



UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

Development of recycling industries within the UNIDO circular economy approach

INCLUSIVE AND
SUSTAINABLE
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DEVELOPMENT



A proposed strategy for positioning recycling and development of recycling industries within a UNIDO-wide circular economy approach

This background and strategy paper proposes that development of recycling industries for industrial and post-consumer waste would be an ideal entry point for the United Nations Industrial Development Organization (UNIDO) to consolidate and scale up its circular economy activities. It further propounds that this approach would complement with its Member States' and partner countries' socio-economic and environmental needs, capabilities and objectives, to enable them to transition to a circular economy together with the other “cogs” such as green design and cleaner production of the circular economy. To this end, it outlines a broad strategy framework, which provides some guidance as to how this objective could be achieved.

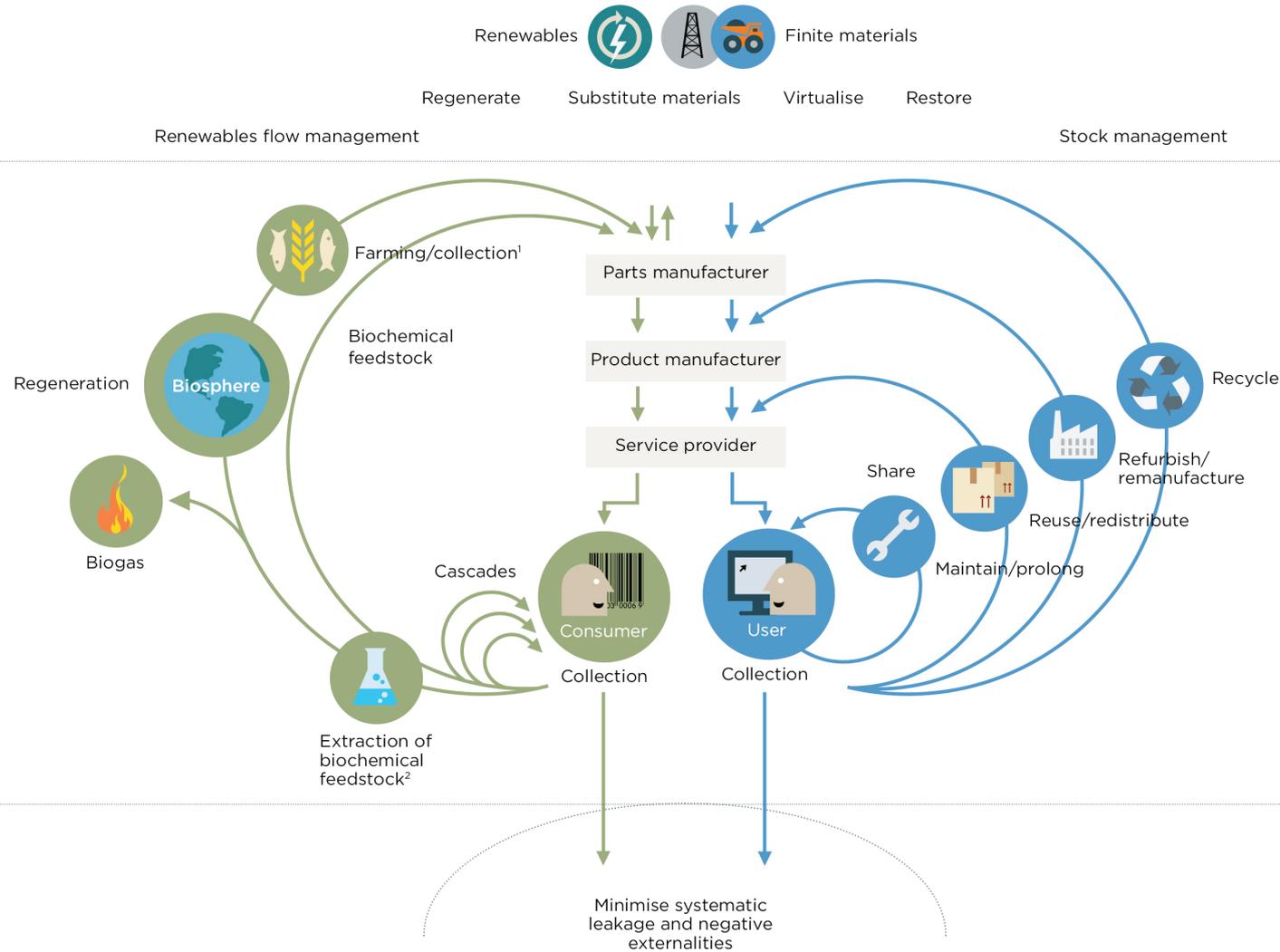
The depletion of finite resources, rising populations, rapid urban expansion, growing middle-class consumption levels, pollution and anthropogenic climate change are placing the world's economic and ecological systems under immense strain. This predicament can be linked to the current global economic model, which is becoming increasingly redundant within the ecological limits of the planet, and which from its very nature, encourages waste and continued resource extraction.

An increasingly popular concept gaining traction globally is the circular economy as depicted in figure 1. Circular Economy departs from the linear economic model into a new global system whereby goods are made, used, reused, repaired and then converted again into reusable secondary raw materials. The way in which products are designed, how resources are consumed, concepts of ownership, modes of production and business models, are some of the areas in which change is needed for a sustainable future.

A shift in narrative and systems - from a linear to more circular and regenerative systems - is an opportunity to embrace more innovative processes that, amongst others, strive for greater resource efficiency, with cleaner production processes that represent potential gains in economic, environmental and cultural terms.

Recycling can act as a fundamental lynchpin of the circular economy in that it plays a transformative role in turning post-consumer materials into valuable substances or products, feeding used materials back into the value chain and correspondingly achieving the “waste-to-resource” paradigm. It thus presents numerous economic, environmental and social opportunities. Despite this, its potential has yet to be fully realized due to a number of legal, policy, infrastructural and market barriers.

Figure 1. Ellen MacArthur Foundation: The Circular Economy



There are a number of factors that converge to recommend recycling as an effective and logical first step towards helping our Member States and partner countries to ensure that they are “circular ready.” The mounting global waste crisis, point to recycling as a critical first area of intervention within a broader circular economy strategy.

Therefore, greening and strengthening recycling industries to enable them to assume an integral role in the circular economy, presents a great opportunity for our Member States to develop the concept to accommodate their particular needs and capabilities and to simultaneously address their solid waste problems.

Strengthening of recycling industries also requires thinking beyond the firm and sectoral levels; it requires the creation of the right market incentives to ensure that there is a demand from the market that matches supply; the recycled materials need to be safe for both the environment and humans to be handled and then reprocessed and reused; and the trade of materials and components need to be transparent in order to be traceable so that there is confidence in their claim to circularity.

These factors, combined with the fact that the design of goods only occurs in a small number of developing and middle income countries, converge to recommend that recycling and the associated R¹ structures, of which UNIDO is already active, all point to these areas being a logical and urgent first step in the circular economy.

Summary of recommendations

- The first “cog” in UNIDO’s “**Circular Ready**”² strategy should be recycling to catalyse broader circular economy activities targeting activities at the micro (firm); sectoral; and national (framework conditions) levels.
- “Quick wins:” Scale-up current UNIDO recycling activities to ensure that they are “circular ready” to provide secondary raw material feedstock in the circular economy system;
- Additional scaling: For additional impact, recycling activities could be inserted into a range of broader UNIDO initiatives such as industrial symbiosis and wider eco-industrial parks concepts; sustainable cities; or could utilise new technologies from digitization through Industry 4.0.

UNIDO and the circular economy

The mandate of UNIDO is to promote and accelerate Inclusive and Sustainable Industrial Development (ISID) in developing countries and economies in transition by contributing to poverty reduction, economic growth, and sustainable development. A critical component of sustainable growth has proven to be the economic models that govern resource use and production, as many studies have shown that resource efficiency is one of the key factors contributing to Gross Domestic Product (GDP) growth. Not only in the developing world, but all over the globe, even in technologically advanced societies, linear economic models are among the major hindrances to lasting prosperity.

UNIDO supports the adoption of circular economy principles that would lead to higher resource efficiency and less waste and is one of the leading UN agencies in regards to implementing and monitoring Sustainable Development Goal (SDG) 9: “Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation”. The Organization has thus implemented projects and programmes that address various building blocks of circular economy. Some projects supports resource efficient and cleaner manufacturing of products, others help develop safe, easy-to-recycle products with longer lifetimes and still others deal with the recovery or safe disposal of resources at the end of a product’s life. Recycling further aligns well to SDG 12: “Responsible consumption and production”.

In making this shift, it is important that the differing needs of developing and developed countries are taken into consideration. For example, a fall in demand for primary goods from developed countries could have a negative impact on poorer nations, in particular Least Developed Countries (LDCs), which rely heavily on exports. At the same time, LDCs and other developing economies may lack the knowledge

¹ Please refer to the diagram on p. 6: Reuse, repurpose, repair, remanufacture, recycle.

² A suggested term that could be used to describe a Member States’ transition to a circular economy.

and technology necessary to make the circular economy possible. In this regard, UNIDO is working to ensure that the circular economy will benefit the global economic system, including developing economies. Building on decades of work helping developing countries to move to more resource-efficient, clean industrial products, processes and industrial standards, the Organization is positioning itself as a key provider of technical cooperation enabling the smooth transition to a circular economy approach.

