



# International paths for more resource efficiency

Policies and trends in selected countries

For our Environment

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## Policies and trends in selected countries

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## Resources and the environment: Resource efficiency as an opportunity

Global resource use has more than tripled since 1970. According to the International Resource Panel, 85 billion tons of raw materials were mined worldwide in 2015. This corresponds to an average demand of 11.2 tonnes per capita and year (UN Environment 2019).

Although demand for raw materials in some countries is already exceedingly high, more and more nations are expected to reach those critical levels due to the progress of their own economic development over the next few years. Rising economic growth is in most cases associated with increasing resource consumption, thus demand is expected to continue to grow worldwide. With an increasing world population and ongoing economic growth, current trends suggest that material consumption will rise to 180 billion tonnes in 2050 - more than double the current demand.

The intensive anthropogenic use of resources is often associated with negative, in some cases drastic ecological effects. Unchecked extraction of metallic raw materials in mining, burning of fossil raw materials or improper disposal of waste exemplify how the use of raw materials contributes to the aggravation of environmental concerns such as climate change, soil degradation and loss of

biodiversity. Ultimately, the increasing demand for resources further exacerbates both global and local environmental impacts.

### Resource efficiency in political action

In response to these risks, measures are being taken worldwide to render the use of natural resources both more efficient and sustainable. The goal is to decouple economic growth from resource use to achieve an overall reduction in negative environmental impacts. A number of supranational organisations are already active for this purpose:

- ▶ At the international level, the International Resource Panel (IRP) published several reports on the current status and opportunities for the efficient use of resources such as the Global Resources Outlook 2019 (UN Environment 2019).
- ▶ The G7 put the topic of resource efficiency on its agenda in 2015. It has since become an established G7 field of activity (BMU 2016).
- ▶ In addition, the “G20 Resource Efficiency Dialogue” was launched in 2017 to share best practices, exchange knowledge on policy options and improve the scientific foundation (BMU 2017).

### Basic monitoring principles

The selection process for the countries included in the monitoring is based on a screening of almost 50 countries outside Europe. Among other factors, the selection criteria were based on whether approaches or strategies for resource efficiency could be identified in the initial screening. Furthermore, the study aimed to portray a range of geographical regions and varying economic conditions. Thus, the following countries were selected for monitoring: Brazil, China, India, Indonesia, Mexico, Russia, South Africa, South Korea and the USA.

Country profiles were compiled as a reference at the outset of monitoring. For this purpose, a survey on the structure of resource use, different stakeholders, policies and programmes as well as measures for resource efficiency was carried out. For the actual monitoring, a framework was developed that allowed systematic recording and provided a simple overview of key approaches, topics and innovations. The information presented here is based on desk research, in particular the analysis of information provided by ministries, associations or non-governmental organisations, as well as interviews with local experts.

Figure 1

### Monitoring scheme

Based on the scheme, the policies of a given country may be systematically recorded and evaluated.



Own figure

Many countries have also begun to develop policies for a more efficient and sustainable use of natural resources at the national level. A compilation of policies by European countries was published by the European Environment Agency (EEA 2016). However, for non-European countries there is little information available on the measures proposed or adopted outside the respective countries.

### The research project “Monitoring International Resource Policy”

Against this background, the German Federal Environment Agency (UBA) launched the research project “Monitoring international resource policy” (MoniRess) (Funding ID 3716 31 100). The project was carried out by ifeu - Institute for Energy and Environmental Research Heidelberg GmbH in cooperation with Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH between 2016 and 2019.

The present study was designed to capture the international diversity of measures and policies to increase resource efficiency. Based on the German Resource Efficiency Programme - ProgRess and ProgRess II - the focus was placed on abiotic raw

materials in the extraction, production, consumption, disposal and recycling stages of the value chain. Detailed information may be found in the final report “Monitoring internationale Ressourcenpolitik” (Dittrich et al. (a), in press), in a policy brief (Ewers et al. (2018)) and as a chapter in the book “Faktor X” (Dittrich et al. (b), in press).

Since there is no uniform concept of resource efficiency policy at the global level, a narrow definition was deliberately avoided. On the contrary, the aim of the monitoring carried out in this project was to explore the diversity and range of policies, measures and best practice examples implemented to increase resource efficiency internationally.

This brochure provides an overview of the research results and the diversity of topics in the nine countries included in the monitoring. Furthermore, it introduces key political stakeholders and legislations. A selection of particularly relevant measures are presented to illustrate the specific challenges and approaches in each country.



## Brazil: Assuming social and environmental responsibility

Waste disposal is one of the most urgent problems in many regions of Brazil. Rates of landfill disposal in the country are high and proper disposal is often lacking. In light of these circumstances, waste management and the promotion of a circular economy are becoming increasingly important (see text box). Countermeasures are urgently needed, especially in cities where there is a high volume of waste in densely populated areas. The development of an urban environmental agenda should help to find solutions for more sustainable cities (Ministério do Meio Ambiente 2019).

In Brazil, matters of resource efficiency are divided between the Ministry of the Environment (Ministério do Meio Ambiente) responsible for environmental policy questions and the Ministry of Mining and Energy (Ministério de Minas e Energia) focusing on raw materials policy questions. This division implies that the Ministry of the Environment is responsible for all activities in the field of “Responsabilidade Socioambiental” - social and environmental responsibility. Above all, this refers to the promotion of sustainable production and consumption.

### **Sustainable consumption and production**

Sustainable consumption and production has been promoted by the government with the Action Plan on Sustainable Consumption and Production (PPCS) from 2011 to 2014. Regional networks at state and local level, and above all industry associations, are still maintaining a focus on the topic at regular events.

With a range of initiatives and associations, the private sector in Brazil is particularly active. For instance, the SENAI Initiative (National Service for Industrial Training) promotes vocational, technological and efficiency training in companies, in particular with its national centre for clean technologies (SENAI - CNTL). The São Paulo State Industry Association (FIESP) is also committed to this field offering workshops and networking activities and organises an annual environmental week. FIESP promotes the transfer of knowledge on energy and water efficiency with research studies, handouts for companies, workshops and conferences.

