WIENER FORUM FÜR DEMOKRATIE UND MENSCHENRECHTE

cms!

CMS! Clean the Mediterranean Sea

Summary

Hermann und Marianne Straniak Stiftung

Foreword

The Mediterranean Sea faces an escalating environmental crisis due to plastic pollution. Every year, millions of tons of plastic waste enter its waters, posing a severe threat to marine ecosystems, coastal economies, and public health. This growing threat requires urgent legal, political, and scientific responses to ensure the preservation of one of the world's most vital marine regions.

The research project "Clean Mediterranean Sea! – CMS!" was conceived as a comprehensive interdisciplinary initiative to address this issue. Its primary objective is to assess the effectiveness of plastic waste management laws in Mediterranean countries surrounded by the Mediterranean Sea, with a particular focus on their compliance with European and international standards. By conducting an in-depth comparative analysis, this study evaluates the legal frameworks of 14 Mediterranean coastal states, examining their alignment with key international conventions, EU directives, and sustainability initiatives. Additionally, it incorporates insights from the fields of marine biology, political science, and corporate social responsibility (CSR) to provide a holistic perspective on the problem.

The CMS! project and its main outcome, a study on plastic pollution in the Mediterranean Sea, has been the result of 4 years of intense study by over 60 contributors. The analysis contained in this study reflects the legal and policy developments as they stood in 2023.
This study was a tremendous collaborate effort, bringing together various scientific disciplines including biology, economics, political science, and – mostly – law. The study focused extensively on the legal frameworks (nationally, EU wide, and internationally) and their implementation in 14 Mediterranean countries to show the progress but also the gaps in protecting one of the most important ecosystems from collapse due to plastic waste.

A key component of this study is the examination of major international agreements such as the Basel Convention, which regulates the transboundary movement of hazardous waste, the Aarhus Convention, which promotes environmental democracy through public participation and access to justice, and the Barcelona Convention, which aims to protect the Mediterranean marine and coastal environment. While these agreements provide a robust legal framework, their implementation across the region remains inconsistent, hampered by inadequate enforcement mechanisms, infrastructural challenges, and a lack of political will. The CMS! study highlights both the successes and shortcomings of these frameworks, identifying best practices while also pointing out significant gaps in enforcement and compliance.

Moreover, this research integrates findings from the Austrian scientific marine biology NGO MareMundi, which has documented the devastating impact of plastic pollution on the Mediterranean ecosystem. Scientific data reveals that this semi-enclosed sea acts as a plastic trap, accumulating vast amounts of waste with limited natural outflow. Microplastics, in

particular, pose an alarming threat, as they enter the food chain and contribute to widespread contamination. The study underscores that addressing this issue requires not only legal and regulatory measures but also a fundamental shift in production and consumption patterns to prevent plastic waste from entering the environment in the first place.
Based on its legal and scientific findings, the CMS! project puts forward a set of key recommendations aimed at strengthening plastic waste management policies across the Mediterranean region. These recommendations focus on:

- Enhancing legal implementation and enforcement: Governments must ensure that existing international and regional agreements are effectively transposed into domestic law and properly enforced. This includes creating stronger monitoring mechanisms and sanctioning non-compliance.

- Improving waste management infrastructure: Many Mediterranean states still lack the necessary facilities to manage and recycle plastic waste efficiently. Investment in modern waste treatment technologies and recycling systems is crucial.

- Encouraging corporate responsibility and sustainable practices: Businesses, particularly those in the tourism, fishing, and manufacturing industries, should be incentivized to adopt environmentally friendly practices and reduce their plastic footprint.

- Strengthening regional cooperation: Given the transboundary nature of marine pollution, increased collaboration between Mediterranean states and international organizations is necessary to develop coordinated and effective responses.

- Raising public awareness and promoting behavioural change: Citizens and communities play a vital role in reducing plastic waste. Educational campaigns and community engagement initiatives should be expanded to foster a culture of sustainability.

- Advancing scientific research and innovation: new technologies, such as biodegradable plastics and improved waste processing methods, must be explored and integrated into environmental policies to reduce long-term plastic pollution.

Beyond its legal and scientific dimensions, this study also aims to serve as a policy tool for international organizations, including the European Union, the United Nations, and the OSCE, advocating for stronger commitments and coordinated action at the regional level. The findings of the CMS! project indicate that while significant progress has been made in recent years — particularly due to EU regulatory influence — there remain critical gaps in implementation, monitoring, and enforcement. Many existing policies and regulations exist only on paper, with insufficient mechanisms to translate them into tangible improvements in environmental protection.
Finally, the CMS! project emphasizes the need to redefine the relationship between humans and the marine environment, requiring a paradigm shift in legal, economic, and social approaches to plastic waste management. By combining legal analysis with scientific research and policy recommendations, this study aspires to be one catalyst for meaningful change, seeking to

contribute a future where the Mediterranean Sea is no longer a dumping ground for plastic waste, but a protected and thriving ecosystem.

Conclusions and Recommendations

Jessica Good, Christian Stadler, Lisa Chaleil, Christine Lanners, Sarah Dicher

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1. Introduction

Although governments and industry leaders have started taking actions against the plastic crisis and have implemented new policies and voluntary initiatives, more far-reaching measures are required to effectively tackle the plastic pollution of the Mediterranean Sea. By 2040, the leakage to the oceans will have only been reduced by 7% (in comparison to a Business-as-Usual (BAU) Scenario) as a result of the current commitments. The commitments are too narrow in their scope and often only apply to countries with relatively low leakage of plastic into the environment.[1]

This is not due to a lack of technical solutions, but mainly a result of regulatory and political shortcomings. We have the solutions today to reduce annual land-based plastic leakage into the oceans by around 80 % by 2040 relative to a BAU-scenario. This would not only lead to a new circular economy but would also have positive effects on numerous societal, economic, and environmental objectives, such as climate change and new employment opportunities.[2] However, to achieve an 80 % reduction public and private collaboration needs to set higher standards regarding materials, formats, reuse and recyclability.[3]

A single solution will not be capable of achieving sufficient change to stop the excessive flows of plastic entering the Mediterranean. Rather a combination of various synergistic policies, including up-, mid- and downstream measures, is necessary to reduce consumption, to shift demand towards more eco-friendly products and to manage plastic waste sustainably.[4] Just to name some examples, new policies should combine circularity measures, bans of unnecessary and avoidable plastic products as well as hazardous chemicals in plastics, fiscal measures such as taxes and extended producer responsibility schemes (EPR), incentives for safe and sustainable plastic alternatives, initiatives to change consumer habits and new models and designs for eco-friendly product reusability.[5]

While in the beginning a shift from a linear to a circular business model has to be accompanied by incentives for multiple stakeholders, after successfully implementing comprehensive coherent measures the need for public financing will diminish. The profits of plastic producers, plastic converters, and plastic consumer good companies in the linear business sector will decrease, whereas the profits of 'green' business models will increase. The subsequent effect will be raised interest of investors and companies in circular business models. Additional revenue could also help to offset the negative impacts of plastic pollution on poor and

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[1] *Systemiq/The Pew Charitable Trust*, Breaking the Plastic Wave – A comprehensive Assessment of Pathways towards Stopping Ocean Plastic Pollution 9 https://www.systemiq.earth/wp-content/uploads/2020/07/BreakingThePlasticWave_MainReport.pdf.

[2] *World Bank Group*, Where Is the Value in the Chain? – - Pathways out of Plastic Pollution (2022) xx https://doi.org/10.1596/37285; *Systemiq/The Pew Charitable Trust*, Breaking the Plastic Wave 10.

[3] *Systemiq/The Pew Charitable Trust*, Breaking the Plastic Wave 12.

[4] *UNEP ea*, Turning of the Tap – How the world can end plastic pollution and create a circular economy (2023) 11 https://www.unep.org/resources/turning-off-tap-end-plastic-pollution-create-circular-economy.

[5] *McGlade ea*, From Pollution to Solution – A global assessment of marine litter and plastic pollution (2021) 16 https://www.unep.org/resources/pollution-solution-global-assessment-marine-litter-and-plastic-pollution.

vulnerable populations.[6]

Despite increasing governmental and industrial efforts to curb plastic pollution, existing policies and voluntary initiatives remain insufficient to effectively tackle the Mediterranean's plastic crisis. Current commitments are too narrow in scope, often applying only to countries with relatively low plastic leakage, and projections suggest that by 2040, plastic waste entering the ocean will only be reduced by 7% under a Business-as-Usual (BAU) scenario (Lebreton & Andrady, 2019). To significantly mitigate this crisis, far-reaching regulatory and systemic changes are imperative.

The issue is not a lack of technical solutions but rather regulatory and political shortcomings. Research indicates that land-based plastic leakage into oceans could be reduced by approximately 80% by 2040 relative to a BAU scenario (Borrelle et al., 2020). Achieving this goal requires a multi-stakeholder approach, involving both public and private sectors, to enforce higher standards for materials, packaging formats, reuse models, and recyclability.

Since plastic pollution transcends national borders, solutions must be coordinated at the international level. A legally binding global treaty on plastic pollution, akin to the Paris Agreement for climate change, could enforce stricter regulations across jurisdictions. The ongoing negotiations under the UN Environment Assembly for a Global Plastics Treaty present a crucial opportunity to establish worldwide commitments (UNEA, 2023).

This report will explore key recommendations to effectively reduce plastic pollution in the Mediterranean, focusing on regulatory measures, economic incentives, and international cooperation to foster a circular economy. By implementing comprehensive strategies, we can achieve a significant reduction in oceanic plastic pollution and safeguard marine biodiversity and human livelihoods for future generations.

[6] *World Bank Group,* Where ist the Value in the Chain?

I-Strengthening national and international legal framework

A-Constitutional protection of the environment

Constitutional Environmental Protection in the Mediterranean: A Legal Assessment

Lisa Chaleil

Since constitutional law defines the functioning of the state, the fundamental rights and duties of citizens, and the legal basis for state action, integrating environmental protection into the constitutional framework is crucial to effectively addressing plastic waste in the Mediterranean Sea. A robust constitutional foundation strengthens environmental governance and ensures long-term sustainability.

1. Current Constitutional Framework

The constitutional frameworks of Mediterranean states have, to a large extent, incorporated environmental protection. According to the Constitutional Law Report, every Mediterranean country (except Israel) has included environmental provisions in its constitution.

More than half of these countries recognize either substantive or procedural environmental rights**.** Substantive rights include explicit constitutional recognition of the right to a healthy environment, as seen in Egypt and France**.** Procedural rights encompass the right to information, the right to public participation in environmental decision-making, and access to legal remedies. Additionally, many Mediterranean constitutions impose environmental duties on both the state and its citizens. Notably**,** Montenegro, Slovenia, and Italy explicitly allow for the limitation of other constitutional rights in favor of environmental protection**,** reinforcing the prioritization of ecological concerns.

2. Enforceability and Legal Effectiveness

All countries analyzed in the report provide some form of mechanism to enforce constitutional environmental rights, typically through their constitutional courts. Furthermore, many states are constitutionally bound to uphold international and regional environmental agreements**,** ensuring that national policies align with global environmental standards.

However, constitutional provisions alone are insufficient if they are not effectively interpreted and enforced by the judiciary. In some states, such as Albania and Egypt, there is a **l**ack of constitutional case law on environmental protection, making it unclear how courts would rule in environmental disputes. For several countries, no information is available regarding constitutional jurisprudence on environmental rights and duties.

Nevertheless, where constitutional provisions have been litigated, courts have generally supported environmental protection. Some judges have clarified **t**he legal definition of the environment, specified state obligations, and upheld the restriction of other constitutional rights to safeguard ecological interests.

3.Challenges in Enforcement and Implementation

Despite the presence of enforceability mechanisms, the effectiveness of constitutional protections varies significantly. While some courts actively interpret and enforce environmental provisions, others lack the institutional capacity, political will, or legal clarity to do so. This results in unequal levels of environmental protection across the Mediterranean region**.**

To strengthen constitutional environmental protections, the CMS! Team proposes the following recommendations:

Ensuring Directly Enforceable Environmental Rights and Duties

-Constitutional provisions should clearly establish environmental rights and duties as self-executing, meaning they can be directly invoked before courts without requiring additional legislation.

-The Venice Commission advises that **all regular courts should have the right to petition the constitutional court** if they encounter unconstitutional environmental legislation.

Strengthening Judicial Review and Access to Constitutional Justice

-Countries that do not yet allow individual constitutional complaints or judicial referrals to constitutional courts should implement these mechanisms.

-This is particularly relevant in Lebanon, where neither of these options is currently available.

Enhancing Constitutional Commitments in Countries Without Strong Provisions

-Israel remains the only Mediterranean country without a constitutional reference to environmental protection. To align with international legal standards, it is recommended that Israel adopt a constitutional framework recognizing environmental rights and obligations.

