



Shaping Cycles, Protecting the Future

The role of quality infrastructure for a reliable circular economy

Circular economy aims to create a resource-conserving and waste-preventing economic system that will help to make our world worth living in. Standards and technical regulations, alongside reliable measurements and conformity assessments, are needed so that a socially just and climate-neutral economy can become a reality.

Quality infrastructure (QI) institutions make available the services necessary for this to happen. German Development Cooperation provides support for establishing global circular economy systems and promotes projects to bolster QI in its partner countries.

Initial Situation

The dominant linear economic model has pushed our planet beyond its limits. Earth Overshoot Day – the date on which humanity’s consumption of renewable resources exceeds the Earth’s capacity to supply and regenerate those resources – is coming earlier and earlier every year. The result is not only a shortage of resources, but also the climate crisis, pollution, loss of biodiversity and increasing social injustice. Against this backdrop, the concept of the circular economy is at the heart of global efforts to achieve sustainable development and a socially and environmentally just economic transition. It implies a fundamental restructuring of the global economic system and describes a network of interconnected material cycles that are as closed and renewable as possible, starting early in the design of a product and including consumer behaviour.

The overexploitation of natural resources particularly affects developing and emerging countries. Most raw materials are extracted in the countries of the global South, without any benefit to the local population. Instead, industrialized countries process the raw materials, often dumping highly toxic waste in poorer countries. The result is environmental degradation, health hazards, inequality, poverty and migration. In addition, as consumption accelerates, so does the amount of waste.

The concept of the circular economy connects ecological, economic and social benefits, providing developing and emerging economies in particular with the opportunity to fulfil the Sustainable Development Goals (SDGs). For this reason, Germany’s development policy fosters establishing and expanding circular economy systems within the scope of multilateral, bilateral and regional cooperation. Through the *Just Transition* concept, circular economies not only contribute to fight poverty but also support the economic development of the partner countries and the creation of new jobs.

The International Organization for Standardization (ISO), through its Technical Committee 323, is currently developing a definition, guidelines, tools and requirements concerning circular economies; furthermore, the German Institute for Standardization (DIN) describes standards as well as new and revised technical regulations as being the basis for the transformation to a circular economy in a document published in 2023 titled *Standardization Roadmap Circular Economy*.¹

ISO 59004 provides the following consensus-based definition of a circular economy as an:

“Economic system that uses a systemic approach to maintain a circular flow of resources, by recovering, retaining or adding to their value, while contributing to sustainable development.”²

A suitable technical foundation is needed in order to enable the transformation to a circular economy. Recognized standards are critical to reusing materials as secondary materials and to guaranteeing their quality. These include suitable measurement procedures as well as testing and inspection services. In other words: a circular economy in which materials and energy are used efficiently requires competent quality infrastructure services.

Quality infrastructure refers to a complex system comprising organizations, policies, practices and regulatory framework conditions to guarantee the quality, safety and sustainability of products, services and processes. With the globalization of trade, almost all countries have started to develop a national QI or to improve their existing infrastructure.

However, the level of development of national QI systems varies considerably from one country to another. While some countries have a strong export economy and well-developed QI services, others often have only rudimentary facilities for metrology and standardization. For more than sixty years, German Development Cooperation has been active and successful in fostering QI in developing, transitional and emerging economies, as primarily implemented by the Physikalisch-Technische Bundesanstalt (PTB), and is highly valued by its partners.

Our Contribution

The promotion of quality infrastructure for the circular economy follows a multi-level approach. Projects target supporting institutions comprising standardization and accreditation bodies as well as national metrology institutes (meso level), but they are also effective as pilot projects in companies, clusters and value chains (micro level). Capacity development enables partners within the quality infrastructure to recognize circular economy-based needs and offer suitable services. Here, the focus is on improving and establishing technical, human-resource and institutional competence as well as collaboration between QI institutions and industries or laboratories. The success of the measures also depends on

¹ Standardization Roadmap Circular Economy, published by DIN, DKE and VDI. <https://www.din.de/en/innovation-and-research/circular-economy/standardization-roadmap-circular-economy>. Last accessed on 14 April 2024.

² <https://www.iso.org/obp/ui/en/#iso:std:iso:59004:dis:ed-1:v1:en>. Last accessed on 30 Jan 2024.

support from political decision-makers concerned with circular economy undergoing awareness-raising on the importance of QI and receiving support themselves in the development of national quality policies (macro level).

