Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan

switchasia

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# SUSTAINABLE CONSUMPTION AND PRODUCTION ACTION PLAN

# REPUBLIC OF KAZAKHSTAN

FULL EDITION

## ACKNOWLEDGEMENT

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# TABLE OF CONTENTS

# LIST OF ACRONYMS

| | |
|---|---|
| **AQM** | Air Quality Management |
| **AQP** | Air Quality Pollutants |
| **BAT** | Best Available Techniques |
| **bcm** | Billion Cubic Metres |
| **Blue Hydrogen** | Hydrogen gas produced by the steam reformation of methane (natural gas), the $CO_2$ (carbon dioxide) by-product of this process being separated from the hydrogen and either put to beneficial use or immobilised using CCS technology. |
| **CCS** | Carbon Capture and Storage |
| **CE** | Circular Economy |
| **CEAP** | Circular Economy Action Plan |
| **$CH_4$** | Methane |
| **CHP** | Combined Heat and Power |
| **CIS** | Commonwealth of (Newly) Independent States |
| **CLRTAP** | Convention on Long Range Transport of Air Pollutants |
| **CO** | Carbon Monoxide |
| **$CO_2$** | Carbon Dioxide |
| **$CO_2$-eq** | Carbon Dioxide Equivalent of a gas concerning its Global Warming Potential (GWP) relative to that of carbon dioxide. |
| **COD** | Chemical Oxygen Demand – a measure (mg oxygen/litre) of the oxidisable strength of a wastewater or other water stream |
| **DEFRA** | UK Government Ministry: Department for Environment, Food and Rural Affairs |
| **EC** | European Commission |
| **EE** | Energy Efficiency |
| **EEBPP** | Formerly the Energy Efficiency Best Practice Programme of the United Kingdom |
| **EGD** | European Green Deal |
| **ELP** | End of Life Product or Products |
| **EMS** | Environmental Management System e.g. one certified as compliant with ISO14001 |
| **EN** | European Standards (European Norm) - technical standards drafted and maintained by CEN (European Committee for Standardization) and others |
| **EPA** | Environmental Protection Agency of the USA |
| **EPR** | Extended Producer Responsibility |
| **ETS** | Emissions Trading System |
| **ETSU** | Formerly the Energy Technology Support Unit of the United Kingdom |
| **EU** | European Union |
| **FOLU** | Forestry and Other Land Use |
| **GDP** | Gross Domestic Product |
| **GE** | Green Economy |
| **GEAP** | Green Economy Action Plan |
| **GHG** | Greenhouse Gas |
| **GM** | Genetically Modified |
| **Green Hydrogen** | 'Green Hydrogen' is hydrogen produced by the electrolysis of water using electricity generated from renewable energy sources. |

| | |
|---|---|
| **Ha** | Hectare |
| **HSE** | Health, Safety and Environment |
| **INCD** | Intended Nationally Determined Contribution to reducing GHG emissions under the Paris Agreement |
| **IPCC** | Intergovernmental Panel for Climate Change |
| **ISO** | International Organization for Standards |
| **LCA** | Lifecycle Assessment |
| **MEGNR** | Ministry of Ecology, Geology and Natural Resources |
| **MSW** | Municipal Solid Waste |
| **MSWM** | Municipal Solid Waste Management |
| **MWth** | MegaWatt Thermal |
| **MS** | Member State of the European Union |
| **NAP** | National Action Plan/s |
| **NAPCP** | National Air Pollution Control Programme |
| **NGO** | Non-governmental Organisation |
| **NMVOC** | Non-Methane Volatile Organic Carbon Compound/s |
| **$N_2O$** | Nitrous oxide |
| **$NO_2$** | Nitrogen Dioxide |
| **NOx** | Nitrogen Oxides |
| **OECD** | Organization for Economic Cooperation and Development |
| **PM** | Airborne Particulate Matter. $PM_{10}$ is the concentration in air of all PM whose aerodynamic diameter is equal to or less than 10µm. Hence it includes the finer PM fraction, $PM_{2.5}$, whose aerodynamic diameter is equal to or less than 2.5µm. |
| **PRC** | Peoples' Republic of China |
| **R&D** | Research and Development |
| **RES** | Renewable Energy Source |
| **SCP** | Sustainable Consumption and Production |
| **SCP-SM** | SCP Support Mechanism |
| **SDG** | Sustainable Development Goal |
| **$SO_2$** | Sulphur Dioxide |
| **TA** | Technical Assistance |
| **TI** | Tracking Indicator and Indicators |
| **TPP** | Thermal Power Plant |
| **UK** | United Kingdom |
| **UN** | United Nations |
| **UNECE** | United Nations Economic Commission for Europe |
| **UNEP** | United Nations Environment Programme |
| **USA** | United States of America |
| **VAT** | Value Added Tax |
| **WCP** | Whole Chain Plans, e.g. for food waste reduction |
| **WEEE** | Waste Electrical and Electronic Equipment |
| **WHO** | World Health Organization |
| **WRAP** | Waste & Resources Action Programme |
| **WWTP** | Wastewater Treatment Plant |

# EXECUTIVE SUMMARY

Kazakhstan's economic development has been driven mainly by an increase in extractive industries, accompanied by significant degradation of the environment and reducing people's quality of life. Since the mid-2000s, national Government through the Ministry of Ecology, Geology and Natural Resources (MEGNR and its forerunners) have crafted policies and legislative measures to aid the transition to a Green Economy. These have included the preparation of the Environmental Code (Eco-code) that has led to significant changes in industrial production methods and the adoption of new environmental policy tools. And the Eco-code's revision to accommodate European best practices such as at-source waste minimisation and the implementation of best available techniques (BAT) in industry. A further major development was the preparation of a Concept for the Transition of the Republic of Kazakhstan to a Green Economy (Green Economy Concept, GEC), and its approval by a Decree of the President of the Republic of Kazakhstan in May 2013, whose strategic objectives and targets are to be met in stages by 2050, with the Government formulating and requiring the implementation of timebound GEC Action Plans, the latest of which covers the period 2021-2030.

Kazakhstan has signed up to the United Nations Sustainable Development Goals (SDG), which include Goal 12 to 'ensure sustainable consumption and production (SCP) patterns' and meet its 11 subsidiary targets, mostly by 2030. Consequently the Switch-Asia SCP Facility, the MEGNR (National Focal Point) and EU Delegation to Kazakhstan organised a Multi Stakeholders Dialogue (MSD) with line Ministries and key Stakeholders to identify main priorities for supportive Technical Assistance activity. The MSD was held on 12 November 2019 and two priority areas were identified for support, including the Preparation of an SCP Action Plan. An official demand letter was received from the MEGNR on 25 February 2020, including an objective 'To strengthen national policy frameworks related to SCP and Circular Economy (CE) through the elaboration of an SCP Action Plan in support to the transition to a Green Economy in the country and the implementation of the Green Economy Action Plan for 2021-2030.' The SCP Action Plan is structured as follows:

- **Chapter 1** introduces SCP, its relationship to higher-level environmental and other policies and goals, and to many of the SCP tools and measures that can help identify practical measures for improving resource efficiency, reducing waste, substituting more benign resources for those that are potentially harmful, and for the reuse and recycling of end-of-life products. A major consideration in applying SCP is the mapping of sectoral 'value chains', which comprise all the stages in production, product use (consumption) and the management and disposal of products that have reached the end of their useful life.
- **Chapter 2** provides a principled rationale for the scope of the national SCP Action Plan. Three major value chains are identified: (i) agriculture and agri-products; (ii) the extraction, processing and use of fossil fuels (gas, oil and coal); and (iii) the mining of metal ores, and their processing for export and domestic use. Four cross-sectoral themes are discussed: (a) water resources availability and demand management; (b) resources recovery (materials and/or energy) recovery from municipal solid waste; (c) reducing national GHG emissions in response to climate change – requiring action on energy efficiency (resource efficiency cornerstone), adoption of renewable energy sources (substitution cornerstone), and shifting towards a decarbonised energy system in the longer term; and (d) ambient air quality. Since the latter two themes are so closely associated with the energy value chain, they are presented as part of the energy value chain in Chapter 6 as well.
- **Chapter 3** details the scope of the agriculture and agri-product value chain. It breaks down the value chain into major stages and their subsidiary steps, describing major resource consumption and emission issues (to air, water, soil and wastes) for each – including the predominant role of crop growing in the abstraction and consumption of freshwater. The chapter identifies SCP tools and measures that may be appropriate in each step of the value chain to improve resource efficiency and reduce ecological degradation.
- **Chapter 4** introduces the cross-sectoral role of SCP in achieving water-use efficiency in non-agricultural sectors.
- **Chapter 5** addresses the role of SCP in the recovery of resources – materials and energy – from municipal solid waste. An enabling environment is especially relevant to this cross-sectoral theme, hence the concept is developed here in some detail. Chapter 5 concludes with sections on applying an SCP approach to (i) minimising the rate of solid waste generation and (ii) strengthening waste collection and resource recovery.

- **Chapters 6 and 7** refer to the energy and metals value chains, respectively, the approach being the same as for agriculture in Chapter 3, and again identifying potentially applicable SCP tools and measures. An emphasis is placed on the adoption of Best Available Techniques (BAT) in the extraction and processing stages, and in large-scale combustion plants. Chapter 6 also includes sections on the cross-sectoral role of SCP in reducing GHG emissions – including energy efficiency and renewable energy – and improving ambient air quality.
- **Chapter 8** introduces the need for a mechanism to promote and stimulate the adoption of SCP in priority areas. Because much SCP action is voluntary, attitudinal and behavioural change is critical to its widespread uptake. A promotional mechanism is needed, therefore, targeting the stimulation of behavioural change as a major goal. The chapter identifies the underlying principles for such a mechanism. And it presents some international experience that illustrates how such a mechanism may evolve over time, as experience is gained.
- **Chapter 9** presents the SCP Action Plan to 2030, derived from the analysis presented in the preceding chapters and the reviews of national and EU policy presented in the Annexes.
- **Annex A** provides a summary of major national legislation, concepts and projects related to achieving a green economy.
- **Annex B** summarises the European Union's Green Deal, including the goal of Net Zero GHG emissions by 2050, a toxic-free environment and achieving a circular economy. It concludes with a comparative analysis of Kazakhstan's Green Economy Action Plan (to 2030) with the EU's Green Deal (EGD), and notes the opportunities to introduce EGD ideas into the SCP Action Plan for Kazakhstan.
- **Annex C** identifies the United Nations' Sustainable Development Goals (SDGs) relevant to SCP implementation, important drivers for Green Economy policy implementation.
- **Annex D** provides indicative Terms of Reference and staff complement for one possible institutional measure to promote SCP.

# 1. SUSTAINABLE CONSUMPTION AND PRODUCTION (SCP)

## 1.1 The Three Cornerstones of SCP

The concept of sustainable consumption and production (SCP) has evolved and been defined in a number of ways. For instance, the Oslo Symposium in 1994 proposed a working definition of SCP as '*the use of services and related products which respond to basic needs and bring a better quality of life while minimising the use of natural resources and toxic materials as well as the emission of waste and pollutants over the life cycle of the service or product so as not to jeopardise the needs of future generations*'.[1]

The United Nations Environment Program (UNEP) in 2011 defined SCP more simply as a '*holistic approach to minimising the negative environmental impacts from consumption and production systems while promoting quality of life for all*'.[2]

Regardless of the definition of SCP, four underlying SCP principles apply:

1. Improving the quality of life without increasing environmental degradation and without compromising the resource needs of future generations
2. Decoupling economic growth from environmental degradation by:
   - Reducing material/energy intensity of current economic activities and reducing emissions and waste from extraction, production, consumption and disposal
   - Promoting a shift of consumption patterns towards groups of goods and services with lower energy and material intensity without compromising quality of life
3. Applying life-cycle thinking which considers the impacts from all life-cycle stages of the production and consumption process

4. Guarding against the re-bound effect, where efficiency gains are cancelled out by resulting increases in consumption

**Three fundamental concepts** may be extracted from the above definitions and principles: **resource efficiency, substitution,** and **circularity**. Drawing on these concepts, SCP may be seen as a delivery agent for a national Green Economy (GE); see Figure 1.

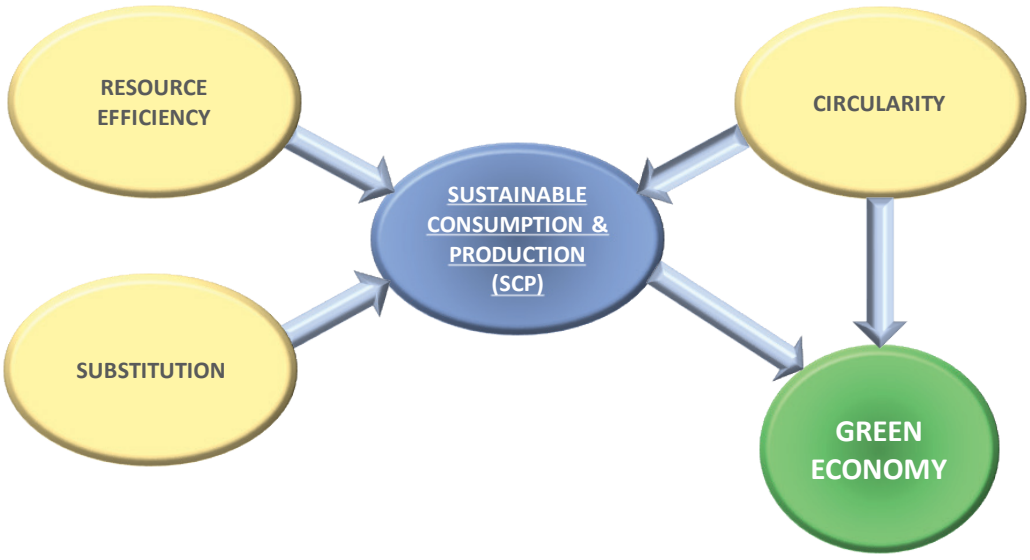



***Figure 1: SCP, together with Circularity, contributes to delivering a Green Economy***

1 Oslo Symposium, 1994: https://enb.iisd.org/consume/oslo004.html
2 UNEP, 2011, Sustainable Consumption and Production: A Handbook for Policymakakers, Global Edition, p. 10.
The online PDF be freely downloaded from Research Gate: https://www.researchgate.net/publication/324583885_Sustainable_Consumption_and_Production_A_Handbook_for_Policy_Makers

Understanding each of these concepts helps us develop our appreciation for and recognition of the systematic, deep-seated changes in behaviour and practice that SCP strives to achieve. It represents a profound shift away from 'business as usual'. A further feature of SCP is that it recognises and places an emphasis on the role not only of producers but of consumers, and this latter group includes governments, institutions, members of the public, and businesses. Each of the three concepts is described below; Section 1.2 introduces the roles of governments, producers and consumers.

**Resource Efficiency (Use Less)**: reduce the consumption of energy, water and materials in production; design, buy and use fewer resource-intensive products. Some examples:

- Increase the energy efficiency of buildings by improving insulation
- Adopt water-saving techniques to reduce the net freshwater consumption of agricultural and industrial production
- Optimise product design and production operations so that fewer resources are consumed in making and using consumer products
- Consumers purchase resource efficient products (incentivised by eco-labelling and communication messaging, for example)

**Substitution (Use Better):** use harmless or less harmful resources to produce goods and services:

- Produce, buy, and use paints that contain fewer, or are free of, organic solvents
- Generate electricity using renewable energy sources instead of fossil fuels

**Circularity ('From Cradle to Cradle'**): in a minimalist sense, this method involves saving resources by recycling or reusing a product or waste stream. A fuller interpretation, as exemplified by the Circular Economy approach being adopted by the EU, represents a strategic transformation from a linear to a more sustainable economy that decouples economic growth from resource use (see Section 1.3). It thus affects product design, production, end-of-life product management and consumer behaviour, and includes waste recycling (solid, liquid, gaseous), as for example:

- Recovery and recycling of waste streams (solid, liquid and gaseous) at production sites and from consumers, and, where this is not possible, in off-site facilities etc.
- Designing products for low-resource consumption while in use, and for durability, repairability, and ease of end-of-life disassembly (i.e. 'circularity')
- Applying a value-chain approach in key sectors, including measures to reduce all forms of waste systematically, and reusing or recycling whatever waste is produced
- Adopting necessary systems and infrastructure to enable the recovery and reuse/recycling of constituent components and materials from products that have reached the end of their lives

## 1.2 Roles of Government, Producers and Consumers in SCP

The three main stakeholder groups noted in the foregoing section are introduced below.

### Government

In addition to setting appropriate goals and policies, the government has the responsibility to ensure that those policies are implemented effectively and that the outcomes of implementation are recorded and fed back into the policy-review process. And it has the primary responsibility, through its agencies, to monitor and inspect entities in the productive, supply and waste management sectors to enforce legislative requirements. As prime mover in the policy decision to adopt SCP as a key part of its green agenda, **government must also ensure there exists a sustained enabling environment**. Key elements of an enabling environment for SCP include the following:

- Applicable policy documents are clear and unambiguous, and policy requirements are enforceable
- SCP tools and associated information are made available for producers and suppliers to use
- Entities in the productive and supply sectors have the capacity to apply SCP tools and, where their capacity is limited, receive capacity-building training and advisory support

- Those entities in the sectors of the economy lying within identified national key value-added chains (see Section 1.5) undertake coordinated SCP action in pursuit of a circular economy agenda
- The policy goals, the policies themselves, and the practical steps including the use of SCP tools that help to identify and implement measures are communicated effectively to producers and suppliers
- Similarly, policy and what it implies for consumers – households and others – is communicated effectively to consumers
- Consumers are motivated to buy green products, and producers and suppliers are motivated to supply them
- Government ministries and departments purchase goods and services in accordance with the government's Green Economy agenda, consistent with SCP principles and concepts
- Financial resources are available to catalyse all of the above, and economically disadvantaged members of society are treated fairly

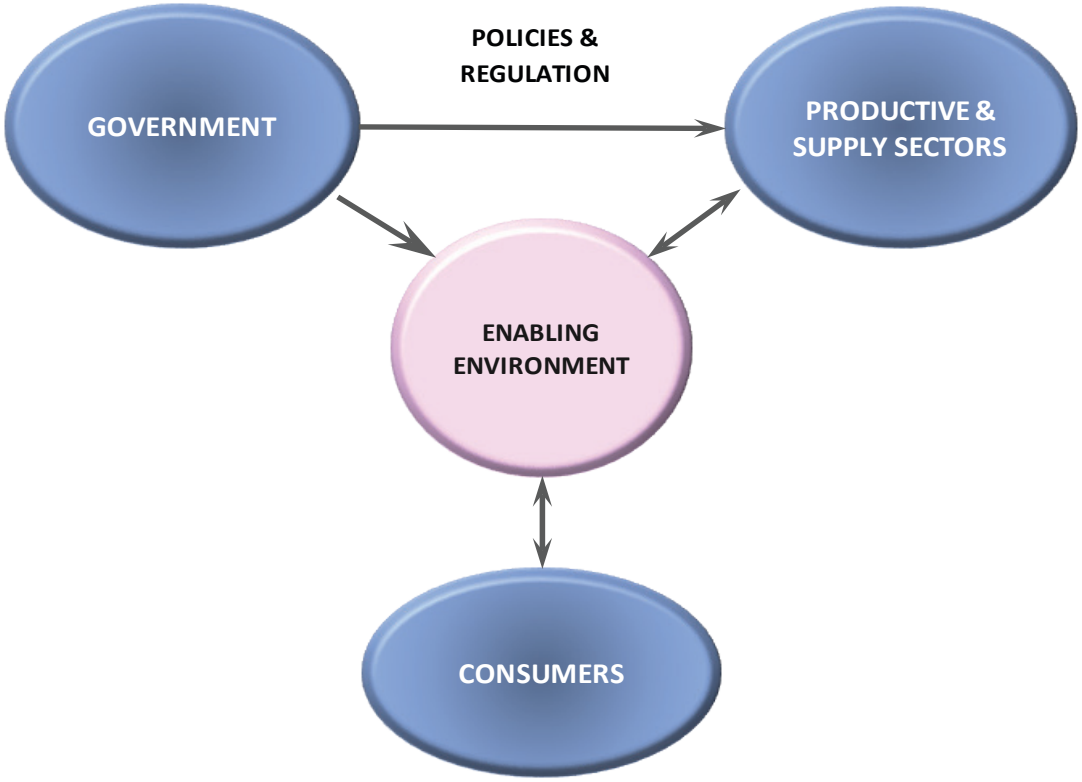



*Figure 2: Schematic illustration of the need for an enabling environment to interface with government, producers and suppliers, and consumers*

## Producers and Suppliers

It is the responsibility of producers and suppliers to apply appropriate SCP tools to identify, and then implement, the specific measures that will contribute to achieving the national Green Economy vision. In particular, for those entities in key value-added chains, the measures include taking coordinated action to respond to the national Green Economy agenda. Consumers, as purchasers of intermediate goods and services, are also implicated in these measures.

## Consumers

Consumers can be private, business or government, for whom different instruments and approaches are available to facilitate action. The roles of consumers include:

- Responding positively to communications regarding the green agenda
- Buying and boosting the demand for green products, communicating their desires to suppliers
- Using products responsibly, avoiding waste where possible, and avoiding excessive use of water and energy, etc.