Conclusion

While constitutional environmental provisions in the Mediterranean region provide a strong legal basis for tackling issues such as plastic waste, their impact depends on judicial enforcement and political commitment. Strengthening legal mechanisms, judicial oversight, and constitutional interpretations will be key to ensuring that constitutional protections translate into effective environmental governance.

B-Criminal, administrative, and civil sanctions

Recommendations for criminal, administrative and civil sanctions

Christine Lanners

1. Lack of enforcement and specific units

Although some countries have dedicated environmental agencies and ministries of the environment, the dramatic plastic pollution in the Mediterranean region makes it seem inevitable to establish specialized authorities focused solely on combating (plastic) waste. These authorities should be equipped with executive bodies to ensure the implementation of existing laws. In Morocco, for example, the Framework Law 99-12 established environmental police responsible for prevention, control, and inspection concerning environmental regulations. This law was enacted to enhance the enforcement of environmental laws since its implementation in 2017 (page 48). Moreover, Tunisia has created a National Agency for Environmental Protection (ANPE) aimed at implementing the country's environmental policies since its establishment in 1988 (page 41). In Europe, France, Spain and Italy also dispose of special "units" to enforce environmental laws; namely the "Office Central de Lutte contre les Atteintes à l'Environnement et à la Santé Publique", the "SEPRONA unit within the Civil Guard" and the "Carabinieri Command for Environmental Protection".

2. Model Law on the Establishment of Specialized Environmental Police Units

Preamble

This law aims to establish and empower specialized environmental police units to enhance the enforcement and compliance landscape of environmental regulations, ensuring adherence to both national and international environmental laws.

Section 1: Establishment of Environmental Police Units

Article 1: Creation of Specialized Units

1.1. The government shall establish specialized environmental police units within the existing law enforcement framework.
1.2. These units will focus on the enforcement of environmental laws, particularly concerning pollution control, illegal dumping, and waste management compliance.

Section 2: Structure and Function

Article 2: Composition of Environmental Police

2.1. The Environmental Police shall consist of personnel trained in environmental science, law, and enforcement practices.
2.2. Recruitment efforts will prioritize candidates with relevant educational backgrounds and practical experience.

Article 3: Responsibilities

3.1. The Environmental Police shall be responsible for:

a) Conducting inspections and investigations related to environmental offenses.
b) Monitoring compliance with environmental regulations and permits.
c) Responding to reports of pollution and illegal dumping incidents.
d) Collaborating with local authorities and community organizations to ensure effective environmental protection.

2.4 Section 3: Training and Resources

Article 4: Training Programs

4.1. Personnel within the Environmental Police shall undergo comprehensive training that includes:
a) Understanding environmental laws and regulations.
b) Techniques for effective monitoring and investigating environmental crimes.
c) Public engagement and community outreach strategies.

Article 5: Resource Allocation

5.1. The government shall allocate funding and resources to equip the Environmental Police for effective operations, including:
a) Monitoring equipment for pollution detection.
b) Technology for data collection and analysis.

5.2. The Ministry of Environment shall allocate funding for the establishment and maintenance of the Community Environmental Watch Program (see Section 5, article 8.1.) and Environmental Awareness Campaigns.

2.5 Section 4: Accountability and Reporting

Article 6: Accountability Mechanisms

6.1. The Environmental Police shall operate under strict accountability measures, including:

a) Regular audits of operational effectiveness.
b) An independent oversight body (Ministry of Environment) to ensure transparency and investigate complaints.

Article 7: Reporting Requirements

7.1. The Environmental Police shall submit annual reports detailing:
a) Activities conducted in inspection and enforcement.
b) Statistics on environmental offenses detected and resolved.

2.6 Section 5: Community Engagement

Article 8: Public Awareness and Involvement

8.1. The Ministry of Environment shall establish a *Community Environmental Watch Program* (CEWP) to encourage local communities to report environmental crimes, including but not limited to illegal waste disposal, water and air pollution, and harm to natural habitats.

8.2. The duties of the Community Environmental Watch Program include:
a) Facilitate community participation in monitoring local environmental conditions and reporting potential violations. b) Designate local CEWP coordinators responsible for organizing volunteer activities, training sessions, and reporting procedures in each designated region.
c) Provide a 24-hour hotline, mobile app, or other accessible platforms for community members to submit reports, including options for anonymous reporting.
8.3. Any individual who, in good faith, reports environmental violations under the CEWP shall be protected from retaliation or any adverse consequences.
8.4. The Ministry of Environment shall conduct regular *Environmental Awareness Campaigns* to inform the public and local businesses about:
a) The consequences of environmental violations for community health, biodiversity, and ecosystems.
b) The benefits of compliance with environmental laws and regulations.
c)The role of citizens in supporting environmental enforcement efforts.
d) The importance of recycling, its benefits and practices.
8.5. The Ministry shall collaborate with schools, community centers, and local businesses to integrate environmental education and promote responsible practices, such as waste reduction, recycling, and sustainable resource use.

Conclusion

This law establishes specialized environmental police units to enhance compliance with environmental regulations. By clarifying responsibilities and ensuring accountability, it aims to strengthen the monitoring mechanisms necessary for environmental protection and public

health.

3. Low Recycling Rates

Another common significant and key environmental challenge across multiple countries are the low recycling rates. Even though, there is European legislation such as the EU Waste Framework Directive which requires member states to achieve at least 50% recycling of paper, plastic, metal and glass by 2020, the problem of low recycling rates remains unchanged. Moreover, the European Green Deal aims to ensure all packaging in the EU is reusable or recyclable by 2030. Internationally, the Basel Convention includes amendments specifically addressing plastic waste management, though it doesn't set specific recycling rates.

Table with plastic packaging recycling rates in EU countries

Country	Plastic Recycling Rate in %
Slovenia	51
Italy	47
Spain	41
Cyprus	39
Greece	32
France	25
Malta	16

Source: https://ec.europa.eu/eurostat/en/web/products-eurostat-news/w/ddn-20241024-3

In Malta and France, the situation is particularly concerning, with only 16% respectively 25% of plastic packaging waste being recycled. The only country that met the target set out by the EU WFD is Slovenia.

Montenegro has a low recycling rate of 11.52% of total collected municipal waste, falling significantly short of its 50% target for recyclable waste 26. In Morocco, the recycling performance is modest, with only 25% for household waste and 35% for industrial waste being recycled 60.

The low recycling rates can be attributed to mainly two factors:

1. Economic barriers play a major role. Recycling costs often exceed the costs of just producing new plastic, so there is no incentive to recycle. In Morocco for example, collecting plastic bags for recycling costs MAD20,000/ton while virgin plastic production only costs MAD12,000/ton, making recycling economically unfeasible.
2. Infrastructure limitations are widespread, many regions lack proper and adequate recycling facilities.
3. Limited awareness and education about recycling practices

In Albania for example, the recycling industry is underperforming. The recycling sector is currently not meeting its potential, functioning at merely 26.8% of its production capacity, with a recycling efficiency of only 10% for urban waste (page 38). Montenegro, for example, only

has two regional landfills for non-hazardous waste.

4. Model Law for Enhancing Recycling Rates

4.1 Civil Law

Article 1: Right to Recycling

1.1. Citizens have the right to access recycling services and information about recycling practices in their communities.
1.2. Local authorities must ensure that recycling facilities are available and accessible to all residents.

Article 2: Civil Liability for Non-Compliance

2.1. Any entity that fails to provide adequate recycling services or misrepresents recycling capabilities shall be liable for damages.
2.2. Damages may include costs for environmental restoration and compensation for community members affected by inadequate recycling services.

Article 3: Citizen Suits

3.1. Citizens may file lawsuits against local authorities or private entities that fail to comply with recycling regulations.
3.2. Courts shall have the authority to mandate compliance, impose penalties, and order corrective actions.

4.2 Criminal Law

Article 1: Definition of Offenses

1.1. Any individual or entity found to violate recycling regulations shall face criminal penalties.
1.2. Offenses include failing to meet established recycling targets, engaging in fraudulent practices related to recycling claims, and illegally disposing of recyclable materials.

Article 2: Penalties

2.1. Individuals found guilty of recycling-related offenses shall be subject to fines not exceeding € XXX, imprisonment for a term not exceeding 2 years, or both.
2.2. Corporations found guilty shall face fines not exceeding € XXX based on the severity of the offense and may have their operations suspended for repeated offenses.

4.3 Administrative Law

Article 1: Regulatory Framework

1.1. The Environmental Police shall establish a specific sector for recycling oversight (RO) to

oversee the implementation of this law and monitor recycling initiatives.

1.2. RO will develop guidelines for compliance with recycling targets and ensure alignment with national and EU directives.

Article 2: Recycling Targets

2.1. Municipalities must achieve a minimum recycling rate of 50% within five years, increasing to 70% by the end of ten years.
2.2. Businesses must recycle at least 60% of their waste within five years to ensure corporate responsibility in waste management.

Article 3: Financial Incentives

3.1. The government shall provide subsidies covering up to 50% of the costs associated with establishing and maintaining recycling facilities for local authorities.
3.2. Businesses that meet or exceed recycling targets may qualify for tax breaks of up to 20% on annual waste management expenses.

Article 4: Extended Producer Responsibility (EPR)

4.1. Producers of recyclable materials must register with RO and submit an EPR plan detailing their waste management strategies.
4.2. EPR plans must include strategies for increasing recycling rates and financial contributions to support local recycling initiatives, amounting to at least 1% of annual revenue.

Article 6: Compliance and Reporting

6.1. Municipalities must submit annual compliance reports to RO detailing their recycling rates and initiatives.
6.2. RO shall publish an annual public report on recycling performance to enhance transparency and accountability.

5. Human right to a clean and healthy environment

Even though a human right to a healthy and clean environment is repeatedly acknowledged and discussed, this right is neither explicitly enshrined in the European Convention on Human Rights (ECHR) nor is it an international, universal, unquestionable human right. Some countries have enshrined the right to a clean and healthy environment in their constitutions. For instance, Article 56 of the Turkish Constitution asserts that everyone has the right to live in a healthy and balanced environment, emphasizing the state's duty to protect this right (page 51). Similarly, Morocco's 2011 Constitution highlights environmental rights alongside civil, political, and social rights, mandating that public institutions ensure access to a healthy environment (page

19). Furthermore, Tunisia's legal framework reflects the commitment to sustainable development and the rights of citizens to a healthy environment (page 19). Article 46 of the Egyptian constitution also recognizes the right to live in a healthy environment in its Constitution (page 5). France's Environmental Charter (2004) is incorporated into the French Constitution and recognizes the right of all citizens to live in a healthy and sustainable environment. It mandates that public policies respect this principle and that every person must contribute to preserving and improving the environment (page 1). Furthermore, also Spain, Greece, and Montenegro guarantee the right to a healthy environment in their constitutions. However, this is not the case in every country and since the

The absence of a specific human right to a clean environment in the European Convention on Human Rights (ECHR) raises significant concerns. Firstly, this gap leads to a lack of legal clarity, making it difficult for individuals to seek legal remedies for environmental harm and hindering accountability for governments and corporations regarding environmental degradation. Without a clearly defined right, the enforcement of existing human rights related to environmental issues becomes inconsistent across member states, resulting in varying levels of protection.

Moreover, the current legal framework limits judicial review opportunities for environmental issues, preventing courts from adequately addressing cases where environmental damage impacts fundamental human rights, such as life and health. This limitation can obstruct the creation of effective environmental policies and reduce the urgency with which pressing issues like pollution are tackled. Additionally, the lack of a specific environmental right may hinder civil society's efforts to advocate for stronger environmental protections, which are essential for both individual well-being and ecological integrity.
Internationally, environmental protection principles dating back to the Aarhus Convention encompass the right to access information, public participation, and justice in environmental matters, underscoring the significance of a healthy environment for the enjoyment of basic human rights 14.
These constitutional and international provisions collectively form a robust argument that supports the assertion that there is indeed a human right to a clean environment, reinforcing the imperative for safeguarding ecological integrity for current and future generations.

C- Access to justice and legal remedies to combat plastic pollution

The Aarhus Convention has significantly improved access to justice in environmental matters, particularly regarding plastic pollution. It allows citizens and NGOs to challenge public authority decisions that negatively affect the environment, thus promoting transparency and accountability in the fight against plastic pollution. However, several challenges persist. First, financial constraints limit the effective enforcement of laws in countries such as France, where insufficient resources hinder comprehensive implementation, restricting public participation and access to justice (*Expert opinion report, France, p.34*). Furthermore, the shortage of human resources, such as the lack of follow-up by public prosecutors, undermines the enforcement of environmental laws, including those related to plastic waste. Additionally, the possibility of appeal is limited in many jurisdictions, and the high costs associated with appealing decisions make it more difficult for citizens and organizations to seek redress, especially in plastic pollution cases. The issue of case law is also problematic; for example, in Montenegro (*Domestic report, Montenegro, p.34*), the lack of significant case law on plastic waste prevents the full realization of legal protection under the Aarhus Convention. Moreover, in some countries like Lebanon, national legislation does not guarantee access to justice for NGOs, limiting their ability to take legal action against polluters (*Domestic report Lebanon, p.11*). Delays in court proceedings also pose a major obstacle, discouraging many individuals and NGOs from pursuing legal actions. Finally, in certain regions, companies use intimidation tactics to discourage individuals or organizations from taking legal action against plastic pollution, undermining the fairness of the judicial system. This issue is particularly problematic in countries where law is largely shaped by case law, such as Cyprus (*Domestic report Cyprus, p.32*), where the absence of clear legal precedents on environmental matters leads to legal uncertainty and inconsistency in judicial outcomes.