In the field of environment, UNIDO's services include capacity-building for the industrial sector to improve resource productivity, reuse and recycling, as well as policy advice and training on the adoption of sustainable energy solutions, environmentally sound technologies and new business models and approaches for addressing environmental challenges, such as cleaner production chemical leasing and circular economy.

Why recycling can act as the first “cog” in the transition to a circular economy for UNIDO and its member states

Recycling plays a catalytic role in the circular economy through its role in turning post-consumer materials into valuable substances or products, feeding used materials back into the value chain; however, it is often argued that the circular economy is more than “just” recycling.

Design is integral to the circular economy as it facilitates the use of safer chemicals and sustainable production processes are essential for reducing releases throughout the life cycles of chemicals and products, including during the reuse, recycle and disposal stages. These front-of-the-pipe solutions, such as green design, also help ensure that secondary raw materials rechannelled into a circular economy are not contaminated with hazardous chemicals.

One impediment to design being the starting point of a circular transition (in the context of a national or sub-national framework) is that design typically occurs in wealthier industrialised countries; therefore, it does not appear to be a useful starting point in countries where there is not a flourishing design industry or market in existence, although the issue can be addressed through increased Extended Producer Responsibility (EPR) measures and supported through Blockchain technology.

Another argument of starting circular economy work from recycling and development of recycling industries, is the acute waste management challenge faced by many developing countries. This is also true for many industrialised countries, whose waste management systems also under pressure after China's National Sword Policy banned many scrap materials and implemented strict contamination requirements.

Use of electronic devices, fast fashion, growing industries, etc. are all converging to create a “perfect storm” of solid waste proliferation, which if viewed as a valuable reusable resource, could be used to be used as feedstock to introduce back into a circular system.

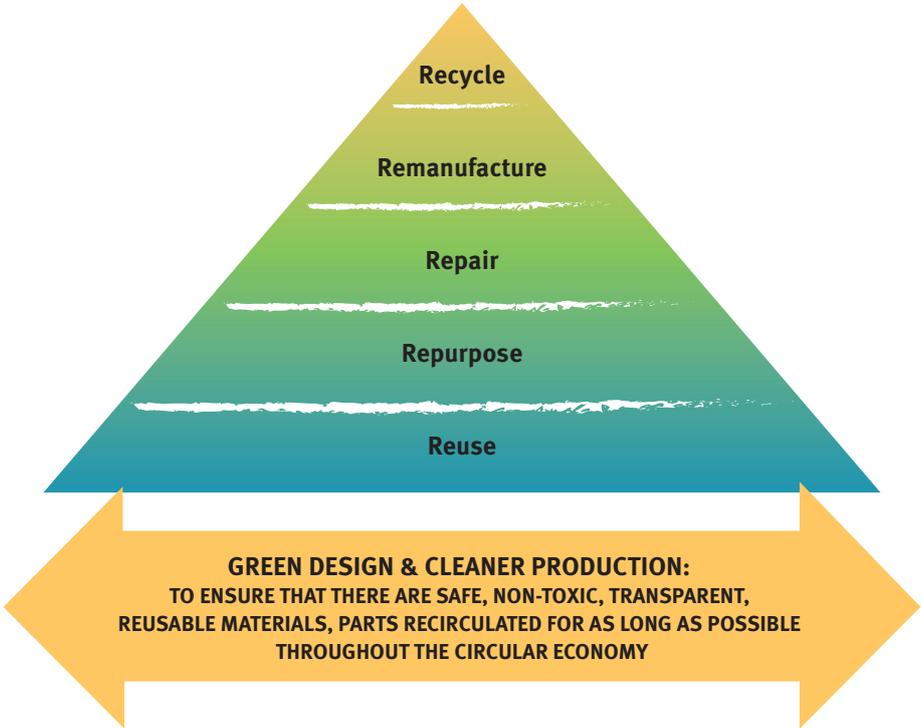
Aside from precedent, which naturally helps to give guidance as to what other countries can do and provide insight into what other countries or other levels of governance felt to be a priority, the mounting global waste problem, all point to the urgency required with which to strengthen recycling industries and to ensure that their recycled products or materials, have a market, that they are designed in a manner which utilises materials that are safe, and the components of which are transparent, traceable and con-

flict free. These factors, combined with the fact that the design of goods typically do not occur in developing countries, converge to recommend that recycling and the associated R structures, of which UNIDO is already active, all point to these areas being a logical and urgent first step in the circular economy.

When examining the general profile of UNIDO’s technical cooperation countries and their developmental and industrialisation objectives and capacities, then working within the recycling hierarchy as part of a transition to a circular economy would most likely be better aligned with their immediate to medium term needs and capacities.

This is hardly surprising given a 2016 European Environmental Agency report, which reviewed approaches to material resource efficiency and to circular economy in 32 European countries found that circular economy activity so far has mostly been associated with waste management and emerged out of downstream considerations.

Figure 2: Circular economy secondary raw materials hierarchy (UNIDO).



The figure above represents a new “recycling as part of the circular economy” hierarchy. It demonstrates how green design is key to ensuring that the “R’s”(reuse, repurpose etc.) are safe, clean and green and can go through an extended lifespan before being recycling into a new material or product and that the processes adhere to UNIDO’s Resource Efficient Cleaner Production principles.

The figure above represents the ideal journey of post-consumer and industrial waste as contrasted to and the waste hierarchy in a linear economy where waste is ultimately disposed of in a landfill. In this revised version, the waste goes through a “process” or journey, from reuse, to repurposing, repair, remanufacturing and then recycling of the reusable material into new products. This process or elements of this process are well established in many lower income countries, but often within the informal sector. Whether

the processes outlined below need to be formalised and how they can be formalised and by whom is an issue that can be explored in greater detail.

Phasing out of hazardous substances

UNIDO's work of phasing out of hazardous substances is a particularly pertinent area that will need scaling-up as part of the circular economy drive. Substances that pose a threat to human health, or the environment need to be prevented from re-circulation through the circular economy. Again, this reiterates the importance of green design, to ensure that the composition of a product is known, traceable and can be reutilised in a safe, non-toxic manner.

As a leading global implementing agency of Multilateral Environmental Agreements, which include the Montreal Protocol on Substances that Deplete the Ozone Layer, Stockholm Convention on Persistent Organic Pollutants (POPs) and the Minamata Convention on Mercury, UNIDO works with Member States to limit the negative effects of industrial production on the environment and on human health through promoting the enhanced production of green goods and services. Such agreements are crucial for developing countries, which are home to most of the world's industrial production and at the same time face the most severe consequences of environmental degradation.

Through these activities, UNIDO brings change to entire industrial sectors by reducing and phasing out substances that degrade the environment, thereby helping to improve health and climate as well as indices and to foster more competitive, environmentally-friendly and sustainable industries.

The challenge to be tackled

Recycling: Overview

- Significant resources in value chains are lost due to low recycling rates. Only 9 per cent of global material resources are recycled.³
- Less than 9 per cent of the 6.3 billion tonnes of plastic waste generated up to 2015 has been recycled, while 12 per cent was incinerated and 79 per cent was disposed in landfills or in the environment.
- Much economic activity in lower-income countries revolves around sorting and reusing waste. However, higher-value, employment-generating opportunities for reuse and remanufacturing are yet to be captured. (Chatham House).
- Strong (albeit often informal) sorting, reusing and repairing waste systems and a cheap labour force are a competitive advantage that many lower income countries have. This advantage needs to be explored further in order to develop a niche for these countries within the circular economy.

³ https://wedocs.unep.org/bitstream/handle/20.500.11822/27651/GCOII_synth.pdf?sequence=1&isAllowed=y

- Many developing countries already possess vibrant repair and refurbishment sectors (Schmitz 2016), whose development and professionalization could be further supported to reach their full potential.
- Secondary raw materials global market: Increased quality demands, such as from China's National Sword Policy have increased quality demands, which have put a strain on Materials Recovery Facilities' ability to meet these requirements.
- Secondary raw materials supply continues to outpace demand.

Solid waste management systems

A basic precondition for recycling as part of the circular economy is to establish a system of primary waste selection and separation to obtain as clean fractions and as large amounts as possible. This can be achieved by putting in place a clear, comprehensive and economically viable model, supported by adequate infrastructure.

In order to have a system that can recycle (and, as shall be noted below-repair, remanufacture, repurpose and then finally recycle) there needs to be a system that can collect, transport, sort, store (then the R's) and then finally recycle the waste/resources. This is why a robust take-back and waste management system is required even before a discussion of recycling at scale can be discussed.

Recycling industries

Recyclers play a key role in this transition by being the link in the circular economy which turn waste into new resources and re-introduce them into production chains. The use of recycled materials directly translates into fewer natural resources being used and considerably less energy being consumed when compared to production processes using virgin materials⁴.

Recycling industries are a significant employer globally, with an approximate 1.6 million people worldwide active in the recycling industry.⁵ Together, they handle more than 600 million tonnes of recyclables every year. With an annual turnover of more than \$200 billion, the sector has already become a key driver for tomorrow's sustainable development."

In practice, however, recycling operations and the establishment of a sustainable recycling industry still encounter barriers as discussed below, if recycling is to effectively play its role in the SDGs and the circular economy.