- Complying responsibly with requirements to, for instance, separate solid wastes at the source before their collection, and disposing of end-of-life products defined in accordance with regulatory requirements, and making use of available facilities

## 1.3 How Linear and Circular Economies Differ

Creating a greener economy requires the transformation of the consuming and productive sectors of the economy – primary, secondary and tertiary – to shift from a predominantly linear model to one that is more circular. What distinguishes these two models? The differences are illustrated schematically in Figure 3 and elaborated below.

### Linear Economy

Put simply, a linear economy is one in which little or no emphasis is placed on minimising resource consumption; and material recycling, energy and water efficiency measures are not practised. *In extremis*, a linear economy may be characterised as **Take-Make-Use-Dispose**. At present, despite energy substitution, resource efficiency, recycling, and (solid, liquid and gaseous) waste management measures that have been adopted, the Republic of Kazakhstan's economy bears an uncomfortably close resemblance to the linear model.

### Circular Economy

In contrast, as indicated in Figure 3 and Annex D, a circular economy involves substantial feedback loops, in which efforts are made at the design and subsequent stages to eliminate or, if this is not possible, to minimize waste generation throughout a product's life-cycle – starting with production, and until the end of its useful life. It involves all sectors of the economy, for instance:

- **Primary sectors**: agriculture, forestry, fisheries, water abstraction/extraction, mining for coal and ores, quarrying for stone, oil and gas extraction

- **Secondary sectors**: processing of primary raw materials and foodstuffs, treatment of freshwater for the purpose of supply, oil and gas refining and petrochemicals production, energy transformation processes including the generation of electricity and heat from the combustion of fossil fuels, coke production, and the manufacture and production of all manner of goods and packaging materials for sale

- **Tertiary sectors**: distribution and supply of goods and services, public transport, municipal sewerage and wastewater treatment services, municipal solid waste management facilities, retail outlets, health and educational services offices, and the supply of all manner of services including government at national and lower-level tiers

- **Consumers**: government and institutions, households, the hospitality sector, private transport, all users of goods and services in all sectors irrespective of their being produced in-country or imported, and all external users of goods and services exported from Kazakhstan

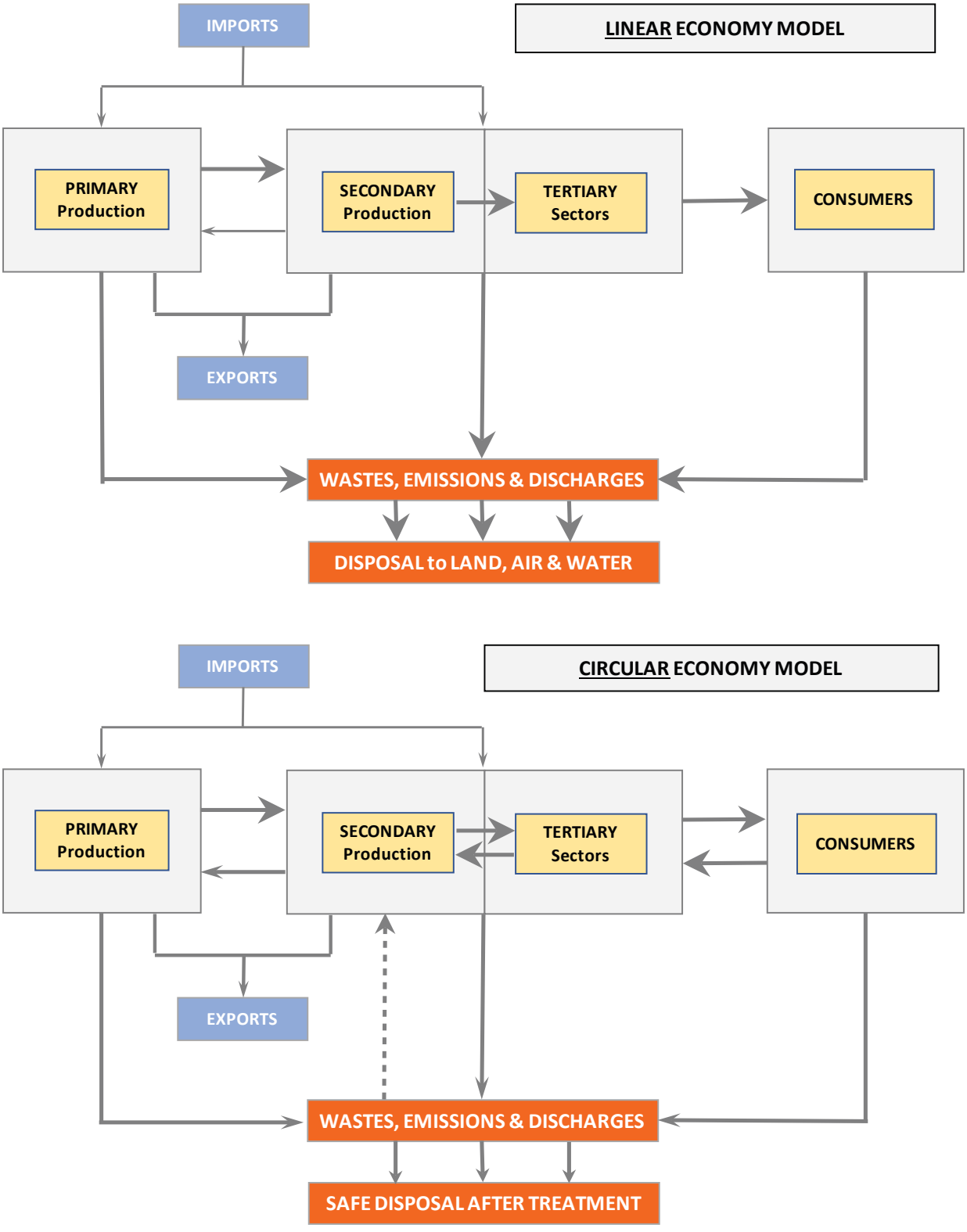



*Figure 3: Simplified schematic illustration of the differences between linear and circular economies*

A circular economy (CE) is one which successfully **decouples economic growth from resource consumption and Greenhouse Gas (GHG) emissions** and achieves or approaches a state of **sustainability**: it is the antithesis of the linear 'Take-Make-Use-Dispose' model and **applies, the Waste Management Hierarchy**, which is a key concept within the EU's Green Deal (see below and in Annex B). **Adoption of SCP concepts and tools is key to delivering a CE.** Qualitatively, **SCP tools may be applied in policy areas that include**:

- Reducing national energy demand through applying energy efficiency policies and measures in all sectors

- Minimising greenhouse gas (GHG) emissions through using renewable energy resources (RES) to the full, thereby eliminating or reducing the need to extract and burn fossil fuels. Improved ambient air quality and public health is a co-benefit
- Gasifying an energy system, since the combustion of natural gas instead of coal releases fewer GHGs, although it does not entirely eliminate them. Hence this policy should be seen as representing an intermediate stage of development towards a CE
- Minimising freshwater demand within river basins and catchments through applying water efficiency policies and measures in all sectors including industry, energy, institutions, offices and households – but especially in agriculture. Co-benefits include the safeguarding of water resources, freshwater and wetland habitats along with their biodiversity
- Adapting agricultural practices to minimise, where elimination is not feasible, the use of inorganic nitrogenous and phosphate fertilisers, pesticides and other chemicals; minimising emissions to air from arable cultivation, animal manures management, and crop residues management; and minimising, reusing or recycling agricultural solid wastes
- Minimising all food wastes downstream of agricultural production and, where feasible, recovering and recycling them. This concerns all segments of the agri-food production, distribution, shops, hospitality, institutional and household sectors – and includes treating food wastes and municipal wastewater sludge solids in such a manner as to enable their use as organic fertiliser in agriculture
- Designing all material products and packaging through applying the principles of sustainable production as embodied in the examples of 'Circularity' noted in section 1.1 and Annex B.1., along with motivating consumers to base their product purchasing and disposal decisions on those principles – catalysed in part through communication measures. Special provisions may be needed to deal with the management of end-of-life products that have been imported and are not manufactured within Kazakhstan.

Figure 4 shows an alternative visualisation of the Circular Economy, commonly referred to as a 'Butterfly Diagram', developed by the Ellen MacArthur Foundation.[3] It portrays the flow of materials in an economy as two main cycles: one biological (renewables, left-hand side of the diagram), and one technical (finite materials, right-hand side of the diagram). In a circular economy, we eliminate waste and pollution, circulate products and materials, and regenerate nature. The circular economy system diagram (butterfly diagram) illustrates the continuous flow of materials in the economy. In the biological cycle, the nutrients from biodegradable materials are returned to the Earth, through processes like composting or anaerobic digestion. This allows the land to regenerate so the cycle can continue. In the technical cycle, products are kept in circulation in the economy through reuse, repair, remanufacture and recycling. In this way, materials are kept in use and never become waste.[4]

Biological and material resource leakage occurs when 'goods' – intermediate and final products – are produced and consumed. Leakage takes the form of miscellaneous solid waste, emissions to air, and wastewater discharges. Viewed from a sustainable use of resources perspective, the closer the subsidiary cycles or 'loops' (keeping resources in circulation) are to the points of leakage, the better.

3 https://ellenmacarthurfoundation.org/circular-economy-diagram
4 https://ellenmacarthurfoundation.org/topics/circular-economy-introduction/overview

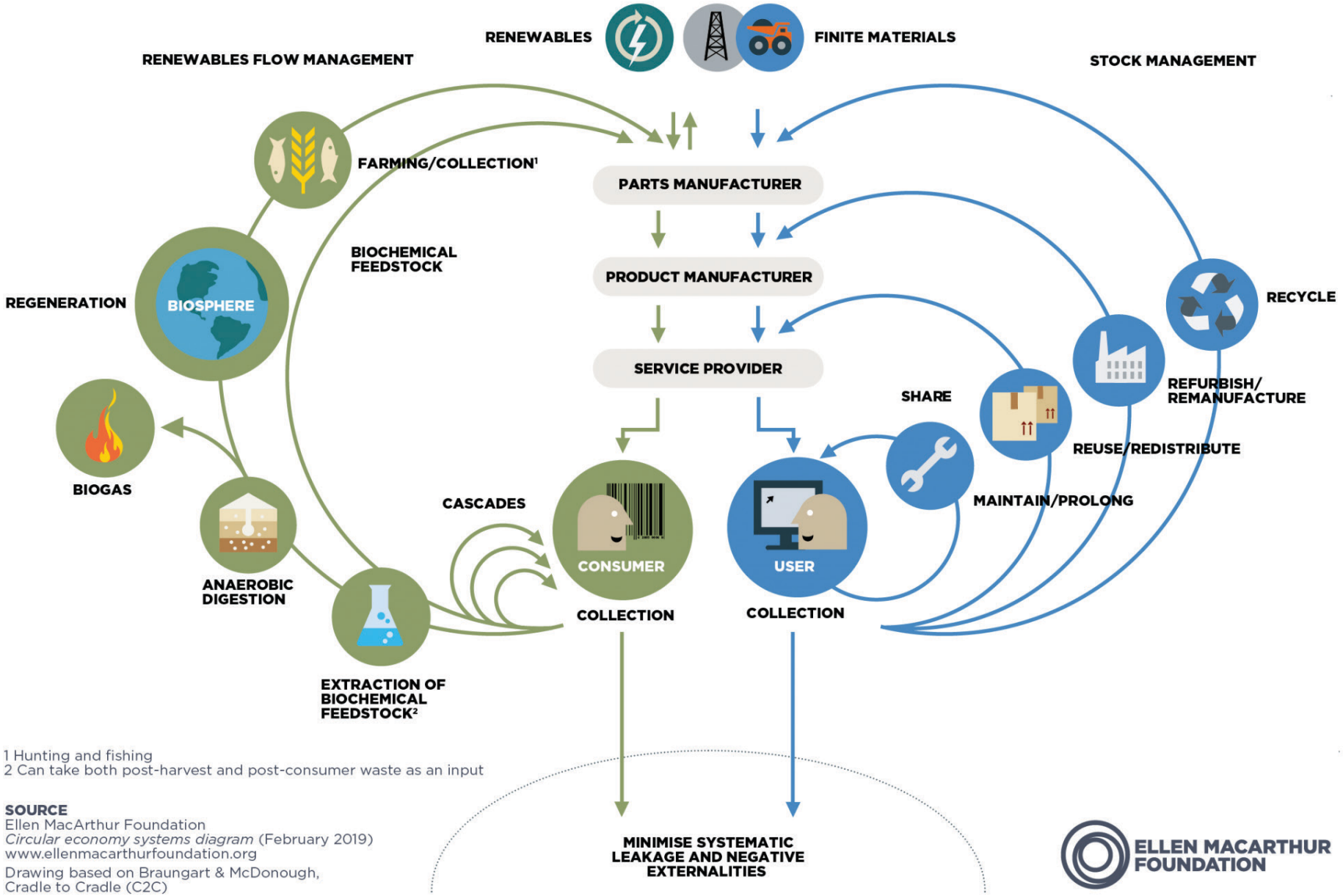



*Figure 4: Butterfly Diagram: visualisation of a circular economy*

## Waste Management Hierarchy

The waste hierarchy lays down a priority order of the theoretically best overall environmental and sustainable options in waste management. In a circular economy, every effort is made to adopt options that lie at the pyramid's pinnacle. In reality, departures from applying the hierarchy in practice may be justified for specific waste streams on the grounds of technical feasibility and economic viability.

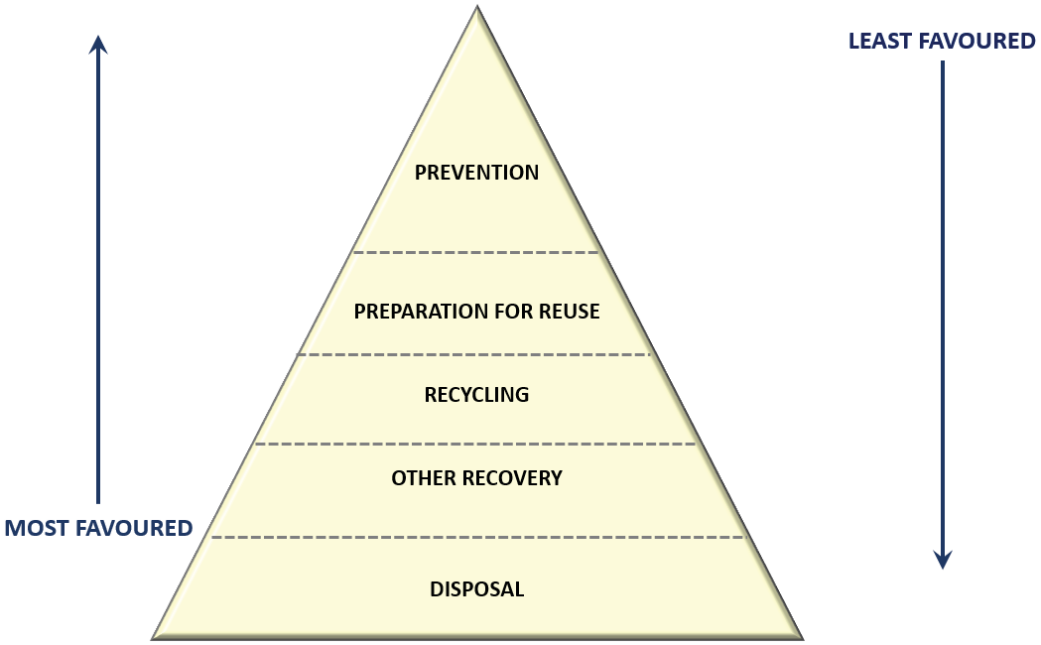



***Figure 5: Waste management hierarchy***

Figure 5 represents the waste management hierarchy as defined in Articles 3 and 4 of the EC Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives, and in particular, Article 4:

*The following waste hierarchy shall apply as a priority order in waste prevention and management legislation and policy:*

*a)* *Prevention:* measures taken before a substance, material or product has become waste, that reduce:
- the quantity of waste, including through the re-use of products or the extension of the life span of products;
- the adverse impacts of the generated waste on the environment and human health; or
- the content of harmful substances in materials and products;

*b)* *Preparing for re-use:* 'preparing' means checking, cleaning, repairing or recovery operations, by which products or components of products that have become waste are prepared so that they can be re-used without any other pre-processing; 're-use' means any operation by which products or components that are not waste are used again for the same purpose for which they were conceived;

*c)* *Recycling:* means any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations;

*d)* *Other Recovery, e.g. energy recovery:* means any operation, the principal result of which is that waste serves a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste prepared to fulfil that function, in the plant or in the wider economy. Annex II of the Directive sets out a non-exhaustive list of recovery operations; and

*e)* *Disposal*: means any operation which is not recovery even where the operation has as a secondary consequence the reclamation of substances or energy. Annex I of Directive 2008/98/EC sets out a non-exhaustive list of disposal operations.[5]

5 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32008L0098

## 1.4 Environmental Goals, Policies and Indicators

### Goals and Policies

In moving towards a Green Economy there must be a vision as to what this means in substance. This vision may be expressed as achieving a number of environmental, economic and social goals. They will be nationally specific. A **major role of SCP and of SCP tools is their application to help identify measures whose implementation may help meet Green Economy goals**. Table 1 provides an illustrative set of potentially relevant environmental goals – based on but not necessarily the same as those of the EU's Green Deal, see Annex B. In addition, it provides a set of policies whose implementation could contribute to achieving one or more goals.

***Table 1: Illustrative Green Economy goals and potentially appropriate policies***

| Example of Goal | - Examples of Contributing Policies |
|---|---|
| The link between national economic growth and resource consumption/waste generation is broken | Broaden the national Green Economy Concept (GEC) to embrace the EU's 'Sustainable Product Policy Framework', a major component of the EU's CE Action Plan (CEAP), to include:<br>- promotion and coordination of activity in national 'Key Product Value Chains'<br>- introduction of 'Sustainable Consumption and Production' concept and 'Sustainability Principles' into the GEC<br>- applying Sustainability Principles to regulated economic activities<br>- placing 'Extended Producer Responsibility' requirements on producers and importers of defined categories of goods<br>- prohibiting, from a defined future date, the placement on the market of energy-related and other consumer products that lie within the scope of the current/strengthened Ecodesign Directive and Ecolabel scheme<br>- setting a mandatory requirement that public sector bodies adopt minimum 'Green Public Procurement' criteria<br>- introducing CE practices in best available techniques (BAT) reference documents |
| | Broaden the national Green Economy Concept (GEC) to embrace the 'Less Waste, More Value' component of the EU's CEAP, to include:<br>- creation of a well-functioning market for secondary raw materials, including the export of high-grade recovered/recycled materials to product-producing countries<br>- mandatory at-source separation and collection of household and other municipal solid wastes, in support of such markets<br>- strengthening the provisions for managing end-of-life vehicles, electronic equipment, and batteries<br>- strengthening the provisions for the prevention and minimisation of packaging wastes, including setting waste-reduction targets for selected streams<br>- commitment to exploring pricing and financial instruments as a means to change the patterns of waste generation and disposal, with the aim of minimising disposal quantities |
| | Broaden the national Green Economy Concept (GEC) to embrace the principles of the 'Farm to Fork' strategy for reducing food waste in the Agriculture-Agrifoods-Consumption Value Chain |
| | Establish an appropriate set of stage-based Target Indicators to track progress, and systems to collect the necessary data, their analysis, reporting and time-bound review |

| Example of Goal | - Examples of Contributing Policies |
|---|---|
| The link between national economic growth and GHG emissions is broken, Net-Zero emissions to be achieved by 2050/2060 | Broaden the national Green Economy Concept (GEC) to embrace the EU's 'European Green Deal' (EGD) proposals concerning Net-Zero emissions, to include:<br>- ratification of the protocols to the UNECE Convention on Long-Range Transport of Air Pollutants (CLRTAP), requiring progressive reductions in national emissions<br>- requiring that biennial national GHG emission projections to 2050/2060 are prepared and published<br>- setting national targets for energy efficiency improvements in key sectors, and publicising progress in achieving these targets<br>- setting national targets for renewable energy use as a share of the total energy consumption, and publicising progress in achieving these targets<br>- committing to gasification to replace coal as the source of energy for electricity generation and residential heating, while recognising that this is only an interim policy measure<br>- committing to explore pricing and financial instruments as a means to change the patterns and intensity of energy use in order that fewer GHG emissions are generated. |
| | Establish an appropriate set of stage-based Target Indicators to track progress, and systems to collect the necessary data, their analysis, reporting and time-bound review |
| Urban ambient air quality to satisfy World Health Organization (WHO) recommended limit values by 2050 | Broaden the national Green Economy Concept (GEC) to embrace an unambiguous commitment to achieve non-toxic ambient air quality and to reduce the emissions of air quality pollutants (AQPs) accordingly, to include:<br>- ratification of the protocols to the UNECE Convention on Long-Range Transport of Air Pollutants (CLRTAP), requiring progressive reductions in national air quality management (AQP) emissions<br>- committing to the preparation of a National Air Pollution Control Plan (NAPCP) in line with EU Directive (EU) 2016/2284 and to a cycle of periodic review and updating (every four years)<br>- set ambitious national targets for renewable energy use as a share of the total energy consumption, and publicise progress in achieving these targets<br>- prohibiting, from a defined future date, the placement on the market of energy-related and other consumer products that lie within the scope of the current/strengthened Ecodesign Directive and Ecolabel scheme<br>- prohibiting the import of pre-EURO 4 diesel-powered road vehicles from a defined date (and restricting imports prior to that date) |
| | Establish an appropriate set of stage-based Target Indicators to track progress, and systems to collect the necessary data, their analysis, reporting and time-bound review |
| The water demands of the general public and of the nation's productive sectors are met while at the same time freshwater abstraction rates are minimised, surface and groundwater resources are used sustainably, freshwater and wetland habitats are conserved, and biodiversity is safeguarded | Introduce specific policy commitments into the National Green Economy concept, to include:<br>- sustainable quantitative limits set on the maximum annual volumes of freshwater abstracted from each defined water basin<br>- development of a national strategy to develop, adapt and introduce water conservation and water efficiency techniques in major water using sectors – principally agriculture – and implementing the strategy, tailored where appropriate, in each water basin<br>- committing to explore pricing and financial instruments as a means to reduce net freshwater demand as a component of these national and basin strategies |
| | Establish an appropriate set of staged Target Indicators to track progress, and systems to collect the necessary data, their analysis, reporting and time-bound review. |

## Policy Implementation Indicators

Implementation of policy measures to achieve national goals is always challenging – both in terms of implementation being timely and being applied to the full technical extent envisaged in policy. Financial and institutional capacity constraints often apply, while unforeseen regulatory ambiguities and enforcement weaknesses can also be issues. To assist the high-level monitoring of implementation progress, it is always useful to adopt a robust, targeted set of indicators whose values may be determined using basic statistical data that are, or could be, collated nationally. Data collection should be conducted in a strategic manner as this process requires resources, and maximum use should always be made of existing data-collection systems.