Overall, while progress has been made, the current state of legal mechanisms for combating plastic pollution remains insufficient, and further efforts are needed to ensure full implementation of EU laws and the Aarhus Convention. Recommendations include increasing financial resources to ensure the proper implementation of environmental laws, including those addressing plastic pollution. Additionally, strengthening human resources by hiring more staff in public prosecutor offices and other relevant institutions will help expedite legal proceedings and ensure better oversight of cases. Expanding appeal options and making them more accessible and affordable will allow more citizens and NGOs to challenge decisions related to plastic pollution. Reducing legal costs associated with taking action against plastic pollution will encourage greater participation from affected individuals and organizations. Furthermore, national legislation should be reinforced to guarantee unwavering access to justice for NGOs and citizens, especially in countries where this is currently lacking. On a global scale, there is a need to accelerate the creation of robust environmental legal frameworks that promote accountability and transparency in the fight against plastic pollution. Legal systems should be reformed to ensure coherent and comprehensive laws that address plastic pollution and its impacts on the environment and public health. Moreover, access to justice and human rights institutions must be made more accessible, particularly for marginalized groups, to support the fight against plastic pollution. Promoting gender equality in land and waste management is

another key factor for sustainable resource management and tackling plastic pollution[7]. Lastly, a shift in legal thinking is required to prioritize environmental protection and adopt innovative approaches to addressing the plastic waste crisis[8].

II-Public policies and regulatory measures

This report gathers different policy recommendations designed to tackle the plastic crisis, with a particular regional focus on the Mediterranean. The policy recommendations outlined address the entire life cycle of plastic products and are concerned with upstream, midstream and downstream actions that can be taken to achieve a Mediterranean Sea free from plastic pollution. The realisation that the implementation of one single solution will not be enough to make this goal a reality lies at the basis of this report. With the synergised implementation of various policies addressing different goals ranging from a decrease in virgin plastic production all the way to increasing the efficiency, scope and profitability of recycling processes this aim becomes much more feasible. However, even when taking such a holistic approach there are a number of challenges in the way of combating the plastic crisis, such as the competitive pricing of virgin plastic products, the convenience of single-use plastic products and the logistic challenges of reuse systems, which are also acknowledged in combination with the relevant policy recommendation discussed at hand. Ultimately it is most important however to realise that the necessary solutions are within our reach and with their immediate, relentless and well-coordinated implementation the sheer endless stream of plastic pollution into the Mediterranean can be halted.

Although governments and industry leaders have started taking actions against the plastic crisis and have implemented new policies and voluntary initiatives, more far-reaching measures are required to effectively tackle the plastic pollution of the Mediterranean Sea. By 2040, the leakage to the oceans will have only been reduced by 7% (in comparison to a Business-as-Usual (BAU) Scenario) as a result of the current commitments. The commitments are too narrow in their scope and often only apply to countries with relatively low leakage of plastic into the environment.[9]

This is not due to a lack of technical solutions, but mainly a result of regulatory and political shortcomings. We have the solutions today to reduce annual land-based plastic leakage into the oceans by around 80 % by 2040 relative to a BAU-scenario. This would not only lead to a new circular economy but would also have positive effects on numerous societal, economic, and environmental objectives, such as climate change and new employment opportunities.[10] However, to achieve an 80 % reduction public and private collaboration needs to set higher

[7] Five Steps to Environmental Justice

[8] UNDP Environmental Justice Framework

[9] *Systemiq/The Pew Charitable Trust*, Breaking the Plastic Wave – A comprehensive Assessment of Pathways towards Stopping Ocean Plastic Pollution 9 https://www.systemiq.earth/wp-content/uploads/2020/07/BreakingThePlasticWave_MainReport.pdf.

[10] *World Bank Group*, Where Is the Value in the Chain? – - Pathways out of Plastic Pollution (2022) xx https://doi.org/10.1596/37285; *Systemiq/The Pew Charitable Trust*, Breaking the Plastic Wave 10.

standards regarding materials, formats, reuse and recyclability.[11]
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While in the beginning a shift from a linear to a circular business model has to be accompanied by incentives for multiple stakeholders, after successfully implementing comprehensive coherent measures the need for public financing will diminish. The profits of plastic producers, plastic converters, and plastic consumer good companies in the linear business sector will decrease, whereas the profits of 'green' business models will increase. The subsequent effect will be raised interest of investors and companies in circular business models. Additional revenue could also help to offset the negative impacts of plastic pollution on poor and vulnerable populations.[14]

1. Upstream Measures

1.1 Reduction of virgin plastic pollution

The most promising solution to address the plastic crisis in the Mediterranean is to drastically reduce virgin plastic production at its source. By eliminating unnecessary plastics, of which there will be 110 - 142 million metric tons globally by 2040 under a BAU-scenario[15], and promoting reuse, repair and new delivery systems, the mass of plastic production could be reduced by around 31 %, keeping the per capita use in 2040 at roughly the same level as today.[16] This strategy does not only provide the greatest decrease in plastic pollution, but it also has the highest potential for net savings and the greatest possibility to reduce GHG emissions.[17] Actions to reduce plastic production must include the removal/ban of all plastics that do not serve a necessary function and are avoidable (i.e. overpackaging and excessive headspaces) as well as the re-design of plastic products in an eco-friendly way (i.e. reusable and recyclable)[18].

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[11] *Systemiq/The Pew Charitable Trust*, Breaking the Plastic Wave 12.

[12] *UNEP ea*, Turning of the Tap – How the world can end plastic pollution and create a circular economy (2023) 11 https://www.unep.org/resources/turning-off-tap-end-plastic-pollution-create-circular-economy.

[13] *McGlade ea*, From Pollution to Solution – A global assessment of marine litter and plastic pollution (2021) 16 https://www.unep.org/resources/pollution-solution-global-assessment-marine-litter-and-plastic-pollution.

[14] *World Bank Group*, Where ist the Value in the Chain? xx.

[15] *Systemiq/The Pew Charitable Trust*, Breaking the Plastic Wave 11..

[16] *UNEP ea*, Turning of the Tap 23.

[17] *UNEP ea*, Turning of the Tap 23.

[18] *Collins ea*, Scientists' Declaration on the Need for Governance of Plastics Throughout their Lifecycles https://www.plasticstreaty.org/scientists-declaration/.

Furthermore we must develop and incentivise new delivery systems[19] and unpackaged products, reduce the complexity and diversity of plastics (since complex and diverse plastics are particularly difficult to recover and recycle), increase utility per package and extend life and usage of durable goods, using high-value reusable and refillable products.[20] A systemic shift with obligatory standards in place that enable packaging free options and reusables to become the norm as the efficiency of reuse systems is improved is required.[21] Particularly in the fast paced consumer goods sector large-scale packaging reuse schemes need to be established.[22]

Policies to reduce plastic production must cover a wide range of application purposes, otherwise the effects will hardly contribute toward stopping the plastic pollution of the Mediterranean. As a review by The Pew Charitable Trusts and SYSTEMIQ shows, the key government initiatives worldwide so far (e.g. the European Union's single-use plastics directive and a number of national plastic policies) mostly focus on a narrow range of selected items (e.g. straws, bags, cups, stirrers, cotton swabs and bottles) and therefore reduce the mass of total leaked plastics insufficiently.[23] The aim should rather be a far-reaching ban/limitation of single-use plastics, other plastic waste that is often found in marine litter, easily fragmentable plastic materials (e.g. oxo-plastics and synthetic polymers in foam)[24], intentionally and unintentionally added nano- and microplastics (especially in consumer products; such as plastic glitter, sequins and microbeads) and plastic granules, flakes and pellets that are used in open environments (i.e. playgrounds and sport fields)[25]. Urgent action is particularly necessary when looking at non-recoverable items (such as microbeads in cosmetics products and personal care items) since they are a key source of marine litter and their removal from aquatic environments is almost impossible, because of their small size and the required time to biodegrade.[26]

The Montreal Protocol on Substances that Deplete the Ozone Layer and the Stockholm Convention are viable examples of how to design such bans or restrictions.[27]

Where virgin fossil-fuel based plastic products cannot be banned, a reduction may be obtained by a tax, penalising specific unwanted products or chemical additives.[28]

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[19] *Collins ea*, Scientists' Declaration on the Need for Governance of Plastics Throughout their Lifecycles.

[20] *UNEP ea*, Turning of the Tap 14; *Collins ea*, Scientists' Declaration on the Need for Governance of Plastics Throughout their Lifecycles.

[21] *Center for International and Environmental Law*, How can EU legislation tackle microplastic pollution (06.2022) 16 https://www.ciel.org/wp-content/uploads/2022/07/RPa-Microplastics-Position-Paper-July-2022.pdf.

[22] *UNEP ea*, Turning of the Tap 54.

[23] Systemiq/The Pew Charitable Trust, Breaking the Plastic Wave 9.

[24] *Wagner ea*, Policy Brief: Role of chemicals and polymers of concern in the global plastics treaty (2023) https://doi.org/10.5281/zenodo.7941525.

[25] *Center for International and Environmental Law*, How can EU legislation tackle microplastic pollution; *Collins ea*, Scientists' Declaration on the Need for Governance of Plastics Throughout their Lifecycles.

[26] *Bruch ea*, Marine Litter Legislation – A Toolkit for Policymakers (2016) 69 https://www.unep.org/resources/report/marine-litter-legislation-toolkit-policymakers.

[27] *Landrigan ea*, The Minderoo-Monaco Commission on Plastics and Human Health (2023) 124 https://annalsofglobalhealth.org/articles/10.5334/aogh.4056.

[28] *Watkins ea*, Policy approaches to incentivise sustainable plastic design, OECD Environment Working Papers (19.07.2019) https://doi.org/10.1787/233ac351-en.

For the remaining (single-use) fossil-fuel based plastic products on the market systematic labelling should be introduced to inform consumers of the environmental impacts and the recycling capacities or disposal options of the product.[29]

1.2 Shifting to reuse schemes

A plastic product in the midstream phase of its life cycle is at its highest value, making this phase ideal for circularity with the aim of keeping the product at midstream for as long as possible.[30] Reuse systems have been identified as providing the greatest opportunity to reduce plastic pollution with a reduction of 30% by 2040 when compared to the BAU-scenario.[31] Reuse schemes allow the plastic product to retain its economic value beyond the first use,[32] as they facilitate for the product to achieve "multiple trips, rotations or uses for the same purpose for which it was originally used".[33]

Reuse systems require "collection points, return incentives […], reverse logistics (including washing and sanitation), labelling and communication, consumer awareness, among others".[34] There are multiple approaches to improve the economics of reuse and some can be guided by legislation which stabilises the market and provides assurance to encourage investments from the private sector, allowing for an upscaling of the reuse systems. This also includes policies that increase customer demand for reuse by promoting behavioural changes.[35]

To facilitate the shift towards reuse schemes from a financial stand point, an efficient set up also requires attention, which has lead the WWF, the Life Cycle Initiative and the World Economic Forum to partner with stakeholders to realise the endeavour of creating a "one-stop-shop Reuse Portal designed to provide practical, action-oriented tools and networks to scale reuse solutions", while involving "innovators, large and small businesses, policy makers, activists, experts, consumers and citizens". The platform shall act as a collection point for credible guidance and best practices giving national and local stakeholders the tools necessary to take action and push the implementation of reuse solutions.[36]

1.3 Sustainable alternatives

Another beneficial upstream measure will be the substitution of virgin plastics – particularly of single-use plastic products, as they make up 50 % of the marine litter found on European Beaches[37] – with alternative materials that are both safe and sustainable. This will reduce plastic pollution by 2040 by 17 % compared to a BAU-scenario[38] and facilitate a circular end-of-life

[29] *Center for International and Environmental Law*, How can EU legislation tackle microplastic pollution 16.
[30] *UNEP ea*, Turning of the Tap v.
[31] *UNEP ea*, Turning of the Tap xiv.
[32] *UNEP ea*, Turning of the Tap 21.
[33] *UNEP ea*, Turning of the Tap 20.
[34] *UNEP ea*, Turning of the Tap 21.
[35] *UNEP ea*, Turning of the Tap 21.
[36] *Life Cycle Initiative*, The relevance of Life Cycle Approaches to Beat Plastic Pollution, (Stand 26.05.2022).
[37] Center for International and Environmental Law, How can EU legislation tackle microplastic pollution 7.
[38] *UNEP ea*, Turning of the Tap xiv.