Some barriers that currently prevent recycling industries from realizing their full potential

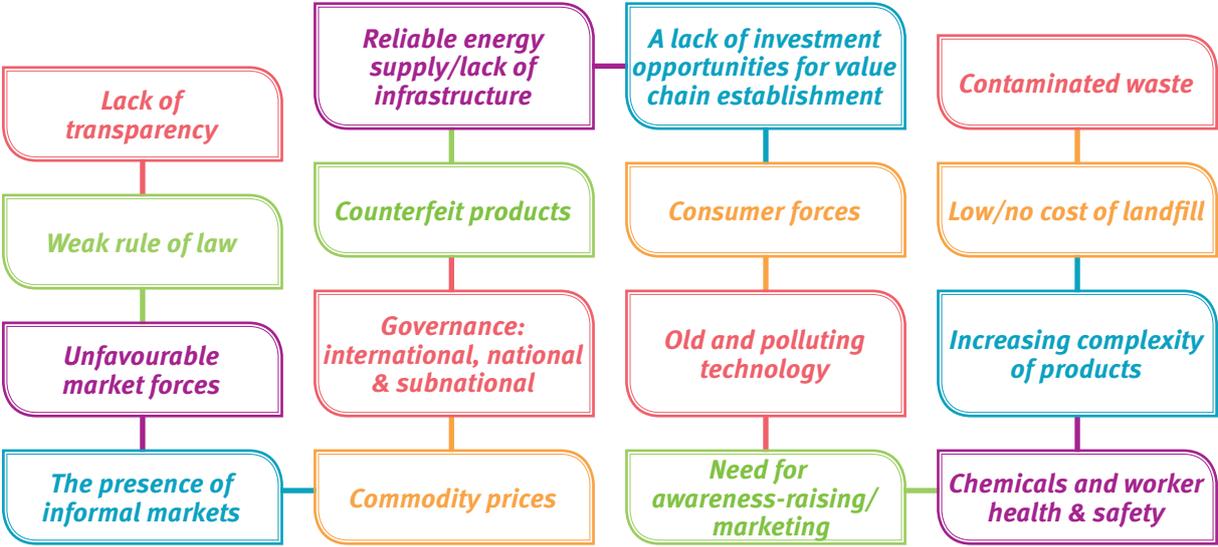
In 2018, a shift in emphasis was initiated to develop a more coherent approach by bringing projects more into line with the aims of the circular economy. An important step in this direction came in November with a conference of around 50 UNIDO partner countries in Vienna under the heading: "Circular Economy: Development of Recycling Industries".

⁴ Bureau of International Recycling.

⁵ Bureau of International Recycling

The conference identified, as visualized below, current barriers hindering progress and elucidating the types of policies and measures that would support the development of robust and sustainable recycling industries around the world.

Figure 3: Visual depiction of the Barriers to Recycling Industry Development⁶ (UNIDO)



The conference was concluded with participants endorsing the contents of the draft background report annexed and the attached the Chair’s Summary represents the participants’ agreement as to the main barriers that currently hinder recycling industries from harnessing their full potential and challenges to realizing a sustainable recycling industry as part of a circular economy.

Both documents therefore represent participants’ consensus as to a shared way forward for UNIDO’s programmatic and policy work, with the ambition of embedding recycling as a central cog in the circular economy. These results, as summarised in the following tables, represent the key outcomes of the discussions and the shared will of participants, which in turn have played a central role in shaping this strategy.

Desired intervention areas as articulated by Member States	
Policies	<p>Policies at both supply and demand side to create or change the conditions to increase the recycling rates of plastic.</p> <p>It is necessary to establish a tight control of operations, a level playing field, and clear rules so that the recycling industry can achieve its set targets.</p>
International governance	<p>Develop internationally accepted criteria for recyclability of materials to enable responsible cross-border movement of waste based raw material and intermediate products and enable producers and brands to legally collect waste.</p>
Partnerships	<p>There is a need to create partnerships for action on technology transfer to help countries to develop e-waste management systems and strategies based on the whole recycling value chains and life-cycle analyses.</p>
Greening of recycling industries	<p>Strengthening and greening recycling industries is a key step for implementing a circular economy.</p>

6 Paper by K. Kummer-Peiray (Kummer EcoConsult) presented at Circular Economy: Development of Recycling Industries meeting, Vienna, November 2018

The conference noted that the success of any interventions to remove barriers to the development of a sustainable recycling industry is contingent on:

- An investment-friendly environment allowing business development, which in turn depends on political and economic stability, security, and reliable infrastructures (e.g. transport, energy, communications). This also comprises a functioning legal and institutional framework within which the industry can develop.
- A paradigm shift towards perceiving waste as a valuable resource rather than a costly problem
- Placing waste and materials management at the top of the political agenda (including in development cooperation)

Main recommendations stemming from the Recycling Industries and the Circular Economy background report (in Annex attached)	
Supportive policies	<ul style="list-style-type: none"> • Awareness-raising on environmental/economic benefits of recycling • Waste management policies favouring recycling • Green public procurement supporting recycling • Green manufacturing policies integrating recycling
Enabling and incentives	<ul style="list-style-type: none"> • Taxation, tax reliefs, and subsidies favouring recycling • Regulatory requirements favouring recycling • Material composition: clear definitions and good understanding • Requirements for manufacturing favourable to recycling
International cooperation	<ul style="list-style-type: none"> • International networks and partnerships • Targeted technical assistance and capacity building • Harmonization of requirements and procedures for recyclables management • Trade liberalization for recyclables

A proposed way forward: Recycling of post-consumer and industrial waste as part of UNIDO's approach to the circular economy

Broadly, UNIDO aims to support Member States and recycling industries to:

- Support recycling industries to be able to recycle post-consumer and post-industrial waste into high grade secondary resources as part of the “closed loop” system.
- To ensure that these activities are guided by RECP to ensure that recycling activities are “green” and safe.
- (Less of a focus) is to also provide support to the other “R’s as outlined below.
- Strengthen the framework conditions to ensure that they are supportive of recycling industries and the circular economy.

UNIDO has been working on the building blocks of the circular economy for quite some time (as described above), it is therefore recommended that circular activities build on the work that has already been undertaken in the waste management or recycling domain with a view to integrating these activities into a circular economy for “quick wins.”

UNIDO's Comparative Advantage

- UNIDO has already made a strong contribution to the foundations of the circular economy, even before the concept was widely known. It can consolidate these activities, and address the majority of the main “cogs” simultaneously, drawing on its technical know-how, policy experience; its convening power and presence around the world.
- UNIDO recognizes that stakeholder engagement and building solid partnerships are necessary to achieve development results. UNIDO's convening role brings Member States, the private sector, civil society and other partners together in major outcome-oriented events that serve to exchange and disseminate knowledge and information, facilitate partnerships, and forge common positions and action plans for inclusive and sustainable industrial development.
- Importantly, it also has a strong presence in recycling activities and complementary thematic areas, such as chemicals management (and associated activities), which intersect with green/eco-design, green industry/CP which combined the alignment of which will be instrumental to making the circular economy possible.
- Combined, these factors place UNIDO in a competitive advantage vis-à-vis its partners. This is an opportunity to scale-up and further promote these activities, which demonstrate that UNIDO has a strong foundation at the micro, meso and macro levels in middle income and developing countries.

Working strategy

UNIDO will continue to offer cutting edge expertise on a range of recycling activities at the micro, meso and macro levels, see figure 3, all with the view of transitioning towards a circular economy by working with its partner countries to embed recycling as a central “cog” in the circular economy. UNIDO shall endeavour to realize this through the establishment of pilot projects, expanding the network of recycling beyond individual sites, working towards the establishment of national networks of CE ecosystems in which recycling is one enabler of broader CE activities. Work can include the development of national or regional action plans, the improvement of the legal and institutional frameworks, training and capacity building, technical cooperation and the development of business models.