### **Handling municipal waste - the Zero Landfill Programme (Programa Lixão Zero)**

The “Programa Lixão Zero” (Zero Landfill Programme) launched in 2019 is an important step in the implementation of the national policy on municipal waste management in Brazil. The programme is an initiative of the Ministry of the Environment to help municipalities find suitable solutions for the treatment and disposal of solid waste. The goal is to improve the environmental quality of cities with specific measures. The programme is part of the national agenda for urban environmental quality, the “Agenda Nacional de Qualidade Ambiental Urbana”, which focuses on the topic of municipal waste (Ministério do Meio Ambiente 2019).

In the agenda, the Ministry of the Environment outlines the current situation of municipal waste and proposes to develop indicators for the implementation of the programme. For this purpose, an action plan detailing measures was developed in 2019 and has been continuously updated throughout the programme. For instance, the schedule specified the introduction of an information system for solid waste (SINIR) in June 2019. In August, the draft national plan for solid waste (Plano Nacional de Resíduos Sólidos, PLANARES) was published, which is due to be adopted in December (Ministério do Meio Ambiente 2019).



The Brazilian catadores (private waste collectors) are an important part of urban waste management. The Cataki platform offers catadores, such as Fabiano Soares, the opportunity for better networking with waste producers to improve disposal. Cataki was founded in 2016 by the non-profit organisation Pimp My Carroça. (© Bruno Rezende, Pimp My Carroça)

## Public procurement

The Ministry of the Environment initiated various programmes to promote sustainable consumption in Brazil - and in particular consumption by public authorities. One established project of the Ministry of the Environment is the Environmental Agenda in Public Administration (A3P) programme, which was founded in 1999. The goal of A3P is to create public administration awareness for sustainability and socio-ecological issues. In essence, it is a programme to rationalise the use of natural resources in public administration and procurement. Under the A3P programme, there will be at least 60 signed partnerships between the Ministry and businesses in 2018.

The A3P programme rapidly achieved high visibility in Brazil, yet there was no legal basis for it for a long time. It was not until February 2018 that A3P was institutionalised. In March 2019, the official guidelines for the programme were published in the “Diário Oficial da União”, the Official Gazette of the Government (B&S Gestão Publica 2018). According to the Ministry of the Environment, the

programme focused on improving the quality of advice, publicising the current A3P agenda and promoting training for public administrators in Brazil between 2016 and 2018.

As part of this programme, the Ministry of the Environment organised the tenth annual A3P Forum in 2018, at which the A3P awards for Successful Sustainability Models (Melhores Práticas de Sustentabilidade) are presented (Ministério do Meio Ambiente 2018). Projects are honoured in the four categories network highlights, waste management, innovation in public administration and sustainable use of natural resources to promote awareness of sustainable projects (Ministério do Meio Ambiente 2018).

## China: Resource efficiency as a political agenda

China is a country of superlatives. A population of over 1.3 billion with a rapidly growing appetite for consumption meets an ever-expanding industrial sector. As a result, China already has by far the highest total material consumption of 35.1 billion tons. How can a country of such dimensions promote the efficient use of natural resources?

The Chinese government is well aware of the pressure to act: the Circular Economy Promotion Law has been promoting the circular economy in China since 2009. It is globally the first national law to define the decoupling of economic growth from resource consumption as a strategic goal for economic and social development. Since the adoption of the legislation, China's circular economy has been further developed with the implementation of each five-year plan.

During the current five-year plan (2016-2020), the Chinese government was restructured. Moreover, the Chinese Ministry of the Environment was fundamentally reformed and expanded. In 2018, a number of responsibilities of various ministries were merged and transferred to the newly established Ministry for Ecology and Environment. In addition to the original tasks of the Ministry of the Environment, the newly formed ministry was assigned responsibilities of other departments, such as climate change and reduction of emissions or marine conservation (ChinaDaily 2018).

### Spatial aspects of restructuring

In comparison to the European approaches, the integration of spatial planning into the policy for the promotion of a circular economy is particularly striking (McDowall et al. 2017). Demonstration projects in different regions provide an example of these spatial instruments. A distinction is made between the micro-level (e.g. environmental protection in individual companies), meso-level (e.g. recycling in industrial parks) and macro-level (i.e. material flows in entire regions).

The Chinese government is thus trying to explore the conditions under which projects can be successfully implemented, e.g. how projects operate in less developed versus highly developed regions. (Qi

et al. 2016). Definitions for the three levels micro, meso and macro may be found below.

### Elements of spatial planning

**Micro-level (individual company level):** implementation of ecodesign and environmentally friendly production strategies (reduction, reuse, recycling) within companies.

**Meso-level (industry level):** promotion of reuse and recycling of raw materials between different companies. Specific focus on industrial parks to achieve positive impacts on the regional economy and environment, so-called spread effects.

**Macro-level (regional level):** local governments promote efficient production and consumption based on the material flows of an entire region.

### Ecological assessment criteria for local authorities

For some time now, Chinese officials have been assessed based on economic growth criteria: the better the economic performance of a region, the better the evaluation of local politicians. To improve the local implementation of national environmental policy, this assessment has been extended to include a factor measuring environmental performance.

In 2007, the Target Responsibility System (TRS) was introduced to assess the responsibility local governments accept for energy and emission reduction measures. The TRS derives binding targets for local governments from overall national targets. Furthermore, the TRS links the career development of civil servants to the achievement of these targets. Thus, the central government achieves broad implementation of the adopted regulations (McDowall et al. 2017).

The concept of regional responsibility can also be found in the 2015 law on Measures for the Accountability of Party Leaders and Heads of Government for Damage to the Environment. The law aims to



promote the development of an “ecological civilisation”. Article 3 states that local governments shall assume overall responsibility for preserving the local environment. The law further stipulates that the accountability of party and government leaders for damage to the ecological environment shall be prosecutable by law. For instance, if the Central Committee’s decisions on environmental protection are poorly implemented, the behaviour of those responsible must be reviewed. In the event of serious environmental pollution, those responsible are excluded as candidates for political positions (Law Info China 2015).