management.[39] But it is crucial to ensure that these substitutes do not inadvertently lead to negative environmental consequences but instead are produced in an environmentally and socially sound manner.[40] Life Cycle Assessment studies indicated that merely replacing single-use plastic products with single-use equivalents made from other materials does not yield a desirable outcome.[41] To truly address the problem of plastic pollution, it is essential to prioritise long-term solutions that promote durable and reusable plastic alternatives made of recyclable materials, as well as encourage behavioural changes and innovative approaches to minimise waste generation altogether. Therefore further research and development, especially regarding the substitution of single-use plastic products, is needed,[42] as other challenges may arise such as the switch to alternative materials causing emissions to increase alongside an increase in product weight or impacts on biodiversity and land use due to a surge of bio-based materials becoming problematic.[43] However, if managed sustainably the substitution of single-use plastic products will also lead to a significant reduction in GHG-emissions.[44]

1.4 Fiscal instruments

To ensure that sustainable plastic alternatives can compete in markets with products made of virgin fossil fuel-based polymers as well as to incentivise the reduction of plastic usage in total, governments are urged to establish an incrementally increasing taxation system. This virgin plastic tax or levy shall address the price gap between virgin plastic products and those reducing the demand for virgin plastic (such as substitutes, reusable and recycled products).[45] Such a tax or levy should be in place by 2025 rising from 15 % of the external costs to 50 % in 2040 and should therefore partly offset indirect costs, which arise from the linear plastic economy.[46] A report by the United Nations Environment Programme (UNEP) estimates annual social and environmental costs resulting from plastic pollution between USD 300-600 billion per year with a chance to accelerate above USD 1.5 trillion per year.[47] If only USD 500 per metric ton would be charged on virgin plastic for short-lived products (which would be financially viable for the industry) this would result in a revenue of USD 1.1 trillion from 2025 until 2040 – more than the total costs of expenditure required for a system change towards a circular economy. Such revenue could be used to fund and leverage this system change.[48]

Although some riparian states to the Mediterranean have already implemented such taxation systems on a national basis (such as Spain[49]), a harmonised global or regional taxation system

[39] *UNEP ea*, Turning of the Tap 34.

[40] *UNEP ea*, Turning of the Tap 34.

[41] *Life Cycle Initiative*, The relevance of Life Cycle Approaches to Beat Plastic Pollution, (Stand 26.05.2022).

[42] Collins ea, Scientists' Declaration on the Need for Governance of Plastics Throughout their Lifecycle.

[43] *Watkins ea*, Policy approaches to incentivise sustainable plastic design 12.

[44] *UNEP ea*, Turning of the Tap 36.

[45] *UNEP ea*, Turning of the Tap 21.

[46] *UNEP ea*, Turning of the Tap 26.

[47] *UNEP ea*, Turning of the Tap xv.

[48] *UNEP ea*, Turning of the Tap 11.

[49] *UNEP ea*, Turning of the Tap 26.

(e.g. in the Global Plastics Treaty or the Barcelona Convention) would be highly preferential, as it ensures more effectiveness and a fair market.
Additionally, all financial flows towards virgin plastic production and conversion must be reduced, the cost advantages of virgin plastics over more sustainable products have to be removed and the planned expansion of plastic production capacity must be curtailed.[50] Therefore public and private investments in the manufacturing of virgin plastics (which are considered "safe investments") must be stopped and redirected towards reuse and new delivery models, substitute materials and recycling capacities (which are perceived as "risky investments").[51] As this will only be possible with governmental actions and a risk-taking industry and investors, it is important that governments support these changes and implement significant financial incentives for investors and companies to align their business models and investments with a circular and sustainable economy.[52]

1.5 Product composition, design, and use

A recent report by the UNEP found 13.000 chemicals that compose parts of plastics as monomers, additives as well as processing aids and although only around 7.000 of these chemicals were analysed, more than 3.200 were identified as alarming due to their potential hazardous qualities.[53] Currently only 128 (equals 4 %) of these more than 3.200 known hazardous chemicals in plastics are internationally regulated.[54]
Moving forward policies should therefore establish rigorous safety and sustainability criteria with regards to plastic chemicals.[55] We need to ban/limit potentially hazardous polymers, additives, monomers, catalysts and polymerization aids as well as complex synthetic compositions that pose a particular risk to human health, animal- and plant life and ecosystems in the Mediterranean. This includes for example toxic chemicals in fishing gear and in food packaging (i.e. phthalates, bisphenols, mineral oils, PFAS) as well as colourants in plastic packaging.[56]
Specific suggestions include the gradual switch from multi material flexibles to mono material or recyclable combinations, aiming for completion by 2040, the removal of all dyes, pigments and additives that pose obstacles in the recycling process, increasing homogeneity of plastic types and formats in combination with bans for troublesome polymers and hazardous chemicals, while focusing on the development of non-harmful alternatives that hold an increased share of recycled material.[57] A particular measure to be taken is the implementation of "a legal requirement for plastic products to contain increasing minimum recycled content of

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[50] Systemiq/The Pew Charitable Trust, Breaking the Plastic Wave 9.
[51] *UNEP ea*, Turning of the Tap 16; *Systemiq/The Pew Charitable Trust*, Breaking the Plastic Wave 105.
[52] *Systemiq/The Pew Charitable Trust*, Breaking the Plastic Wave 12.
[53] *Weber ea*, Chemicals in plastics – a technical report (2023) 11 https://www.unep.org/resources/report/chemicals-plastics-technical-report.
[54] *Wagner ea*, Policy Brief: Role of chemicals and polymers of concern in the global plastics treaty 1.
[55] *Collins ea*, Scientists' Declaration on the Need for Governance of Plastics Throughout their Lifecycles.
[56] Wagner ea, Policy Brief: Role of chemicals and polymers of concern in the global plastics treaty 3; Collins ea, Scientists' Declaration on the Need for Governance of Plastics Throughout their Lifecycles.
[57] *UNEP ea*, Turning of the Tap 29.

plastics".[58] In connection to e-waste accessibility was also addressed through a "right to repair", which prohibits manufacturers form limiting repair materials necessary to fix electronics.[59]
The aim should be a legally binding list, defining groups of chemicals and polymers of concern, which should be phased out and banned or limited to certain threshold concentrations for toxins, as well as a positive list with chemicals and polymers safe-by-design, which are tested and evaluated under health- and environmental-protection standards before they enter the market. The formation of groups of chemicals based on their structure will simplify this process and will avoid loopholes for substitutes that are only modified slightly and therefore pose the same risks. If combined with a global inventory for plastic chemicals, polymers and materials, containing information about the production process, the trade volumes and the chemicals used, a positive and negative list of chemicals and polymers will also lead to more transparency and will strengthen accountability.[60]
To establish a list of hazardous additives and polymers, it is recommendable to use an already established legal framework. One such framework is the Stockholm Convention, which identifies persistent organic pollutants (POPs) and aims to eliminate and reduce them. Utilizing the Stockholm Convention and listing some polymers as POPs would offer several benefits, as a significant number of countries, particularly the riparian states to the Mediterranean, signed and ratified the Convention.[61]
As for the mentioned health- and environmental-protection standards, it is important to (1) ensure a sustainable, circular, non-toxic design, (2) to facilitate mutual data exchange (i.e. through "The Mutual Acceptance of Data"-system by the OECD; to avoid regulatory divergencies and promote work-sharing), (3) to obtain transparency on the composition and toxicity of the respective plastics, (4) to improve traceability and (5) to enable human biomonitoring as well as post market surveillance (as already done with pharmaceuticals and food).[62]
Another advantage of a ban/limitation of certain plastic chemicals is the increased usability of plastic materials in a circular economy. Their chemical composition often makes them hard to recycle or reuse and leads to either high dumbing rates or a low quality in secondary materials. A ban/limitation of certain chemicals would eliminate such a physical or toxicological barrier and would enhance repairability, recyclability, durability for reuse as well as bio and eco-safety of plastic products.[63]
The legislation in this field should take into account the fact that the safety of plastics should not be judged with a linear approach in mind that allows the products to only pass through the economy once, but much rather with a focus on the circular economy model, meaning that products need to remain safe for use even when passing through the economy several times and when they are eventually cycled back into new products. This should be the standard that safety-

[58] *UNEP ea*, Turning of the Tap 54.
[59] *Landrigan ea*, The Minderoo-Monaco Commission on Plastics and Human Health 127.
[60] Wagner ea, Policy Brief: Role of chemicals and polymers of concern in the global plastics treaty 3.
[61] *Landrigan ea*, The Minderoo-Monaco Commission on Plastics and Human Health 128f.
[62] *Landrigan ea*, The Minderoo-Monaco Commission on Plastics and Human Health 4ff, 125.
[63] *Watkins ea*, Policy approaches to incentivise sustainable plastic design 3; *Collins ea*, Scientists' Declaration on the Need for Governance of Plastics Throughout their Lifecycles.

related regulations adhere to.[64]

2. Downstream Measures

2.1 Introduction

Next to "upstream" and "midstream" focused policies "downstream" solutions also exist and encompass post-consumer measures such as recycling and disposal.[65] While there is no single solution to end ocean plastic pollution downstream measures play an essential role when working towards this goal. However, the measures taken should be carefully coordinated with the aforementioned policies to face the challenges of downstream solutions being "limited by economic viability and the realistic speed of infrastructure development in the face of growing plastic waste production", and to assure the best possible output by combining upstream and downstream solutions.[66]

There is great potential to improve the circularity of our system through downstream measures in our currently entrenched throwaway society. "Of the 100 billion tonnes of resources that the world uses every year, only 8.6% is cycled back into our economy: over 90% of what we take from the earth to fulfil our needs and wants goes to waste".[67] At the same time plastic recycling alone is not a solution to a problem of this magnitude and should be combined with the up- and midstream measures as outlined above. Drawbacks include that "only a small portion and very few types of monomaterial plastics are currently recyclable, manufacturing with recycled materials requires the use of virgin plastics, the issue of toxic residues in recycled plastics is not being addressed, recycling carries its own environmental burden and recycling campaigns have often been used to increase rather than decrease plastic product consumption".[68] While acknowledging that increased recycling by itself will not end plastic pollution it should form a part of the policies adopted when moving towards that goal, as it is estimated that the amount of plastic pollution could be reduced by 20% by 2040.[69]

To achieve the greatest impact the following available policies should be applied in alignment with one another.

2.2 Downstream legislation to end marine plastic pollution

To ensure a systematic approach to combat the issue of marine plastic pollution a system of applicable legislation needs to be in place to provide structure and direction, combined with government policies as well as leadership demonstrated by consumer goods companies, which will be essential in upstream as well as downstream action when focusing on the improvement of collection and recycling.[70]

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[64] *UNEP ea*, Turning of the Tap 23.

[65] *Systemiq/The Pew Charitable Trust*, Breaking the Plastic Wave 9.

[66] *Systemiq/The Pew Charitable Trust*, Breaking the Plastic Wave 9.

[67] *Circle Economy*, The Circularity Gap Report 2022 21.

[68] *Collins ea*, Scientists' Declaration on the Need for Governance of Plastics Throughout their Lifecycles.

[69] *UNEP ea*, Turning of the Tap xiv.

[70] *Systemiq/The Pew Charitable Trust*, Breaking the Plastic Wave 9.