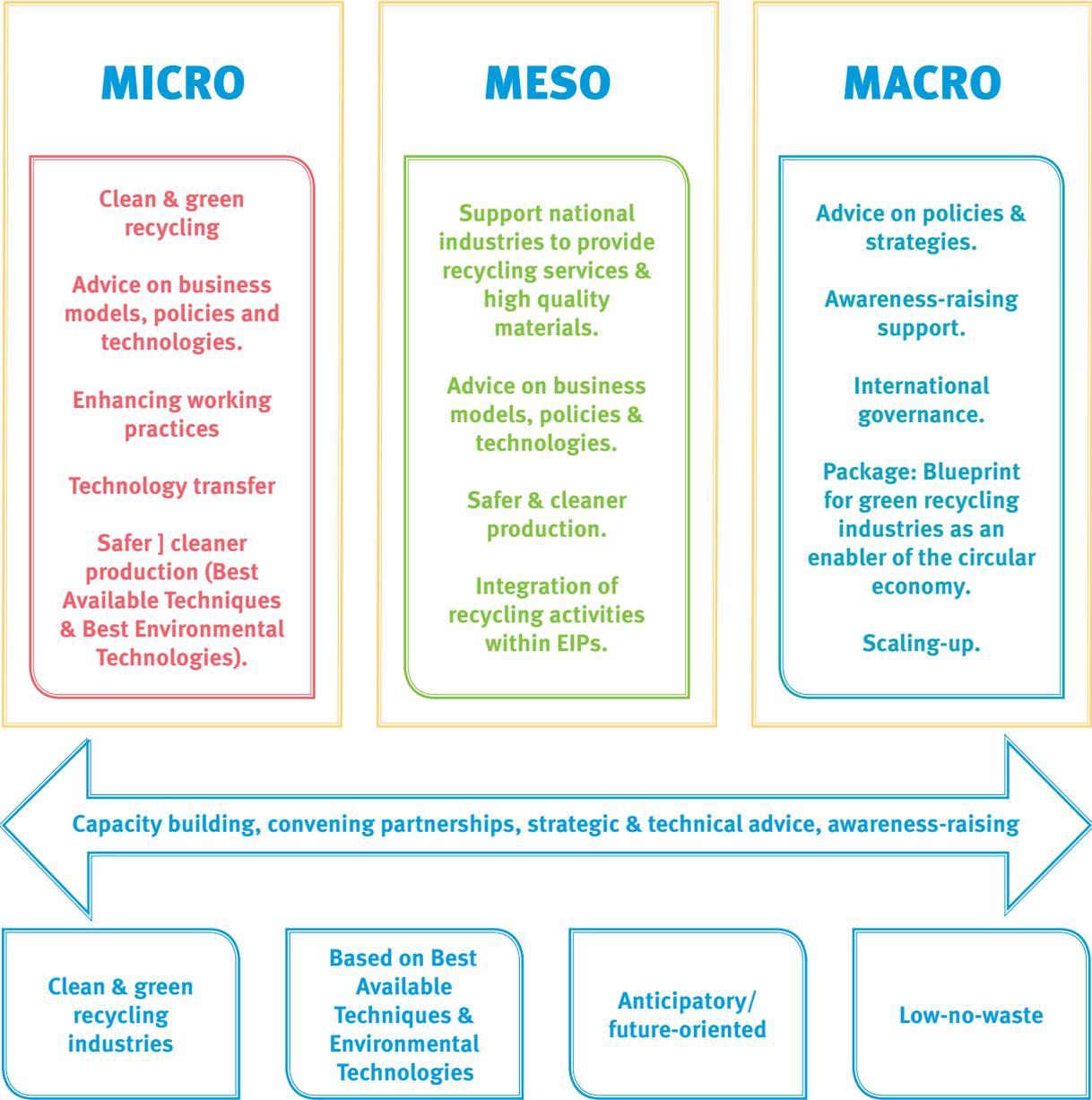
UNIDO’s goal is to affect change at every level. For wide-reaching impact, there needs to be a policy and governance framework in place to provide certainty, guidance and correspondingly confidence. To this end, UNIDO offers what could be called a “Circular Ready” Package/ “Blueprint for green recycling industries as an enabler of the circular economy” package, which can help governments and other entities to navigate the complexity of cross-sectoral and multilevel governance challenges associated with large scale changes in the recycling sector.

Guiding principles of this work

The principles that should guide UNIDO’s work in strengthening the recycling industries so that they can assume a strong role in broader circular economy activities are as follows:

- Low-no waste production
- Green industry/cleaner production resource efficient recycling activities with a careful life cycle assessment (LCA) undertaken: Low emissions and high materials, water and energy use efficiency in production and maximize uses of renewable resources as core characteristics. Reduction refers to minimizing inputs of primary energy and raw materials which can be achieved through improvements in production efficiency.
- Employing state-of-the art (safe and clean) technologies to the greatest extent possible.
- Extended Producer Responsibility and working at the design stage to ensure for safe and easy “r” process.
- Integrating the informal waste sector into the formal sector.

Figure 4. UNIDO Assistance and Expertise



Options for scaling up this work

There are a number of entry points to be explored together with development partners that could assume a wider circular objective. These include:

- Expansion of current recycling projects
- Eco-Industrial parks:
- Multilateral Environmental Convention activities
- Sustainable cities work;
- Infrastructure developments, with waste management upgrades;

Conclusion

The central tenets of the circular economy include the ambition to design out waste and pollution and to keep products and materials in use. This remains the objective and UNIDO is working towards this. In the meantime however, recycling presents a feasible option to aid Member States in their transition towards circular economies as recycling is also intricately linked with green industry and green design, with the former in particular providing ample opportunity to be addressed within the recycling component.

ANNEX 1

Removing the Barriers to Recycling Industry Development

This paper was prepared for UNIDO by Katharina Kummer Peiry (Kummer EcoConsult). The inputs from the Bureau of International Recycling (BIR) and the comments from staff members of UNIDO are gratefully acknowledged. The presentations and discussions at the conference “Circular Economy: Development of Recycling Industries” organized by UNIDO on 14-15 November 2018 have also been taken into account.

BARRIERS TO THE DEVELOPMENT OF A SUSTAINABLE RECYCLING INDUSTRY

Recycling thus has a crucial role for both the achievement of the SDGs and the transition to a Circular Economy, and accordingly receives broad support at the policy level. In practice, however, recycling operations and the establishment of a sustainable recycling industry still encounter barriers, including in particular in developing countries. Policy makers and sector stakeholders must therefore identify and address these barriers if recycling is to effectively play its role in the SDGs and the Circular Economy.

As is the case for all industrial operations, the overall political and economic stability of a country as well as its level of development are crucial to the development of a sustainable recycling industry. A politically unstable country does not offer the investment friendly environment required for any commercial activity, given the lack of security and the constant danger of disruption of the operations. This is often compounded by the absence of a strong and effective legal, policy and institutional framework; the lack of economic stability; and a weak, insufficient or unreliable general infrastructure, including in the areas of transport, energy, and communications. Where the level of economic development is low, there is often no significant industrial development, or the industries may be fragmented.

The existence of a strong, reliable and efficient legal, policy and institutional framework is a key prerequisite for any sustainable industrial development, including the development of a sustainable recycling industry. It ensures security, predictability, and a level playing field for all commercial actors. Deficiencies in this respect are often (although not always) associated with political and economic instability and/or low economic development. A generally weak legal and institutional framework is characterized by processes that are unfair, corrupt, non-transparent, slow, or bureaucratic.

1. Institutional, structural and economic barriers

In addition to the impact on industrial development generally, a low level of economic development, a weak general infrastructure and an ineffective legal and institutional framework also present specific challenges to the development of a recycling industry. These include the absence of the infrastructure required for collection, storage, dismantling and processing; limited investment possibilities to establish

the value chain from collection to processing; and lack of financial incentives for recycling. These factors may prevent the development of a recycling industry even where a market for recyclable products and materials would exist. Geographic, economic and demographic factors also have an influence on the development of a sustainable recycling industry. Population growth drives the use of recycled materials. Low per capita income may lead to low consumption of materials and goods, which in turn limits the availability of recyclable materials. Conversely, the throw-away mentality in consumer societies will generate more recyclables. Many countries, including in particular small island developing countries, generally do not have a level of industrial development that will generate a sufficient amount of recyclable materials to allow the development of a domestic recycling industry. A low level of development often leads to a strong presence of the informal sector. For example, in many developing countries, a large informal recycling sector for electric and electronic waste has developed as a result of the absence of a legal framework for recycling, and due to the lack of capacity and resources for a formal waste collection and treatment system¹.

Market forces can constitute a key economic barrier to recycling. The volatility of commodity prices and unfavourable markets for specific types of recyclables (e.g. metals) strongly influence the viability of recycling operations, as do declining secondary raw material streams and limited availability of fractions that produce high quality recycled material. Market fluctuations can be exacerbated by the payment methods used (e.g. payment by credit letter, in advance, or on delivery). The recycling sector consists to a large extent of small companies that are not resilient to market shocks. Sims Recycling Solutions, the world's largest recycler of electrical and electronic wastes, closed down its operations in the UK in 2014, due to its recycling capacity exceeding the amount of available recyclable materials, which made the operations unprofitable². The market situation is in some cases strongly influenced by trade restrictions, as in the case of China's 2017 National Sword policy banning the import of post-consumer plastics. Limited availability of primary material used in production processes also influences the market for the corresponding secondary raw materials used in manufacturing. For example, 95% of the reserves of the rare earth metals that are used for the manufacturing of electric or hybrid vehicles, wind turbines, consumer electronics and other clean energy technologies occur in China, giving that country virtual control of the market³. The Democratic Republic of Congo has control over a large proportion of the world's resources of cobalt, which is crucial for the production of lithium-ion batteries⁴.

2. Policy and regulatory barriers

In countries with a weak regulatory framework, legislation in areas relevant for recycling, such as labour and employment, environmental protection, taxation, and import/export of recyclable materials, may not exist or be only partially developed. Different pieces of contradictory legislation may apply to a given process or operation, or it may be unclear which legal rules apply. Existing legislation may be inconsistently applied, or policy decisions may be taken in disregard of the legal provisions. For example, in many countries, the procedures related to export and import of recyclable materials that are considered hazardous wastes are excessively bureaucratic, with several ministries involved and lengthy decision-making

1 M. Schluep, Resource recovery from electric and electronic waste, p. 165, in K. Kummer Peiry, A.R. Ziegler and J. Baumgartner (Eds.), Waste Management and the Green Economy, Edward Elgar 2016.

2 E-Scrap News, 27 June 2014, <https://resource-recycling.com/e-scrap/2014/06/27/sims-closes-operations-in-canada-uk/>

3 <https://www.globalsecurity.org/military/world/china/rare-earth.htm>; World Trade Organization, Dispute Settlement No. DS431: China — Measures Related to the Exportation of Rare Earths, Tungsten and Molybdenum, https://www.wto.org/english/tra-top_e/dispu_e/cases_e/ds431_e.htm

4 <https://www.greentechmedia.com/articles/read/congo-cobalt-reliance-grows-despite-europe-discoveries#gs.8x01ZHw>

processes, taking up to two years. This can lead to significant financial loss for recyclers, as prices change due to market fluctuations.

