorities.

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