A key goal when developing and implementing legislation focusing on downstream action is to prevent the waste, once created, from entering into the marine environment. While the establishment of a circular economy model that reduces the creation of items that easily become marine litter should stand at the forefront establishing practices such as covering landfills near aquatic bodies can help prevent existing waste from entering the marine environment.[71]
Globally uniform standards regarding production, use and disposal of plastics should be established as a part of the required legislation and could be developed in the form of a Global Plastics Treaty, thereby also applying these standards to waste management within countries and not only shipments that enter into international trade as regulated by the Basel and London Conventions.[72] Ambitious recycling targets per material should also be agreed upon in a binding fashion, thereby boosting the percentage of recycled plastics to 50% by 2035 and increasing demand for secondary plastics while simultaneously de-risking investment in recycling capacity.
Reduction targets should also concern the release of microplastics by recycling facilities resulting in binding agreements with the target of achieving zero plastic emissions long term.[73] This also requires the containment of recycling facilities to combat pellet as well as other microplastic loss in the water and soil and prevent any spillage.[74]

2.3 Ban of the burning of plastic waste

While the view that the open burning of plastic waste should be prohibited globally seems widely undisputed,[75] the UNEP Report cited promotes burning plastic waste in cement kilns as a key strategy.[76] Other sources however state that allowing this constitutes a "'get out of jail free card' for the plastic industry to keep ramping up plastic production by claiming that the plastic problem can simply be burned away".[77]
The systematic burning of waste in cement kilns would create demand for cheap plastic waste to act as fuel, thereby acting against global efforts to decrease plastic production. Burning waste in cement kilns would also only replace one form of fossil fuel with another, as 99% of plastics are made from fossil fuels and "burning one tonne of plastic waste releases roughly the equivalent greenhouse gas emissions".[78] The burning of waste in cement kilns is furthermore associated with environmental disaster and the violation of human rights in the communities surrounding the territories where this takes place, as burning plastic waste releases dioxins that permanently remain in the environment and are linked to cancer and various other impairments. The "burning [of] plastic in cement kilns has [also] increasingly been used as a greenwashing

[71] *Bruch ea*, Marine Litter Legislation: A Toolkit for Policymakers ix.
[72] *Landrigan ea*, The Minderoo-Monaco Commission on Plastics and Human Health 5.
[73] *Center for International and Environmental Law*, How can EU legislation tackle microplastic pollution 16.
[74] *Center for International and Environmental Law*, How can EU legislation tackle microplastic pollution 16.
[75] *Landrigan ea*, The Minderoo-Monaco Commission on Plastics and Human Health 132.
[76] *UNEP ea*, Turning of the Tap 44f.
[77] *GAIA*, New UNEP Report sparks Controversy ahead of Global Plastics Treaty Negotiations – Civil Society, Academics, and Frontline Groups Denounce Promotion of Burning Plastic Waste in Cement Kilns, (Stand 16.05.2023).
[78] *GAIA*, in New UNEP Report sparks Controversy ahead of Global Plastics Treaty Negotiation.

tactic by the plastic and consumer-facing industries under the guise of 'recycling'".[79]
Chemical and thermal conversion also involves heating or burning of plastic waste in furnaces or kilns or the breaking of chemical bonds in chemical reactors to produce smaller molecules. These technologies hold unknown risks, which have not yet been proven effective at any useful scale, causing investments into the costly yet unproven technologies to divert funding away from proven and effective strategies, giving them the potential to derail efforts to address the root causes of the global plastics crisis.[80]
It is of fundamental importance that plastic production is drastically reduced[81] and the remaining plastic is managed and recycled in a way that serves the establishment of a circular economy model, rather than being burned.

2.4 Efficient set up of recycling processes

Another key contributor to ending ocean plastic pollution is putting in place a well thought out and coordinated system for recycling. Waste can only be deemed recyclable, if the system is in place for it to be "collected, sorted, reprocessed, and manufactured back into a new product or packaging – at scale and economically".[82]
A precondition for an overarching recycling and reuse system are standardised design rules, particularly in problematic sectors such as packaging, that reduce the number of different polymers overall and prioritise design choices that result in products that are easier to reuse and recycle. A possible approach could be the standardisation of formats spanning across multiple companies to encourage reuse, which would also improve the profitability of reuse and recycling schemes.[83] By improving the economics of recycling, investment into its infrastructure is also enabled.[84] Losses in recycling processes generally are estimated at around 25%, which could be notably reduced by improvements in technology.[85]
Once products are designed in a way that allows for their big scale efficient reuse and recycling, collection systems need to be in place, as currently an estimated two billion people are not connected to waste collection systems, with numbers only changing for the worse as population growth continues.[86] In addition to the ability to access a collection system the sorting of waste at source/home needs to become the norm in combination with improved separation technologies at recycling plants. High income countries need to double the share of waste that is currently being sorted at source achieving a 50% share whereas low- and middle-income countries should achieve an increase of around 20%-30% from their currently minimal share of waste sorted at source to achieve the systems change scenario outlined by the UNEP.[87]

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[79] *GAIA*, in New UNEP Report sparks Controversy ahead of Global Plastics Treaty Negotiation.
[80] *Landrigan ea*, The Minderoo-Monaco Commission on Plastics and Human Health 132.
[81] *GAIA*, in New UNEP Report sparks Controversy ahead of Global Plastics Treaty Negotiation.
[82] *UNEP ea*, Turning of the Tap vii.
[83] *UNEP ea*, Turning of the Tap 25.
[84] *UNEP ea*, Turning of the Tap 25.
[85] *UNEP ea*, Turning of the Tap 25.
[86] *UNEP ea*, Turning of the Tap 25.
[87] *UNEP ea*, Turning of the Tap 30.

2.5 Transparency, traceability and sharing of information

Through transparency, traceability and sharing of information regarding chemicals, material and waste flows a multitude of positive results can be achieved, including improved enforcement. Thereby illegal dumping of plastic waste in countries not looking to receive said waste or lacking the infrastructure to manage it as required could be restrained.[88] Plastic waste exports should also be largely eliminated as plastic waste principally flows from regions capable of its management that are faced with high recycling costs to countries struggling with the mismanagement of waste and deficient enforcement capacities.[89]

Another desired action point in terms of knowledge distribution, particularly with regards to the production and design of recyclable plastics, is the creation of "an open access database for all chemical additives introduced in recycled plastic, including their concentration and CAS numbers".[90] This could contribute to tackling the lack of information about the constituents of plastic products, which can cause the loss of quality through the mixing of waste streams, making research in this field necessary.[91] The life-cycle assessments of recycling facilities should also be disclosed, encompassing microplastics, particularly with regard for chemical recycling technologies.[92]

2.6 Financial mechanisms and investments

Deposit refund schemes (DRS) as well as extended producer responsibility schemes (EPR) are promising approaches designed to recover the costs of waste management as well as helping "to create a market for products which prevent waste, or are easy to re-use or recycle".[93] Deposit systems work particularly well for PET bottles,[94] metal cans and glass bottles and minimum requirements on effective operation should be implemented, taking into consideration reusable and refillable packaging and including other relevant packaging types.[95] This could be encouraged by policy makers through fiscal "incentives for companies that implement reuse models".[96]

Several sources also call for EPR Frameworks to encompass fishing gear, as in Directive 2019/904 for example, also holding that it should be marked with acoustic transponder tags for tracking and retrieval.[97] It has also been suggested to approach the issue at the manufacturing stage with innovative designs that focus on completely biodegradable fishing gear as well as making it easier to separate and recycle plastics utilised by the fishing industry, and then use EPR schemes to incentivise the return of fishing gear at the end of its life span.[98]

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[88] *UNEP ea*, Turning of the Tap 25.

[89] *UNEP ea*, Turning of the Tap 47.

[90] *Center for International and Environmental Law*, How can EU legislation tackle microplastic pollution 16.

[91] *McGlade ea*, From Pollution to Solution: A global assessment of marine litter and plastic pollution 84.

[92] *Center for International and Environmental Law*, How can EU legislation tackle microplastic pollution 16.

[93] *Watkins ea*, Policy approaches to incentivise sustainable plastic design 11.

[94] *Landrigan ea*, The Minderoo-Monaco Commission on Plastics and Human Health 128.

[95] *Center for International and Environmental Law*, How can EU legislation tackle microplastic pollution 16.

[96] *UNEP ea*, Turning of the Tap 55.

[97] *Landrigan ea*, The Minderoo-Monaco Commission on Plastics and Human Health 127.

[98] *UNEP ea*, Turning of the Tap 49.

However, price instruments, including levies, are limited in their effectiveness due to the low-price elasticity of demand, which signifies a low responsiveness of demand to price increases, consequently increasing revenues rather than decreasing demand. The relevant instruments should therefore be combined with other measures such as "bans on single use plastic products and additives and polymers that are particularly hazardous for human health and the environment".[99]

Several areas also simply require financial flow, such as the formal collection and sorting sectors in middle- and low-income countries, as well as the improvement of recycling technologies and the endeavour to increase recycling capacities generally. End of life management facilities and technologies also require funding.[100] Industry should join with governments to secure the financing of waste collection and sorting.[101]

To encourage the investments needed into these areas governments and businesses could "incentivize and de-risk investments into recycling infrastructure e.g. through inclusion of minimum recycled content criteria in public procurement or long-term offtake contracts to guarantee demand for recycled polymers, similar to power purchase agreements in the energy sector.[102] Turning recycling into a more stable and profitable venture could reduce plastic pollution by 20%, provided that there is an adequate availability of recyclable feedstock and that the competition between recycled materials and virgin materials is based on equal terms.[103]

A plastic credit system has also been suggested as a possible approach designed as a market-based solution. Similar to carbon credits businesses can purchase plastic credits from informal waste collectors for example in the shape of a diversion system where pay out occurs once proven that the collected materials have been received by a recycling or manufacturing system rather than entering nature or a disposal facility. Another option is the set up as a premium or bonus payment surpassing the market price for plastics sold to the recycling industry, which is paid in association with an actual purchase by the recycling or refurbishment industry.[104]

2.7 Engagement of civil society

To allow for the most fruitful engagement of civil society "biodegradable, compostable and bio-based plastics need clearer labelling and repeated awareness-raising campaigns targeting users to ensure their correct disposal and treatment".[105] To create the conditions necessary a certification scheme with international standards and definitions is needed to ensure the integrity of compostable and biodegradable claims.[106] The information flow required can be facilitated by technology including "app-based platforms for consumers including wider access to Environmental Product Declarations (EPD) for plastic products".[107]

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[99] *UNEP ea*, Turning of the Tap 11.

[100] *UNEP ea*, Turning of the Tap 16.

[101] *Systemiq/The Pew Charitable Trust*, Breaking the Plastic Wave 12.

[102] *UNEP ea*, Turning of the Tap 26.

[103] *UNEP ea*, Turning of the Tap xiv.

[104] *UNEP ea*, Turning of the Tap 48.

[105] *UNEP ea*, Turning of the Tap 37.

[106] *UNEP ea*, Turning of the Tap 37, 54.

[107] *Watkins ea*, Policy approaches to incentivise sustainable plastic design 11.

Through policy measures and government programs, states should also support marine litter clean-up efforts and marine debris monitoring, while engaging in education and awareness-raising initiatives.[108]

[108] *Bruch ea*, Marine Litter Legislation: A Toolkit for Policymakers 69.

3. Lost, abandoned and otherwise discarded fishing gear: CMS! Recommendations for tackling the problem of lost, abandoned and otherwise discarded fishing gear ("ALDFG")

3.1. Background

Plastic parts of fishing gear counted towards 27% of marine litter items in the EU (*Reducing Marine Litter: action on single use plastics and fishing gear (1/3)*, 2018, p. 10).

Roughly, a half of the "Great Pacific Garbage Patch"[109] in the Pacific Ocean consists of ALDFG (European Commission Directorate-General for Maritime Affairs and Fisheries, 2018). While such a "patch"– in contrary to the major oceans – has not been reported in the Mediterranean Sea, new findings of Baudena et al. indicate, that high concentrations of plastics particles are nonetheless flowing in the Mediterranean crossroads (Baudena *et al.*, 2022, p. 2). That leads to the conclusion that even though the Mediterranean does not have regions where plastic debris visibly accumulates, the amount should not be underestimated.

In addition to accumulating as waste, ALDFG poses the severe risk of "ghost-fishing", a phenomenon, that describes lost or abandoned fishing gear that continues to trap animals for decades (*Reducing Marine Litter: action on single use plastics and fishing gear (2/3)*, 2018, p. 58).

High quality monofilament fishing lines are estimated to take 600 years to degrade in the ocean (European Commission Directorate-General for Maritime Affairs and Fisheries, 2018). Hence, its harmful effects will last over centuries and as more ALDFG enters the marine waters every year, it will accumulate to huge extends over time.

3.2. Recommandations of CMS!

To achieve a significant reduction of ALDFG in the seas and oceans, both national and European legislation must tackle the issue comprehensively and emphasise the strengths of the introduced directives and regulations and for the best, close their loopholes. Existing laws should be improved by the following proposals under the guidance of the given best practice examples.

Importantly, the measures to reduce plastic marine litter in general must be preventative measures, aiming to directly affect the amount of plastic litter produced, such as proper waste management and reduction measures. Thus, in order to achieve a significant reduction, any preventive measure must be accompanied by corrective measures, that aim to retrieve plastic in specific areas through clean-ups and retrieval actions (Stolte *et al.*, 2019, p. 24f.).

3.3. Facilitating reporting mechanisms of lost gear

An efficient system to report positions of gear losses enables fast retrieval and emphasises both

[109] The "Great Pacific Garbage Patch" is an accumulation of plastic in the Pacific Ocean in an area of 1.6 million km^2, floating on the water surface, that forms an island three times the size of France (Lebreton *et al.*, 2018).

the recovery of the valuable materials and the adequate disposal of nets (Stolte *et al.*, 2019, p. 4). Old fishing gear is usually reused by fishermen, although no data on the number of reuses is available (Hogg *et al.*, 2020, p. 122). Due to the value of gear, in particular trawls[110] fishers will expend considerable effort to retrieve the gear when it is lost (Hogg *et al.*, 2020, p. 123). Obligatory identification marking of fishing equipment can create an opportunity to implement rewards for retrieving and to return retrieved gear to the owner for reuse or to the producer for recycling. Moreover, it may improve visibility for retrieving.