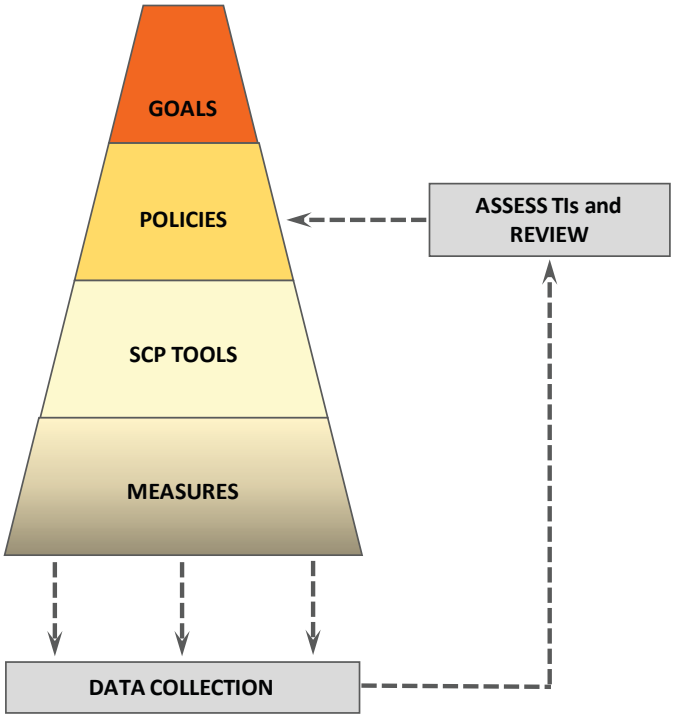



*Figure 6: Hierarchy of goals, policies, tools and measures, and monitoring outcomes via Tracking Indicators*

The use of tracking indicator/indicators (TIs) can help government and other stakeholders track progress in the achievement of policy goals. Interim, time-bound targets for TIs enable government to review overall progress at stages and, where laggard progress is evident, and to step in to instigate remedial actions that might include policy adjustments. Figure 6 illustrates the hierarchal concept, while Table 2 provides non-exhaustive examples. Setting goals drives policy development, and SCP tools aid the identification of appropriate measures. The effects of implemented measures are determined through monitoring and data analysis, and the results of reviewing progress on meeting the TIs feedbacks into policy revision (if needed). Establishing an appropriate set of country-specific TIs – which may also help assess the degree and extent of SCP tools and measures use – depends on the precise nature of the national goals.

*Table 2: Illustration of the hierarchal relationship between a goal and subsidiary policies, SCP tools, and measures*

| Example | GOAL: Net Zero GHG Emissions by 2060 | | |
|---|---|---|---|
| **Policies** | Prohibit the disposal of biodegradable waste in landfill sites | Decarbonise the energy supply | Minimise GHG emissions from the agriculture value chain |
| **Tools** | Inventories of waste arisings and fishbone analysis<br>Guidance and awareness-raising activities targeting households and other stakeholders | GHG emissions inventory and projections policy to tool<br>Benchmarking (external and internal) of energy use in processes & operations<br>Energy efficiency audits | Life-cycle analysis of emissions from the value chain<br>Walk-through audits & fishbone analysis at food-processing plants<br>Awareness-raising and guidance activity targeting specific stakeholders |
| **Measures** | Separate wastes at the source and separate collection<br>Install and operate anaerobic digestion and composting plants to process bio-wastes<br>Put the processed bio-waste to beneficial use | All energy efficiency measures<br>Incentivise the generation of renewable energy and its use<br>Production of 'blue' hydrogen from gas<br>Carbon Capture and Storage technology | Adopt best practices to match fertiliser use to crop type and nutrient needs<br>Anaerobic digestion of animal manures, with energy recovery<br>Changes in consumption behaviour that minimises food waste |

The application of SCP Tools and implementation of measures to deliver policy goals involves many stakeholders, each group having distinctive roles (see Section 1.2). But all stakeholder groups act also as consumers, because the consumer category is not limited to households.

## 1.5 Key Value-Added Chains

Key value-added chains are those which offer multiple opportunities to apply SCP in adopting a Circular Economy approach, and are significant for the national economy. Three are explored in Chapters 3, 4 and 7 for the agriculture, energy, and metals sectors, respectively.
Resources are consumed, and one or several waste streams are generated, at each stage of a value chain. **SCP actions apply to each stage** on these value chain maps. Wherever appropriate and possible, stakeholders should undertake action – coordinated where necessary – to maximise the application of the three SCP cornerstones. Such actions increase resource efficiency, minimise resource consumption and waste, and reduce environmental harm.

## 1.6 Glossary of SCP Tools, Measures and Terminology

Developed and proven internationally, an array of SCP tools is available (see Table 3). Their application helps to identify measures whose implementation contributes to putting Green Economy policies into effect.[6] In practice, many SCP tools may be used at several stages in the product life cycle and may apply to one, two or all three cornerstone principles; and they may be policy focused, application focused, or applicable in both roles.

6 The practical measures identified through using SCP tools are sector-specific and too varied to mention here, but some that may be relevant in the agricultural and downstream production sectors and consumption are noted in Table 2, above.

*Table 3: SCP tools and measures and their application of cornerstone principles*

| SCP Tool / Measure | Resource Efficiency | Substitution | Circularity |
|---|---|---|---|
| **Policy Focused** | | | |
| BAT Reference/Conclusions | ✓ | ✓ | |
| Benchmarking - external | ✓ | ✓ | |
| Carbon Pricing/Taxes | ✓ | ✓ | ✓ |
| Communication | ✓ | ✓ | ✓ |
| Consumer Awareness, Interest, Motivation & Behaviour | ✓ | ✓ | ✓ |
| Consumption and Procurement | ✓ | ✓ | ✓ |
| Eco-Design Product Standards | ✓ | | ✓ |
| Education | ✓ | ✓ | ✓ |
| Emission Projection | | | ✓ |
| Financial Incentives | ✓ | ✓ | ✓ |
| Forestry Stewardship | | | ✓ |
| Green Purchasing Criteria/Code | ✓ | ✓ | ✓ |
| Mapping the Sectoral Value Chain | ✓ | ✓ | ✓ |
| Pricing of Publicly Delivered Goods | ✓ | ✓ | ✓ |
| Producer Responsibility | | | ✓ |
| SCP Support Unit | ✓ | ✓ | ✓ |
| Waste Management Hierarchy | ✓ | ✓ | ✓ |
| **Application Focused** | | | |
| Baseline Assessment | ✓ | | |
| Benchmarking - internal | ✓ | ✓ | |
| Carbon Footprinting | ✓ | ✓ | ✓ |
| Champions | ✓ | ✓ | ✓ |
| Cleaner Design | ✓ | ✓ | ✓ |
| Communication | ✓ | ✓ | ✓ |
| Counter-current washing/heat-exchange | ✓ | | |
| Dematerialisation | ✓ | ✓ | ✓ |
| Energy Audits | ✓ | ✓ | ✓ |
| Environmental Management System | ✓ | ✓ | |
| Fishbone Analysis | ✓ | ✓ | |
| Good Practice Guides and Case Studies | ✓ | ✓ | ✓ |
| Green Purchasing Criteria/Code | ✓ | ✓ | ✓ |
| Heat Exchanger Network | ✓ | | |
| Innovation | | | ✓ |
| Life-Cycle-Analysis | | ✓ | ✓ |
| Mapping the Sectoral Value Chain | ✓ | ✓ | ✓ |
| Mass and Energy Balances | ✓ | | |
| Metering, Monitoring and Sampling | ✓ | ✓ | ✓ |
| Product-as-a-Service | | | ✓ |
| Reformulation | | ✓ | |
| Resource Efficiency & Waste Minimisation Club | ✓ | | |
| Separation of Wastes at Source | ✓ | | ✓ |
| Walk-through Audit | ✓ | | |

The glossary below provides a brief introduction to the tools and measures listed above.

**Baseline Assessment**: An initial identification and quantitative assessment of the resources consumed by an entity (institutions, buildings, processes and operations). In order that a 'fresh pair of eyes' is brought to bear, the assessment is best led and undertaken by personnel without direct experience of the entity's daily operations. This technique may utilise a number of the others mentioned below, and any other available, relevant information. Its use helps the identification of priority areas, where action should be focused to minimise resource use in the short-medium term and deploy more radical measures longer-term.

**BAT Reference Documentation**: Published by the European Commission (EC), these documents on Best Available Techniques (BAT) definitively identify those technologies and operational practices that provide the best protection for the environment and human health. Moreover the economic costs are taken into consideration as well. Prepared for given production sectors, they are updated periodically and are mandatory for those sectors. Governments of countries that are not Member States (MS) of the EU may adapt these documents to suit their national circumstances. They provide an authoritative source of guidance on potential measures.

**Benchmarking – external**: Comparing the efficiency of resource use (electricity, coal, gas, steam, water, materials, etc.) with that of comparable institutions, buildings, processes and operations. This method requires metering of the resources being consumed. Typically, comparisons are made with the average, or ranges, of resource consumption values, e.g. kWh/tonne product, $m^3$ water/$m^3$ milk processed, in the public domain or published by accredited institutions guaranteeing respondent confidentiality. Use of this broad-brush technique can provide a 'wake-up call' to stimulate a search for efficiency measures and can be useful at a policy level.

**Benchmarking – internal**: A powerful technique that may be used by any institution, office, or enterprise to monitor and analyse resource use in a process or operation, inform the search for measures to achieve efficiency gains, and determine the savings once measures have been implemented – providing valuable information feedback. Similarly, it may also be used to analyse material wastage rates. The technique is often referred to as **monitoring and targeting**. As with external benchmarking, its use requires the metering of resource consumption and material wastage in parallel with a measurement of production over the same time. In essence, the measured resource consumption of a defined operation, over a defined interval of time, typically per month or per batch, depending on the nature of the production process, is plotted against a relevant measure of production over the same period of time. The graphs may be easily prepared using a simple spreadsheet program, and will yield quantitative information which can be used to help drive the search for efficiency measures and determine the resource savings made once efficiency measures have been implemented.

**Carbon Footprinting**: A tool or methodology to calculate the total greenhouse gas (GHG) emissions caused by an individual, event, organisation, service, place or product, expressed as carbon dioxide equivalent (abbreviated as $CO_2$-eq). Carbon footprinting is related to carbon accounting and life-cycle analysis. Greenhouse gases, including the carbon-containing gases carbon dioxide and methane, can be emitted through burning fossil fuels, land clearance and the production and consumption of food, manufactured goods, materials (including cement and steel, etc.), wood, roads, buildings, transportation and other services. Carbon footprint may be calculated as a $CO_2$-eq using the relevant 100-year global warming potential. Once the carbon footprint of a specific organisation, activity or product has been identified, it may be compared with that of other entities, activities and products so that actions may be devised to reduce the footprint.

**Carbon Pricing/Taxes**: Assigning a price for the (input and intrinsic) carbon content of energy and other products is a mechanism whereby carbon-rich products will, all else being the same, be more expensive than alternative products, leading to less of the former and more of the latter being bought and consumed. It is a tool available for government to use, either by setting a carbon price or by issuing a limited number of carbon quotas, leaving it to 'carbon market' forces to determine the carbon price. Effectively designed, this mechanism may be used to help implement a national GHG emissions reduction strategy. Its effects range from the short-term, rising prices affecting immediate consumer choices, to the longer term, sending firm signals on future price changes to producers and consumers.

**Champions**: A member of an enterprise's staff appointed as a 'champion' to stimulate broad-based interest and to push through measures to use resources efficiently and stimulate product redesign. Enterprises have found that appointing such a champion – someone who is genuinely interested and motivated – helps to motivate others in the enterprise and to sustain initial pushes for improvement.

**Cleaner Design**: A technique in which a critical examination is conducted into how a product is made, its

resource consumption when used, its durability and ease of repair, and the ease of its dismantling at the end of its working life. The objective of this examination is to identify and implement production changes that (i) minimise the number of components, quantity of materials, and, where possible, the hazardous nature of the materials used to produce a product, and (ii) enable the recovery of materials and components from end-of-life products to be maximised. Forming part of a Cleaner Design exercise, **Life-Cycle-Analysis** may be undertaken in parallel.

**Communication**: Effective communication is an indispensable tool to raise awareness and understanding among all stakeholder interests of the need to take action, and to stimulate their interest in and motivation to contribute to the creation of a Green Economy, for which SCP is such a significant component. Stakeholder groups on which targeted communication activities should focus include the production sectors – primary through to tertiary – and, just as important, all consumer groups. The latter range from households, governmental and non-governmental institutions, through to all manner of enterprises purchasing intermediate products. Effective consumer-oriented communication is important since motivated consumers will form a major driver of demand for greener products – placing pressure on producers and suppliers to meet this demand. All manner of media and other techniques – including educational programmes – may be used to achieve effective communication.

**Consumer Awareness, Interest, Motivation and Behaviour**: The behaviour of households and other consumers whose awareness is raised, and that have become interested and motivated, will be changed in many ways. For instance, they will demand and search out greener products, will be less tolerant of waste and more likely to separate at source and recycle the wastes they do generate. They may drive less aggressively on the roads, consider vehicles that are more fuel-efficient when changing their cars, and they may seek out opportunities to reduce household energy consumption. Achieving such changes in consumer behaviour requires sustained communications efforts, targeting both the young and the more mature members of society.

**Consumption and Procurement**: See Green Purchasing Criteria/Codes

**Counter-Current Washing/Heat Exchange**: Where possible, wash or heat/cool an intermediate or final product in counter-current mode as opposed to batch mode. This ensures a more efficient use of the washing medium, whether the washing or solvent medium (or heat exchange fluid) is water or some other substance.

**Dematerialisation**: Substitution of a digital service for a physical product. Examples include the availability of music and films on demand via the internet, as opposed to buying CDs and DVDs, the availability of e-books, and the submission of forms, letters and invoices electronically instead of by paper via the mail service.

**Eco-design Product Standards**: A requirement that appliances such as electrical, electronic and heating equipment placed on the commercial market must meet minimum energy efficiency limits.

**Education**: Closely linked to and forming part of a long-term communication strategy, curricula for specific age groups, from elementary school through to university undergraduate study, may be adapted to include SCP and Green Economy concepts. This tool provides a long-term, bottom-up approach to mainstreaming SCP in society.

**Emission Projections – GHGs and Air Quality Pollutants (AQP)**: In places where policies are in place requiring quantitative reductions in emissions to air by specified dates, emission projection tools are indispensable aids to policy makers. Whether GHGs or AQPs are the subject of the policy, they enable decision takers to examine the potential impacts of implementing alternative or complementary policy options and measures. Projection tools are ineluctably linked to historic emission inventories and their quality. Both inventories and projections need to reflect adequately the influences of alternative technologies and their (expected) uptake on activity levels and emission factors. AQPs commonly included in inventories and projections are $SO_2$, NOx, NMVOCs, $NH_3$, $PM_{2.5}$ and $PM_{10}$. See also **Carbon footprinting**.

**Energy Audits**: Defined by the Energy Law of the Republic of Kazakhstan dated 13 January 2012 No. 541-IV (as amended) as the collection, processing and analysis of data on using energy resources for the purpose of assessing the possibility and potential for energy saving and the preparation of a conclusion.

**Environmental Management System (EMS)**: An EMS, such as ISO14001, is a set of processes and practices that enable an organisation to reduce its environmental impacts and increase its operating efficiency. It is applicable for large and most small businesses, institutions and government departments and agencies.

**Financial Incentives**: They represent the 'pull' mechanism in contrast to the 'push' provided by the **Pricing** tools concerning Carbon and Publicly Delivered Goods. Financial incentives to encourage greener

consumption and production come in various guises. They can include (time-limited) subsidies on greener consumable goods, investment grants, low-interest loans for green investments, favourable tax allowances for innovative research or investments, etc.

**Fishbone Analysis**: Also known as root cause analysis, an aid to determining the root causes of resource inefficiencies. The results of such an analysis may be represented diagrammatically in the form of a skeletal fish – hence its name. The technique questions why a given source of resource inefficiency prevails and may deploy brainstorming sessions to help identify the deeper causes and find solutions.

**Forestry Stewardship**: A certification system for the sustainable management of forests and woodlands in order to ensure that timber extraction is not exploitive and is compatible with maintaining biodiversity.

**Good Practice Guides and Case Studies**: Guides provide practical information on how to get started and use many of the other SCP tools, while Case Studies summarise the real-life experience of entities in identifying opportunities and implementing identified measures. Complementary to reports on external benchmarks, Good Practice documents may be cross-sectoral or focus on a single sectoral.

**Green Purchasing**[7] **Criteria/Codes**: Requiring that all products purchased by an entity meet minimum environmental criteria is a tool whose widespread adoption encourages increased procurement of green goods and services while discouraging the supply of goods and services failing to meet such criteria. Entities that may employ such Purchase Codes include governmental and non-governmental institutions, and enterprises in multiple sectors including retail outlets.

**Heat Exchanger Networks**: Utilising the heat content of liquid or heat exchange fluid output from one production unit to provide the heat needed by a second production unit.

**Innovation**: Research and innovation as a tool can lead to improvements in existing processes, production and supply of goods and services, and the design and development of new, greener technologies and techniques. Sectoral-specific innovation and its application in practice is perhaps most relevant to **Mapping** and driving improvements in Key **Value Chains**.

**Life-Cycle-Analysis**: An analytical process in which all the resources consumed during the production, use and post-working life management of a product are estimated along with the atmospheric emissions, wastewater and solid wastes that are generated. This far-reaching analysis may include, for instance, estimating the energy consumed (and emissions generated) in producing the materials that compose the product. The outcome of this analysis may be presented as a map or process flowchart which helps to identify the most resource-intensive stages of a product's life. Undertaken as part of a **Cleaner Design** process, it informs radical thinking on how to transform products and reduce their carbon and environmental footprints.

**Mapping the Sectoral Value Chain***:* A technique to help visualise the major stages involved from product production to final consumption and end of life, it also helps identify the cross-links to other sectoral activities. It may be used to help focus concerted action to minimise waste throughout the value-chain and help recognise minimised waste streams that can be recovered and reused in other sectors.

**Mass and Energy Balances**: A standard technique which relies on the principles of conservation of mass and energy. Its use can help to identify previously unrecognised waste streams and energy losses.

**Metering, Monitoring and Sampling**: The means by which quantitative data are obtained, enabling the use of most of the other SCP tools noted here. The systems adopted for data collection and capture should be systematic and compatible with goals.

**Prevention of Waste**: See Waste Management Hierarchy

**Pricing of Publicly Delivered Goods**: Electricity and water are examples of publicly delivered goods and services. If priced at or below the costs of provision, or of the value of the benefits conferred, users – including large-scale production installations – may be encouraged to use more of the resource than is strictly necessary, and their incentive to minimise its use may be minimal. On the other hand, progressively raising the prices for such public goods increases the incentives to reduce their consumption. Also, establishing a framework for future increases in price sends advance signals to users, providing them with time to take resource efficiency action.

**Producer Responsibility**: Policy requirement placed on the producers of certain products whose end-of-life disposal represents a significant waste of material resources and is environmentally damaging. In present

7 Also known as Green Procurement

and former EU Member States producers have the responsibility to recover materials from and recycle end-of-life products that include goods such as road vehicles, batteries, electronic goods, and packaging. Although it predates the EU's Circular Economy (CE) approach, the Producer Responsibility principle lies at the heart of the CE and its focus on identified product value chains.

**Product-as-a-Service**: Producers or suppliers retain ownership of a product, leasing it out to customers as a service, and are responsible for managing its end-of-life dismantling, material recovery, recycling and disposal. Examples include electronic goods and vehicles.