Even where the legal and policy framework of a country is well developed, it can be generally unsupportive of recycling, lacking incentives and favourable regulatory requirements. A related problem is the lack of awareness of the environmental and economic benefits of recycling among politicians, government authorities and the public, resulting in low priority accorded to recycling in government programmes and budgets.

Legal provisions (e.g. on quality control) that are too strict may also present a barrier for the recycling industry. This is a problem especially in highly industrialized countries. For example, the costs of compliance with regulatory requirements regarding logistics, depollution and labour have been identified as one of the factors that affect the functioning of the regulated market of collection and treatment of electrical and electronic wastes in the EU. Cheaper treatment of the materials in countries where compliance with the EU's WEEE legislation is not required is one reason for scavenging, which in turn has been identified as one of the main obstacles to full compliance with applicable EU legislation⁵. Overregulation can force especially small recycling companies out of business. Waste and chemicals regulations are in some cases contradictory in that waste regulations aim for high recycling targets and thus set high content level thresholds, whereas chemicals regulations aim for reducing the chemicals content in materials and therefore set low thresholds.

A specific problem with regards to recycling is the lack of a clear distinction between what is considered a waste and what is considered a product or a secondary raw material, and the lack of clear definitions of hazardous and non-hazardous wastes. This is often linked to a weak regulatory framework and/or lack of implementation: the definitions may not exist, or they may be unprecise or overly complex, or the legal instruments setting out the definitions may not be implemented and enforced. These definitions are important because they determine the level of control applied to the management of the relevant substances, and can thus be favourable or unfavourable to recycling. For example, if materials manually or mechanically processed to commodity specifications are not defined as products, they may be considered wastes and thus subject to the same level of control as mixed materials collected from households and industries, or unsorted mixtures of materials.

A specific challenge exists where a material continues to be considered a waste even when it is used as a secondary raw material for recycling: in that case, the manufacturer using the material must comply with the regulatory requirements for waste management, which often means a significant administrative and financial burden. For example, Camacho Recycling, a Spanish-based company processing CRT for use in ceramic tiles on a large scale, has recently suspended imports of CRT glass because the authorities require application of waste management procedures to these materials⁶. The same problem can occur in other contexts, for example in relation to rubber granulate for sports fields, artificial turfs, rubber mats and moulded products that is derived from used tyres.

Regardless of the level of development of the legal framework, lack of compliance and enforcement is a major problem in many parts of the world. Contrary to a widespread belief, this occurs not only in the developing world but also in highly developed countries. For example, according to a recent report of the

5 F. Magalini and J. Huisman, WEEE Recycling Economics: The shortcomings of the current business model, United Nations University, January 2018, <https://www.eera-recyclers.com/news/weee-recycling-economics>

6 E-Scrap News, 19 January 2018, <https://resource-recycling.com/e-scrap/2017/01/19/opinion-proven-benefits-sending-glass-tiles/>; E-Scrap News, 8 November 2018, <https://resource-recycling.com/e-scrap/2018/11/08/spanish-crt-outlet-halts-u-s-glass-shipments/>

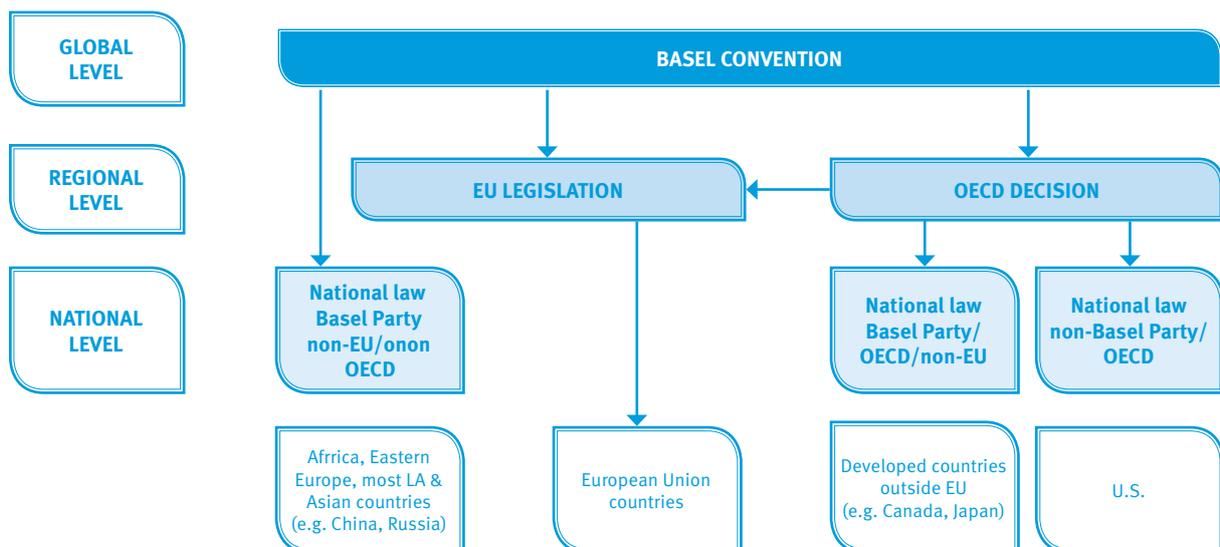
United Nations University, the WEEE Directive of the European Union entered into force in 2003, and in 2015 only approximately one-third of the total volume of electrical and electronic equipment placed on the market was reported as collected and treated in compliance with the Directive⁷. Information from an informal source indicates that the closure of Sims Recycling Solutions operations in Canada in 2014 was due to the applicable legislation not being enforced, placing recyclers that comply with the law in unfair competition with non-compliant operators.

3. Barriers related to international trade

3.1. Different national regulatory requirements for the management of recyclable materials

As regards international trade in recyclable materials, the obstacles created by legal, policy and institutional frameworks are exacerbated by the complexities and inconsistencies of the international legal and policy framework. International regulation of transboundary movement of recyclable materials that are considered waste exists at the national and international levels. The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal provides an overall global framework, and thus some degree of harmonization. However, this is limited, as the Convention covers only materials that are considered hazardous wastes, not applying to recyclables such as paper, plastics and textiles unless they are contaminated with hazardous substances. In addition, the Convention leaves considerable flexibility for national regulation. The United States, a major player, is not a Party to the Convention and thus not bound by it.

The international regulatory framework governing recyclable materials that are hazardous waste is fairly complex, as the example of international shipments of used and waste electronics (UEEE and WEEE) illustrates. It is determined by different pieces of legislation at different levels, and by adherence of a given country to the relevant legal instrument.



Source: Kummer EcoConsult, 2018

⁷ Magalini and Huisman, see N 5

Accordingly, different national definitions of the materials in national legislation and the absence of internationally agreed limits and tolerances of contaminants pose significant obstacles to international trade in recyclable materials, as the material will be subject to different levels of import and export control in different jurisdictions.

3.2. National import bans on recyclable materials

Import bans on recyclable materials are in place in many countries, mostly for the purpose of protecting human health and the environment from the negative effects of materials that are considered hazardous. A prominent example is China's New Sword Policy adopted in 2017, which prohibits the importation of post-consumer plastics. This has reshaped the global recycling landscape, with markets moving to other Asian countries, some of which subsequently also enacted import bans. In some cases, import bans are imposed as a result of national authorities having insufficient understanding of the content and composition of a material. For example, some countries ban the import of all metals destined for recycling, regardless of their composition and hazard potential⁸. Import bans may also constitute protectionist measures. An example is the so-called Mitumba Ban on the import of second-hand clothing imposed by East African Community countries to protect their domestic textile industry⁹.

Import bans reduce the availability of recyclable or recycled material in a country, forcing recyclers or manufacturers to find alternative materials. This may lead to price increases or volatility of prices. It may also mean that the volume of recyclable material available in a country does not allow economically viable recycling operations. This happens particularly in small countries where the volumes of solid wastes generated within the country, e.g. metals, inorganics and organics, are not high enough to sustain a domestic recycling industry.

3.3. Tariff and non-tariff barriers to recycling

Tariffs on recyclable materials include border costs; percentage of goods due on import (customs duties); duties applied to recycled or recyclable materials but not to primary materials, or to imported, but not to domestic recyclables. For example, some countries impose fees on imported second hand clothing.

Non-tariff barriers include permits, licences, testing requirements and emission controls used as means to control import and export. Standards (such as R2, RIOS, WEEELABEX and CENELEC for electronics) may also constitute non-tariff trade barriers. While their purpose is to ensure environmentally sound operations, they can be used to exclude operators that are not certified to the standards, for example where a manufacturer uses only recyclers that are certified to a given standard. As certification to many of these standards is costly, smaller companies may not be able to afford it.

4. Barriers related to industrial activity

Some types of barriers to the development of a sustainable recycling industry are created not by overarching issues related to infrastructure, economy, policy, and trade, but by the interplay of different industrial activities and by lack of technical capacity and funding.

⁸ See for example EU Regulation 1418/2007, Annex, listing wastes banned for import by non-OECD countries.