4. Best practices

Some MS of the European Union, like Estonia and Poland already target marking for electronic reporting systems (*Reducing Marine Litter: action on single use plastics and fishing gear (3/3)*, 2018, p. 7).
Norwegian legislation requires identification marking of fishing nets that allows to identify the owner of ALDFG, so that penalties for intentional dumping can be enforced (*Reducing Marine Litter: action on single use plastics and fishing gear (2/3)*, 2018, p. 86). This measure could be adopted for the EU MS in a consistent manner through the Fisheries Control Regulation.

4.1 Improving technology and promoting research

By using up to date navigational technology fishers can avoid gear loss, f.i., by attaching a transponder to the gear that tracks its location and signals it to the vessel either through radio channels or satellite systems (*Reducing Marine Litter: action on single use plastics and fishing gear (2/3)*, 2018, p. 86). To help locate lost gear, innovative tagging methods like the use of miniature passive acoustic transponders attached to gear have been researched (Hogg *et al.*, 2020, p. 123).
The use of geospatial technologies and remote sensing must be further researched (Potts and Hastings, 2011, p. 47). Overall, improved knowledge of the sinking process of litter and its size may allow for the predictions of the proximity of the location of ALDFG (Potts and Hastings, 2011, p. 46).

4.2 Supporting waste management systems on ports

Support for harbour managers and local waste management companies and training for fisherfolk are required with regard to separating on ports recyclable gear components from non-recyclable fishing material in order to facilitate recycling (Stolte *et al.*, 2019, p. 10).
Both PRFD and WFD provide a solid basis for efficient port management systems of waste and should lead towards national fitting measures to further support these reception facilities and handling system, learning from prior EMFF projects.
Port reception services should ensure proper collection and recycling procedures and ports should provide online information on facilities that the necessary infrastructure is available

[110] Trawls are nets that are towed behind a boat which are used depending on the kind of trawl on the surface, midwater, or bottom (Seafish, 2022).

when required (Stolte *et al.*, 2019, p. 10). To facilitate retrieval and landing of ALDFG, dedicated areas where fisherfolk can collect it and process the material (cutting, extraction of metals/lead, cleaning where feasible, sorting for recycling) have to be established and funded in addition to the financial support schemes of the EMFF (Stolte *et al.*, 2019, p. 10).
Since 2016, the port authorities and the waste collectors in the Dutch ports of Rotterdam Rijnmond and the North Sea Channel district have agreed that sea-going vessels are able to dispose plastic waste free of charge in the ports. However, the waste must be presented separated and clean. To improve this measure, a mobile app was announced for fishers to be launched that can notify port authorities of the type and quantity of waste the vessels will bring ashore ahead of landing and which reminds fishers to prepare and dispose of their waste properly (*Reducing Marine Litter: action on single use plastics and fishing gear (2/3)*, 2018, p. 85).

4.3 Better classification, separate collection and sorting

Reducing both fragmentation and disparities in plastic collection and sorting systems in general could significantly improve the economics of gear recycling, promoted f.i. by EPR schemes (European Commission, 2018, p. 10).
One particular waste management problem lies within waste classification. Recyclable ALDFG and end-of-life fishing gear are currently not classified as a specific waste stream in the European waste classification scheme (Stolte *et al.*, 2019, p. 9). For commercial waste, the general classification "waste from the fishing industry" applies, and so in case lead lines cannot be removed from the retrieved gear, mixed fishing gear often has to be disposed in the hazardous waste landfill (Stolte *et al.*, 2019, p. 27). Hence, European-wide waste gear classification and recommendations for sorting facilities for the handling of single-type and mixed fishing gears with and without lead components are required (Stolte *et al.*, 2019, p. 24f.).

4.3.1 Developing recycling schemes

Lost gear means a loss of valuable resources. There can be functioning value chains for end-of-life fishing gear, aiming for an added value to bring gear ashore and to set up a profitable secondary market, as specific plastic items could be turned into secondary raw materials. The recycling rates for fishing gear in the EU Member States are very low, even though it consists of very high quality material. For instance, the few existing recycling facilities for used fishing gear in Denmark, Lithuania and Slovenia, are running below capacity. Mainly recycling companies process plastic components of fishing gear into yarn (Nylon/extracted PA6) (*Aquafil*[111]), into reusable raw materials such as high-density polyethylene (HDPE), PP and PA (*Plastix*[112] in Denmark) or into regenerated pellets (*Reducing Marine Litter: action on single use plastics and fishing gear (2/3)*, 2018, p. 87).
Stolte et al, summarized the steps needed to allow for material recycling in existing companies as the following (Stolte *et al.*, 2019, p. 11):

[111] Aquafil, Slowenia https://www.aquafil.com

[112] Plastix A/S, Lemvig, Denmark http://plastixglobal.com/

1. Sorting out clean net and rope fragments, cleaning retrieved ALDFG;
2. Separation and distinction of the polymer types PA, PP, PE, PET;
3. Removal of lead lines to avoid toxic contamination;
4. Cutting into 50cm fragments or shredding to 2-4cm fibre length for both thermal processing and material recycling;

The company *Nofir*[113], based in Norway with facilities in Turkey and Lithuania, dismantles and sorts polymer types to enable recycling of metals and synthetic materials. It recycles discarded plastic equipment from fishing and aquaculture sending it onwards, for example to *Aquafil,* where PA6 (Nylon) is regenerated into yarn to use for new textile products, like clothes and carpets (*Reducing Marine Litter: action on single use plastics and fishing gear (2/3)*, 2018, p. 87).
All fishing gear, whether profitable to recycle or not, is accepted for free at the point of collection. As no fee must be paid, it creates an incentive for fishermen to deliver to the scheme as the alternative disposal routes generally charge a fee for disposal. Considerable savings can be made, as a large 20 tonne net would usually cost around €5.600 to landfill and another €1.400 to transport, in contrast to cooperating with *Nofir* for free. Increasingly, small suppliers, who would otherwise have difficulty disposing their waste correctly, cooperate with the organisation. In some cases, *Nofir* may even pay to collect material depending on both the quality and the transport distance required (Hogg *et al.*, 2020, p. 201).
In Sweden, the *Smögen fisheries association FF Norden*, processes 1.500 tonnes of end-of-life fishing gear each year, substantially by manual labour. From the total collection 80-90% by weight are either reused directly by the participating fisheries or shipped for recycling in some form, either to *Plastix*, *Nofir* and *Aquafil* (Stolte *et al.*, 2019, p. 8).
The combination of recycling schemes with EPR has shown positive results in Iceland. As plastic litter was delivered to ports, properly separated, processed and transported to recycling facilities, the losses/discards of gear at sea were reduced by 90% (*Reducing Marine Litter: action on single use plastics and fishing gear (3/3)*, 2018, p. 68).

4.3.2 Providing economic incentives for properly collecting end-of-life gear

a. Introduction of an obligatory EPR scheme for fishing gear

Currently, EU citizens bear the costs of fishing for litter, collection, treatment and cleaning up of plastic waste. Establishing an extended producer responsibility scheme could be a mechanism to finance improved waste management services for fishing gear waste, recycling, education and awareness, research and even facilitate retrieval operations for lost fishing gear (*Reducing Marine Litter: action on single use plastics and fishing gear (1/3)*, 2018, p. 51). The contribution levels of EPR schemes for plastic waste currently in place in the EU Member States differ from €66 per tonne for plastics producers in Greece, to over €222 per tonne in France (Dalberg Advisors, 2019, p. 27). The fee structures reward recyclable products, based on features such as clear labelling, easily separable materials, available recycling technology, and

[113] Nofir A/S, Norway/Lithuania/Turkey https://nofir.no/

markets for secondary materials. Penalties are applied on features such as complex product design or disruptive additives, such as dark colorants, which hinder recycling (Dalberg Advisors, 2019, p. 27). Even though these schemes were primarily introduced for plastic packaging products, they could be adopted for fishing gear as well.

An EPR scheme for fishing gear, that covers firstly, the handling of waste stream and recycling targets, and secondly, a deposit scheme and retrieval operations would reduce the cost of managing returned waste gear for ports. Consequently, it could potentially mitigate increases of port fees, which were found a repercussion for the fishing sector as a result of the PRFD. By implementing EPR, the expected positive impact of the PRFD on the returning of fishing gear may be even better achieved (*Reducing Marine Litter: action on single use plastics and fishing gear (1/3)*, 2018, p. 51).

In contrast to plastic packaging EPR schemes, the derived responsibilities can apply primarily to the fishing industry, as they gain the profits of fishing. It can cover and fund the administrative costs of monitoring and the actual recovery by the EMFAF and be introduced on the whole EU internal market. EPR could become a possible long-term financing solution for a retrieval and waste management scheme for ALDFG.

Additionally, Stolte et al. sees potential in EPR schemes, as they can be used to encourage innovative new net materials from single polymers and alternatives to lead, as less material fractions will make the sorting process and recycling much easier (Stolte *et al.*, 2019, p. 24f.).

b. Reward and deposit-refund schemes

A reward scheme would encourage fishermen and authorities to collect marine litter and bring it back to shore for a reward. Funding could come from taxes from local or regional governments, which also should provide fishers with the equipment for reporting and retrieving the gear themselves while at sea (*Reducing Marine Litter: action on single use plastics and fishing gear (2/3)*, 2018, p. 84). Alternatively, a reward scheme could be covered by the recycling market itself, by an EPR scheme or by a deposit-refund system. For the latter, the fishers could pay a deposit upon the purchase of fishing gear, fish boxes, etc., and once the gear reaches the end of life stage, it could be returned and the deposit retrieved, so that responsible waste management can be ensured (*Reducing Marine Litter: action on single use plastics and fishing gear (2/3)*, 2018, p. 84). Very few deposit refund systems for fishing gear are in place, as due to the risk of loss and the financial burden on the fishers it is considered not aspirable. Nevertheless, a deposit scheme would add to the impact of the revised Fisheries Control Regulation, that is envisaged to address marking, retrieval, and reporting of loss by leading to higher compliance (*Reducing Marine Litter: action on single use plastics and fishing gear (1/3)*, 2018, p. 66). However, a deposit scheme increases administrative burdens and is costly for the sector to implement. In addition, the Commission reminded that "*in the case of fishing gear, the risk of losing the deposit is relatively high, potentially diminishing its impact as an incentive*" (*Reducing Marine Litter: action on single use plastics and fishing gear (1/3)*, 2018, p. 73). Therefore, a deposit measure has to be accompanied by other measures to improve locating and retrieving gear.

2.1. No-special-fee system in fishing harbours

The introduction of a no-special-fee system of the PRFD for the delivery of waste to ports is still very young, as it had to be transposed by 28 June 2021. It is considered a key measure to tackle the problem of ALDFG and other marine litter and should therefore be constantly facilitated.

Best Practices

The Icelandic experience with EPR-type and take-back scheme shows that dedicated schemes can lead to fairly high recycling rates to the benefit of the economy in general and the fishing industry in particular (*Reducing Marine Litter: action on single use plastics and fishing gear (1/3)*, 2018, p. 24).

In Iceland, there is an open market for fishing gear recycling companies to compete for the material. Between the *Federation of Icelandic Fishing Vessel Owners (LIU)* and *The Icelandic Recycling Fund,* funded by a levy on imported goods or local production as a way of EPR, there is a voluntary agreement on collection of fishing gear made of synthetics (*Reducing Marine Litter: action on single use plastics and fishing gear (2/3)*, 2018, p. 83). Most of the waste collected in Iceland is then recycled, or transported onwards to Denmark to be processed for recycling, as currently the Danish firm *Plastix* receives most of the material (Hogg *et al.*, 2020, p. 205). There are no producer fees for quantities of gear placed on the market and no fees are charged to fishing vessel owners beyond the cost of transport of material, which tends to be cheaper than disposal through landfill. The costs of the system are covered from the recycling revenue and from transport charges to fishing vessels, for which the industry association for providing the collection and recycling of fishing gear is responsible for. The cost of shipping from Iceland to Denmark (~€95/t) is paid by the receiving recycler and no gate fee is charged (Hogg *et al.*, 2020, p. 205). The sale of end-of-life gear to recycling companies achieves a recycling rate up to 90% (*Reducing Marine Litter: action on single use plastics and fishing gear (3/3)*, 2018, p. 13).

In Korea fishers are paid for gear returned to port. This reward scheme has reportedly resulted in a very effective recovery and disposal of gear and even goes beyond the Icelandic EPR system. The European Commission calculated, that a similar scheme introduced in the EU would reduce the loss of gear in the EU to only 5% remaining ALDFG, meaning a reduction of 2.691 tonnes of plastic fishing gear by this measure (*Reducing Marine Litter: action on single use plastics and fishing gear (3/3)*, 2018, p. 69).