**Recovery and Recycling**: See **Waste Management Hierarchy.**

**Reformulation**: Reformulation of a product to substitute harmless for harmful components to the maximum extent possible while maintaining product quality. A prime example is the reformulation of paints to minimise their organic solvent content, replacing them with water, thereby reducing the emissions to air of non-methane volatile organic compounds (NMVOC) when paint is applied.

**Resource Efficiency & Waste Minimisation Club (Informal Associations)**: Representatives of enterprises or entities in a given area meeting informally to share experience on searching for resource efficiency and waste minimisation opportunities, and their implementation of measures. Experience shows that such associations, providing the opportunity to learn from the efforts of others, can be helpful in stimulating ideas for change. This holds even when the entities involved lie in different sectors, since their reticence due to competition fears are lessened.

**Reuse**: See Waste Management Hierarchy

**SCP Support Unit**: An institutional tool that Governments may use to catalyse SCP activity at local level across the country. The United Kingdom (UK) government, for instance, funded several multi-year programmes[8] that operated at arms-length from the Government in the energy sector (*Energy Technology Support Unit, ETSU*) and business waste minimisation (*Envirowise*), developing benchmarking reports, good practice guides and case studies, market reports, and actively marketing them via comprehensive communication campaigns, and periodically evaluating the impacts of the communication programmes. Superseding these programmes in the UK, the Waste and Resources Action Programme (WRAP) provides, among other things, market intelligence reports on secondary materials. Action on food waste has been a major focus of its activities. SCP Support Units can play a vital role in helping to secure an enabling environment for the practice of SCP to flourish.

**Separation of Wastes at Source**: Whether applied to solid waste, wastewater or gaseous streams it is a basic principle of waste recovery and recycling that, wherever possible, concentrated should not be mixed with dilute streams and dissimilar streams should not be mixed. Failure to do so is liable to (i) increase the costs of resource recovery and recycling above what they could be and (ii) contaminate the recovered resource or recyclate. Both factors may jeopardise the practicality and viability of waste recovery and recycling. This principle is enshrined also in the management of end-of-life products subject to **Extended Producer Responsibility**.

**Walk-through Audit**: Inspection of the conduct of normal (and abnormal) operations to visually identify sources of waste, whether of materials, water, or energy. Undertaken as part of a **Baseline Assessment**, a 'fresh pair of eyes' is best brought to bear, the walk-through-audit undertaken by personnel without direct experience of the entity's daily operations. Having identified the sources of waste, the root causes may be identified using **Fishbone Analysis** involving plant personnel. Solutions may then be found, and measures implemented.

**Waste Management Hierarchy**: This hierarchy schematically expresses the favoured forms of waste management options from an environmental and sustainability perspective. It ranks options by priority, taking into consideration prevention, preparation for reuse, recycling, other recovery, and disposal. See the Section titled Waste Management Hierarchy, under 1.3 above, for an explanation of the concept and definitions of the ranked options.

To illustrate the relevance of various available SCP Tools and measures at different stages of a product life-cycle, and provided only as one example, Table 4 presents a sample of the SCP tools and measures applicable in the agricultural product chain.

8 For example: the Energy Technology Support Unit (ETSU) in the energy sector and Envirowise for business waste minimisation.

*Table 4: One example – e.g. Agriculture – Considering crop and animal product chains – to show application of some of the SCP tools and measures in a product's life cycle*

| Cornerstone | Sub-branch | Primary Production | Processing | Wholesale & Retail | Consumption | End of Life Management |
|---|---|---|---|---|---|---|
| **Resource Efficiency** | Crops | Apply good practice guidance regarding:<br>Water-efficient crop watering techniques;<br>Timing N&P fertiliser application - to improve efficiency of use & reduce consumption. | Baseline assessment including walk-through audit.<br>Set improvement targets & monitor performance using benchmarking tools.<br>Champions to drive the identification of measures and their implementation. | As for processing - to reduce resource inputs, food waste | Communication to alert consumers to the effects of food waste.<br>Apply good practice and change habits to reduce food waste in households and hospitality sector. | Separate food waste at source for collection and treatment & utilisation as biogas, fertiliser, and compost. |
| | Animals | Optimise feeding regimes of non-range animals to minimise N emissions in urine and faeces. | As above | As for processing to reduce waste and resource inputs | As above | As above |
| **Substitution** | Crops | Grow crop varieties that need less water.<br>Substitute treated bio-wastes for inorganic fertiliser.<br>Substitute less-harmful for hazardous pesticides. | Use renewable energy as a substitute for fossil fuel derived energy where possible. | As for processing.<br>Substitute compostable for plastic packaging. | Communication to alert consumers of the benefits of adopting a more vegetarian diet & eating less meat. | As above |
| | Animals | Minimise antibiotic use. | As above. | As above. | As above | As above. |
| **Circularity** | Crops | Apply good practice guidance regarding the management of crop residues, including their incorporation in soil. | Apply life cycle analysis and cleaner design to minimise food waste and packaging waste. | As for processing. | Communication of the need to minimise food waste and to separate it at source for separate disposal & collection. | Apply treated sewage sludge and animal manures to land, as partial replacements for inorganic fertilisers. |
| | Animals | Rear animals according to organic farming principles. | As above and to minimise leather waste. | As for processing | As above. | - |

# 2. RATIONALE FOR THE SCOPE OF THE ACTION PLAN

## 2.1 Underlying Principles

Eight principles underlie the rationale for the scope of the SCP action plan in Republic of Kazakhstan:

1) First is to align its duration to that of the current Green Economy Concept (GEC) Action Plan, and Kazakhstan's commitments to the Sustainable Development Goal SDG12 and other SDG Goals, i.e. to the year 2030. As shown in Annexes A and C, respectively, the GEC and SDG commitments are key drivers for a green and circular economy in Kazakhstan. Hence it makes sense to align the SCP Action Plan with them in terms of timescale. Towards the end of the decade the Action Plan could be revised and updated.
2) However, the GEC was adopted in 2013, and could not at that time fully embrace the current SCP philosophy. The introduction of SCP into a revision of the GEC, as a contributory means of GEC delivery, thus lay outside the scope of preparing the SCP Action Plan. This linkage is recommended in the current SCP Action Plan. However, the opportunity has been taken to stretch the boundaries for sectoral SCP action beyond that of the current GEC Action Plan, e.g. significant mining and refining activities are included in the SCP Action Plan – see points 6 and 7 below.
3) Third, the mainstreaming of SCP philosophy into practice requires the existence of an enabling environment, which can be considered as a framework of interrelated elements, each of which act to promote, support and enable SCP implementation. Six elements are identified in this Action Plan: a consistent legislative and regulatory framework, institutional capacity and capability, operational infrastructure, sustainable finance, a culture of compliance, and efficient and supportive markets/ outlets. Their relative significance depends on the characteristics of the economic sector in which SCP is to be mainstreamed.
4) While the legislative and regulatory framework has undergone significant development over time, there is always room for improvement and refinement. Policy areas where further Government consideration and action might support the promotion and uptake of SCP are therefore identified in this Action Plan. They derive from a consideration of the potential constraints on SCP adoption in the identified value chains and cross-sectoral themes.
5) Fifth, much of the application of SCP in practice depends on stakeholders and actors taking voluntary action – whether national and regional government branches, households, institutions, farmers, miners, and enterprises in many industrial, energy and service sectors. It is recognised, therefore, that actors need first to be ***motivated and have practical tools and guidance tailored to their specific needs***. A mechanism to stimulate actors to take voluntary SCP action and provide appropriate tools and guidance, therefore, should be regarded as an essential element of the SCP action plan. Its implementation will contribute significantly to strengthening institutional capacity and capability within an enabling environment; its role is complementary to, but distinct from that of legislation and regulation.

   To aid the Government to determine an appropriate mechanism and its institutional 'home', the underlying principles for such a mechanism are provided in Chapter 8.
6) While the scope for SCP action is significant in most economic sectors, an attempt to stimulate strong SCP action in all sectors at the same time will likely fail owing to an initially limited capability and an overstretching of capacity. Therefore, the national SCP Action Plan adopts a ***strategic focus***, concentrating initially on key sectoral value chains and significant cross-sectoral themes that have the Government's attention. Efforts may then be built up over time and phased in so as to allow capability and capacity to develop and be strengthened sustainably. Securing appropriate international Technical Assistance as a first step would help promote the swift development of capability and capacity.
7) ***Key value chains*** for SCP action are selected based on several factors: (i) their identification in the current GEC Action Plan – see Annex A, (ii) their significance in the national economy as measured by GDP – see section 2.2, (iii) the extent of their reach in the primary through to the tertiary branches of the economy, (iv) the significance of their relative consumption and/or overconsumption of major resources, and (v) their significant release of emissions to air, wastewater and pollutants to water, and/ or solid wastes. With these criteria in mind, three sectoral value chains are included in the Action Plan:

***Agriculture and Agri-Products***: essential to food security and the livelihoods of poorer members of society; responsible for 80% of national freshwater demand, and significant GHG emissions from both crop-growing and animal rearing; a user of herbicides and pesticides, hazardous chemicals that can be harmful to human health; the value chain involving a long and complex supply chain starting with primary production, through a myriad of food and beverage processing operations, food storage, distribution and supply to consumers via many retail outlets, and consumption in households, institutions and multiple hospitality venues – all stages collectively generating huge amounts of food waste, which is mostly disposed of to landfill, with significant amounts of packaging waste.

***Energy (Oil, Gas, Coal) – Mining, Refining, Energy Transformation, and Combustion***: a value chain that is the principal source of both national wealth and GHG emissions – both carbon dioxide and methane. And, through the combustion of prepared coal, refined natural gas, and petroleum fuels in various settings along the value chain, a potentially significant source of the ambient air pollutants ($PM_{2.5}$, NOx, $SO_2$, NMVOCs) that may contribute to the poor air quality experienced in some cities and urban areas.

***Metals – Ore Mining, Smelting and Refining, Metallurgical production***: another value chain that is a major source of national wealth but has the potential to cause significant pollution of air, water and land. And is a major consumer of resources. Relative to the energy value chain, that for ferrous and non-ferrous is shorter since most of the metals produced are exported.

8) Even where a specific value chain is a major contributor to significant resource use, ecological and human health issues, the role played by activities in diverse other sectors may also be substantial. Resolving issues such as freshwater resource availability, material and energy resources recovery from solid wastes, GHG emissions reduction in response to climate change, and ambient air quality, requires a ***cross-sectoral approach*** as well, in which SCP can play a big role. The above four cross-sectoral themes are included in the SCP Action Plan, in line with the GEC Concept and national SDG commitments. They also reflect some of the EU Green Deal's priorities – see Annex B.

## 2.2 Structural Composition of the Economy

Drawing on internationally comparable economic data presented by the World Bank[9], Figure 7 indicates the broad structural composition of Kazakhstan's economy, in terms of Gross Domestic Product (GDP). The methodology adopted for preparing the national statistical data incorporates the International Statistical Industrial Classification (ISIC) of economic activities.[10]

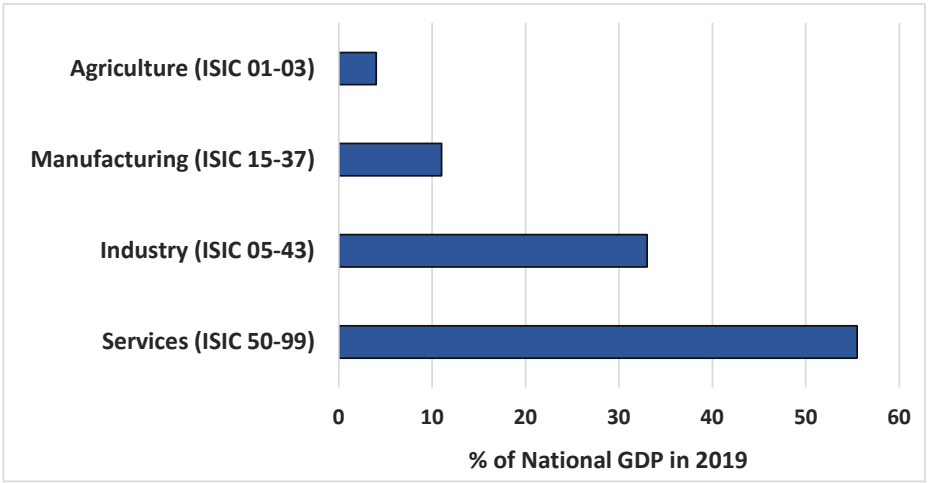



***Figure 7:*** **Broad-based structure of the economy in 2019 – Contributors to National GDP – (source: World Bank data)**

9 World Bank, World Development Indicators: Structure of Output http://wdi.worldbank.org/table/4.2

10 International Standard Industrial Classification of All Economic Activities (ISIC), https://ilostat.ilo.org/resources/concepts-and-definitions/classification-economic-activities/

Within this structural composition:

- Agriculture refers to forestry, hunting, and fishing, as well as the cultivation of crops and livestock production.
- Manufacturing comprises a diverse range of activities including the manufacture of leather, wood and paper products; furniture; and other products. While the category includes the manufacture of motor vehicles, aerospace equipment, machinery, and electronic equipment, such products are mostly imported rather than made in Kazakhstan.
- Industry refers to mining and quarrying (including oil, gas, coal, and mineral ores); some manufacturing activities (ISIC divisions 10-33) that include those involved in making food, beverage and textile products, refining oil and gas, coking of coal, and production of basic metals; utilities - electricity, heat, water, gas, and waste management; construction; and other activities.
- Services refer to wholesale and retail trade (including tourism, hospitality, hotels and restaurants; transport; government, financial and professional services; education and health care; real estate and a range of other services. Also included are imputed bank service charges, import duties, and any statistical discrepancies noted by national compilers as well as discrepancies arising from rescaling. While Figure 7 shows that services provide the greatest contribution to economic output, they are underpinned and driven by Kazakhstan's industrial activity.

# 3. SCP AND THE AGRICULTURE VALUE CHAIN

## 3.1 Scope of the Agriculture Value Chain

The agriculture value chain is comprehensive and links to several significant cross-sectoral themes, in particular to water resources, waste management, energy and air quality. Figure 8 illustrates the sector's range and complexity and shows the many discrete steps in the value chain. Neither fishing nor forestry are shown in the value chain, since the significance of these activities is local rather than national, even though the principles outlined below apply to both. Broadly speaking, each step in the value chain can be considered to lie in one or other of the following economic stages:

- **Primary production sector**: cereals, vegetables, fruit, milk, eggs, wool, meat and animal hides
- **Secondary processing and production sector**: including cereal milling, bakeries, multiple food processing operations, dairies, meat processing, brewing, wine making, etc., the tanning of animal hides to produce leather, and the manufacture of shoes and other leather products
- **Tertiary or services sector**: covering the storage of raw and partly-finished goods, their distribution, and the sale of finished goods through retail outlets ranging from large supermarkets in urban areas down to small shops in villages and towns
- **Consumption**: of foodstuffs in domestic households, institutional canteens (work-place, educational, prison eating halls, etc.), and in the hospitality sector – hotels, restaurants, cafés, etc.; and wearing shoes and other products made from leather

Resources are used in each step, and various solid wastes, liquids and gaseous emissions are generated. In a green economy, actions are taken at each step to:

- Minimise resource consumption, waste arisings and emissions
- Substitute less harmful substances for potentially harmful resources, where possible
- Recover and treat solid and liquid wastes, with utilisation of the treated wastes wherever possible

In order to determine the scope for applying available SCP Tools in the agricultural value chain, it is necessary to analyse each step in turn, considering the ranges of resources and techniques employed, the wastes and emissions that result, and the appropriate actions to be undertaken to help bring about a greener economy. Sections 3.2 to 3.6 inclusive suggest the potential for applying resource efficiency, substitution and circularity approaches to manage resource inputs at each step in the value chain. **The most appropriate tools will depend on the specifics of each step in the value chain, but suggestions are made in sections 3.2 to 3.6.** The colour-coding shown below is adopted:

*Key to Applicable SCP Tools and Measures*

| | |
|---|---|
| Resource efficiency | R |
| Substitution | S |
| Circularity | C |

An appreciation of the undesirable environmental issues posed by these wastes and emissions, and how they may be better managed, is also needed so that the reasons why action is necessary may be best communicated to affected stakeholders. Sections 3.2 to 3.5 provide a qualitative analysis for the primary, secondary and tertiary sectors, respectively, while section 3.6 addresses final consumption.

**Note:** the contents of rows in the 'Resource Inputs' column and in the 'Wastes and Emissions' column are independent of each other (Figures 9 and similar).


*Figure 8: Mapping of the product chains for agriculture, agriculturally-derived products, and consumption*

## 3.2 Primary Production

Many types of resources are used in agricultural primary production, which may be broken down into three steps: (i) Figure 9, crop production, (ii) Figure 12, animal rearing – principally those animals that are housed for much or part of their lives, and (iii) Figure 13, slaughterhouses for both housed and free-ranging animals.

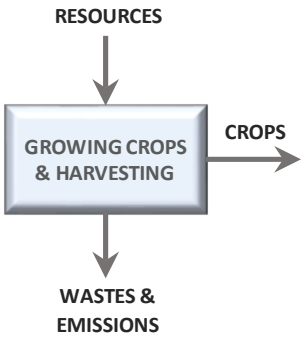
| STEP IN THE VALUE CHAIN | RESOURCE INPUTS | | | | WASTES & EMISSIONS |
|---|---|---|---|---|---|
| **CROP PRODUCTION** | | | | | |
|  | Water | R | | C | Crop spoilage – food waste |
| | Fertilisers – N and P | R | S | C | Crop residues |
| | Pesticides and herbicides | R | S | C | Emissions to air |
| | Seeds | | S | C | Discharge to surface water & groundwater |

***Figure 9: Resource inputs and wastes arising from primary production (crops), and the applicable types of SCP action***

### Crop Production and the Applicable Types of SCP Action

Crops include all cereals, vegetables and fruits whether grown for human or animal consumption. Adequate water and nutrients are essential whatever the crop grown, as is a healthy soil, and appropriate lighting and temperature conditions. While all these are prerequisites for good crop growth, farmers can make many choices which affect the impact of crop production on resources and the environment. The introductory comments below address the issues resulting from specific resource use and waste arisings.

#### *Water Consumption*

The agricultural consumption of water (mainly for irrigation and crop watering) accounts for about 65% of the abstracted freshwater resources in Kazakhstan. Water conservation and efficiency measures to reduce overall water demand, thereby reducing the known pressures on the nation's river basins and water resources, must be applied as a priority in the agricultural sector.

As recognised in the Green Economy Concept, a major strategic challenge is posed by many of Kazakhstan's river systems being transboundary (Figure 10). A particular issue is the reluctance of the authorities in China to agree to equitable sharing of water resources. The water resources actually available to Kazakhstan therefore need to be used with utmost efficiency, focused on the production of crops yielding high economic added value, consistent of course with ensuring national food security and Kazakhstan's commitments to sustaining biodiversity. Benchmark comparisons formed the basis for recognition in the Green Economy Concept that Kazakhstan has considerable scope for improving the efficiency of water use in crop irrigation (Figure 11).