⁹ See https://www.businessdailyafrica.com/analysis/ideas/Why-banning-mitumba-is-a-bad-idea/4259414_4395006-3smd5w/index.html

4.1. Barriers related to the informal sector

Informal recyclers operate outside the regulatory system without protection or social security, and in unsound conditions that pose a threat to human health and the environment, and often involve child labour. The informal sector constitutes an unfair competition to formal recyclers, given that informal recyclers do not pay taxes and do not comply with regulatory requirements and procedures and therefore offer significantly lower prices. Where a strong informal sector has developed, this can hinder or prevent the development of a formal recycling industry. The informal sector also impacts municipal waste management systems: on the one hand, informal recyclers discard the residues, including any hazardous components, which then become the responsibility of the municipality. On the other hand, informal recyclers collect the valuable and easily extractable materials, often taking them from public waste containers, thus depriving the municipality or scrap yard of the income derived from these resources.

4.2. Barriers related to manufacturing

Several barriers to recycling relate to the manufacturing sector. A general problem is the increasing complexity of products, which make recycling difficult. Also, recyclability of a product is not usually a factor in design and production: the concept of “design for recycling” has yet to enjoy widespread support. This is the case especially for high technology products such as smartphones: attractive features and high performance to satisfy customer needs are the predominant consideration, and these features often present technical obstacles to recycling. Another significant barrier stems from lack of knowledge of the composition or contents of a product. The original manufacturer often does not disclose the content of a product. This means that recyclers and users of recycled materials may not be aware of possible hazardous components, for example the mercury content of flat screen televisions, the presence of lithium-ion batteries in an electronic device, or the multiple components of used tyres. To determine the composition and ensure that the recycled material is suitable and safe for use, testing and subsequent removal of undesirable substances may be necessary (e.g. sanitization of used mattresses prior to recycling). For example, used clothes are often composed of a large variety of materials, and the labels may have been removed by the wearer. Also, the cost of management and disposal of non-recyclable residues can be high, and manufacturers tend to shift these costs to the recycler. These factors affect the price of the recycled materials and may render it unfeasibly high.

4.3. Barriers related to technical, financial and capacity constraints

Technical constraints and lack of knowledge of best practices and technologies can constitute significant barriers to recycling industry development, especially in developing countries. Examples include limited availability of technologies or techniques for adequately processing or treating, in an integrated and sustainable manner, all existing and emerging types of wastes, especially composites; insufficient knowledge of collection and separation techniques; lack of data, for example on the chemical composition of products used for recycling, and country-adaptive technologies; and inadequate capacities or infrastructure to test, characterize and separate wastes in accordance with their nature and hazardous materials content. As a consequence, it may not be possible to ensure sufficient quality for the recycled output to be tradeable.

Insufficient information or understanding can also be an obstacle to the development of recycling industries, for example a lack of understanding how local recycling schemes work. Financial constraints can impede solutions that are technically viable.

SUPPORTIVE POLICIES: ACTIONS TO REMOVE THE BARRIERS IDENTIFIED

Many of the barriers inherent in the lack of political and economic stability and a solid institutional and regulatory framework are beyond the direct control of national authorities or the industry itself, as is the overall market situation. Policy interventions and development cooperation at the macro level can nevertheless help address some of the issues. In areas that have attracted global interest and awareness, such as the management of electric and electronic wastes, international organizations, national development cooperation agencies and development banks have for some years been implementing technical assistance projects in different parts of the world with the objective of creating favourable conditions for the management of the relevant materials. These projects often include the development of a national action plan, the improvement of the legal and institutional framework, training and capacity building, and the development of business models. Similar projects might be considered in other areas relevant for recycling. For example, following the recent surge of interest in combatting the plastics pollution of oceans and rivers, capacity building projects in this area with a strong recycling component could be initiated. Equally, projects or programmes could be launched to help establish infrastructures in areas such as energy, transport, communication. In high-profile areas such as electronic waste management, a wide range of partnerships and networks exist that could collectively help address the barriers identified.

1. Institutional, structural and economic barriers

Interventions aimed at promoting the development of a sustainable recycling industry include the development of innovative manufacturing and recycling systems such as industry parks or industrial symbiosis; the establishment of waste treatment facilities that can manage multi-component wastes and different waste materials and streams; the development of waste collection and sorting systems; and the development of a value/supply chain approach to waste valorisation and management. Development cooperation or public-private partnerships could support such approaches. In developing countries, business models for recycling industries with or without EPR systems could be established.

Market interventions to support to the development of a sustainable recycling industry can take the form of tax incentives for action favourable to recycling (for example, a tax relief for using recycled materials; ecotaxes on products with the possibility of exemption or reduction for recycling friendly actions; eco modulation); subsidies to recycling operations under specific conditions; and taxes on activities unfavourable to recycling (e.g. landfill). An approach recently introduced in China is to promote division of labour between the informal sector and formal recycling plants through subsidizing the purchase of e-waste from informal sector actors by the formal sector¹⁰. Complementary instruments include taxes on landfill and prohibition of incineration as well as green public procurement. However, such measures can only be effective where a solid legal and policy framework is in place, including well-developed legislation on incineration and landfill. Well-organized collection and sorting systems for recyclable materials such as glass, paper, and packaging materials improve the quality of the recyclable materials, and are thus favourable to the development of a sustainable recycling industry. State programmes to support recycling operations, as under the EU's LIFE programme, can also constitute effective measures.

¹⁰ X. Tong et al., Towards an inclusive circular economy: Quantifying the spatial flows of e-waste through the informal sector in China, in *Resources, Conservation and Recycling*, Volume 135, August 2018, pp. 163-171

2. Policy and regulatory barriers

The establishment of a strong regulatory framework that creates rights, incentives, and minimum standards, and prohibits unsound practices, is essential in the transition to a Green Economy¹¹, and thus to a Circular Economy and to promoting recycling as one of its key drivers. Such a regulatory framework should create a level playing field for all actors. In the case of electrical and electronic waste, for example, this would make cannibalizing solely for valuables less attractive, and would avoid harmful recycling practices¹². An overview of the situation in a number of Asian countries regarding electrical and electronic wastes shows that resource recovery rates are higher in countries with policies that support recycling¹³. As a general approach, policy, systems and processes should support valuing waste as a resource providing economic and social benefits rather than perceiving it as a costly problem. Policy approaches such as zero waste, green public procurement, design for recycling, green design, and green manufacturing underpin measures favourable to recycling.

The legislation should establish clear obligations related to the disposal and recovery of different types of waste materials. The following measures could be introduced to specifically support recycling:

- Recycling targets such as those featured in the European Union's 2018 Circular Economy Package¹⁴; these can be an important driver for development of the recycling industry, provided that they are realistic, consistently enforced, and that the social and economic situation in the country supports their achievement.
- Take-back obligations with advance recycling fees and establishment of collection points. An example is the system operating in the European Union in accordance with the WEEE Directive recast¹⁵. Similar systems are in place in other countries.
- Deposit refund schemes
- Recycled content standards (stipulation of a ratio of recycled materials in a product to total materials used); however, it should be noted that a ratio set too high can be counterproductive.
- Restrictions on landfill and incineration of recyclable materials.
- Third party environmental health and safety (EHS) certification standards.
- Introduction of labels and standards for secondary raw materials to increase their market value, and thus recycling ratios; simplicity is however important.
- Extended producer responsibility (EPR) schemes for ensuring sustainability and financing for proper management of hazardous fractions. As an example, after Korea introduced an EPR system in 2003, recycling rates increased by 30% by 2007¹⁶.
- Life Cycle Assessment (LCA)

11 V. Weick, p. 122, 142, in Kummer Peiry et al. (Eds.), see N 1

12 M. Schluep, p. 168, in Kummer Peiry et al. (Eds.), see N 1

13 J. Li et al., p. 211, in Kummer Peiry et al. (Eds.), see N 1

14 http://ec.europa.eu/environment/waste/target_review.htm.

15 M. Schluep, p. 159, 164, in Kummer Peiry et al. (Eds.), see N 1

16 J. Li et al., p. 211, in Kummer Peiry et al. (Eds.), see N 1

The legislation should also introduce a clear distinction between what is considered a secondary raw material, and what is considered a waste; relevant definitions and classifications; and criteria for differentiating between hazardous and non-hazardous wastes. Defining threshold levels of contamination with hazardous material that render a waste hazardous provides a clear basis for this distinction, for example for flame retardants in plastics, textiles and furnishing. In this context, it should however be noted that a very low threshold can constitute a barrier to recycling in itself, as it may render materials unsuitable for recycling if validated measuring protocols for the threshold do not exist. The legislation should also determine the conditions under which a material ceases to be a waste and becomes a raw material. For example, materials that come out of interim processes before entering the manufacturing process (such as granulate from used tyres, or broken-up building waste) should not be considered wastes. The definitions and classifications should take into account the needs of the industry, and be in line with the relevant international definitions, including those of the Basel Convention, the OECD, and the EU. A review of the relevant legislation of different countries could be carried out in order to benefit from successful experiences and best practices that allow sufficient control without placing unnecessary burdens on the recycling industry. Finally, the legislation should provide for clear and effective processes for the management of the different types of wastes and secondary raw materials, including import, export and transit.

In developing or amending national legislation, it is important to have a thorough understanding of the legal system of the country and the existing legal framework relevant to recycling operations, so as to ensure that any revisions are fully consistent with the existing framework. The recognized principles and elements of effective waste and materials management legislation that are used in international law and in countries around the world should be built in, as should the requirements of any international treaties to which the country is a party. The legislation should also take into account the concrete situation in the country with regard to recycling. It is also important to establish the necessary institutional framework and capacities to ensure that the legislation can be correctly and consistently applied.