### **Ban on imports of contaminated materials: Programme National Sword**

For many years, China was the largest global importer of waste. At one point, 56 percent of all global plastic waste arrived at Chinese ports (Die Zeit 2018). To reduce environmental damage from processing and often incineration of unsorted plastic waste, the Ministry of Ecological and Environment decided to “stop all imports of waste that can

be replaced by domestic resources before the end of 2019” (Euwid 2018).

Since the beginning of 2018, a Chinese import ban for low-quality and unsorted waste fractions has been in place: the National Sword Programme. Since its introduction, 24 different waste fractions (including unsorted plastic waste, mixed waste paper, used CDs and textiles) are prohibited.

In practice, this primarily involves the inspection of ongoing commercial traffic at the transshipment ports in China. Specific, material-dependent limits for permissible impurities have been set for other waste fractions, such as 1% for non-ferrous metals and 0.5% for paper, plastics and ferrous metals. In addition, the import of 16 other material groups, including special copper waste such as cables and engines, will be banned from the end of 2018 if contamination is too severe (Reuters 2018).

Since China has banned the import of contaminated plastic waste with National Sword, arising waste has been diverted to other Southeast Asian countries. Alternatives include countries such as Malaysia, Vietnam and Thailand. (© joey333, Fotolia)



## India: New political ground - the first national resource panel

Since the turn of the millennium, an increasingly large middle class has emerged in the world's second largest economy by population. This development has been associated with a growing demand for raw materials. A number of raw materials, including mass building materials such as sand and cement, were temporarily scarce in various regions. In light of the desired further economic and social development and the associated demand for raw materials, resource efficiency in India is seen as a necessary and central strategy.

The key government agency is the Indian Ministry of Environment, Forest and Climate Change, which is also responsible for cooperation with multilateral environmental organisations such as the South Asia Cooperative Environment Programme and the Commission on Sustainable Development (Kooperation International 2019).

The National Institution for Transforming India, or NITI Aayog, has considerably more strategic planning responsibility for national development policy. NITI Aayog is a state coordination institution that calls itself the government's political think

tank. The institution plays a key role in coordinating the research policy activities of the central government and the individual regional governments of the Ministry of the Environment.

### The Indian Resource Panel (InRP)

India was the first country in the world to establish a national resource panel, the Indian Resource Panel, in November 2016. The council advises the Ministry of the Environment and other national, state and local stakeholders on means and ways to make efficient use of natural resources, especially abiotic raw materials (Rathi 2016).

The main role of the panel is to advise the Indian Ministry of the Environment and the political think tank NITI Aayog on the design and implementation of a national resource efficiency strategy. A roadmap strategy on resource efficiency was adopted in November 2017. It includes a short- and medium-term action plan from 2018 to 2020 with content on material flow indicators, environmental labels and recycling standards.

The Punjab National Bank office building in Dwarka, India, was awarded the GRIHA Five-Star-Award for its sustainable construction. Secondary raw materials such as fly ash in cement and masonry were used wherever possible. (© Rajinder Kumar & Associates)



### Secondary raw materials as an element of GRIHA

Sustainable development is receiving much attention in the Indian construction and building sector. The Indian Council for Environmentally Friendly Construction (IGBC) has developed a certification process for green buildings as part of its vision of “India as a pioneer in sustainable construction by 2025”. The Green Rating for Integrated Habitat Assessment (GRIHA) was developed by the IGBC in collaboration with the Institute for Energy and Resources (TERI).

The certification system establishes mandatory requirements in the guidelines for a successful assessment. This includes sustainable architectural design, water savings, energy efficiency and sustainable construction materials. Since all government buildings must be GRIHA-certified, GRIHA has become particularly widespread in public buildings. Resource efficiency in the form of secondary content in building materials is part of the evaluation scheme (GRIHA n.d.).

A successful recycling method for mineral construction waste has been developed in the project “Resource efficiency and secondary raw material management as a contribution to climate protection” that produces paving stones from recycled materials. These paving stones made from mineral construction waste were certified until 2017 and are recognised under the GRIHA label for green buildings. Since 2017, the EU-REI project has prepared guidelines for the recycling process and promotes nationwide implementation, in particular by public authorities (BMU / IKI 2019)

One element of the resource efficiency strategy is the promotion of sustainable procurement, which gives preference to certified products. These are awarded an eco-label and made more price-competitive with the help tax concessions (NITI Aayog / EU External Action 2017).

### Indian Resource Efficiency Programme (IREP)

In the spring of 2017, the Indian Resource Council presented its proposal for an Indian resource strategy, the Indian Resource Efficiency Programme, in Delhi and submitted it to the Environment Minister. The National Institution for Transforming India (NITI Aayog) has endorsed this resource strategy and developed its own complementary Resource Efficiency Strategy with a short- and medium-term action plan.

An important goal was to create awareness of resource efficiency among other government bodies, which was attempted by highlighting the link to supply security and sustainable development goals (Government of India / NITI Aayog 2017). The

implementation is also supported by the Resource Efficiency Initiative funded by the EU (EU-REI).

Since 2017, the EU and the Indian Ministry of the Environment have been cooperating closely within the framework of the EU-REI Initiative (Ministry of External Affairs 2017). The cooperation advances the technological, scientific and administrative capacities of the Ministry of the Environment and the relevant partners and thus facilitates the implementation of resource efficiency projects. Current activities of the initiative focus on the development of indicators and the implementation of the medium-term action plan of the Strategy for Resource Efficiency.



## Indonesia: Green industry links economic growth and sustainability

As the fourth most populous country and largest island state in the world, Indonesia currently seeks to change its economic model with its traditional focus on raw material exports. The expansion of domestic raw material processing is intended to increase the added value within the country.

For this purpose, various instruments are used, such as export bans and taxes as well as the promotion of efficiency and innovation in the basic processing industries to boost their competitiveness. To this end, Indonesia has adopted comprehensive and interdependent strategies and measures for sustainable development.

Strategic planning in Indonesia is the responsibility of several superior coordinating institutions. The Ministry of National Development Planning is responsible for the general concept, in particular the medium- and long-term development plans. The National Development Planning Agency (BAPPENAS) is also closely involved in the strategic focus of the policy. BAPPENAS is responsible for the preparation of the development plan, the evaluation of implementation and development coordination (Bappenas n.d.).