SCP Tools and measures that may be applicable to making the most efficient use of water in crop production include the following:

- Maintenance of irrigation distribution systems (channels, etc.) to minimise leakage and evaporation losses
- Adoption of water-efficient crop watering techniques

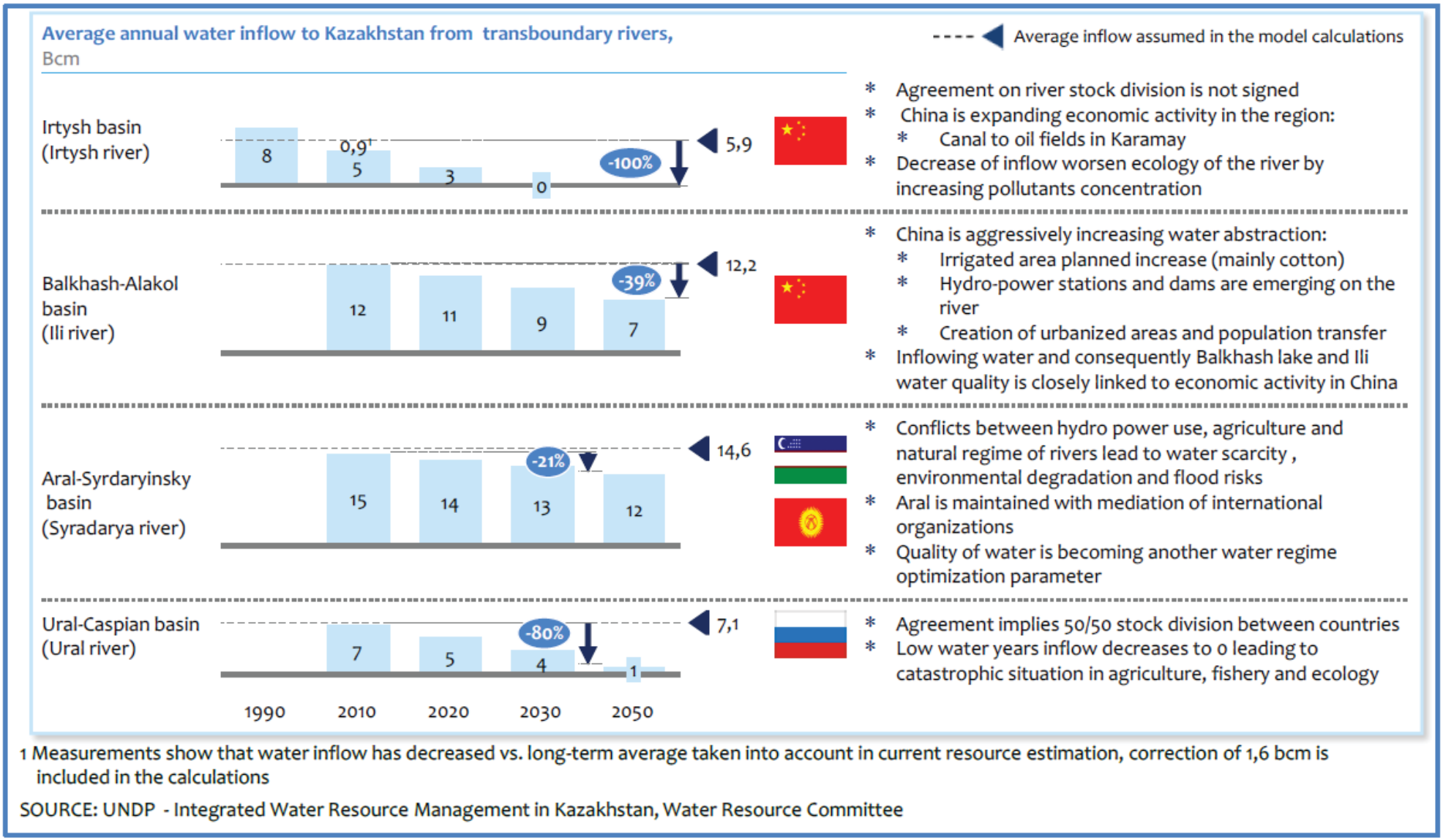



***Figure 10: Measured and projected transboundary river inflows to Kazakhstan***

Source: Green Economy Concept (2013), Exhibit 4

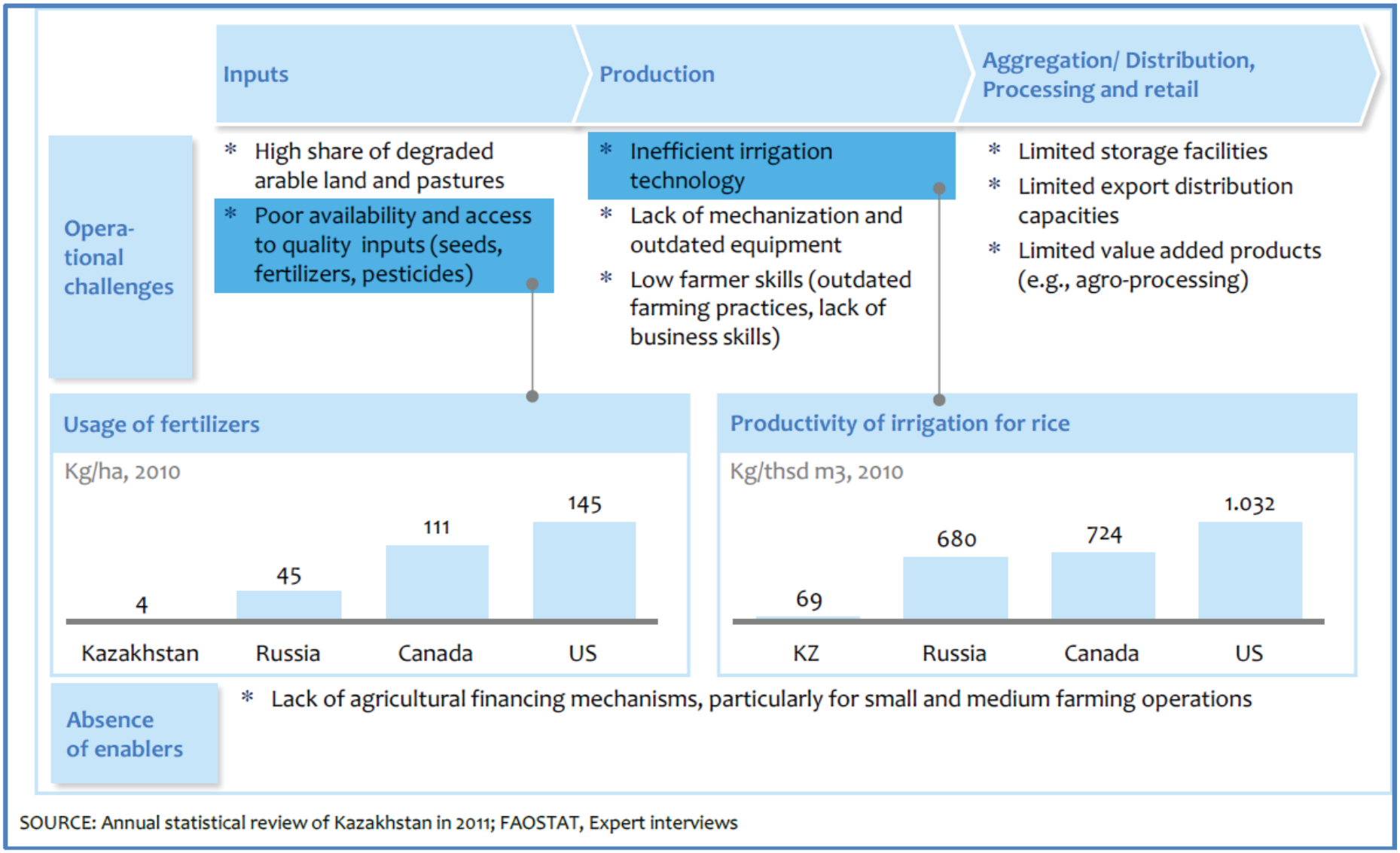



***Figure 11: Operational challenges, water-use productivity for rice growing and fertiliser use***

Source: Green Economy Concept (2013), Exhibit 8

- Innovation and adopting good practice guidance on the choice of crop and crop varieties grown – selecting crops requiring less water for their growth – with the twin goals of reducing water demand per hectare and increasing the added value of crops produced per hectare
- Innovation (medium- to long-term) to develop and plant seeds/cultivars that have been gene-edited (for example) to tolerate low levels of water availability or to consume less water
- Adopting good practice guidance on the timing of water application (i) to soil prior to seed sowing/planting and (ii) to growing crops, the goal being to maximise the efficiency of water use
- Communication of good practices – both national and international – to the land-owning and farming communities
- Outreach activities, providing advice and access to technical support on the above techniques

Policy measures that could help **incentivise farmers** to adopt the above tools and methods to reduce the water-intensity of crop production, many understood to be adopted currently, include the financial incentives presented by:

- Partial grants and subsidised loans for investing in water-efficient technologies
- Additional tax relief for making such investments

Policy measures that could help to **steer farmers** to adopt the above tools and methods to reduce the water-intensity of crop production include:

- Increasing the prices paid for water abstraction and use, the additional monies raised being used to invest in water efficiency measures and, for instance, outreach programmes to disseminate good practice
- Mandatory limits on the annual quantity of water abstracted from surface and groundwater resources for use in agriculture, those limits being enforced

As an example illustrating how to steer farmers in adopting water-saving policies, one recommendation for an EU-funded programme (Environmental Policy Instruments) in 2010 was that an abstraction limit of 3.0 $km^3$ per year be adopted for the Ili-Balkhash basin in order to conserve Lake Balkhash. However, it was recommended that this limit be reassessed in future to consider the progress made (or lack of it) in global GHG emissions mitigation as well as on negotiations with China on water sharing, and any observable changes in the long-term flow rate of the Ili River from China into Kazakhstan (whether the result of climate change or additional, post-2010, abstraction upstream in China).

***Inorganic Fertiliser Consumption***

Although the application of inorganic nitrogenous (N) and phosphate-based (P) fertilisers can boost crop production in the short-term, it does nothing to sustain the soil structure needed for healthy crop production in the long-term. Used to excess and in conjunction with over-ploughing or cultivation, such fertilisers may indirectly lead to exhaustion of the humous content of soil and increase the vulnerability of crops to water shortages. Also, several potentially significant environmental issues can result from the application of inorganic N and P fertilisers:

- The carbon footprint of these fertilisers is significant, their production involving substantial energy consumption (and the conversion of hydrocarbon feedstock in the case of N-fertiliser production). Their use therefore contributes to Kazakhstan's carbon footprint (whether nationally produced or imported) and GHG emissions.
- Dependent in part on the rate and timing of their application to land and their chemical speciation, the applied N-fertiliser may degrade rapidly after application, releasing ammonia ($NH_3$). If not taken up by growing plants, ammonia is either released to air as a gas or, if retained in the soil, oxidised to nitrite and nitrate-nitrogen in the soil moisture.
    - Ammonia is an air pollutant that may also react with other pollutants to form aerosols (fine particulate material, $PM_{2.5}$) that are harmful to human health
    - Oxidation of airborne ammonia may also contribute to acid rain and soil acidification in land distant from the site of fertiliser application

- Oxidised nitrogen (nitrite and nitrate) may discharge diffusely into surface waters in wet periods, adversely affecting surface water quality and ecological state
- Nitrite and nitrate-nitrogen may also percolate downwards into the groundwater with adverse effects for water quality, especially if the groundwater is used as a source of drinking water

– Dependent in part on the rate and timing of their application to land and their chemical speciation, break-down of the applied P-fertiliser may release more phosphate ($PO_4$) than can be readily assimilated by the growing crops. Excess $PO_4$ leaches out into surface waters and groundwater, potentially causing water pollution, and the eutrophication of watercourses in particular.

SCP tools and measures related to the use of inorganic fertilisers principally involve the adoption of available good practice guidance.[11] Guidance should be sought on (i) when and how much of these fertilisers are applied, (ii) the types of inorganic fertiliser applied – for instance, the use of ammonium carbonate is banned in the EU, (iii) the partial or total substitution of organic N and P containing wastes for inorganic fertilisers, and (iv) effective communication and outreach programmes to disseminate good practice and guidance:

– Subject to appropriate pre-treatment, controls to limit their application rates, and crop type, organic wastes such as animal manure, sewage sludge, and composted food and green wastes may be applied to arable land (and pasture) as a partial or total substitute for inorganic fertilisers.[12]
  - Salad vegetables which are eaten raw are examples of crops where the application of such materials may not be appropriate or is severely constrained
  - International good practice guidance and regulatory approaches may be taken as foundations for the development of trial-based guidance tailored to Kazakhstan's climatic range and crop types

Organic farming practices seek to minimise or eliminate the use of chemicals, including inorganic fertilisers, going beyond the partial substitution of inorganic fertilisers by such treated wastes.

***Pesticides and Herbicides***

Pesticides and herbicides are hazardous substances by definition and are commonly used in modern agriculture: (i) to protect growing crops from depredation and infestation by pests and (ii) to suppress the growth of unwanted plants (weeds) that may compete for the light, water and the nutrients needed by crops. However, their indiscriminate and excessive use can contaminate crop products, for example when applied to the surfaces of growing fruit and vegetables, posing health risks to consumers. Their adsorption onto soil particles, subsequently carried by surface water run-off to rivers and streams, may result in spreading the chemicals further afield.

Adhering to good practice guidance can reduce the quantities of these chemicals that are used and reduce such undesirable risks. Good practice can involve the use of naturally occurring substances instead of synthetic pesticides and herbicides.

***Crop Spoilage***

According to an estimate made in 2011 by the UN's Food and Agriculture Organization, about a third of all food produced globally is lost as food waste.[13] More refined estimates prepared in 2016 suggest that the average food loss from post-harvest up to but excluding food retailing was 13.8% globally but 20.7% in central and southern Asia.[14] Post-harvest crop spoilage arises from handling operations and storage. The adoption of post-harvest good practices not only reduces food waste but increases net output, productivity and the effective efficiency of all resource inputs to crop production.[15]

***Crop Residue Management***

After crops have been harvested a common traditional practice has been to burn the dried residues *in situ* – in the field. Field burning releases many pollutants to air including the products of incomplete combustion,

11 The UNECE Framework Code (2014) for Good Agricultural Practice for Reducing Ammonia Emissions

12 See, for example: WRAP (2016), 'Digest and Compost Use in Agriculture - Good practice guidance for agricultural contractors'. https://wrap.org.uk/resources/guide/compost-and-digestate-agriculture-good-practice-guide

13 https://www.fao.org/food-loss-and-food-waste/flw-data)

14 https://www.fao.org/sustainable-development-goals/indicators/12.3.1/en/

15 See, for example: https://www.fao.org/3/x0039e/X0039E01.htm

such as particulate matter (both $PM_{10}$ and the finer fraction $PM_{2.5}$), black carbon, PAHs, dioxins and furans. Nitrogen oxides (NOx) are also emitted into the air. Depending on the field burning locations relative to populated areas and weather conditions, the air pollutants generated may contribute to health risks to surrounding populations subjected to the polluted air, and field burning can moreover cause severe nuisance. Where field burning is practised, alternative methods of managing crop residues may be considered, adopting good practices. As in the EU, the field burning of crop residues is banned in Kazakhstan.[16] Alternative methods of dealing with residues include:

- Baling straw and other residues and transporting the compressed bales to engineered straw-bale burning facilities equipped with energy recovery; the ashes may be applied to land as a fertiliser.
- Incorporating the residues into the soil by ploughing or other techniques, helping to sustain the humus and soil structure.
- Composting the residues and applying them to the land as a soil conditioner.

### *Ecosystems and Biodiversity*

Sustainability relates not only to the physical world and the resources it provides, but also to humanity and perhaps even more so, to nature – the ecological system also inhabited by humankind. Sustainable development goal SDG 15 (Annex C) specifically refers to the protection, restoration and sustainable use of terrestrial ecosystems (including rivers and inland waters) and to halting the loss of biodiversity. Through the use of various chemicals and land management practices, agriculture, especially when practised intensively, is a major source of the pressures exerted on nature. This may be observed anywhere, whatever the state of economic development.[17]

Hence, changes in agricultural practice should be considered not only as a resource issue but for their repercussions in nature, on its ecosystems and biodiversity.

## Animal rearing

Many animal species – including cattle, horses, pigs, goats, sheep, camels, chickens and other fowl – are raised to provide meat and/or other resources. Some are housed for at least part of their lives while others range more or less freely prior to collection and slaughter. Milk, eggs and wool are harvested from live animals while slaughtered animals provide meat, hides, skins, feathers and other animal by-products. The introductory comments below concern the consumption of specific resources and the wastes and emissions generated in animal rearing (see Figure 12 below). Good practice guidance is available.[18]

### *Food and Feeding Regime*

A major issue in animal rearing, as with fertiliser applications in crop production, is the emission of nitrogen as ammonia. In general up to 90% of a nation's ammonia emissions into the air are generated by the agricultural sector, of which about two-thirds can result from animal rearing. Increasing evidence points to the significant role that ammonia plays worldwide in the formation of secondary fine particulate matter ($PM_{2.5}$), $PM_{2.5}$ air pollution, and the health impacts of air pollution – $PM_{2.5}$ being the major air pollutant of concern for human health.[19]

16 Order of the Minister of Agriculture of the Republic of Kazakhstan dated January 17, 2020, No.7.

17 In the UK for instance, agricultural practices are associated with significant ecological impacts. See *The State of Nature 2019*., UK-wide assessment and national summaries available online at: https://nbn.org.uk/stateofnature2019/reports. Highlights included in Frost RC and Newman PJ (2021) FWR Publication FR/G0011, 'Freshwater and Wetland Habits – Opportunities to Get Involved in their Conservation and Restoration.

18 Although the BAT Reference Document and BAT Conclusions published by the European IPPC Bureau refer specifically to the intensive rearing of poultry and pigs, many of the good practices that may be found there are generally applicable to rearing other animals. See: https://eippcb.jrc.ec.europa.eu/reference/intensive-rearing-poultry-or-pigs-0.

19 World Health Organization: https://www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health

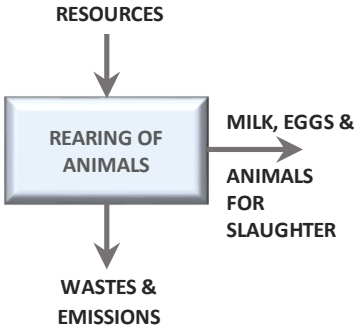
| STEP IN THE VALUE CHAIN | RESOURCE INPUTS | | | | WASTES & EMISSIONS |
|---|---|---|---|---|---|
| **(HOUSED) ANIMAL REARING** | | | | | |
|  | Food – including additives | R | S | C | Manure – faeces & urine, bedding |
| | Water – drinking, cleaning | R | | | Emissions to air – ammonia, methane |
| | Bedding | R | S | C | Wastewater |
| | Energy – ventilation, heat | R | | | |

***Figure 12: Resource inputs and wastes arising from primary production (animals), and the applicable types of SCP action***

Management of the nitrogen cycle therefore is one of the central features of modern, sustainable agriculture, and animal feeding is just one aspect that has to be considered.[20] Housed animals need to be fed, while free-ranging animals may also receive feed supplements, especially in harsh weather. Feeding regimes, therefore, need to take into account the lower protein conversion and higher ammonia emission rates when animals are given high-protein feed.

Authorised food additives to animal foodstuffs and/or drinking water may be used for one or more specific functions,[21] for example:

- In meeting the animals' nutritional requirements
- To improve the quality of animal feed, and/or the quality of food (for human consumption) from animal origin (e.g. meat, fish, milk, eggs)
- To improve animal performance and health.

The use of antibiotics as feed additives used to be permitted in the EU and UK but, with limited exceptions, their use is now prohibited. Coccidiostats and histomonostats are exceptions: these are antiprotozoal agents that act upon Coccidia parasites in poultry and sheep, for example.

Emissions of methane (a potent GHG) by ruminant animals such as sheep, cattle and horses, whether housed or free ranging, is probably an inescapable consequence of animal rearing. Studies have however suggested that emission volumes depend to an extent on animal diet and might therefore be reduced.

A further issue concerns the resource inefficiencies and associated generation of wastes implicit in producing food for animal consumption and its conversion into animal protein for human consumption. At-source means of reducing resource consumption, waste generation and methane emissions from animal rearing include a societal-wide change of diet, namely eating more cereal products, vegetables and fruit and eating less meat and other protein-rich foods of animal origin. While such considerations may be culturally challenging in Kazakhstan, it is an issue that is raised and debated in Europe and elsewhere – not only for reasons of GHG emissions mitigation but as a healthier lifestyle choice.

### *Cleaning*

Animal housing needs to be cleaned as a matter of routine. Cleaning will probably generate solid wastes such as soiled straw or other materials used as bedding, and wastewater from washing surfaces with water. Care however should be taken to avoid using excessive volumes of water when cleaning (for reasons of resource efficiency) and avoiding unnecessary mixing of cleaning wastewater with the manures and soiled bedding. Mixing too much lightly contaminated wastewater with manure might increase the cost and reduce the effectiveness of manure treatment by anaerobic or aerobic digestion. While the wastewater generated

20 The UNECE Framework Code (of 2014) for Good Agricultural Practice for Reducing Ammonia Emissions: https://unece.org/environment-policy/publications/framework-code-good-agricultural-practice-reducing-ammonia.

21 In the EU and the UK, for instance, they are regulated through EU Regulation 1831/2003, which means that they can be placed on the market only if they have been authorised for use and are used only for the purpose stated within the authorisation. See: https://eur-lex.europa.eu/legal-content/en/ALL/?uri=CELEX%3A02003R1831-20190726

initially in hosing down a soiled floor, for example, might be heavily contaminated and should be handled with the manure and soiled bedding, the wastewater generated subsequently is likely to be much less contaminated and it may be better treated by other means.

***Manures and their Management***

The excreta (faeces and urine) of free-ranging animals naturally falls onto land where it degrades naturally through a combination of aerobic and anaerobic processes and becomes incorporated into the soil. For housed animals, their wastes need to be collected, treated and disposed of effectively in order to reduce their potential adverse environmental effects and to recover useful energy and nutrients. Bedding that is biodegradable, such as straw, may be treated and disposed of with the animal manure also produced, consistent with Sanitary Standard SNiP RK 3.02-11-2010 (Box 1).

**BOX 1: Sanitary Standard SNiP RK 3.02-11-2010**

16.3.1

Enterprises should provide for the disposal and storage of organic waste products – manure (slurry), bedding, and feed residues mixed with manure or bedding.

16.3.3

The main opportunity for the disposal of organic waste is [holding] in storage facilities for subsequent processing into organic fertilisers and biogas.

Enterprises should use energy-saving and low-cost technologies for the disposal and processing of organic waste into biogas and organic fertilisers.

Potential adverse impacts resulting from the improper management of animal manures include the transmission of pathogenic organisms; high emissions of ammonia and methane to air; water pollution if either raw or treated manures are stored near to and are allowed to enter surface freshwater bodies and/or pollution of groundwater if they are stored in unlined ponds or lagoons; and severe odour nuisances if operations are conducted close to inhabited areas. Good practice techniques should therefore be adopted, including:

- Heated anaerobic digestion of manures coupled with the combustion of recovered biogas for digester heating and heat/power generation. An alternative option that may be considered is the composting of mixed manures, bedding and other solid biodegradable wastes. Considering the climatic features of the northern regions, composting of waste can take place in enclosed areas or using a pile cover.
- Storage of untreated and treated wastes in ventilated housing or tanks, the air extracted being fed with air extracted from ventilated animal housing to digester gas burners, or treated otherwise.
- Lined and bunded storage areas to prevent surface water and groundwater pollution.
- Application of treated manures to arable land or pasture, reducing the need to apply synthetic inorganic fertilisers.