A prerequisite for any intervention at the policy level is the building or strengthening of the corresponding political will. This can be done through policy declarations, information and outreach campaigns (e.g. inclusion in school curricula) and studies that highlight the contribution of recycling to the achievement of fundamental policy objectives that enjoy broad support, for example the protection of human health, the creation of employment, and the fight against climate change. This raises public awareness of the importance of recycling for the high-level issues in question, and generates the necessary political support. For example, it can be shown that recycling protects human health through avoiding the contamination of water, air and soil with hazardous substances leaking from uncontrolled landfilling, and helps combat climate change by reducing methane emissions from landfills. An example is the EU's Work Programme on Climate Action, Environment, Resource Efficiency and Raw Materials, which defines waste as one of its main focus areas¹⁷. Awareness raising measures should target all stakeholders, including politicians, communities, civil society, and SMEs. Highly publicized voluntary commitments by major companies can support a favourable public opinion.

Strengthening enforcement is a universal challenge that goes beyond waste and recyclables management. The enforcement capacity of a country depends to a large extent on the strength of its legal and institutional framework as well as on its financial resources, technical capacities, and the availability of trained personnel. In the area of waste and recyclables management, participation by the country in global and/or regional enforcement organizations, networks or partnerships can provide some support. Global organizations include the International Network for Environmental Compliance and Enforcement

¹⁷ See <http://ec.europa.eu/programmes/horizon2020/en/h2020-section/waste>

(INECE), the Green Customs Initiative, and INTERPOL's Environmental Crime Programme. Under the Basel Convention, the Environmental Network for Optimizing Regulatory Compliance on Illegal Traffic (ENFORCE) was established in 2013, with the objective of promoting compliance with the Convention's provisions on preventing and combating illegal traffic through the better implementation and enforcement of national law, through a network of relevant experts. Regional organizations include UNEP's Regional Enforcement Network for Chemicals and Wastes (REN, covering Asia); the Asian Network for Prevention of Illegal Transboundary Movement of Hazardous Wastes; the Latin American Environmental Prosecutors Network (LAEPN); the European Network of Prosecutors for the Environment (ENPE); and the European Network for the Implementation and Enforcement of Environmental Law (IMPEL)¹⁸. Some of these organizations offer training activities, develop tools or provide support for enforcement projects.

3. Barriers related to international trade

3.1. Harmonization of national regulatory requirements for the management of recyclable materials

Harmonization of the legal requirements for importation, exportation and transit of recyclable materials may be partly achieved through a review of the national legislation, as discussed in Section 2 above, which could result in the introduction of the definitions, codes and import/export requirements established by international organizations and treaties (e.g. Basel Convention, OECD, EU, WCO Harmonized Commodity Description and Coding System). Use of existing guidelines and similar materials developed by competent international organizations such as UNITAR and the Basel Convention could facilitate harmonization. Further means to support harmonization of national requirements include

- Development of internationally accepted criteria for recyclability
- Development of guidelines, toolkits, handbooks and similar materials specifically addressing the management of recyclable materials by specialized organizations (including e.g. UNIDO)
- Training and workshops organized by specialized organizations (e.g. UNIDO, Basel Convention Regional Centres for Training and Technology Transfer)
- Building of networks and partnerships to promote a harmonized approach to recycling
- Adoption of a regional approach to wastes management and recycling through regional economic entities and business associations
- Strengthening cross-border cooperation

Harmonization of legal requirements should include harmonization of the elements outlined in Section 2 above, in particular national definitions and classifications as well as the standards applicable to recyclable materials, and the levels of control applicable to export, import and transit of recyclable materials on the basis of these definitions, classifications and standards.

¹⁸ For an overview, see <http://www.basel.int/Implementation/CountryLedInitiative/History/Combatingillegaltraffickmoreeffectively/EnforcementNetworks/LAEPN/tabid/3480/Default.aspx>

3.2. Modification of national import bans

Import bans for hazardous wastes and materials are a highly politicized issue. However, to promote a sustainable recycling industry, the transition to a Circular Economy must not be seen only as taking place within national borders but also globally. It is important to reach an understanding that recyclable materials must move across national borders under certain conditions if a viable international market is to be maintained. Accordingly, it is crucial to achieve a balance between protection from unwanted imports of hazardous materials and support for trade in recyclable materials. Practical approaches could include a fast track notification for recyclable materials under defined conditions, or the exemption of recyclable materials from import bans where negative effects on human health and the environment can be excluded, for example where the material does not have hazardous properties, or where it is destined for processing in a facility that meets recognized standards. However, this is realistic only where clear definitions and thresholds for contamination with hazardous materials are in place and are used to guide the relevant decisions. It also requires government authorities to have a good understanding of the composition of a given material. Standards and certification schemes, although they can be used to constitute trade barriers, play an important role in this respect.

3.3. Engagement through global or regional trade agreements

Trade barriers affecting recycling of particular materials are in the domain of global trade politics and thus influenced by numerous factors beyond the remit of the recycling industry and individual governments. Multilateral negotiations in the framework of the World Trade Organization (WTO) or regional free trade agreements to liberalize trade in secondary raw materials, machinery and equipment used by the recycling industry constitute an obvious approach. However, such negotiations are notoriously difficult. For example, discussions on an Environmental Goods and Services Agreement were initiated in the framework of the WTO in 2014 but stalled in 2016¹⁹.

At a more practical level, any WTO member state can engage the WTO's dispute settlement mechanism to contest a particular trade barrier. For example, an import ban on re-treaded tyres imposed by Brazil was successfully challenged by the EU in 2006²⁰.

4. Barriers related to industrial activity

4.1. Integration of the informal sector in the waste management and recycling system

When considering measures to eliminate informal recycling, it should be borne in mind that despite its serious impacts on human health and the environment, the informal sector provides a livelihood to large numbers of people around the world (for example, there are an estimated 100'000 informal recyclers in New Delhi) and often offers them a significantly higher income than the minimal wages. In addition, in many developing countries, a very significant proportion of recycling is informal, and the informal sector accordingly increases the recycling rates of the country. Efforts should therefore aim at integrating informal recyclers rather than eliminating the informal sector. To this end, different approaches are used by countries around the world, ranging from cooperation arrangements between the formal and informal

¹⁹ See e.g. the report at [http://www.europarl.europa.eu/legislative-train/theme-a-balanced-and-progressive-trade-policy-to-harness-globalisation/file-environmental-goods-agreement-\(ega\)](http://www.europarl.europa.eu/legislative-train/theme-a-balanced-and-progressive-trade-policy-to-harness-globalisation/file-environmental-goods-agreement-(ega))

²⁰ https://www.wto.org/english/tratop_e/dispu_e/cases_e/ds332_e.htm

sectors to formalization or legalization of informal recyclers. Full formalization is often rejected by the informal recyclers themselves. A promising approach is the division of labour between the informal and formal sectors, by which collection and sorting is carried out by informal sector operators and the complex recycling operations by a specialized facility. Guidelines and tools for recycling could be developed to include the informal sector. Measures adopted to strengthen the legal and policy framework can help prevent or reduce informal recycling.

4.2. Obligations to manufactures and/or consumers

In adopting policy and legislation, recycling should be considered an integral part of green manufacturing and green design. New business models for sustainable recycling should be developed. To address the barriers related to manufacturing, measures to introduce specific obligations to manufacturers or consumers should be taken, including obligations to manufacturers to use of production processes that facilitate recycling; to disclose product composition; and to assume the costs of recycling. Thresholds of concentration of hazardous components in materials (e.g. flame retardants in plastics, textiles and furnishing) shift the burden of disposal of residues to the manufacturer through EPR: if a manufacturer cannot send a waste material resulting from a production process to recycling due to exceeding the threshold, he will have to arrange for incineration and assume the costs. Advance recycling fees included in the retail price of a product shifts the financial burden from the recycler to the consumer.

4.3. Technical capacity building and funding

Barriers to the development of recycling industries created by technical, capacity and knowledge limitations exist at different levels. They can accordingly be addressed either by the industry itself, by government authorities, or through development cooperation. A political, economic, legal and institutional framework conducive to industrial activity will help promote private investment in the required technologies, capacities and best practices. Development cooperation projects including training and technology transfer can also help address the relevant issues. Demonstrations and pilot project are important instruments to advance knowledge. Research programmes should advance technical development, including innovative technologies that can be used in situations where a legal and institutional framework and infrastructure is lacking, for example in poor or remote areas in developing countries. An example is the recent development of micro-factories for recycling of end-of-life computers and cell phones by the Centre for Sustainable Materials Research and Technology of the University of New South Wales in Australia²¹.

In terms of financing, options include targeted public financial support to relevant industries and government programmes to support recycling; the establishment of a green financing mechanism to encourage and promote recycling; and the use of international financial mechanisms linked with specific environmental targets, such as the reduction of harmful substances, for the development of relevant programmes. For example, some substances that are released through improper treatment of electrical and electronic waste are classified as POPs, ozone depleting substances, or greenhouse gases; these substances are regulated by international treaties, which makes activities aimed at their reduction or destruction eligible for funding from the related international financial mechanisms²². At the community level, civil society groups or charitable organizations may support recycling, e.g. by collecting materials as part of fund-raising activities.