In contrast, the Coordinating Ministry for Economic Affairs of the Indonesian government is responsible for the planning and coordination of all economic policy measures. The Ministry of Finance, Industry and Trade and the Ministry of the Environment and Forestry, which was founded in 2014 by merging the two themes, are subordinate to it.

### Political framework

Economic growth and the development of domestic industries are key components in Indonesian politics. To support the long-term development plan of 2005-2025, in 2011 the government adopted the Master Plan to Accelerate and Expand Indonesia's Economic Development (2011-2025). According to the plan, Indonesia aims to establish itself as one of the top ten economies by 2025 with an annual economic growth rate of 7-9%. The driver for this development is to be found in boosting production by expanding the domestic value chain. Production should also become more efficient, more innovative and ultimately more competitive. The master plan envisages implementing the defined goals through incentive-based reforms together with the Ministry of Finance (Fritsche et al. 2013).

### Assessing sustainable green businesses

In Indonesia, business evaluation systems and awards are an important policy tool for government and industry. The Program for the Control, Evaluation and Assessment of Environmental Pollution (PROPER) plays a particularly prominent role here. In essence, the evaluation system is seen as a trial and error approach by the Indonesian government, i.e. successful experience gained with PROPER may form the basis for new legislation and its implementation.

PROPER has turned into Indonesia's most popular national initiative for public environmental reporting. It was launched in 1995 and builds on several predecessor programs, including the Clean City Program (ADIPURA) and the Clean River Program (PROKASIH) (Afsah et al. 2011). PROPER is aimed at companies that either voluntarily apply for an evaluation or are invited to do so by the regional authorities. Participating companies must comply with air pollution regulations and publish the results of periodic reviews (SCP 2012). The programme uses a colour-coded rating for the ranking of companies, ranging from gold for excellent performance to black for a poor result.





Textile production is an important industry in Indonesia. It is supported by the Center for “Resource Conserving and Cleaner Production Indonesia”. Specific training on site allows companies to optimise material and energy savings. (© ILO/Better Work Indonesia, flickr (CC BY-NC-ND 3.0 IGO))

The focus of the so-called Grand Strategy for the Green Industry launched in 2010 is specifically on the promotion of sustainable industries. This development strategy aims to achieve the efficient use of resources and the minimisation of waste. Energy efficiency targets have been defined for eight sectors, including high-emission cement, iron and steel production, the pulp and paper industry, textiles and chemicals. A 2% reduction in greenhouse gas emissions is sought by 2020 and a carbon labelling system is called for (SCP 2012).

### **Resource efficiency and cleaner production network initiative (RECP)**

To promote resource-efficient production, a national Network for RECP in Indonesia (NRECPI) was set up in Indonesia with the assistance of the United Nations Industrial Development Organization (UNIDO). Due to the systematic integration of many specialised groups and institutions, the network can be seen as an important competence cluster for resource efficiency. In the regions of South Sulawesi, North Sumatra, East, West and Central Java, opportunities for further training and evaluation

in businesses are offered and exchanges between different companies are promoted.

Network partners include the Center for Resource Efficient and Cleaner Production Indonesia (CREC-PI), which is responsible for the technological implementation, and the Indonesia Cleaner Production Center (ICPC), which was founded by the Ministry of Environment and Forestry and the Indonesian Chamber of Commerce. They are responsible for the implementation of the goals of the 10-year Framework Program for Sustainable Consumption and Production (10YFP-SCP) (RECP Indonesia, n.d.; Centre for Resource Efficient & Cleaner Production Indonesia, n.d.).

## Mexico: Resource efficiency by and for businesses

During the project period, Mexico held the largest elections in Mexican history. In consequence, public attention and the political environment were heavily absorbed and distracted by the events. The new appointments to over 3,400 offices interfered with the further development and implementation of environmental programmes (New York Times 2018). The elections also affected existing resource efficiency initiatives such as the specifically developed special programme for sustainable production and consumption (PEPyCS).

Most of the momentum for promoting resource efficiency during monitoring came from the private sector and also from universities. The most urgent concern of the Mexican government is the creation of a sustainable waste management system.

The most important state agency in environmental policy is the Ministry of the Environment SEMARNAT (Secretariat for the Environment and Natural Resources). Unlike many other countries, SEMARNAT is responsible for both legislation and implementation (OECD 2013). The Ministry focuses on water, forests, air quality, biodiversity and climate. There are also local environment ministries at the federal state level. These, however, have considerably less financial resources at their disposal and thus limited capacity to act. The independent environmental authority “Procuraduría Federal de Protección al Ambiente” (PROFEPA), founded in 1992, is responsible for monitoring the implementation of environmental legislation.

In Mexico, private sector organisations such as the “Iniciativa Gemi” are actively involved in political processes. The initiative is the Mexican branch of the international Global Environmental Management Initiative (GEMI). As a non-profit corporate organisation, GEMI seeks to promote sustainable structures and environmental management systems in its companies, always taking ecological, social and economic aspects into account. According to GEMI, international member companies include Henkel, Colgate-Palmolive, Procter&Gamble and Nestlé.

The GEMI business initiative and SEMARNAT or the PROFEPA environmental authority have been cooperating on the topic of circular economy since the year 2000. The GEMI has developed a mission statement for the year 2030 for the promotion of a circular economy in Mexico, which outlines an action plan including the necessary individual steps (Iniciativa Gemi Mexico n.d.).

### Political programmes

Environmental and resource policies are important elements of the national development plan from 2013 to 2018. With the Sectoral Programme for the Environment and Natural Resources (Programa Sectorial de Medio Ambiente y Recursos Naturales), environmental matters are given a separate initiative. It defines guiding principles for sustainable development, green growth and the overall goal of a prosperous, economically thriving Mexico.