***Wastewater and its Management***

Wastewater generated in the cleaning of animal housing will be contaminated to a varying extent. Low volumes of highly contaminated wastewater, e.g. the first flush of wastewater from cleaning soiled floor areas and drains, may be mixed and treated with the manure and soiled animal bedding. Where climatic considerations permit, less contaminated wastewater may be treated in lagoons having a relatively long residence time, allowing sedimentation, natural degradation and oxidation processes to take place, prior to the discharge of treated effluent to surface water. Where climatic factors prevent such operations, it may be necessary to develop alternative good practice approaches.

***Air Emissions***

As noted above, methane (a powerful GHG) and ammonia are the principal air emissions of environmental concern, to which odour nuisance may be added in some locations. Adoption of good practice techniques – many have been documented and are available – should become the norm. However, some research and development may be needed to adapt them to accommodate Kazakhstan's climatic range and other potential considerations.

***Slaughterhouses and Animal By-Product Production***

Whether housed or allowed to range freely, most farm animals raised by humans are destined for the slaughterhouse, either small-scale local operations or industrial-scale abattoirs.

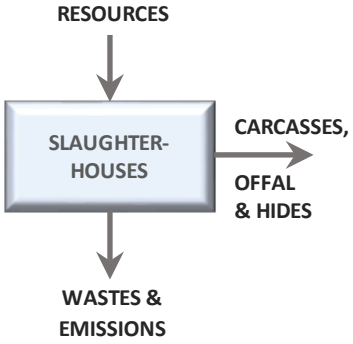
| STEP IN THE VALUE CHAIN | RESOURCE INPUTS | | | | WASTES & EMISSIONS |
|---|---|---|---|---|---|
| **SLAUGHTERHOUSES** | | | | | |
|  | Animals for slaughter | | | C | Animal parts (waste) |
| | Energy – chilling & heating | R | | | Animal excreta – faeces & urine |
| | Water - cleaning | R | | C | Wastewater |

***Figure 13: resource inputs and wastes arising from primary production (slaughterhouses), and applicable types of SCP action***

The introductory comments below relate mainly to the consumption of resources and the generation of wastes and emissions in industrial-scale facilities (see Figure 13). Good practice for slaughterhouses and the production of animal by-products may be found in the appropriate BAT Reference Document issued in 2005 (currently undergoing revision: the 1st draft was published in June 2021).[22]

***Resources Consumed and Wastes Generated***

In addition to the provision of drinking water to animals held in pens or stockyards, slaughterhouses consume freshwater in washing down surfaces and cleaning carcasses and animal parts (such as the intestinal tract). Energy is required also for space heating, hot water and steam-cleaning, stunning animals prior to slaughter, and chilling the skinned carcasses and by-products prior to further transport. Forming part of good practice, SCP tools and measures should be used to ensure that water and energy are used efficiently, and that wastewater is captured effectively.

In addition to carcasses that pass inspection for disease, significant by-products of animal slaughter can include offal (organs selected for human consumption or pet food), blood (as the basis for certain foodstuffs), untreated hides and skins, feathers, and other animal parts that can be either eaten or used to make food and non-food products.

All other non-retained parts of the slaughtered animals, including unwanted bones, form a significant waste stream that should be managed in a hygienic and environmentally acceptable manner. Good practice should be adhered to, including the separation of solid and waterborne wastes.

Animal excreta (faeces and urine) generated in the holding pens (lairage), in the slaughtering process, and produced in the post-slaughter cleaning of intestinal tracts, contribute to the waste streams. This waste, together with wastewater from other cleaning operations, should be managed using good practice at least as stringent as that applied to farm-generated manures.

## 3.3 Secondary Production

### Food and beverage processing and packaging

Shown schematically in Figure 14, food and beverage production involves a wide and diverse range of activities. In addition to the transport and local storage of raw foodstuffs, intermediate and processed foods and drink are operations that need to be considered.

22 https://eippcb.jrc.ec.europa.eu/reference/slaughterhouses-and-animals-products-industries

| STEP IN THE VALUE CHAIN | RESOURCE INPUTS | | | | WASTES & EMISSIONS |
|---|---|---|---|---|---|
| PROCESSING AND PACKAGING OF FOODS AND BEVERAGES | | | | | |
|  | Primary feedstocks: meat, fish, milk, cereals, vegetables, fruit, pulses, fungi etc. | R | | | Food wastes |
| | Other food ingredients and additives | R | S | | Packaging wastes |
| | Packaging & other material | R | S | C | Other solid wastes |
| | Energy | R | S | | Wastewater |
| | Water – process & cooling | R | | | Cooling water |
| | Chemicals | R | S | | Emissions |

***Figure 14: Resource inputs and wastes arising from food & beverage production, and the applicable types of SCP action***

Activities include:

- Bakeries – bread, pasta and pastries, etc.
- Bottling of beverages, vegetables and fruits, etc.
- Butchering – preparing meat for retail sale
- Brewing – beer and other liquors produced by the fermentation of cereals, potatoes, etc.
- Canning of processed foodstuffs
- Dairies – milk pasteurisation and sterilisation, production of dried milk powder, cheeses, cream, yoghurts, kefir and other fermented products
- Distillation – wines and other brewing liquors to make brandy, vodka and other high-strength liquors
- Freezing of meat, vegetables and fruits for sale
- Meat processing, e.g. to make mince, sausages, etc.
- Milling of cereal grains
- Packaging (primary and secondary) of foods and beverages
- Pet food production
- Pickling of vegetables, mushrooms and fruits
- Processing of raw and other food ingredients to make ready-meals, confectionary, etc.
- Storage of raw and processed foods, in bulk or small-scale
- Vinification – fermentation of grapes (and fruit) to make wine

***Resource efficiency***

Generic SCP tools for identifying resource wastage and measures to improve resource efficiency are applicable to all food processing and beverage production operations. This applies to each agri-food sub-sector although the precise measures adopted will be sub-sector and site specific. From an economic and financial perspective, it can be expected that taking SCP action to reduce the wastage of primary feedstock material will be especially beneficial since this material wastage represents lost product value. Relatively simple monitoring can indicate the amount of potential product wastage. For instance, monitoring the flowrate and chemical oxygen demand (COD) or organic carbon content of a dairy's wastewater – mostly associated with milk and other product or by-product losses – can readily give an indication of 'lost' product value. However, the efficiency with which the other resources noted in Figure 14 are used should be considered at all production sites, using SCP tools. Expanding the sample presented in Table 3 (Chapter 1), those of most immediate practical relevance to the resource efficiency of food processing operations at the enterprise level are:

| | |
|---|---|
| Baseline Assessment | Good Practice Guides and Case Studies |
| BAT Reference Documents | Heat Exchanger Networks |
| Benchmarking | Mass and Energy Balances |
| Champions (for resource efficiency) | Metering, Monitoring and Sampling |
| Counter-current washing/heat-exchange | Resource Efficiency & Waste Minimisation Clubs |
| Environmental Management System | Separation of Wastes at Source |
| Fishbone Analysis | Walk-through Audit |

***Additives and chemicals***

The possibilities to reduce the addition of other food ingredients, or their substitution by other, healthier alternatives may also be considered. Examples of common ingredients and additives whose use may have undesirable side-effects for human health include salt, sugar, curing and preservative agents such as nitrites in processed meat, and a range of synthetic colouring and flavouring agents. Similarly the quantity and type of chemical substances used for cleaning (for product safety and hygiene reasons) in the processing of food and beverages, and bottling operations, should be examined.

***Packaging and packaging waste***

Packaging is needed for the distribution, storage, presentation to consumers at retail outlets, and storage of food products in the kitchens of households, institutions and hospitality venues. It thus serves several purposes: protecting food from contamination, enabling its efficient transport and storage, serving as a medium for product advertising and the conveying of product information to the purchaser/consumer, and as a convenience for the consumer. Three levels of packaging may be identified: [23]

1) Primary packaging to contain and prevent contamination and spoilage of a product is usually essential and takes many forms: e.g. bottles (glass, plastic), jars, cans, cartons (plastic, cardboard and composite), tubes, plastic pouches or bags (e.g. to contain frozen foods), cardboard, and (portion) wrappers.
2) Secondary packaging for the ease of retailers and consumers includes e.g. cardboard boxes containing primary packaged products; shrink-wrapping to bind several cans, bottles or packets together.
3) Tertiary packaging to reduce damage during transport and for the ease of distributors and retailers includes pallets to support boxes containing primary-packaged products, and shrink-wrapping of such boxes to form a larger 'package', etc.

In meeting these and other requirements the cumulative consumption of packaging materials can be excessive, while the use of composite materials (such as plasticised cardboard, e.g. Tetra Pak) may result in the recovery and recycling of packaging material becoming impracticable. Food processors and distributors therefore should pay attention to all aspects of packaging design and materials specification in order to:

- Reduce the quantity of primary, secondary and tertiary packaging materials, and thus the resources consumed in their manufacture, to the minimum needed to meet functional requirements (this will reduce also the quantity of waste packaging arising at retail outlets and household consumers, etc.)
- Require that the producers and suppliers of packaging use recycled materials to as great an extent as practicable, and to at least the extent that Government may mandate
- Wherever possible, avoid the use of composite materials that inhibit or prevent the recycling of packaging waste
- Include signage on primary packaging to inform consumers as to whether the packaging waste may be recycled and, where this is so, to which waste stream it should be classified when separating at source. Allied to other measures, this will help enable final consumers to practice at-source separation of household and similar wastes, thereby enhancing the recycling of household and similar wastes
- Replace materials that are difficult to recover and recycle with materials that can be reused, recycled,

23 See, for instance, the EU's Packaging and Packaging Waste Directive 94/62/EC as amended by (EU) 2018/852.

or processed for incorporation into the environment[24]

SCP tools that are most relevant to packaging design and material specification include:

| | |
|---|---|
| Benchmarking | Good Practice Guides and Case Studies |
| Champions for minimal packaging | Innovation |
| Cleaner Design | Life-Cycle-Analysis |
| Communication | Mapping the Sectoral Value Chain |
| Environmental Management System | Mass and Energy Balances |
| Fishbone Analysis | Metering, Monitoring and Sampling |

***Management of food wastes and wastewater***

Food wastes and wastewaters are generated at each stage of food and beverage processing. Their characteristics will be highly dependent on the nature of the feedstock and the operation, but it is likely that all may be biodegradable and therefore amenable to some form of biochemical processing, whether anaerobic (in the absence of oxygen) or aerobic (in the presence of oxygen). In general, and where feasible, it is advisable that:

- Food waste streams are segregated according to whether they are solid, high-strength waterborne waste, or low-strength wastewater
- Where (solid) food wastes are deemed unfit for human consumption, they may be considered as feedstock for pet-food production; otherwise:
  - solid and high-strength waterborne food waste – including animal fats and greases – may be treated in heated anaerobic digestion reactors, utilising the generated biogas to provide process heating and for other beneficial purposes
  - aerobic treatment of solid food waste by composting is another possibility
- Medium to low-strength waterborne food wastes may be treated aerobically in wastewater treatment plants (there are many designs)
- Unless there is a valid reason for doing so, spent cooling water should not be mixed with other waste/wastewater streams, but discharged to surface water or to the sewerage system (mixing with food wastewaters will dilute and thereby increase the volume of these streams to be processed, thus raising the cost of treatment)

Subject to sanitary and hygienic protocols being adhered to and ensuring that appropriate safeguards are upheld, treated food wastes may be utilised in agriculture as a soil additive, providing humus and partially substituting for inorganic fertilisers (N and P).

***Management of other wastes and emissions***

Other solid wastes generated in food and beverage processing may be similar to household municipal solid waste (MSW). They may be managed similarly. Emissions from food processing operations and food waste treatment processes can cause major smell nuisance. Depending on their location, it may be necessary to treat the emissions in an odour removal process.

## Leather and leather goods production

The production of leather involves the chemical stabilisation of raw animal hides and skins, a process known as tanning (see Figure 14, adapted from the BAT Reference document referred to below). Appropriate levels of care need to be exercised in leather production, because the stabilising agents, solvents (that release non-methane volatile organic carbon substances (NMVOCs) into the air), and other chemicals used, typically have hazardous properties.

24 An example of the latter, in the retail sector, is the replacement of plastic bags for holding loose vegetables and fruit by clear bags made from potato starch.

The European Commission's BAT Reference Document for the Tanning of Hides and Skins gives a comprehensive description of the many steps involved in the process (Figure 15), and of applicable BAT, but is over 270 pages long.[25] Published in 2007, the World Bank Group's Environmental, Health, and Safety Guidelines for Tanning and Leather Finishing provides an easier 21-page introductory description to leather production and a good practice summary.[26]

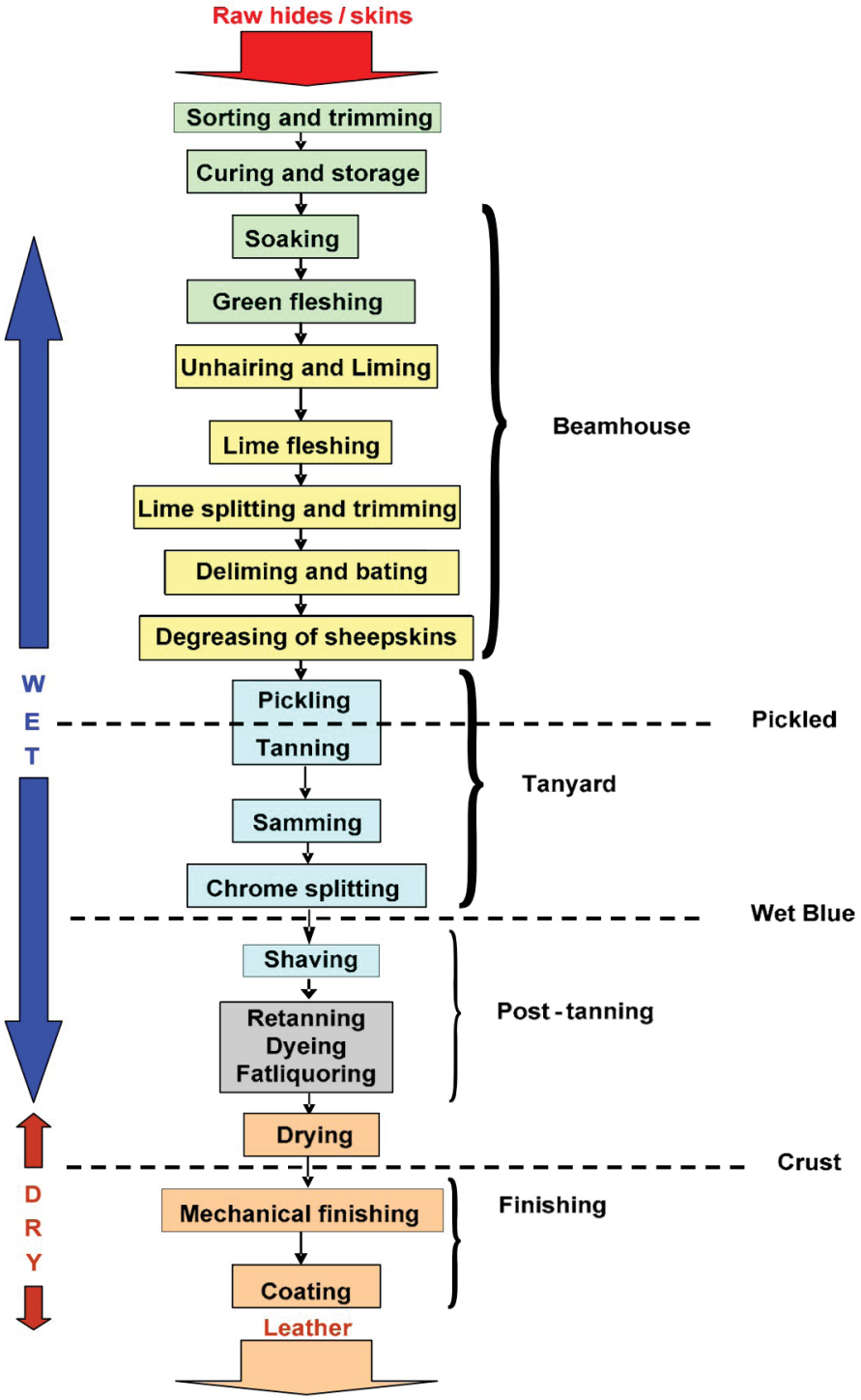



*Figure 15: Process steps in the (chrome tanning) production of leather (BAT Reference Document)*

Figure 16 schematically shows the main types of resource inputs to, and wastes and emissions generated from tanning and leather finishing. SCP tools to identify resource-efficiency saving measures, such as may be found by reference to good practice documentation, will likely play the major role, although substitution and circularity actions may also be relevant. Opportunities to substitute less-hazardous tanning chemicals

25 JRC Reference Reports, European Commission, 'Best Available Techniques (BAT) Reference Document for the Tanning of Hides and Skins – p.13' (2013)

26 IFC, World Bank Group (April 2007). 'Environmental Safety and Health Guidelines for Tanning and Leather Finishing'.

and leather finishing solvents should be sought and implemented where feasible.

The wastes and emissions from tanning and leather finishing operations are environmentally damaging unless appropriately treated. Therefore adopting good practice guidance is essential.

| STEP IN THE VALUE CHAIN | RESOURCE INPUTS | | | | WASTES & EMISSIONS |
|---|---|---|---|---|---|
| **TANNING OF ANIMAL HIDES** | | | | | |
|  | Hides and skins | R | | C | Raw hides and skins – trimmings, hair, grease and spoilage |
| | Tanning chemicals | R | S | C | Tanned hides and skins – trimmings and spoilage |
| | Solvents and other chemicals | R | S | | Chemical wastes, drums, sludge etc. |
| | Water | R | | | Wastewater |
| | Energy | R | S | | Emissions to air |

***Figure 16: Resource inputs to and wastes arising from the tanning of animal hides and the applicable types of SCP action***

The production of leather goods such as shoes, clothing, furniture upholstery and so on may be carried out in small workshops or as a large-scale activity employing many people. Whatever the scale, typical leather working operations include cutting to shape, stitching, gluing and trimming. Principal issues are to minimise the wastage of tanned and finished leather and ensure that glues and solvents are used responsibly so as not to cause adverse health problems among leather workers.

## 3.4 Tertiary Sectors

### Storage and distribution

Foodstuffs may be stored between most stages of production, and food wastage may occur at storage facilities and in transport operations: e.g. foodstuffs being eaten and or spoiled by vermin; spoilage resulting from inappropriate handling and storage conditions; spillages; etc. Tools such as baseline assessment, walk-through auditing and fishbone analysis are well-suited to identifying the sources and causes of such waste. Good practice should be adopted to minimise foodstuff waste, and to build knowledge and capacity in the treatment, use, and disposal of any wastes that do arise.[27]

Electricity is consumed in the storage and distribution of chilled and frozen foods. To ensure that this resource is used efficiently, attention should be paid to thermal insulation of cold container and storage units, and in maintenance and operating conditions. The replacement of old, inefficient units with new ones having higher design efficiency should also be considered.

Should failures in transport logistics cause delays, perishable foods are the most vulnerable. Where this is an issue, baseline assessment and fishbone analysis may help in the assessment of current transport arrangements and assist in identifying effective measures to improve them.

### Retail outlets

Foodstuffs, beverages, footwear and other products for consumption are obtained by consumers from retail outlets. There are many types of outlets, ranging from local markets where products are sold by individuals on a semi-casual basis, through dedicated outlets such as bakery shops and retail butchers, small-scale local supermarkets that sell numerous goods (although the range of their stock might be limited), up to large supermarkets able to provide a comprehensive range of products and services. Some of the latter may also provide their goods to consumers via a delivery service, the goods having been ordered over the internet. Figure 17 shows the main resource inputs and the wastes and emissions generated. While appropriate good practice is applicable to all types and scales of retail outlet, the comment and discussion below is directed

27 See, for example, the resources made available by WRAP: https://wrap.org.uk/taking-action/food-drink/sectors/manufacturers-brands

primarily at supermarkets and specialised shops.

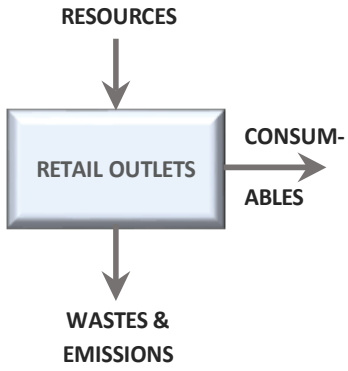
| STEP IN THE VALUE CHAIN | RESOURCE INPUTS | | | | WASTES & EMISSIONS |
|---|---|---|---|---|---|
| **RETAIL OUTLETS** | | | | | |
|  | Foodstuffs etc. | R | | C | Food wastes |
| | Packaging | R | S | C | Packaging wastes |
| | Energy – heating, chilling, freezing, lighting, etc. | R | S | C | Other solid wastes including used lamps & other equipment |
| | Water | R | | | Emissions to air – including refrigerants |
| | Transport (delivery to meet internet orders) | R | S | C | Wastewater |

*Figure 17: Resource inputs to and wastes arising from retail outlets, and applicable types of SCP action*

### *Food waste*

Food waste (including beverages) at retail outlets results from foodstuff storage conditions along with how they are packaged, displayed and handled on site. Waste is also created by store 'sell-by date' policies and practices, which lead to products being withdrawn from sale when not sold by the due date, because the withdrawn product then enters the waste stream.