Changes in product design

Fishing gear is designed to be robust and durable. Certain changes in product design could achieve a reduction of materials that are difficult to recycle (f.i. combination cordage made of mixed materials) or susceptible to loss and/or abrasion (e.g. dolly rope[114]). This measure should include a ban or levy on materials likely to get lost and/or difficult to recycle and a substitution of plastic products in fisheries (*Reducing Marine Litter: action on single use plastics and fishing*

[114] Dolly rope is used in pots and traps to protect the net from wear and tear caused by contact with the seabed.

gear (1/3), 2018, p. 52). In the Netherlands there is an ongoing testing phase of alternative materials (i.e. yak leather, biodegradable rope, polyethylene ropes, etc.) to exchange dolly ropes under the scope of the Green Deal (*Reducing Marine Litter: action on single use plastics and fishing gear (2/3)*, 2018, p. 83).

1. Biodegradable gear

Most plastics labelled as "biodegradable" generally degrade under certain conditions, but if these exact conditions do not occur in the natural environment, biodegradable plastics can still harm ecosystems. Therefore, applications with clear environmental benefits should be further researched and identified, given that the particular challenge of biodegradable material is that the conditions under which it should operate and degrade have to work alongside each other (European Commission, 2018, p. 12). Material characteristics need to ensure full functioning during the time of operation, as well as biodegradability in marine ecosystems after its dedicated time of use. This requires a specific marine biodegradability standard for material degradation and its related timeframe under the specific underwater conditions (*Reducing Marine Litter: action on single use plastics and fishing gear (1/3)*, 2018, pp. 52, 60). Proper, well researched biodegradability may be appropriate for floating fish aggregating devices that are particularly difficult to locate and recover (*Reducing Marine Litter: action on single use plastics and fishing gear (1/3)*, 2018, p. 52).

Currently, biodegradable polymers tend to be significantly more expensive. As their adoption for components of fishing traps may require financial inducement, the United Nations Environmental Programme (UNEP)[115] assessed in 2015, that biodegradable plastics will not play a significant role in reducing marine litter in the near future (Kershaw, 2015, p. 31).

2. Design for recyclability

As fishing gear is designed to be highly durable, the design is often detrimental for machine shredding for recycling (Hogg *et al.*, 2020, p. 122). As fishing equipment is made from diverse materials and various types of plastics from a range of polymers, preparation for recycling is costly and time consuming. A single gill net[116] can contain a floating swimline made of polypropylene (PP) or polyethylene (PE), net panels made of polyamide (PA) and a sink line with a PET shell (Hogg *et al.*, 2020, p. 122). While PA is a valuable material that can easily be recycled when isolated, when heavily entangled with other metals and plastics, it cannot be extracted. As dismantling requires extensive manual labour and time effort, extracting the mixed material fractions for recycling is not viable. In consequence, gillnets are considered hazardous waste in accordance with the WFD**,** as it cannot be incinerated or processed in standard waste processing facilities. Therefore, in Germany, the only option currently available for ALDFG is dumping in open-air hazardous waste landfills (Stolte *et al.*, 2019, p. 4). Due to the different values of the many types of material, only the recycling of specific parts is

[115] United Nations Environmental Programme: https://www.unep.org/

[116] A gill net is a is collective name for many different styles of nets, that form a single wall of netting anchored on the seabed to catch fish that swim into it (Seafish, 2022).

economically feasible. In principal, the polymers can be used to generate energy and the metal and nylon lead content is valuable recycling material when extracted (Stolte *et al.*, 2019, p. 4). Nylon 6/polyamide retrieval from fishnets, for instance, can currently be used as base material for clothing (*Reducing Marine Litter: action on single use plastics and fishing gear (1/3)*, 2018, p. 67). Fewer types of components, especially fewer polymers, should be used. Instead, materials for which secondary markets exist, f.i. nylon, or which are technically easier to recycle should be preferred. To promote recycling, certain parts of gear could be coded by colours to facilitate the distinction of polymer types. Alternatives to heavy metals in sink lines should be developed as well as fixings for pots and traps which are re-closable (Hogg *et al.*, 2020, p. 122).

Promoting the demand for recycled plastic

The misgivings of many product brands and manufacturers suggest, that recycled plastics might not meet the needs for a reliable, high-volume supply of materials with constant quality specifications (European Commission, 2018, p. 8). These worries have to be tackled by incentives for the use of recycled material, pilot studies and information campaigns. Under the MSFD, Spain, Malta and Belgium have already been exploring the creation of a market for plastic waste from fishing gear (*Reducing Marine Litter: action on single use plastics and fishing gear (3/3)*, 2018, p. 7).

Enforcing anti-dumping laws and penalties

Even though vessels are forbidden to dump their end-of-life gear into the sea, laws have to be stricter and more efficient. The EU itself is not party of the MARPOL Convention (International Maritime Organisation, 1983), that imposes a complete ban on the disposal into the sea of all forms of plastics Annex V Prevention of Pollution by Garbage from Ships (entered into force 31 December 1988). However, Regulation (EC) No 1013/2006 (*Regulation (EC) No 1013/2006 of the European Parliament and of the Council of 14 June 2006 on Shipments of Waste (OJ L 190, 12.7.2006, p.1.)*, 2006), which includes rules for transporting waste across borders is currently revised to close loopholes for illegal dumping at sea (European Commission, 2021, para. 7). The responsible authorities need to be identified and they must ensure effective punishment. Also, a penalty scheme has to impose a fine on a vessel that does not discharge any waste at port or does not show it during inspections, considering prima facie it has been discharged at sea. The fine could correspond to the 100%-indirect fee to be paid on port reception facilities, regardless of the delivery of waste.

Implementing fishing for litter on a regular basis

More ports should be required to participate in fishing for litter schemes. They shall provide containers for marine litter collected during regular fishing activities at sea and brought back to the harbours by fishermen. In addition to plastic waste collected in fishing nets during active trawling at sea, the containers can be used for disposing nets and ropes. Dedicated search and retrieval actions for ALDFG in particular results in larger quantities of waste, which often

exceeds the capacity of the available containers (Stolte *et al.*, 2019).

Best practices

Under the scope of the MSFD, fishers in Croatia are required to collect marine waste that accumulated in their nets, store it in prepared sacks and place it in dedicated port reception facilities (*Reducing Marine Litter: action on single use plastics and fishing gear (3/3)*, 2018, p. 7).

Supported by the EMFF, the German NGO *Naturschutzbund* (NABU[117]) has been developing a fishing for litter scheme in the Northern and the Baltic Sea since 2011. Within two years, the cooperation has landed more than 6 tonnes of litter, of which 80 % was plastic, 13 % rubber, and 9 % metal. NABU provides containers for marine litter collected during regular fishing activities, which consists between 15 and 30% of recovered fishing gear fragments (Stolte *et al.*, 2019, p. 27).

The organisation *Kommunenes Internasjonale Miljøorganisasjon* (KIMO[118]) has 75 member authorities from the UK, Sweden, Denmark, The Netherlands, Belgium, Lithuania, Estonia, Germany, Faroe Islands and the Isle of Man and reduces marine pollution of the seas and coastal waters of the North-East Atlantic and Baltic regions by fishing for litter operations (*Reducing Marine Litter: action on single use plastics and fishing gear (2/3)*, 2018, p. 87).

1. Raising awareness for the issue

Education on the topic of marine litter must be facilitated**.** Ireland, France, Malta, Greece and Spain are developing specific trainings and education programmes in order to sensitize fishers and seafarers to the issue of marine litter and ALDFG and the key role they could have in solving the challenge (*Reducing Marine Litter: action on single use plastics and fishing gear (3/3)*, 2018, p. 7).

2. Better compliance and harmonisation within the EU

The WWF sees a lack of harmonised binding standards for reduction measures, effective compliance and enforcement mechanisms and calls for global standards for research monitoring and reporting of ghost gear, to mitigate geographic gaps on the scale of the issue (World Wildlife Fund, 2020).

The best model seems to be a harmonised EU wide implemented process of retrieving lost gear and landing it in harbours, followed by proper waste management. Therefore, appropriate harbour reception facilities are required and information regarding the location of the floating gear and the port reception facilities must be available for fisherfolk and divers. On the ports, the gear must be pre-processed and sorted for potential recycling. There have to be logistics for collecting the gear from harbours and waste management facilities, equipped for recycling or thermal processing (Stolte *et al.*, 2019, p. 7).

[117] For further information see: NABU, https://en.nabu.de/

[118] For further information see: KIMO, https://www.kimointernational.org/news/exploring-extended-producer-responsibility-schemes-for-fishing-gear/

Final Conclusions

After an in-depth analysis of the issue, CMS! has identified the following requirements for achieving the best results of ALDFG in the oceans and seas. Agreeing with the findings of Stolte et al. (Stolte *et al.*, 2019, p. 28f) and Potts and Hastings (Potts and Hastings, 2011, p. 101f).

Harbour managers and municipalities should:

- Implement no-special-fee systems to discourage abandoning or dumping litter at sea, as set out in the PRFD (Stolte *et al.*, 2019, p. 28);
- provide reception facilities, with separate containers for end-of-life/retrieved fishing gear, scrap metals and lead lines (Stolte *et al.*, 2019, p. 28);
- dedicate a certain space to spread out and clean nets ("pre-processing")(Stolte et al., 2019, p. 28);
- promote that nets are "*pre-cut into 1 meter pieces"* and inform fisherfolk about the consequences of lead lines and plastics in the marine environment (Stolte *et al.*, 2019, p. 28);
- support retrieval actions of ALDFG (Stolte *et al.*, 2019, p. 28);
- develop waste handling plans with the local waste management company (Stolte *et al.*, 2019, p. 29);

Furthermore, policy and authorities should act by:

- defining the responsible authorities: national authorities hold the financial responsibility for the development of a "*pathway to process retrieved fishing gears*" and for the distribution of funds for retrievals at sea, while "*national, state or communal authorities are responsible for establishing a harbour collection system and other required waste management infrastructure*" (Stolte *et al.*, 2019, p. 24f.);
- defining who is responsible for retrievals, developing a funding scheme and encouraging retrieval actions (Stolte *et al.*, 2019, p. 29);
- promoting reporting of lost gear and the implementation of net markers for fishing gear (Potts and Hastings, 2011, p. 101f);
- supporting municipalities and harbours to expand their infrastructure and reception facilities to collect retrieved and end-of-life fishing gear (Stolte *et al.*, 2019, p. 29);
- imposing obligatory no-special-fee systems in harbours, monitoring it and fining

violations;

- searching for technological solutions for the treatment of fishing gears;
- "*supporting waste sorting facilities and harbours in pre-processing*" in order to avoid that ALDFG and lead lines are disposed as hazardous waste (Stolte *et al.*, 2019, p. 29);
- set binding recycling targets;
- promoting awareness-raising campaigns on the issue of marine pollution from plastic and microplastic (*The impact on fisheries of marine litter*, 2020).

III-Implementation

1. Legislation

To effectively implement measures against the plastic pollution of the Mediterranean, both regional and international/global actions need to be taken. Whereas regional measures are particularly relevant to address local challenges of the plastic crisis and may contribute to a 7 % reduction in plastic waste emissions, a wide systemic change requires implementation at an international scale. This could take the shape of the UN Global Plastics Treaty.[119]

New legislation must implement strong and comprehensive provisions, which are based on scientific, peer-reviewed research and ensure effective actions that address the entire life cycle of plastics are taken urgently. It should provide an overall legal framework on the prevention, reduction and managing of marine litter, while considering the diverging challenges and needs of certain regions, especially those of developing countries, as they often lack sufficient resources, infrastructure and technological capacities to manage plastic properly.[120]

Without urgent actions, the surge in plastic production will lead to an increase in the annual waste flow of plastics into the oceans by nearly 200 % by 2040. In other words, the amount of plastics leaked into the oceans will range from 23 million to 37 million tons per year – equal to 50 kg of plastics per meter of coastline.[121]

However, one also needs to be cautious about the potential adverse environmental and social effects of new measures.[122] For instance, downstream measures will only reduce the demand for virgin fossil-fuel based plastics, while upstream measures also increase the price. Therefore a combination of both up- and downstream measures is essential to avoid a 'green paradox' (where downstream measures lead to higher plastic production levels) and to close loopholes for companies, which are not covered by certain downstream measures and would (without appropriate upstream measures) be able to buy fossil-fuel based plastics at a cheap price, due to the reduced demand.[123]

Additionally, it will take time to implement such measures, especially in countries with less institutional capacities. Thus the implementation of measures must be organised wisely and prioritise solutions for the highest leakage plastic categories, such as flexible plastic packaging (bags, films, etc.), multilayer/multi-material plastics (diapers, sachets, etc.) and microplastics.[124] The key objective should be to ensure resource efficiency in the ways we

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[119] *Collins ea*, Scientists' Declaration on the Need for Governance of Plastics Throughout their Lifecycles.