Table 1

#### Mexico: PEPyCS indicators for the implementation of sustainable production and consumption

Objective	Indicator
Increase of the share of sustainable public procurement	Share of sustainable procurement in total employment rose to 6.9 % in 2018
Increase of the productivity of businesses based on sustainability criteria	Increase in the number of companies certified as sustainable each year from 1145 (2013) to over 6600 (2018)
Promotion of sustainable lifestyles	Reduction of waste per person and GDP to 88% of the level in 2013

Source: Gobierno de Mexico 2014



Representative of SEMARNAT talking to children and young adults at the announcement of the agreement between Mexico and the USA to promote environmental education. Education is also an important element in the joint “Frontera 2020” environmental programme of the two countries to promote environmental protection in the border region. (© SEMARNAT)

In 2014, the Special Programme for Sustainable Production and Consumption (Programa Especial de Producción y Consumo Sustentable, or PEPyCS) was published to address the topic of resource efficiency. With PEPyCS, SEMARNAT follows the national development plan and defines goals and strategies to promote sustainable economic development in Mexico. Many objectives in the programme are translated into indicators with quantifiable parameters. Table 1 provides a selection of objectives and associated indicators.

### **Circular economy**

As in many other countries, waste prevention, especially the reduction of municipal waste, is a key concern in Mexico. According to the government, Mexico produces around 44 million tonnes of (municipal) waste annually, a total that is expected to reach 65 million tonnes by 2030. However, 95% of the waste is currently deposited in landfills and only 5% is recycled or reused (Gobierno de Mexico 2019).

In light of this, SEMARNAT has developed a sustainability vision that clearly focuses on municipal waste and identifies waste prevention targets that were published in February 2019. A transparent waste hierarchy is defined: Waste prevention has top priority. The aim is to minimise waste, followed by reuse, recycling and recovery before considering landfill disposal as the final option. The creation of a circular economy is one of the basic principles in the vision. As part of the agenda set for 2030, a roadmap with key points will be introduced (Gobierno de Mexico 2019). The government is pursuing the following objectives:

- ▶ Inventory of the existing infrastructure
- ▶ Closure of existing landfills not complying with standards
- ▶ Provision of technical and financial support for waste management
- ▶ Promotion of recycling in the processing industry

## Russia: Modernisation of industry and waste management

The Russian economy is closely linked to the considerable domestic deposits of raw materials and is based on the exploitation of these natural resources. The main focus is on reducing energy use and promoting energy efficiency. In addition, the mounting problems in waste management call for political action: both selective collection systems and sufficient capacity are urgently needed.

After intensive restructuring of the Russian political landscape between 2000 and 2010, environmental concerns are now addressed by the joint competence of the government and the individual federal subjects (territorial units, e.g. a region). The Ministry of Natural Resources and the Environment of the Russian Federation is responsible for the development and implementation of government policy and legislation in the field of research, use and protection of natural resources (Piskulova 2012).

In 2010-2012, the Ministry of the Environment adopted more than 100 regulations and directives to create a new structure for environmental legislation (Piskulova 2012; RNEI 2013). The central legislation here is the Federal Law on Environmental Protection of 2002, which defines all the fundamental principles (RNEI 2013).

### Topic: Industrial development and municipal waste

The monitoring of Russia identified further development of the raw material-based economic model through innovation as a key priority. The medium- and long-term goal is to reduce the dependence of the Russian economy on natural resources and to advance the economic model based on primary raw materials. A key intention of the government is to accelerate innovations in the traditional economic sectors (e.g. metallurgy, chemistry or agriculture) by establishing the respective Best Available Techniques (BAT) (see text box).

Waste disposal is an escalating problem in Russia in general, but especially in major cities. As there is currently no nationwide collection and separation system for waste in Russia, the classic way to dispose of household waste is still by landfill disposal. It is estimated that 90% of waste is sent to landfills, not least because waste incineration plants are only available in the Moscow area (EU Recycling 2016). The volume of waste increases by around 5 billion tonnes annually. Less than 40% of industrial waste and only 10% of household waste is currently disposed of in an environmentally safe manner (AHK Russia 2017).

### Best available techniques (BAT)

With the implementation of Best Available Techniques (BAT), Russia has been promoting the development of its economy since 2014/2015. The domestic industry should be rendered more competitive with changes in legislation, while efficiency, productivity and export volume are expected to rise simultaneously. To reduce emissions, the gradual introduction of BAT in metallurgy, the petrochemical industry, cement production and in the mining industry began in 2019. Production facilities have to be refurbished to meet current technology standards and are approved for operation only if they can demonstrate their efforts. The body responsible for the implementation of the BAT is associated with the Chamber of Commerce. The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) advises the Russian government in this project (GTAI 2018).

Economic instruments are used to implement the project. Incentives include, e.g. a reduction of environmental taxes for companies, while penalties will be imposed if the implementation plan is not met. Starting with demonstration plants, the most important industrial plants (around 15,000) are expected to comply with BAT standards by 2040 (Romanov 2016).





Current challenges and the results of the German-Russian project "Climate-friendly management: Introduction of Best Available Techniques (BAT) in Russia" were discussed at a panel discussion in Moscow (September 2019). (© GIZ GmbH)

The inadequate management of waste, i.e. matters of waste disposal and landfilling, is exerting increasing pressure on Russia to act. The situation is particularly critical in the large cities of Moscow and St. Petersburg, where landfill sites are becoming scarce. Increasing amounts of waste are being shipped from the metropolitan areas to the surrounding countryside, leading to conflicts with the local population.

In 2015, an essential foundation for waste management was introduced with the adaptation of the Federal Law on Industrial and Consumer Waste to reduce waste volumes and facilitate recycling. The law requires manufacturers and importers of goods to provide recycling and disposal of product and packaging waste. If the manufacturer or importer of goods cannot provide recycling themselves, they are obliged to pay an environmental levy. The levy is set by the government and calculated according to the type of material and the quantities involved. However, recycling standards can also be met by creating an appropriate network of producers or importers (FAO 2014).

### **An integrated system for municipal waste**

Due to the mounting challenge, a state-run system for handling municipal waste is expected to be in place by the beginning of 2020 at the latest. In January 2019, Russian President Vladimir Putin signed a decree for the founding of a company offering an integrated system for the treatment of municipal waste. The so-called Russian environmental/ecological operator (REO) is to start operations in 2019 (Vedemosti 2019).