Food wastage can also occur indirectly as a consequence of an outlet's other policies and practice. For instance, large-scale supermarkets may have contractual agreements with commercial farmers that stipulate (unnecessarily) rigorous standards on the visual appearance of vegetable produce. The application of such standards may require the farmer to discard harvested produce as waste if it fails to meet the standards. Another example is when, for reasons of hygiene and food safety, an outlet (and supplier) applies 'best before date' information on products for sale. However, adopting an over-cautious approach can result in, say, a householder throwing away as 'waste' a food product that is near or beyond its 'best before date', even though its appearance (sight, smell, etc.) causes no concern.

Good practice to prevent and minimise the generation of food waste should be adopted at all retail outlets.[28] This can include participation in food banks where tinned and otherwise unwanted but packaged food products may be provided to poorer members of the local community. At retail outlets, consumer contributions of unwanted food and beverage products can likewise be included in such arrangements (see below, section 3.5).

Food waste that does occur should be collected separately, transferred to processing centres for treatment by anaerobic digestion or composting, and applied to land as a partial substitute for synthetic inorganic fertilisers and as a source of humus.

### *Packaging and packaging waste*

The retail sector is largely the recipient of packaging (primary, secondary and tertiary). However, large retail outlets such as major supermarket chains act in many respects as wholesalers, not only as retailers. They may be able therefore to exert pressure on their suppliers to adopt good packaging practice (see above, section 3.3). Wherever possible they should do so. They may be able to act in partnership – as members of a retail supply chain – to optimally reduce packaging and jointly agree to target indicators.[29] Other areas where retail outlets may act to reduce packaging waste and increase the resource efficiency of the supply chain include:

- Ensuring that all primary, secondary and tertiary packaging waste generated at the retail outlet is

28 See, for example, the resources made available by WRAP: https://wrap.org.uk/taking-action/food-drink/sectors/retailers

29 Retail outlets in EU member states are subject as economic operators to the provisions of the EU's Packaging and Packaging Waste Directive 94/62/EC as amended by (EU) 2018/852.

collected separately from other solid wastes in order to prevent and minimise cross-contamination, and that arrangements are put in place for transfer to recycling sites, which include cardboard producers who may pulp the recovered carboard waste, to be used as a component of animal feed.

- Stop providing customers with plastic carrier bags, whether paid or free, for bulk purchases, substituting (free) paper bags or paid-for durable bags made of natural materials.
- In place of plastic carrier bags, provide thin-film plastic bags (made from compostable cellulosic material) for customers to use for loose/non-packaged products (e.g. bread rolls, apples, etc). Inform and encourage customers to reuse the bags whenever possible and to dispose of the substitute bags with green waste where proper facilities are available. Adopting these measures helps to minimise the generation of plastic waste.
- Participate in glass bottle deposit-and-return schemes, enabling customers to return empty bottles (with or without payment), for bulk transfer from the retailer to bottling plants.
- Provide space on available land, e.g. in affiliated car parking lots, for segregated packaging waste – cardboard and cleaned glass bottles, tinned cans and plastic bottles – thus facilitating collection and transfer to recycling entities.

***Other solid wastes***

Collected separately from food wastes and clean packaging wastes, all other solid wastes generated at retail outlets may be managed as a component or components of municipal solid waste (see below, section 3.5 and Chapter 5).

***Energy***

Cooling and freezing compartments, space heating and lighting all contribute to energy consumption at retail premises. The use of resource efficiency tools to benchmark an outlet's energy consumption and identify the scope for improving its performance should be considered at each site, and certainly at major sites. Good practice measures to reduce energy consumption should be adopted and, where feasible, renewable energy resources (such as heat pumps) considered as local substitutes.

When considering the carbon footprint of a major food retailing entity, the energy consumption and GHG emissions of its product delivery fleet – supplying consumers directly (where ordering on-line is available) – should also be taken into consideration.

***Other considerations***

Food production that adopts organic farming techniques typically avoids the use of synthetic fertilisers, pesticides and herbicide chemicals – relying on 'more natural' methods including the application of natural products and techniques to provide nutrients and pest control. Retail outlets may help promote the production, sale and consumption of such 'cleaner' organic products by presenting them in aisles dedicated to organic produce.

## 3.5 Final Consumption

### Food and beverages

Food and drinks are prepared, served and consumed in households, the hospitality sector (cafes, restaurants, hotels, etc.), industrial and commercial premises (offices, workers' restaurants, etc.), and institutional settings (hospitals, universities, government buildings, etc.). Figure 18 shows the main resource inputs and the wastes and emissions generated.

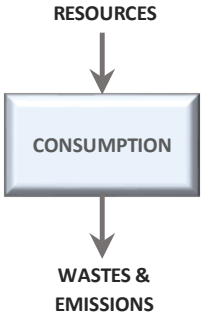
| STEP IN THE VALUE CHAIN | RESOURCE INPUTS | | | | WASTES & EMISSIONS |
|---|---|---|---|---|---|
| **CONSUMPTION** | | | | | |
|  | Foodstuffs including beverages | R | | | Food wastes |
| | Energy – cooking, heating, chilling, freezing | R | S | | Packaging wastes |
| | Appliances – cooking, chilling, freezing | R | S | C | Wastewater |
| | Water – cooking, cleaning | R | | | Emissions – direct & indirect |

***Figure 18: Resource inputs to and wastes arising from final consumption, and the applicable types of SCP action***

### *Food wastes*

At each step of food handling, waste is generated: storage whether in kitchen or larder, meal preparation, serving food (with food left over on the serving dish), and eating meals (with left-over food remaining on the plate). Much of the wastage results from consumer behaviour, which may be more or less easy or difficult to change. However, moderation of consumer behaviour may be achieved through education and concerted communication effort. A number of examples illustrate the influence of behaviour on food wastage in final consumption. Depending on economic circumstances, some of the behaviours indicated below might not apply:

- Frequency of household food buying: a household where one member is the chief food buyer and meal preparer, who shops for food on a daily basis, buying as needed for the day ahead, is likely to waste much less food than one where food is bought once a week. The latter household will likely overbuy 'just in case' – and this is behaviour whose effects are exacerbated when unplanned meals out are taken, leading to stored food becoming stale and surplus food accumulating.
- A tradition of generous hospitality, which can lead to excessive quantities of food being prepared at home, or ordered at a restaurant, with considerable wastage at the end of the meal; the net wastage may nonetheless be minimised if the leftover food is saved (at home), or taken away (at a restaurant) for consumption the following day or so.
- How people respond to 'best-before' date information stamped on packaged food is a further factor: those adopting a precautionary stance may consider that such food should be thrown away once the 'best before' date is passed, or even prior to that date, whereas a more reasonable action would be to discard the food only when the 'use by' date has been reached.
- Over-stocking of food in storage closets or cupboards, resulting in foodstuffs being unseen (hidden away) beyond their 'use by' date and being thrown away as waste.

Inappropriate or defective storage conditions may also result in the generation of food waste; again, poor economic circumstances may be a contributing factor here. For instance, the absence of effective refrigeration for food storage at home may lead to perishable foods going bad in the heat of summer. Other examples: foodstuffs such as cereals are vulnerable to infestation unless stored in air-tight containers, and dry foodstuffs stored in damp conditions are vulnerable to mould formation and spoiling.

### *Energy consumption and emissions to air*

Various appliances are used for processing food (cooking, chilling, freezing, etc.), and the energy used is electricity, gas, etc. The energy efficiency of these appliances – and both their direct and indirect emissions of air quality pollutants and GHGs to air – will depend on their age, design and condition. Good practice techniques should be adopted, and there is a role here that concerted communication efforts can play providing information to all consumers on the relative performance of different appliance types.

Restaurants, other enterprises in the hospitality sector, and institutions (hospitals, education establishments, government buildings, etc.) may also consider applying local renewable energy sources –heat pumps, solar

panels and so on – to provide at least some of the power needed to operate such appliances, thus reducing emissions of GHGs and air pollutants to the air.

***Packaging waste***

Packaging waste is largely outside the immediate control of the consumer: one buys what is needed, as it comes. But consumers can exert some influence and in several ways on the quantity of packaging waste generated and the efficiency of its reuse and recycling. For instance:

- Reuse plastic or other bags provided by retail outlets to bundle multiple purchases together
- Choose to use biodegradable 'thin-film' bags if made available by retail outlets
- Avoid breaking beverage bottles and return empty bottles if this option is offered by retail outlets
- Where the collection of at-source separated waste – food waste, glass containers, clean tinned cans, plastics of defined types – is provided, make the effort to ensure that 'your' wastes are segregated correctly at source and deposited in the appropriate containers

***Indirect effects – Use consumer choice to influence suppliers***

Through awareness and interest activated by effective communication, consumers may also exert a potentially far-reaching influence in several other areas sharing with suppliers a collective demand for change. For instance, by requesting:

- Organic foods – an increase in choice and availability in stores (and stating their willingness to pay the higher prices)
- Elimination of unnecessary (secondary) packaging that consumers have to dispose of
- An increase in the variety and availability of raw and processed vegetarian foodstuffs at retail outlets
- Effective local facilities for the storage of at-source separated wastes prior to their regular and efficient collection (and a willingness to pay higher waste management charges)

***Wastewater and wastewater management***

After humans consume food and liquids, and this passes through the digestive and other bodily systems, much waste is excreted. Where flush toilets are provided these excretions form a major constituent of the domestic wastewater discharged to sewers for treatment at a municipal wastewater treatment plant (WWTP). WWTPs typically generate four main outputs:

- Treated effluent. Depending on the level of treatment provided and provided that all sanitary safeguards are met, such effluents may be (re)used in principle as an agricultural source of water and nutrients (nitrogen and phosphorus) for crop cultivation.[30] In many cases the volume of treated effluent might be small relative to agricultural water demand, but it may be blended with freshwater and could be useful at the margin.
- Emissions to air from the oxidation of organic and nitrogenous matter present in the incoming wastewater, and other emissions from sludge processing operations.
- Grit and gross solids separated and screened out from the incoming sewage. After washing, the grit may be recovered and used in various ways. But the gross solids comprise all kinds of detritus, sanitary products, etc., that are thrown into toilets. This waste stream cannot be recycled but should be disposed of appropriately, to landfill or incineration for example, either alone or with other solid wastes.

30 Within the EU, this practice (though uncommon) is governed by Regulation (EU) 2020/741 of the European Parliament and of the Council of 25 May 2020 on minimum requirements for water reuse. However, sophisticated forms of the activated sludge process for treating domestic wastewater may be designed and operated to remove a high percentage of dissolved phosphate-phosphorus. This minimises the phosphorus content of the final effluent, but the phosphorus-rich process side-stream has a smaller volume and may be utilised in agriculture as an alternative source of phosphorus.

- Sludge containing the solids arising from the settlement and treatment of sewage, after grit and gross solids have been removed (from the sewage). The liquid sludge may be subjected to treatment by a range of processes and, subject to appropriate sanitary and hygienic safeguards being met, may be utilised as a source of humus and nutrients (nitrogen and phosphorus) in agricultural crop production and on pasture.[31] Travel distances between the WWTP and the receiving agricultural land should not be too high or the financial costs of sludge transport may be excessive. For sludge to be used beneficially in agriculture, it is necessary that the municipal WWTP takes responsibility to ensure that environmental and health risks are minimised. Essentially, that:
    - Sludge is given extensive thermal or other treatment, followed by an appropriate period of storage, prior to its application to land. This is to minimise the risk posed by pathogenic microorganisms passed by people and ending up in sewage and sludge.
    - Householders and others do not dispose of toxic or otherwise undesirable wastes into toilets or drains that flow into the public sewerage system. Communication and educational messaging may be needed to minimise this practice.
    - The discharge of heavy metals and persistent organic micropollutants into sewage is minimised. Where industrial effluents are discharged into public sewers receiving domestic wastewater, this criterion demands that effective control is exercised over the volume and composition of trade effluents.
    - To control the accumulation of contaminants to within safe levels, the concentrations of heavy metals and nutrients in the sludge, and the land to which it will be applied, are monitored. And that records on where sludge has been applied are maintained.
    - Sludge should not be applied to land of high slope subject to heavy precipitation, on snow, or near to sources of water supply.
    - Sludge application to land should be timed to harmonise with the growth cycle of the receiving crop, to maximise nutrient uptake.
    - Farmers understand that appropriate time intervals have to be adopted between the application of sludge to land and planting, and especially before harvesting and consumption.
    - If and when applying inorganic fertilisers to land, farmers should allow for the nutrient content of the sludge they have already applied or intend to apply.
    - Liquid sludge may be applied to pasture, preferably by sub-surface injection.

The requirements summarised above for utilising sewage sludge may seem daunting. Yet with due diligence they can be met. The use of sewage sludge in agriculture then provides a valuable outlet for an unavoidable solid waste stream, a solution that demonstrates a prime example of the circularity principle being applied in practice.

Alternative beneficial outlets for treated sewage sludge can include land reclamation, forestry, and as a backfill material for MSW landfill sites.

Other means of sewage sludge disposal are possible but are non-beneficial: long-term deposition in lagoons, disposal to landfill site, and incineration. They also pose environmental issues regarding emissions to air and the potential pollution of groundwater resources.

## Used Leather Goods

Such end-of-life products can be handled with other MSW streams for disposal to landfill or incineration. However, potential opportunities for leather recovery and recycling, and the repurposing of recovered products (such as footwear) should be sought where possible. For instance, local charities may be able to pass on discarded footwear to poorer members of the community.

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31 See, for example, DEFRA (May 2018), Guidance - Sewage sludge in Agriculture: Code of Practice, available at: https://www.gov.uk/government/publications/sewage-sludge-in-agriculture-code-of-practice/sewage-sludge-in-agriculture-code-of-practice-for-england-wales-and-northern-ireland. And Environment Agency (July 2020), Policy Paper - Environment Agency Strategy for Safe and Sustainable Sludge Use, available at: https://www.gov.uk/government/publications/environment-agency-strategy-for-safe-and-sustainable-sludge-use/environment-agency-strategy-for-safe-and-sustainable-sludge-use.

## 3.6 Summing Up

The preceding sections have outlined major issues concerning resource consumption and the wastes (solid, liquid, gaseous) arising at each step of the agriculture and agri-products value chain. The range of this value chain is wide and deep. At each step there are opportunities to apply SCP to improve resource efficiency, substitute more benign for potentially harmful inputs, and reduce the net generation of wastes. The SCP Action Plan (Chapter 9) addresses these issues and reflects the path for achieving the EU's 'Farm to Fork' Strategy outlined in Annex B.

# 4. SCP, WATER CONSERVATION AND WATER EFFICIENCY

## 4.1 Background

The Republic of Kazakhstan's Green Economy Concept (GEC) of 2013 cited the address of the President in 'Strategy Kazakhstan 2050' in which sustainable water use was described as a critical issue for the nation. The levels of water savings that could be expected from implementing measures in the agricultural, industrial and public supply (municipal) sectors were indicated in the GEC. Together with measures to increase supply (by 4.5–5.0 bcm/year) from transboundary resources and resources within Kazakhstan, the GEC projected that achieving the savings noted in Table 5 would be sufficient to meet the estimated demand-supply gap (under business as usual) in 2030 (12.9 billion bcm/year).

When the Green Economy Concept was prepared, the agricultural sector accounted for over two-thirds of Kazakhstan's freshwater consumption. At a national level, as shown below, most of the expected water savings are in this sector.

***Table 5: Projected freshwater consumption saving targets cited in the Green Economy Concept (2013)***

| Sector | Measures | Water Saving by 2030[1] (bcm/year) |
|---|---|---|
| **Agriculture** | All the measures below | 6.8 |
| | • Adopt modern irrigation and other technologies | 1.5 |
| | • Shift to more water-efficient, value-added crops | 3.5 |
| | • Infrastructure improvements and water metering | 1.8 |
| **Industry** | At existing plants: adopt water efficient technologies in energy, mining and metallurgical sectors; and water recycling and reuse. At new plants: reinforce water abstraction and treatment standards. | 1.5 – 2.0 |
| **Public Supply** | Network leakage detection and control, water pressure control; and water efficiency standards for household appliances. | 0.1 |

[1] The GEC does not state the total base water consumption figures against which expected annual savings (billion $m^3$) are declared.

Chapter 3 of the present document confirmed the significance of water consumption as an issue for the agricultural value chain – including water losses in irrigation and the potential for recycling and reusing treated WWTP effluent. It also indicated relevant SCP tools and measures that may help to address this issue at different steps of the value chain.

The present chapter therefore addresses the potential for applying the SCP approach in other sectors of the economy. These include industrial and other commercial activities, institutions, households, and water distribution networks.

## 4.2 SCP Applied to Water Conservation and Efficiency in Industrial Production

Water is used extensively for heat exchange and direct cooling duties and in numerous process applications in the energy and metals sectors (see Chapters 6 and 7) including:

- Oil and gas refining
- Coal washing
- Thermal generation of electricity and heat (large combustion plants)
- Coke production and refining/treating the off-gases

- Metal ore processing –concentration, smelting, and subsequent refining
- Other metallurgical processes

The application of 'best available techniques' (BAT) is required in the EU at most if not all the operations and installations in these sectors, including good practice techniques for water conservation and water efficiency. Provisions for BAT were included in Kazakhstan's 2007 version of the Environmental Code, and the 2019 revision has strengthened these by the introduction of BAT-based integrated permits, to be coordinated by the International Green Technologies and Investments Centre. The Centre plans to develop a number of BAT Reference (BREF) Documents over five years, with the first permits to be issued towards the late 2020s; large combustion plants have been assigned a high priority.[32]

Chapters 6 and 7 address the energy and metals value chains, including downstream processing and transformation operations, and the role that SCP may play. SCP tools (Table 3) that may be considered in applying BAT for water use in installations in the above-mentioned sectors include:

- Baseline Assessment
- BAT Reference/Conclusions
- Benchmarking – external and internal
- Champions
- Communication
- Counter-current washing/heat-exchange
- Energy Audits
- Environmental Management System
- Financial Incentives
- Fishbone Analysis
- Good Practice Guides and Case Studies
- Heat Exchanger Network
- Innovation
- Life-Cycle-Analysis
- Mapping the Sectoral Value Chain
- Mass and Energy Balances
- Metering, Monitoring and Sampling
- Pricing of Publicly Delivered Goods
- Reuse and recycling of (treated) water/wastewater
- Separation of wastewater streams at source
- Walk-through Audit

An SCP Support Mechanism[33] could help to promote and facilitate the introduction of such techniques in the heavy industrial sectors subject to the provisions of BAT. However, the pricing of water has also to be considered as a driver to encourage the voluntary adoption of good practice. If water is undervalued the costs of its consumption may appear too low to warrant the consideration of measures to improve water efficiency. Financial incentives, offered by tax-breaks for instance, also contribute a 'pull-factor', acting to encourage investment in water conservation and efficiency, but are likely to be most effective when the water price is such that water consumption becomes a significant production cost. For these mechanisms to be effective, however, it is essential that water consumption be metered and paid for on a volumetric basis.

32 Marit Hjort (May 2019), 'BAT Approaches Around the World'. Workshop to Promote the Ratification of Technical Protocols of the UNECE Air Convention with Focus on Countries in the EECCA Region. OECD Better Policies for Better Lives. https://unece.org/fileadmin/DAM/env/documents/2019/AIR/Capacity_Building/BAT_workshop_2019/1_3_OECD_BATproject_Hjort.pdf

33 The principles on which a mechanism ought to be based are presented in Chapter 8. The appropriate host and scope of action is for Government to decide, but the International Green Technologies and Investments Centre could play a role in helping to promote the SCP approach in the energy and heavy industrial production sector.

## 4.3 SCP Applied to Water Conservation and Efficiency in Distribution Networks

Referring to the waste hierarchy noted in Chapter 1 and the principle that waste prevention is the first option that should be considered in a waste-reduction strategy, minimising leakage from distribution systems supplying water to consumers should be a strategic priority. This requires effective metering of the water supplied to distribution systems and the application of effective leak detection and repair technologies. This parallels and should inform the repair and or replacement of sections of the distribution system. Good practice guidance on adopting a strategic approach to minimise leakage, and on the available techniques and technologies, is available and should be considered.[34]

## 4.4 SCP Applied to Water Conservation and Efficiency in Other Commercial Activities

As noted in the concluding paragraph of section 4.2, water pricing and financial incentives can be powerful 'push/pull' factors, respectively, to stimulate investment in water conservation and efficiency measures. These mechanisms are applicable to the management of water demand wherever water consumption is metered and paid for.