Plastic recyclates are one example of QI for the circular economy. The demand for this resource is increasing in many partner countries, where it is used for manufacturing food and beverage packaging. The image illustrates how quality infrastructure supports the cycle along the value chain of plastic pellets.

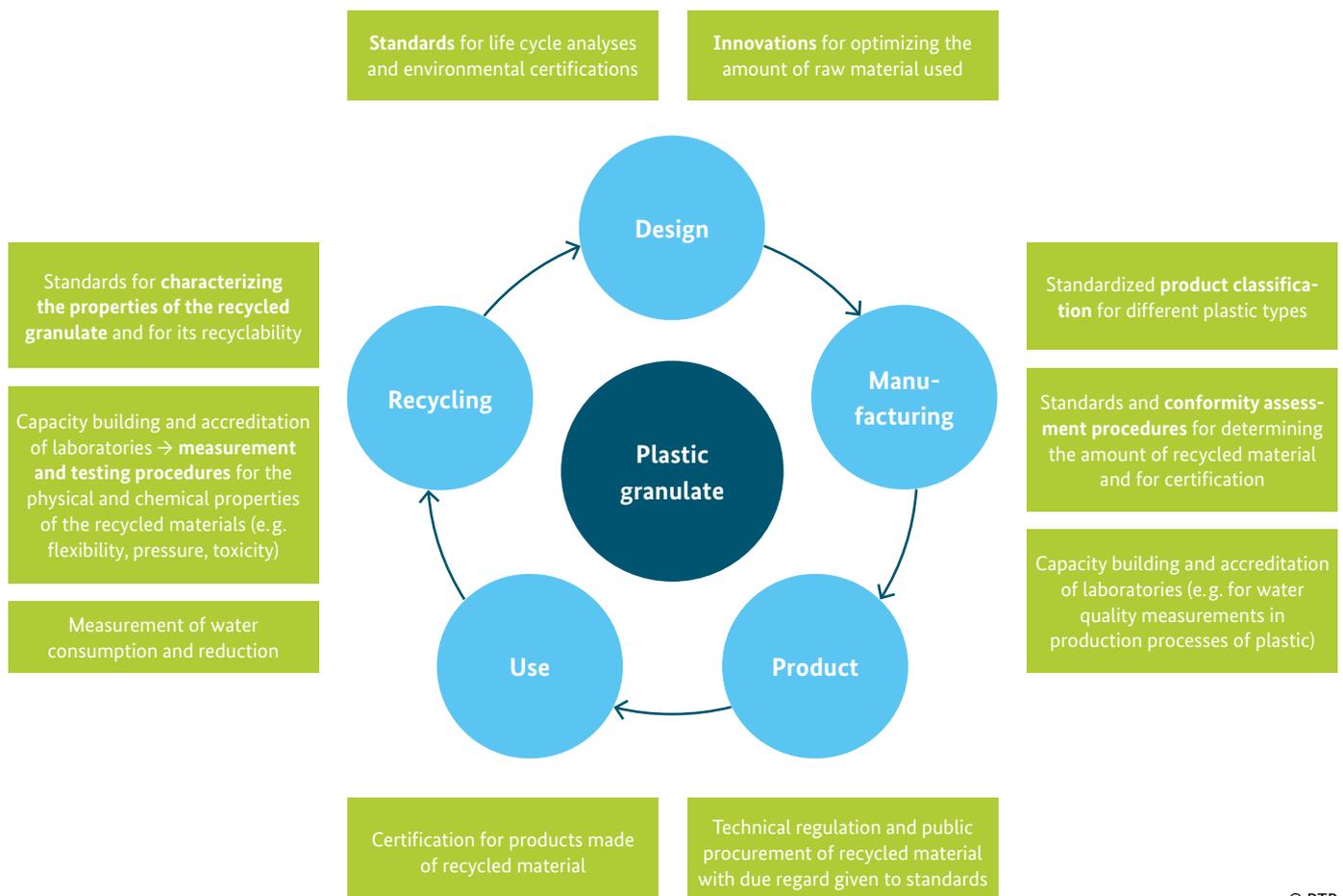
To be able to assess the ecotoxicological suitability of these recyclates, suitable standards and specifications are required, as well as metrological and testing competencies. In Tunisia, for example, government structures such as testing laboratories for packaging and chemistry, the national food-safety authority, the national agency for waste management and companies from the packaging sector are being trained on EU requirements concerning recycled packaging that comes into contact with food, as well as on testing methods required for checking and certifying the recycled material.