A wide range of instruments has been announced for the state-owned enterprise, e.g. to put forward proposals to amend existing legislation, examine regional waste treatment systems and merge them into a national system. Financial resources are to be made available to the company so that land, infrastructure and shares in other companies can be acquired independently (TASS 2019).

## South Africa: Resource efficiency by closing material cycles

South Africa is the most successful economy on the African continent and one of the most important mining countries in the world due to its existing reserves of raw materials. With a population of 53 million, i.e. 5% of the total population of Africa, South Africa generates 23% of the total African gross domestic product (GDP) (AWZ 2014). To promote the economy, there is a comprehensive concept for sustainable development. Economic growth through a green economy and the creation of new jobs play a pivotal role there.

The monitoring revealed that resource efficiency in South Africa is implemented with the integration of political programmes in a systematic approach. Examples of this are the existing action plans. Their goals are coordinated with the requirements of national framework legislation such as the National Framework for Sustainable Development.

The Department of Environmental Affairs (DEA) is responsible for planning strategies and measures for sustainable development. The National Framework for Sustainable Development (NFSD) of the DEA is the overall framework law (Department of Environmental Affairs and Tourism 2008). The law is implemented through the National Strategy for

Sustainable Development and Action Plan (NSSD) adopted in 2011. The strategic plan focuses on the conservation of ecosystems, the efficient use of natural resources, in particular water, and the development of South Africa into a green economy.

In South Africa, the consistent and gradual implementation of the framework plan and the associated specific measures for waste management is remarkable. It includes interrelated aspects such as the extension of the definition of waste, the implementation of (industrial) waste management plans and the treatment of hazardous waste. As in a number of other countries, the promotion of a sustainable economy in South Africa is closely linked to job creation and the reduction of emissions (The Economic Development Department 2016).

### One man's trash is another man's treasure

An industrial symbiosis is the joining of several companies in a network in which waste (or unused resources) from one company represents the resources of another company. In addition to the main focus on material cycles, unused energy or even knowledge can also be shared or transferred. The National Cleaner Production Centre South Africa administers these so-called Industrial Symbiosis Programmes in South Africa.

The approach for South Africa is based on the British National Industrial Symbiosis Programme and has been implemented in close collaboration. However, the South African research institute Council for Scientific and Industrial Research notes that these programmes should not be a mere copy of a European model, as the specific conditions of a country must be taken into account for successful implementation (Godfrey 2017). In April 2019, the provincial government of Limpopo, in collaboration with the National Cleaner Production Centre South Africa, launched the fourth South African regional branch - the Limpopo Industrial Symbiosis Programme. The three networks in the Western Cape, Gauteng and KwaZulu-Natal have been in operation for some time.



The Western Cape Industrial Symbiosis Programme (WISP) is one of four South African networks in which energy, water and knowledge are shared to promote resource efficiency. With WISP, the non-profit organisation “GreenCape” promotes the implementation of sustainable solutions for businesses in the Western Cape. (© GreenCape)

### **Recycling as a strategy for a raw material exporting country**

South Africa is one of the few exceptions among exporters of raw materials where the availability of feedstocks is pursued as an approach for resource efficiency. The focus is on the promotion of domestic recycling of metals, which is promoted with export restrictions on metal scrap (ITAC 2019).

Under the Price Preference System (PPS), scrap metal available to local customers must be offered at a discount of 20 % off the world market price. This measure is intended to reduce the high export rates of scrap metal to Asia and secure secondary raw materials for domestic use. Trade restrictions on the export of scrap metal have been in force since 2013. The export regulations were designed and implemented by the Ministry for Economic Development and the South African International Trade Administration Commission (ITAC).

The legal basis for these measures has been the Act to Regulate the Exportation of Ferrous and Non-Ferrous Waste and Scrap adopted in 2013. The regulation targets metals such as iron, copper, nickel, aluminium, molybdenum, tungsten and tantalum. The metals are evaluated in a weekly updated report and a price is set for each type of scrap metal (Department of Economic Development South Africa 2014).

### **Waste management through product stewardship**

Similar to many other countries, the global focus on the rising tide of plastic waste and marine pollution was also noticed and discussed in South Africa. The increasing quantities of packaging waste and single-use plastics were important topics in South African public discourse during the monitoring. As a solution, South African packaging manufacturers throughout the country will be obliged to document their waste streams and report them in an Industrial Waste Management Plan (IndWMP). As an alternative to the IndWMP, manufacturers can join a non-profit Producer Responsibility Organisation (PRO) financed by the manufacturers of the products (Green Cape 2018).

For electronic scrap (e-waste), discussions have already taken place with stakeholders to improve the management of the quantities of e-waste. Of the estimated 360,000 tonnes of e-waste per year, only between 25,000 and 35,000 tonnes are currently recycled in South Africa. The E-Waste Recycling Authority NPC has therefore worked with manufacturers and recyclers to develop an Industry Waste Management Plan for E-Waste to develop solutions for handling this type of waste (Green Cape 2018).



## South Korea: Green growth - Made in Korea

South Korea pursues a comprehensive Green Growth Strategy. It provides the framework for the regular five-year plans as well as for sector plans and for planning at the lower administrative levels. Due to the many approaches taken by ministries and affiliated (research) institutes, the government may be regarded as the key agent for promoting resource efficiency in South Korea. A particularly interesting example is the Green Credit Card, which is intended to support sustainable consumption among the general public (see text box).

The South Korean government agency in charge of environmental protection is the Ministry of Environment, which was founded in 1994. In addition to developing medium- and long-term environmental protection measures, the ministry is also responsible for passing environmental laws and regulations and setting up framework structures for administration and other environmental protection institutions.

In South Korea, the political framework is defined by a large number of short-, medium- and long-term strategy papers. The Framework Law on Low Carbon Green Growth forms the basis for strategy development for low carbon green growth. Building on this strategy, a National Strategy for Green Growth is to be developed to promote sustainable

processes in society and business. This includes both a circular economy and the creation of advisory bodies. These committees are intended to stimulate the participation of the various stakeholders at national and regional level (Korean Government 2010).