[120] *Earth Negotiations Bulletin*, Summary report, 26 November – 2 December 2022 1st Session of the Intergovernmental Negotiating Committee to develop an international legally binding instrument on plastic pollution, including in the marine environment (INC-1) 3 https://enb.iisd.org/plastic-pollution-marine-environment-negotiating-committee-inc1-summary; *Circle Economy*, The Circularity Gap Report 2022, 37.

[121] *Systemiq/The Pew Charitable Trust*, Breaking the Plastic Wave 9.

[122] *Systemiq/The Pew Charitable Trust*, Breaking the Plastic Wave 9.

[123] *Formitti/Savin/van den Bergh*, Regulation at the source? Comparing upstream and downstream climate policies (05.08.2021) 1,9 https://doi.org/10.1016/j.techfore.2021.121060.

[124] *World Bank Group*, Where ist the Value in the Chain? xxvi.

produce, use, reuse and recycle plastic materials.[125]
Besides environmental protection, a focus needs to be on the protection of vulnerable and at-risk persons. Most affected and exposed to health risks caused by plastic pollution are infants, children, pregnant women, indigenous people, workers and the population in immediate vicinity of plastic industries.[126]
Methods to adopt new provisions may be financial, technical and market-based instruments, supporting the development of up-, mid-, and downstream measures towards more sustainable plastic manufacture and management (for example through "Green Public Procurement" (GPP), as this measure can reduce the impact of public services significantly and promotes investments in green products).[127]
Important to bear in mind is the relationship between and context provided by marine litter legislation and other relevant laws (such as waste management and shipment laws) and if the new legislation aims to supplement existing laws or to replace them. Otherwise the well-intentioned efforts for new legislation would result in confusing and overlapping rules.[128]
Furthermore, it should be mentioned, that beyond a legal framework, it will require serious ambitions, funding, scope and leadership from states and industries to implement and enforce new marine litter legislation. To successfully change or introduce new systems (such as reduction, reuse, redesign, collection and recycling systems) that are able to achieve the necessary reduction of marine litter and respond to social and economic needs, strong engagement from both, stakeholders from the industry and the civil society, is required.[129]
For certain measures, individual means of implementation will be needed, some recommendations on the implementation of actions have already been made in the previous chapters.

2. UN Treaty on Plastic Pollution

One of the most promising legislative initiatives to stop plastic pollution globally, as well as in the Mediterranean, is the United Nations treaty against plastic pollution, which is now being negotiated and has the potential to have far-reaching effects.
To obtain the desirable outcome, the treaty should contain internationally as well as regionally binding provisions, such as general principles of precaution, measurable objectives, universally recognised definitions (e.g. for compostable and biodegradable materials) and performance indicators, harmonised databases with analysis protocols[130] as well as a global cap on plastic production, including a detailed roadmap with targets and timetables, and effective midstream and downstream measures, even though upstream measures have to be prioritised due to their

[125] eunomia 4.
[126] *Landrigan ea*, The Minderoo-Monaco Commission on Plastics and Human Health 129.
[127] *Watkins ea*, Policy approaches to incentivise sustainable plastic design 11; *Collins ea*, Scientists' Declaration on the Need for Governance of Plastics Throughout their Lifecycles.
[128] *Bruch ea*, Marine Litter Legislation: A Toolkit for Policymakers ix.
[129] *Bruch ea*, Marine Litter Legislation: A Toolkit for Policymakers 70; *Systemiq/The Pew Charitable Trust*, Breaking the Plastic Wave 9.
[130] *Collins ea*, Scientists' Declaration on the Need for Governance of Plastics Throughout their Lifecycles.

higher efficiency.[131]
Furthermore, it should establish a permanent scientific policy-advisory body, which provides scientific socio-economic and environmental evidence for the necessity and effects of the taken actions and ensures that local and traditional knowledge, innovations and practices (TKIP) are respected and shared among the contracting parties.[132]
Regarding the pressing matter of lost fishing gear, the treaty needs to set standards and "best practices" in managing fishing gear and must remove regulatory barriers. Regional and international coordination is required to harmonise regulatory standards, to adopt mutually acknowledged definitions of the scope, the sources and the impacts of the problem, to exchange knowledge, "best practices" and guidelines of sustainable prevention, management and removal of ghost gear, to standardise gear marking, to promote the enforcement of existing laws and regulations and to invest in collecting and recycling technologies. Already existing mechanisms, such as the Regional Seas Programme, may be helpful to exchange knowledge and share data and "best practices".[133]
As plastics from all over the world end up in the Mediterranean, the success of a global plastics treaty to end plastic pollution of the Mediterranean is directly linked to a far-reaching ratification by a majority of the countries worldwide. The key challenge therefore is to find a balance between the diverging views of the negotiating parties – on the one hand those favouring a comprehensive legally binding convention with core obligations and control instruments, and on the other hand those preferring a framework convention for individual national action plans (NAPs).[134]
While a bottom-up approach would have the advantage that more countries, including those contributing the most to the plastic crisis in the Mediterranean, would be on board, it would also result in weaker and insufficient measures. On the other side, history has shown (especially the Kyoto Protocol to the UN Framework Convention on Climate Change) that too ambitious top-down approaches in international environmental treaties, may be efficient on paper, though lead to fewer countries ratifying them.[135]
In any case, to ensure efficient implementation with coordinated actions globally, nationally, regionally and locally, it is important to encourage various policymakers from global, national, regional and local levels, to participate in the negotiations to the treaty.[136]
In this context, close attention should be paid to the different challenges different regions face in the light of plastic pollution. Their challenges vary for example due to differences in the sources of plastic leakage, the composition of plastic waste, the existing collection systems, infrastructure and population demographics. High-income countries should focus on microplastic leakages, innovations in technologies and policies to reduce and substitute plastics and on further enhancing the rates of recycling. Middle- and low-income countries on the other side should increase their formal collection efforts, reduce plastic consumption, improve their

[131] *Landrigan ea*, The Minderoo-Monaco Commission on Plastics and Human Health 4f.
[132] *Collins ea*, Scientists' Declaration on the Need for Governance of Plastics Throughout their Lifecycles.
[133] *UNEP ea*, Turning of the Tap 49.
[134] *Earth Negotiations Bulletin*, Summary report, 26 November – 2 December 2022 3.
[135] *Earth Negotiations Bulletin*, Summary report, 26 November – 2 December 2022 8.
[136] *Landrigan ea*, The Minderoo-Monaco Commission on Plastics and Human Health 123.

sorting and recycling infrastructure and end leakage of already collected plastic waste.[137]

3. Monitoring and Reporting

Central for a treaty on plastic pollution to succeed, is the establishment of a global monitoring and reporting system, to evaluate the effectivity of the actions in a national, regional and international scale. Constant and harmonised monitoring and evaluation of plastic production and pollution will provide detailed information on plastic production, trade, consumption, plastic waste management and retrieval, will improve the effectivity of the taken actions against plastic pollution and will identify unknown leakages of particularly harmful plastics (microplastics and toxic pollutants in plastic) into the open environment, especially into the Mediterranean Sea. Moreover, it will prevent and mitigate further harm to the Mediterranean, as it promotes compliance and enforcement.[138]

4. Coordination and Cooperation

Coordination and cooperation among all stakeholders are key elements in the fight against plastic pollution in the Mediterranean. At CMS! we strongly emphasize the importance of a collaborative approach, bringing together governments, NGOs, businesses, and local communities to develop effective and sustainable solutions. Only through collective action and shared responsibility can we achieve significant and lasting progress in protecting the Mediterranean ecosystem from plastic waste.

Considering the cross-border and cross-sector scale of plastic pollution in waters, regional and international instruments as well as scientific bodies should be used to ensure cooperation and coordination among the different states and actors in the plastic industry. Not only will this ensure synergies and improves the pace we target plastic pollution, but it will also avoid duplication and helps to share experience (i.e. technology transfer).[139] Development cooperation may also contribute to an increase in sustainable plastics in non-OECD countries.[140]

To coordinate among the different sectors/stakeholders – including countries, subnational authorities as well as private and civil key stakeholders – that play a role in tackling marine litter, an inter-agency mechanism is necessary to collect and share information on development, implementation and review of marine litter legislation as well as provide a platform to exchange technologies. Sharing this information and these technologies can help other jurisdictions and stakeholders considering similar measures. It will also help to demonstrate the role of various stakeholders and how policy debates around plastic pollution are lead. Online databases may be a helpful tool to share the information and enable access for all relevant stakeholders.[141]

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[137] *Systemiq/The Pew Charitable Trust*, Breaking the Plastic Wave 11.

[138] *Collins ea*, Scientists' Declaration on the Need for Governance of Plastics Throughout their Lifecycles.

[139] *Collins ea*, Scientists' Declaration on the Need for Governance of Plastics Throughout their Lifecycles.

[140] *Watkins ea*, Policy approaches to incentivise sustainable plastic design 11.

[141] *Bruch ea*, Marine Litter Legislation: A Toolkit for Policymakers.

5. Social and behavioural change

In parallel to legal measures, social and behavioural change strategies might be valuable instruments to support policies to stop plastic pollution in the Mediterranean Sea. If used right, sophisticated campaigns, such as educational programs and communication strategies can serve as powerful tools to garner public support and engagement in addressing plastic pollution as well as create a collective sense of environmental responsibility. For regions with less advanced legislation on plastic pollution, behavioural campaigns and subsequently raised public awareness can also help to build pressure on governments and stakeholders to introduce and implement new legislation.[142]

Successful social and behavioural change campaigns should be customised (i.e. based on gender, age, political identity and regional contexts), illustrate a feeling that sustainable practises (such as plastic reduction, safe disposal, etc.) are widely practiced and are socially recognised, demonstrate the benefits of environmental sound behaviour and suggest special and realisable actions (i.e. avoid unnecessary plastics, use durable instead of disposable plastics products, dispose plastic waste in the designated containers, purchase packaging-free products, instead of liquid products buy solid products without packaging).[143]

Conclusion

The foregoing pages have outlined the different areas along the life cycle of plastics that require targeted policies to achieve a transformation of the plastics value chain. While the challenges faced are manifold and cannot be tackled while focusing on one single solution a combination of upstream, midstream and downstream policies implemented globally in a way that is "immediate, ambitious, and concerted […] across the entire plastics value chain"[144] would make it possible for humanity to tackle them as a necessary step to put an end to plastic pollution in the Mediterranean. To achieve this an "approach is needed which principally focuses on prevention, reduction and redesigning problematic plastics out of the global economy".[145]

Key challenges include the competitive pricing of virgin plastics made possible by the "coupling of plastics to fossil-based feedstocks" and its convenience in the form of single-use products, which are detrimental for resource efficiency. Even with a switch to alternative materials other challenges may arise such as emissions increasing alongside an increase in product weight or impacts on biodiversity and land use due to a surge of bio-based materials. The involvement and coordination of all stakeholders – to tackle the manifold challenges using a "mix of instruments and measures" – across municipal, regional and intergovernmental levels as well as the private sector, civil society and consumers is necessary.[146]

While it is important to be aware of the obstacles set firmly in the way of notably reducing plastic pollution it is even more important to remember that "we have the solutions at our

[142] *UNEP ea*, Turning of the Tap 57.

[143] *UNEP ea*, Turning of the Tap 57.

[144] *Systemiq/The Pew Charitable Trust*, Breaking the Plastic Wave 9.

[145] *Collins ea*, Scientists' Declaration on the Need for Governance of Plastics Throughout their Lifecycles.

[146] *Watkins ea*, Policy approaches to incentivise sustainable plastic design 12.

fingertips" and that their urgent implementation can be incredibly impactful. Urgent however being the key word, as "an implementation delay of five years would result in an additional ~80 million metric tons of plastic going into the ocean by 2040".[147]

Nonetheless, crucial efforts have already been made that show that the establishment of a circular economy is under way. For example, the "Ellen MacArthur Foundation's New Plastics Economy initiative […] has already united more than 400 organizations behind a vision for a circular economy".[148] While such efforts are broadly challenged by the threats posed to "human and ecosystem health, human rights and climate stability" by a "largely unregulated plastics industry and the national and international policy frameworks that support and subsidise polluting industries",[149] these challenges can be addressed using the depicted holistic approach, if implementation occurs with tireless determination, ultimately enabling humanity to end plastic pollution in the Mediterranean.

Negotiations to reach a final agreement on the treaty failed in August 2025 but uncertain prospects for the future. However, such a treaty is vital with global plastic waste expected to reach 1.7 billion metric tons by 2060, costing a cumulative $281 trillion by some estimates.[150]

[147] *Systemiq/The Pew Charitable Trust*, Breaking the Plastic Wave 12.

[148] *Systemiq/The Pew Charitable Trust*, Breaking the Plastic Wave 12.

[149] *Collins ea*, Scientists' Declaration on the Need for Governance of Plastics Throughout their Lifecycles.

[150] *Willige*, INC-5.2: The global plastics treaty talks, August 15, 2025.

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