In Colombia, a new standard is being developed to facilitate the use of electric furnace slag as a secondary raw material in road construction. Previously, this slag was a waste product of steel production that required a lot of storage space in Colombian steel plants and was a source of environmental pollution. To allow the slag to be reused, a variety of measurements are required, including a determination of the chemical composition (for example, the metal content) and the grain size. A uniform material analysis and description process now allows the slag to be used in a targeted manner to create added value.

A critical element of the circular economy is that attention should be paid at the design stage to making products that can be used, reused and recycled for a long time. To this end, QI can provide standards for eco-design, while metrology lays the foundation for testing the product's service life and the fulfilment of user requirements. Regulatory and market surveillance authorities then use these QI services. The use of QI services in product design and the support of entrepreneurs is a new concept for many project partners and requires special support via technical cooperation.

Quality assurance services are also crucial for the responsible use of products. Reliable eco-labels allow consumers to make

QI for the circular economy – example: plastic granulate



sustainable consumption decisions when comparing products and services. Avoiding greenwashing requires suitable quality infrastructure, including independent and competent laboratories and certification bodies that can confirm the products' sustainability and recyclability.

The final step is the collection and reuse of unavoidable waste products in order to close the circle and minimize loss of resources. In developing and emerging economies, vulnerable segments of the population often work in precarious conditions in this area; for this reason, attention must be devoted to improving working conditions and creating alternative forms of employment. In standardization processes, it must be ensured that the interests of all stakeholder groups are considered.

The Impact of our Work

German Development Cooperation supports QI institutions in partner countries in providing technical services for a socially just transition to a climate-neutral circular economy (Just Transition). Here, the goal is for metrology, standardization and accreditation institutions to enable sustainable production systems and consumption patterns. In concrete terms, this entails QI institutions focusing their activities on achieving the SDGs and being active in the core areas of Sustainable Economic Development related to the agenda 2030: *Sustainable Economic Development, Training and Employment* (SDG 4, 8, 9, 12, 17) and *Climate and Energy, Just Transition* (SDG 6, 7, 11, 13).

The impacts of fostering QI can be seen in the three dimensions of sustainability:

Economic: The transformation to a circular economy offers significant savings potential via increased resource and energy efficiency in the partner countries. New and adapted quality infrastructure services will improve companies' competitiveness as they implement circular business models and adapt their production to meet the requirements for environmentally and climate-friendly trade. Small and medium-sized enterprises and producers' cooperatives will be enabled to fulfil social and ecological supply-chain requirements and to benefit from global trade (SDG 9). QI institutions themselves will offer ambitious employment options, thereby strengthening the local knowledge economy.

Ecological: At the same time, the importance of quality assurance services in the design phase of products (eco-design) will increase. Here, the aim is to manufacture products in a resource-efficient way, to avoid waste (SDG 14 and 15) and to develop products from the start in such a way that they can be easily disassembled and reused in the recycling process (SDG 12). Less energy is expended for the recovery of raw materials in the recycling process than for the extraction and processing of primary raw materials. Environmental and energy management systems contribute to reductions in water consumption (SDG 6) and greenhouse gas emissions (SDG 13). Finally, eco-labels serve as an aid to consumers in making responsible choices (SDG 12), which can affect a person's diet and thus contribute to their good health and well-being (SDG 3).

Social: A particular challenge inherent to fostering quality infrastructure is socially just development. Via standards and certifications, quality infrastructure contributes to occupational safety and fair working conditions (decent work) (SDG 8). Measures are aligned in such a way that the interests of vulnerable groups working under precarious conditions (such as waste collectors) are considered during standardization and automation. Here, one example is certification of recycling plant workers, which enhances their professional qualifications.

When fostering quality infrastructure in a circular economy, gender-specific impacts are considered in light of a feminist development policy. Women frequently make decisions concerning responsible consumer options and benefit from clean production processes. Equal opportunities and women's participation are also given consideration in new circular-economy business models. Generally, greater involvement of women markedly improves the enforceability of standards. Thus, the gender perspective boosts the effectiveness of quality infrastructure for the transformation into a green and socially just economy.

New skills and competencies are established in the partner countries or adapted to the new requirements. QI services provision in the context of regional cooperation is particularly meaningful for small countries and least developing countries (LDC). In order to make the offer of QI known to potential users from a circular economy and to political decision-makers, awareness-raising measures are a necessary, non-technical project component. At the same time, because QI measures always complement other activities designed to foster circular economies, PTB and GIZ (implementing agencies of German Cooperation working in both areas) work together closely and accompany the partner countries in their socio-ecological transformation.