²¹ <https://newsroom.unsw.edu.au/news/science-tech/world-first-e-waste-microfactory-launched-unsw>

²² M. Schlupep, p. 170, in Kummer Peiry et al. (Eds.), see N 1

CONCLUSION

To summarize, key measures supported by international organizations and governments could include the following:

1. Supportive policies

- Awareness raising on environmental/economic benefits of recycling
- Waste management policies favouring recycling
- Green public procurement supporting recycling
- Green manufacturing policies integrating recycling

2. Enabling and incentives

- Taxation, tax reliefs, and subsidies favouring recycling
- Regulatory requirements favouring recycling
- Material composition: clear definitions and good understanding
- Requirements for manufacturing favourable to recycling

3. International cooperation

- International networks and partnerships
- Targeted technical assistance and capacity building
- Harmonization of requirements and procedures for recyclables management
- Trade liberalization for recyclables

As noted at the outset, the success of any interventions to remove barriers to the development of a sustainable recycling industry is contingent on

- An investment friendly environment allowing business development, which in turn depends on political and economic stability, security, and reliable infrastructures (e.g. transport, energy, communications). This also comprises a functioning legal and institutional framework within which the industry can develop.
- A paradigm shift towards perceiving waste as a valuable resource rather than a costly problem
- Placing waste and materials management at the top of the political agenda (including in development cooperation)

ANNEX 2

Circular Economy-Developing Recycling Industries Meeting Vienna, 14th-15th November 2018

The circular economy presents a paradigm shift away from our current linear production systems that are expensive, inefficient, and which place enormous burdens on global ecosystems. It is a regenerative system in which the making, using and disposal of products—from raw materials extraction to production, distribution, use, waste management and final disposal—are transformed into a continuous, cyclical and regenerative process.

Achieving a circular economy will require unprecedented coordination and collaboration amongst all echelons and participants in the economy. The circular economy will catalyze a new global system whereby goods are made, used, reused, repaired and then converted again into new raw materials. It's an ambitious goal that will require an across-the-board shift in how we think about production and consumption and an alignment of systems to support this transformation. Despite the enormity of the task ahead, the foreseen benefits promise to be felt at the environmental, economic and social levels; a goal that the linear economy has been unable to achieve.

Recycling is a fundamental lynchpin of the circular economy in that it plays a transformative role in turning industrial residuals and post-consumer materials into valuable substances or products, feeding used materials back into the value chain and correspondingly achieving the “waste-to-resource” paradigm. Recycling thus presents numerous economic, environmental and social opportunities. Despite this, its potential has yet to be fully realized due to a number of legal, policy, infrastructural and market barriers.

In order to bridge this potential with concrete action to embed recycling in a circular economy, the United Nations Industrial Development Organization (UNIDO), hosted the meeting “Circular Economy-Developing Recycling Industries” in Vienna from the 14-15th November 2018, in collaboration with its partners, representing the recycling industry, industry associations, think tanks and international organizations.

The meeting programme featured presentations and facilitated panel discussions to foster dialogue and identify areas of convergence to accelerate progress on this issue. The two days were structured around identifying the current barriers hindering progress and elucidating the types of policies and measures that would support the development of robust and sustainable recycling industries around the world. Discussions also examined the plastics, metals, textiles and composite waste streams to reveal barriers and options to encourage the recycling of these waste streams.

A draft meeting background report formed the basis of discussions, providing an overview of the key challenges to the development of a sustainable recycling industry, also presenting a number of options for remedying the current situation.

Identified barriers stemming from the discussions, can be broadly characterized as follows:

- Legal/policy/governance challenges at the international, national and sub-national levels;
- A lack of investment opportunities for value chain establishment;
- Unfavourable market forces;
- The presence of an informal market;
- A lack of infrastructure;
- Consumer forces;
- Commodity prices; and
- Demographic influences (i.e. population size; level of industrialization).

It was felt that the interaction of these factors served to create the conditions that hamper the realization of an effective and sustainable recycling industry.

Poll results

The identified barriers and possible focus areas were then aligned with a range of potential policy and market solutions by means of an interactive poll, where participants were able to indicate their preferred mechanism to address these challenges.

In regards to what participants believed to be the **most efficient policies in the development of sustainable recycling industries**, more than half of respondents thought that waste management policies in favour of recycling would be most effective in catalyzing sustainable recycling industries. Thereafter, it was felt that awareness-raising on the environmental/economic benefits of recycling, targeted at a range of stakeholders (government, private sectors, SMEs and civil society), would also be an effective measure. Less support was shown for i) green design and ii) manufacturing policy integrating recycling, and iii) green public procurement supporting recycling.

In terms of the most **preferred measures and incentives to support the development of recycling industries**, participants preferred legislation that provided incentives and clear definitions, thereafter showing an equal preference for market interventions and manufacturing requirements favouring recycling.

Participants were asked what they thought was the **most supportive form of international cooperation to support the development of recycling industries**. Respondents thought that the harmonization of requirements and procedures for recyclables management was important. However, respondents also showed almost the same preference for targeted technical assistance and capacity building, with trade liberalization being the least preferred option.

In terms of the ***preferred policy options for steering the supply side of recycled plastics***, participants thought that extended producer responsibility would be the most effective option, followed by the introduction of dual or multiple stream collection systems. Lastly, incentives for better plastics design restrictions placed on the use of hazardous additives were viewed to be the least popular option.

In terms of ***steering the demand side of recycled plastics*** the most preferred option amongst respondents was a tax on virgin plastics, followed by recycled content rules. The next preference after this was for recycled content product labels and lastly, respondents thought that public procurement would be the least effective option.

Participants were also encouraged to look beyond policy as the only option for encouraging recycling. More specifically, in regards to metal recycling, participants were surveyed as to what they thought was the ***most effective non-policy measures to encourage metal recycling***. A slight majority thought that intelligent design for future recycling would be the most effective non-policy measure, followed by an improvement of the recycling technologies and then information and education. Standardization was the least popular option.

In concluding the polls, participants were asked to rank what they believed to be the ***main barriers to metals recycling***. A lack of standards and recycling were perceived to be the largest barriers, closely followed by price volatility, which in turn was followed by the cost of collection and virgin ores; the latter two options receiving equal votes.

The way forward

The meeting was concluded with participants endorsing the contents of the draft background report, and the attached Chair's Summary (at Attachment A). The Chair's Summary represents the participants' agreement as to the main barriers and challenges to realizing a sustainable recycling industry as part of a circular economy. At the same time, it also represents participants' consensus as to a shared way forward for UNIDO's programmatic and policy work, with the ambition of embedding recycling as a central cog in the circular economy.

Chair's Summary of Circular Economy: Development of Recycling Industries

Vienna, Austria | 14- 15.11.2018

Policy context

Circular Economy (CE) & recycling:

Sustainable Development Goals (SDGs) & recycling

Barriers to the development of a sustainable recycling industry

Despite the policy support accorded to the role of recycling in the SDGs and the transition to a CE, barriers to the development of recycling industries exist at different levels, especially in emerging economies and developing countries.

A. Barriers related to institutional, structural and economic issues

- A.1. Lack of infrastructure for collection, storage, dismantling and processing
- A.2. Limited investment possibilities for value chain establishment
- A.3. Unfavourable market forces affecting recycling: volatility of commodity prices (e.g. copper, tin); large proportion of essential primary resource controlled by one country (e.g. cobalt / DRC, rare earth metals / China)
- A.4. Impact on population and economic growth
- A.5. Mode of consumption patterns- throwaway society

A. Possible interventions to address barriers related to institutional, structural and economic issues

- A.1. Infrastructure development
- A. 2. Market interventions

B. Barriers related to lack of support of recycling by policy and regulation

- B.1. Lack of clear distinction between waste and secondary raw materials used in recycling processes and lack of clear distinction between hazardous and non-hazardous materials. This places a significant financial and administrative burden on recyclers.
- B.2. Lack of legal/ policy incentives for recycling
- B.3. Lack of political support for recycling: Low level of awareness of environmental/economic benefits of recycling; recycling not considered a priority in government programmes and budgets, lack of support for collection systems to ensure that the demand for recycling is met.

B.4. Legislation are not enforced; policy decisions are not in line with legislation

B.5. Waste and chemical regulations are not working in syn- waste regulations aiming for high recycling rates, chemicals regulation restricting chemicals. Exemption from ban is not a solution.

B. Possible interventions to address barriers related to lack of support of recycling by policy and legislation

B.1. Development or revision of legal instruments

B.2. Adoption of supportive policies

B.3. Measures to raise awareness among politicians, private sector, SMEs and civil society

B.4. Strengthening enforcement through global, regional networks and partnerships

Strengthening of cross-border cooperation

C. Barriers related to international trade

Given that recyclable materials are subject to international trade, the development of a recycling industry can be impacted by:

C.1. Different national regulatory requirements for the management of recyclable materials:

C.2. Pro/contract for national import bans on certain types of materials (different views expressed by panel and the audience)

C.3. Other trade barriers

C. Possible interventions to address barriers related to international trade

C.1. Harmonization of national laws

C.2. Modification of national import bans

C.2. / C.3. Engagement through global or regional trade agreements

D. Barriers related to industrial activity

D.1. Barriers related to the informal sector

D.2. Barriers related to manufacturing

D.3. Barriers related to technical, financial and capacity constraints

D. Possible interventions to address barriers related to industrial activity

D.1. Integrate informal recyclers in the process rather than trying to eliminate them

D.2. Introduction or clarification of obligations to manufactures and/or consumers

D.3. Possible approaches to support capacity building and funding



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