### Presidential and Local Green Growth Committees

The national and regional committees for sustainable growth represent a unique institutional feature in South Korea. As part of the Framework Act, a national Presidential Committee on Green Growth (PCGG) was established in 2009. The committee consists of 50 members (consisting of 14 ministry representatives and 36 civilian experts) and is responsible for implementing the “Low Carbon and Green Growth” vision and for updating the five-year plans for green growth (Jones/Yoo 2011).

The National Committee is supported by the Local Green Growth Committees (LGGCs). These regional committees, each with a maximum of 50 members, are authorised to develop and implement independent five-year green growth plans at the local level to reflect regional requirements. In 2009, 16 cities and regional governments had established an LGGC and adopted over 2,000 guidelines and programmes in pursuit of the strategic direction of

With the Green Credit Card, users in South Korea can collect eco-points when buying environmentally friendly products, saving energy or using public transport. The points can either be redeemed as a payout at participating companies or used for entrance to public institutions. (© UNFCCC)





the five-year green growth plans. For instance, in the section Promoting a Green Lifestyle, a total of 329 policies and programmes were implemented in seven cities and nine provinces (Global Green Growth Institute 2015).

### Plastic waste

The consequences of waste arising from the widespread use of plastics are turning into an increasingly urgent problem. Especially after the Chinese import ban on plastic waste in January 2018, this challenge intensified in South Korea. In consequence, there are considerable political efforts to reduce the use of plastic and thus the amount of waste (The KoreaTimes 2018).

In 2019, all single-use plastic bags were banned in larger supermarkets. Shops are encouraged to offer alternatives such as paper or cloth bags (Independent 2019). There are also plans to take action against excessive packaging and to avoid PVC (polyvinyl chloride) as a component of plastic

products and plastic bags, as it renders them difficult to recycle. In August 2019, a ban came into force prohibiting the use of plastic cups in all cafés. Plastic cups can only be used for take-away drinks, while customers in the shop have to be served with cups made of glass, for example. In this context, the Seoul Municipality committed itself to cutting plastic consumption in half by 2022 (Channel News Asia 2018).

Recycling in South Korea will be boosted by the Framework Act on Resource Cycles, which came into force in early 2018. Management Systems for Resource Cycles encourage companies to voluntarily recycle raw materials and reduce their waste volumes. An ambitious goal is to exclude all recyclable materials from landfills by 2025. To promote this goal, a levy will be introduced for landfill disposal of recycled materials and a market for recycled raw materials and products will be created (UNCRD 2018).

### Green Credit Card

In South Korea, an innovative approach is under way to control private consumption with a targeted incentive system. Since 2011, use of the Green Credit Card allows the collection of bonus points called eco-points. Once acquired, these may be used for the purchase of environmentally friendly products, energy savings and the use of public transport. Eco-points are displayed on invoices when green products are purchased if payment is made with the Green Credit Card. The points can be used as cash at participating companies to purchase environmentally friendly products or services, but also for reduced or free entry to public facilities. In a brief analysis of UNESCAP, the visualisation of accrued savings is seen as a strength of the approach. A drawback, on the other hand, is that there is no incentive to promote sufficiency, i.e. less consumption (UNESCAP 2014).

According to the Ministry, consumers can benefit from the use of the eco-currency to a monetary value of over US\$ 200. In November 2016, the second version of the Card was introduced as the Green Card v2. The new version offers further options for collecting Eco-Money Points: in particular, online purchases and payment by direct debit, e.g. when purchasing electricity, are simplified with the update. Since its introduction in 2011, approximately 14.34 million Green Credit Cards have been issued and a total of 27.7 trillion Won in Eco-Money Points (approx. €22.5 million) have been accrued (Korea Bizwire 2016). The Ministry of the Environment intends to make the Green Credit Card programme known beyond its own country borders as a good example and to establish worldwide partnerships on the Green Credit Card principle. There has been initial success. China, Taiwan and Thailand have already announced their intention to implement the Korean incentive system on the Asian continent (UNFCCC n.d.).

## USA: Less wastage, more networking

The USA are a country rich in raw materials. With a total direct material consumption of 6.6 billion tons, it is the third largest consumer country in the world after China with 35.1 billion tons and India with 7.4 billion tons (UN Environment 2019). The Sustainable Materials Management (SMM) programme provides a national policy framework to promote raw material efficiency. The Federal Government, and in particular the United States Environmental Protection Agency (US EPA), are particularly active in waste management and education for sustainable development, especially in the area of sustainable consumption and energy efficiency.

As one of the key players in the USA, the US EPA offers a comprehensive range of webinars and programmes for companies, public authorities and the general public. The development of indicators and cooperation at the state level further distinguish the wide portfolio of the federal agency. The most important element for resource efficiency is the SMM programme implemented by the EPA (see text box).

The US EPA was founded in 1970 as a federal agency. In addition to handling chemicals and toxic substances, it also addresses matters of waste disposal, air and water quality and the promotion of sustainable energy and transport systems. In addition to the EPA, networking at the federal level is also carried out by the Environmental Council of the States (ECOS). ECOS was founded in 1993 with the aim of fostering a qualitative exchange between federal and state authorities. For this purpose, the transfer of experience and ideas in the implementation of programmes as well as the promotion and coordination of environmental management in the federal states is specifically encouraged. ECOS also prepares position papers for the US Congress, the federal authorities or for information of the general public (The Environmental Council of the States n.d.).

Above all, the focus of both the EPA and ECOS is on voluntary exchange between states, networking and knowledge transfer through best practice models. Here, ECOS serves as a sharing platform to inte-

As part of its Zero Waste Program, the city of San Francisco was looking for a convenient waste separation system. A solution was found with the Fantastic Three: green for compostables, blue for recycling and black for landfill waste. (© Recology)



## Sustainable Materials Management

The Sustainable Materials Management (SMM) Program is designed to consider the entire life cycle of materials and products to optimise productive use and improve reuse of materials. As the implementing agency, the US EPA seeks to reduce material input in the US economy in general, and the use of harmful materials in particular, with SMM.

For instance, one goal of the programme is the continuous exchange of knowledge on materials. As a secondary material, coal fly ash may be used as a substitute for Portland cement in concrete (US EPA 2019). For medium-term planning, the current strategic plan for the period 2017 - 2022 defines the three strategic areas. These include the built-up environment, sustainable food management and sustainable packaging (US EPA 2015).

The programme also organises various information campaigns for companies and the general public, including a national campaign to reduce food waste (U.S. EPA 2016). SMM also includes a variety of platforms such as a Material Management Wizard (MWiz), which provides an online collection of tools and information to support and promote sustainable materials management in municipalities or businesses.

grate problem-solving competencies. The thematic focus of the states is mostly on waste management.

### Federal states focus on consumption and zero waste

A general observation of the study was that matters of resource efficiency are a topic in many of the 50 US states. In almost all states, the focus is on waste management. Due to the large quantities of waste that are still disposed of in landfills, attempts are being made to reduce landfill disposal rates and achieve higher recycling. Some of the states, such as California, are pursuing comprehensive programmes to this end.

In California, the Department of Resources Recycling and Recovery (CalRecycle) is a part of the Environmental Protection Agency. It is responsible for waste and recycling management, sustainable procurement and sustainable construction. For instance, CalRecycle supports and supervises the Zero Waste Communities plans of various cities and communities in California at the municipal level. In this context, zero waste is understood as a process of reducing the amount of waste going to landfills.

The US Zero Waste Business Council considers a 90% reduction in landfill disposal feasible. The goal is to develop municipalities into zero waste

municipalities by a defined target year. In addition to the major cities of Los Angeles and San Francisco, action plans are in development in many municipalities (Burbank, Oakland, San José) (CalRecycle 2019). Furthermore, CalRecycle has been commissioned to implement the California 75 Percent Initiative to recycle, compost or reduce around 75% of waste by 2020, thus drastically reducing the amount of waste going to landfill. In total, 23 million tonnes of additional waste are to be recycled, reduced or composted by 2020 (CalRecycle 2018). At present, around half of the waste generated (37 million tonnes) is recycled or composted (CalRecycle 2016).

Other US federal states rely on education of the general public to reduce waste. For instance, the Mississippi Department for Environmental Quality provides tips on how to protect the environment by putting waste prevention, reuse and recycling into practice during the US holiday season. The festive period is a priority because more than 25% additional household waste is generated between Thanksgiving and New Year's Eve. The information provided includes suggestions for low-waste decorations and ideas for the environmentally friendly purchasing and packaging of gifts (ECOS 2017).

## Paths to more resource efficiency - Summary and outlook

This brochure provided some insights into the diversity of policies and measures to promote resource efficiency in the nine selected countries - Brazil, China, India, Indonesia, Mexico, Russia, South Africa, South Korea and the USA.

The case studies show that the choice of which sectors or raw materials should be targeted for optimised efficiency is closely linked to the economic development goals of each country. The way in which resource efficiency measures are implemented in turn depends strongly on the framework conditions in place.

In addition to the intensive use of raw materials by industrialised countries, the economic rise of densely populated emerging economies is leading to a further increase in global demand for natural resources. With this growing demand for raw materials, however, environmental problems associated with the extraction and use of raw materials are also on the rise. The different approaches to resource efficiency aim to contribute to reducing the demand for raw materials and thus the environmental impacts.

The country case studies show that the more efficient use of raw materials is actively pursued in all countries. Differences can be found in the extent to which countries promote their measures. The following general observations can be derived as a result of the monitoring scheme.

### Cross-sector framework legislation

The majority of the selected countries have defined overall sustainable development goals that include resource efficiency as an integral part. The goals are mostly based on the Sustainable Development Goals of the United Nations.



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In several countries, resource efficiency is a sub-strategy, for example to facilitate new business models or jobs in environmentally friendly sectors, or to promote a circular economy.

In other cases, however, the integration of resource efficiency is less complex and limited to only a few aspects, such as waste disposal. An interesting contrast may be found in those countries that allow a certain latitude between obligatory, binding political stipulations and an incentive-oriented focus on voluntary action.



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Very few countries, among them India, have developed a comprehensive national resource efficiency strategy such as the German ProGress strategy.

### Resource efficiency in production

Approaches to promote efficient production could be observed in all the countries under investigation. Differences can be found between the priority sectors (e.g. basic industries, individual processing sectors, high technology or services) and the desired level of change



(e.g. achieving international production standards versus assuming world market leadership). In many countries, exchange between companies is encouraged. The fundamental idea is that one company's waste is another company's resource. Additional, more widespread instruments include offers for continued education, efficiency consulting and incentive systems such as financial rewards or awards for Best Practice businesses.

### Resource efficiency in consumption

The approaches to promote resource efficiency in consumption are essentially very similar in the countries under investigation. Almost all approaches focus on informing society through educational programmes and product labelling or certification. Specific targets are set almost exclusively for public procurement.

No restrictions on private consumption have been introduced in any of the countries. The Green Credit Card in South Korea is a very unique approach to managing private consumption. When purchasing sustainable products certified with an eco-label or using public transport, users accrue credit that can be used for further purchases of sustainable products.

### Waste and recycling

Waste prevention and recycling approaches are the most widespread. In many countries, the disposal of large volumes of waste poses challenges for policy makers and causes increasing environmental pollution. The inadequate disposal of waste is often a starting point for the establishment of a circular economy in which waste is minimised and raw materials are reused.

Recycling is mainly guided by quotas and the development and advancement of technological solutions. An exceptional case are the export restrictions in South Africa that aim to reduce the export of scrap metal for domestic use as secondary raw material.

### Conclusions and outlook

The present research project successfully developed a monitoring system to compare international resource efficiency policies. The results show the complexity of resource efficiency and sustainable resource use. The promotion of resource efficiency is a largely undisputed policy approach in all the countries studied. A broad range of stakeholders from companies and society show an interest in resource efficiency matters. Politics is not the driving force in all countries investigated. In fact, in some of the countries included in the monitoring, the debate on resource efficiency is primarily advanced by companies or scientific institutes.



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The diversity of goals and measures shows that there is no “one correct” approach. Instead, there are different approaches for more resource efficiency, which are more or less intensively pursued in the individual country-specific context.

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