Apart from its use in major processes in heavy industrial and energy production installations (Chapter 6), and food and beverage production (Chapter 3), water is used in a wide range of commercial and associated activities in the secondary and tertiary economic sectors. They include, for instance:

- Washing down process equipment, floors and other hard surfaces at industrial and other commercial sites
- Pulping recycled paper and cardboard
- Paper and cardboard production
- Printing paper and cardboard products
- Vehicle washing
- Textiles production, dying and printing
- Laundries
- Hotels and restaurants
- As a coolant
- Watering of golf courses and other commercial green spaces
- Bathrooms associated with offices, workshops and other work-places
- Miscellaneous other economic activities

Several SCP tools and actions may be suitable in such situations to help identify the scope to make water savings and raise water efficiency, and to write and enforce effective measures. They include:

- Baseline Assessment
- Benchmarking – external and internal
- Champions
- Communication
- Counter-current washing/heat-exchange
- Education
- Environmental Management System

34 References. European Commission (2015), EU Reference document - Good Practices on Leakage Management, available at: https://circabc.europa.eu/sd/a/1ddfba34-e1ce-4888-b031-6c559cb28e47/Good%20Practices%20on%20Leakage%20Management%20-%20Main%20Report_Final.pdf.
Also, see CIWEM Policy Position Paper: Water distribution system leakage in the UK, available at: https://www.ciwem.org/assets/pdf/Policy/Policy%20Position%20Statement/Water-distribution-network-leakage-in-the-UK.pdf

- Fishbone Analysis
- Good Practice Guides and Case Studies
- Green Purchasing Criteria/Code
- Innovation
- Mass and Energy Balances
- Metering, Monitoring and Sampling
- Resource Efficiency & Waste Minimisation Club - for water
- Walk-through Audit

Generic measures to reduce water consumption and improve water use efficiency may be identified in good practice publications, while identifying other measures may require site-specific analysis, investigation and innovative thinking.[35] Measures can range from making simple changes in operational practice to introducing more sophisticated technical measures requiring investment. Respectively, for example, ranging from equipping water hoses with trigger nozzles (shutting-off by default) to ensure that unattended hoses do not discharge water to waste to using water sequentially in cascading stages (the wastewater from one stage being used as feedwater to a second, the water quality requirements of the second stage being less strict than in the first stage).

In kitchen and bathroom settings, simple measures can include communicating to personnel the need to save water by ensuring that taps are turned off after use and that leaking taps are repaired promptly. Replacing conventional taps with plunge-bayonet taps (supplying water for a set time) is an example of a specific measure that can also be adopted. Installing water efficient flush-toilets is another good-practice measure. Many more examples are available from sources of good practice guidance.

## 4.5 SCP Applied to Water Conservation and Efficiency in Institutions and Households

Institutional settings comprise:

- Hospitals
- Educational establishments – kindergarten, schools, universities
- Research and development institutes
- Public offices - governmental and others
- Municipal swimming baths
- Bathrooms for public use
- Watering of public roads (dust suppression) and green open spaces such as ornamental parks and gardens. Supply to ornamental water fountains also
- Miscellaneous other settings

Improving the efficiency of water use and reducing the net water consumption in institutional and household settings involves the same spectrum of tools and measures noted above (section 4.4). In households, of course, only the simpler measures will be appropriate. Effective communication is essential, both to raise the awareness of households of the overall need to conserve water, and specifically to inform them of the practical steps they can take to reduce their water use while maintaining good levels of hygiene and standards of living.

35 See, for example, Waterwise (2009, updated 2019) Water Efficiency Retrofitting: A Best Practice Guide References, available at: https://www.waterwise.org.uk/knowledge-base/water-efficiency-retrofitting-a-best-practice-guide-2009/

# 5. SCP – RESOURCE RECOVERY FROM MUNICIPAL SOLID WASTE

## 5.1 Issues Raised in the Green Economy Concept of 2013 and GEAP

The Green Economy Concept of 2013 repeated some well-known, long-standing issues concerning (solid) waste management in Kazakhstan, several of which continue to be problematic, for example:

- The legacy of large volumes of industrial waste produced in earlier decades, including high levels of toxic or radioactive waste
- Ongoing generation of large volumes of mining, processing and heavy-industry wastes
- Under-developed systems for managing the municipal solid waste (MSW) generated by households, commerce and institutions:
  - Waste volumes expected to grow 50% by 2025, in line with economic growth (GDP)
  - Low collection rates outside of the main cities, typically about 25%
  - Low rate of processing and recycling of the collected wastes, the provision of at-source waste separation being patchy and poorly developed
  - Transfer and disposal of collected waste to uncontrolled dumps and substandard authorised landfill sites and
  - Inadequate cost-recovery leading to financing levels that leave municipal waste management systems financially starved of investment and operational funds[36]

The Green Economy Action Plan (GEAP) contains eight actions to improve MSW management, see Table 6. However, unless the last-mentioned point concerning financing is addressed satisfactorily, it is hard to see how MSW management can be upgraded sustainably to the desired level. Additional actions, not shown in the Table are: action 46, the construction of biogas plants at sewage treatment works (WWTPs) and poultry farms; and action 47, the elimination of historic waste (accumulations).

***Table 6: Actions in the GEAP 2021–2030 that address MSW Management***

| No. | Action | Year |
|---|---|---|
| **6.1 Collection and Removal of MSW** | | |
| 38 | Development of the Concept of the draft State Program for Waste Management in the Republic of Kazakhstan[37] | 2021 |
| 39 | Organising separate waste collection in populated settlements | Annually |
| 40 | Development and support the construction of energy from waste disposal facilities | 2021-2025 |
| **6.2 Solid Waste Landfills** | | |
| 41 | Ensuring the disposal of solid household waste in accordance with environmental requirements, sanitary rules, and building codes | Annually |
| 42 | Construction of new landfills for solid household waste that meet the requirements and norms of legislation | 2021-2030 |
| 43 | Elimination of illegal landfills with subsequent removal of waste to sorting, processing points | Annually |
| **6.3 Increasing the Share of Recycled Waste** | | |
| 44 | Development of special support measures for the development of the waste management industry, including recycling | 2021-2030 |
| 45 | Development of organic waste processing with biogas production | 2021-2030 |

36 The EU funded project 'Environmental Policy Instruments' in 2009-2010 identified financing and costs recovery as a major issue.
37 In 2011 the EU funded the preparation of a proposed comprehensive national MSW management strategy on behalf of the Ministry of Environment, but it seems that the strategy was not implemented.

No actions in GEAP 2021–2030 relate to the ongoing management of mining, processing and heavy-industry wastes. Nor does the GEAP 2021–2030 identify **specific** measures to reduce the rate of increase in MSW generation (decoupling this from GDP growth); or to implement at source the separation and collection of end-of-life products, thus increasing the rates of effective recycling (resource efficiency), although action 44 refers to this generally.

It is expected that the introduction of BAT in the mining, processing and heavy-industry sectors and its enforcement in the near-medium term future will remedy the first of these issues. Chapter 6 thus addresses this and provides comments on SCP and a Circular Economy approach in these sectors along with their relevance.

## 5.2 Management of MSW and End-of-Life Products – Background and Waste Arisings

The present section considers the potential role of SCP and a Circular Economy approach to stimulate at-source waste separation, material recovery and recycling, which are the aspects of a modern system for managing MSW and end-of-life products (ELP). It also considers in a general way the impacts and decisions to be made should major investments in waste-to-energy plants be made in the near-to-medium term. Action 40 of the GEAP 2021-2030 flags these and provisional planning for plants serving six major cities including Nur-Sultan, Almaty and Shymkent is under way, with final decisions expected by June 2022.

The Green Economy Concept 2013 noted (i) that MSW generation was forecast to grow by over 50% from 3.6 million tonnes in 2011 to 5.6 million tonnes in 2025, and (ii) gave an indicative composition of the MSW (Figure 19).

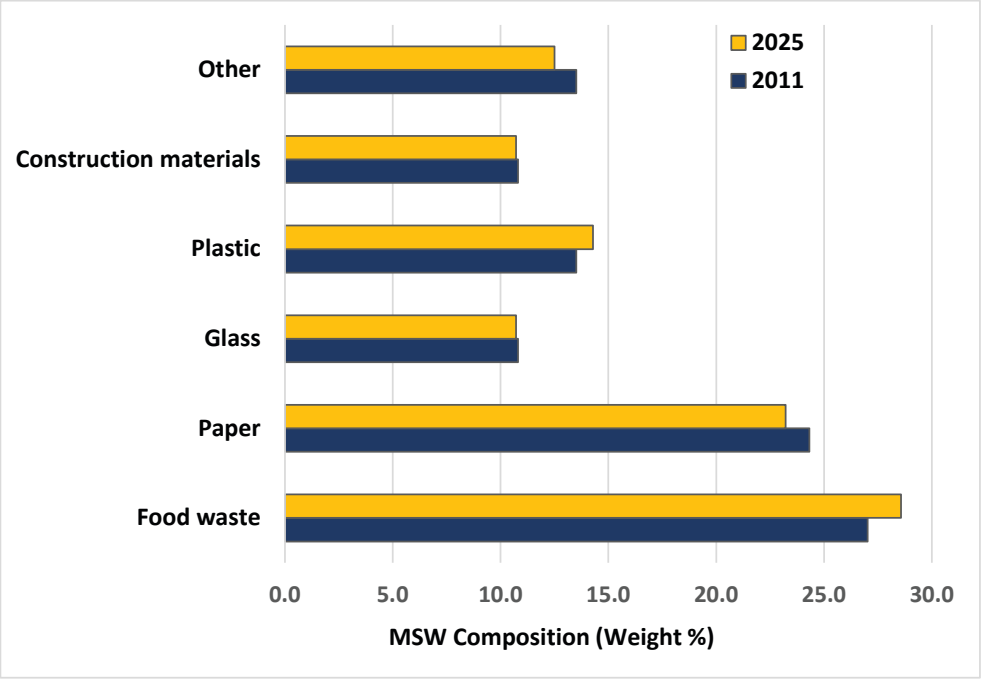



*Figure 19: Composition of municipal solid waste in Kazakhstan (based on Exhibit 20 in the Green Economy Concept, 2013)*

However, the Green Economy Concept provides no information on the volumes of ELP waste generated in the Republic or on how these waste streams are managed. Some, such as textiles, small batteries and others might be included in the unclassified 'other' component of MSW. Other waste streams are perhaps not included: for instance, vehicles, vehicle tyres, batteries embedded in vehicles and electronic equipment, freezers and refrigerators (and the refrigerants they contain), computers, printers, scanners, televisions, washing machines, light fittings, and other waste electronic equipment collectively referred to as WEE.

Most ELP waste streams contain materials that are hazardous to some extent and/or have economic value. Disposing of such products in a manner that ignores their economic value (and the depletion of Natural Capital[38] that it represents) epitomises the linear, 'use-throwaway' economy (see Chapter 1).

## 5.3 Building Blocks of an Enabling Environment for Materials Recovery and Recycling

An enabling environment is one in which actions to achieve desirable outcomes – in this case the recovery of material resources from waste and their sustainable return into the productive sectors of the economy – are facilitated and not unduly constrained by external factors. Such an environment is necessary for the 'circularity' principle (Chapter 1) to be applied in practice. Six key interlocking features or building blocks may be identified, shown in Figure 20. Each building block is explained below.

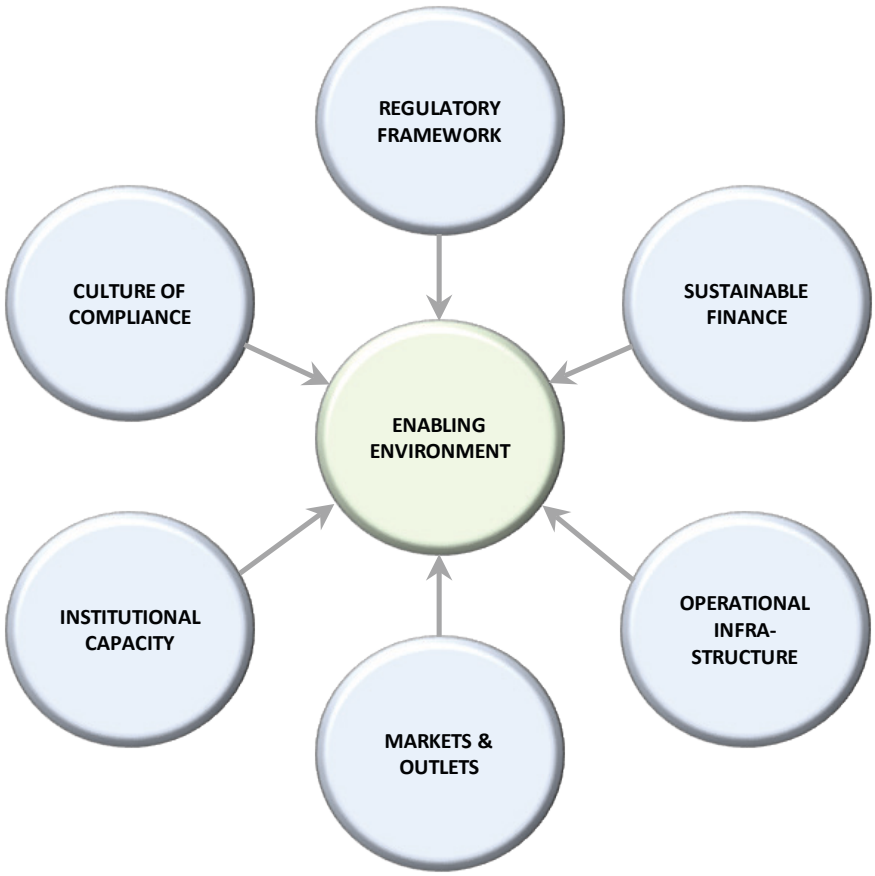



***Figure 20: schematic representation of an enabling environment for materials recovery and recycling from waste***

### Regulatory Framework

Environmental and waste-related legislation – laws and, if applicable, subsidiary regulations – need to reflect and be supportive of high-level goals, as established by national Concepts or other means. Legislation must also be clear, unambiguous, and realistic – capable of being put into practical effect. It needs to establish the direction of travel, specify the mandatory requirements in pursuing high-level goals, and specify the institutional framework and responsibilities. Such issues are summarised separately.[39] As far as possible, the 'hard-wiring' of technological solutions for waste management into legislation should be avoided. Otherwise, legislation can become obsolete very quickly. The need for legislative requirements to be realistic also suggests that when a practice is to be banned (e.g. the disposal of food wastes to landfill), the published regulations should come into force at a given future date, to allow operators the time to introduce new practices and new infrastructure. Not doing so is guaranteed to result in non-compliance, tending to enforce a culture of non-compliance and disrespect for the legislative process.

38 A generic introduction to the concept of Natural Capital, providing links to many authoritative sources, is given by Frost, R.C. and Faircloth, P.L. (October 2021), FWR Publication FR/G0012, Natural Capital and its Relevance to Improving Freshwater and Wetland Habitats. Available to download from Library/Guides at http://www.fwr.org.

39 Yerbol Orazbekov (November 2022), Biodegradable Waste in the Republic of Kazakhstan, Regulatory Framework and Infrastructure Assessment for Municipal Waste Management.

Legislation might need to be amended to help overcome perceived constraints on materials recovery and recycling. Such constraints could include, for instance, a weak enforcement of the legislative requirements, weak penalties for non-compliance, and a prevailing culture of non-compliance (see below). But not all perceived constraints can be overcome through legislation. For instance, a low population density (6.9 persons per $km^2$ in 2019[40]) and substantial distances between major population centres[41] disfavour economies of scale and flourishing markets for recovered waste materials.

## Culture of Compliance

What is the meaning of a 'culture of compliance'? Simply that society in general tends to act in conformity with legislative requirements, i.e. the law and the rules. It does not imply that all individuals and enterprises comply all of the time, but that compliance is the norm, tending to become self-enforcing – tending to set the standard of behaviour expected of people, institutions and businesses. In the absence of a culture of compliance, members of society seek out ways of evading their obligations, behaviour that is compounded when enforcement and penalties are weak.

A simple example illustrates the practical significance of having a culture of compliance. Consider the imposition of a weight-based tax (Tenge/tonne) on MSW disposed of to landfill sites, the tax being payable by the landfill operator (whether in the public or private sector) to the government's revenue collection arm. Such a tax represents a financial mechanism for increasing the effective costs of waste disposal to landfill relative to the costs of material recovery and recycling. By adjusting the relative costs of waste disposal options via a landfill tax, the recovery of materials from MSW and the diversion of untreated biowastes to digestion or composting plants can thus become commercially viable, which otherwise tends not to be the case.

Box 2 below presents a brief case study of the imposition of a landfill tax in the UK since 1996. This shows that the landfill tax, accompanied additionally by other regulatory measures, was highly effective in diverting MSW (non-inert solid wastes) away from landfill while at the same time not causing a significant increase in illegal dumping of waste ('fly-tipping'). In the absence of a culture of compliance, however, it is improbable that such a financial mechanism would achieve the desired outcome. Far more likely instead is that significant quantities of collected MSW would be dumped illegally, forming yet more dump sites.

## Sustainable finance

Investment funds and finance to sustain operations and infrastructure maintenance are essential for waste management to be effective and meet planning and design goals. Funds may come from several sources, such as:

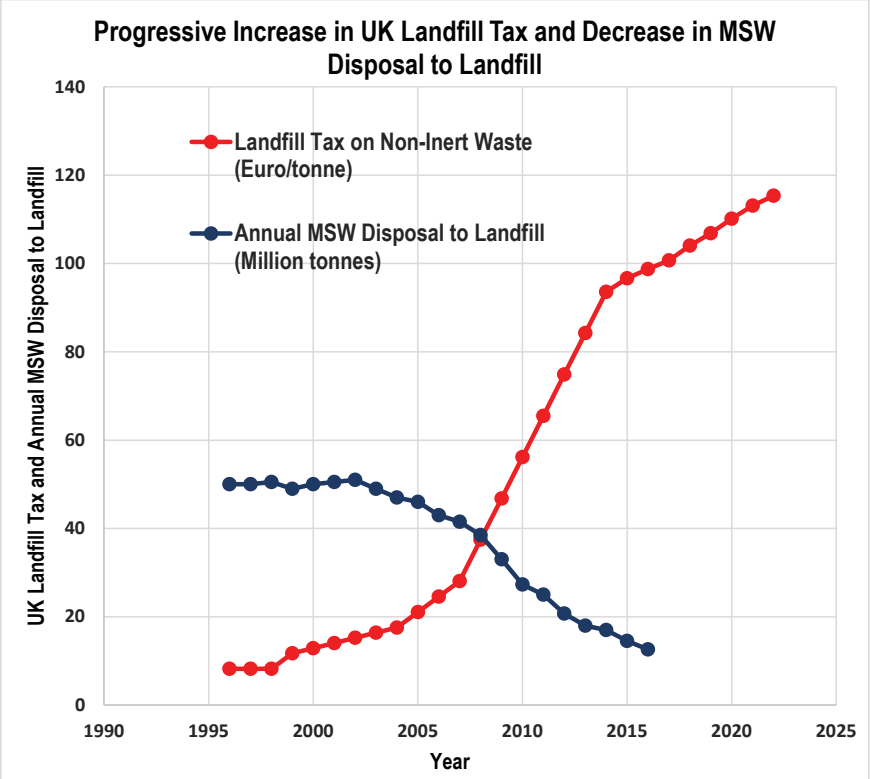
- Cost-recovery from the users of the waste management service, to cover operational and maintenance costs, and debt service charges
- Government (national, regional, city) partial grant-funding of infrastructure investments
- Taking on debt to finance infrastructure investments
- Environmental funds (e.g. a landfill tax) established to receive tax payments and disburse part of the monies to worthy causes that meet predetermined criteria
- Income received for the sale of recovered waste materials or energy into the market
- Government subsidies to operators, to partially meet operational and maintenance costs

40 https://data.worldbank.org/indicator/EN.POP.DNST?locations=KZ

41 The population clusters of Nur-Sultan (1.13 million), Almaty (1.85 million), and Shymkent (1.04 million) lie between 609km and 997km of each other 'as the crow flies'.

**BOX 2. Tax on landfilling of waste – A Case Study from the UK (1996–2020)**

In 1996 a landfill tax was introduced in the UK to better reflect the environmental (non-market) costs of landfilling, to recover value more of the waste that is generated, and to dispose of less waste to landfill. The tax has been applied to two categories of waste – inert and non-inert – the latter attracting the higher tax level. The chart below shows the rate of landfill tax for non-inert wastes increasing from £7.00 per tonne in 1996 (about Euro 8.19 at 2021 exchange rate) to almost Euro 100 per tonne in 2016 and Euro 113.1 per tonne in 2021. The tax on inert wastes has been much lower, increasing from Euro 2.3 per tonne in 1996 to 3.6 per tonne in 2021.[42]




Following the introduction of the landfill tax on non-inert wastes (MSW) the quantity of MSW disposed of to landfill in the UK s decreased significantly, from about 50 million tonnes in 1996 to 12.6 million tonnes in 2016. Regulatory instruments implementing the Packaging and Landfill Directives (the latter requiring reductions in the quantity of biodegradable waste disposed of to landfill) will have had parallel influences also on practice over that period. There is no evidence that illegal disposal of waste onto land in the UK increased as a result of the landfill tax being applied. However, lessons learned from the application of the landfill tax in the UK include:

- The effectiveness of the tax in diverting waste from landfill was minimal in early years owing to the low tax rate per tonne of waste
- The much higher rates of tax in later years have led to some exporting of residual waste, in part as refuse derived fuel (RDF) to continental incinerators having spare capacity and lower gate-fees
- To provide a further driver towards material recovery and recycling, consideration should have been given to impose a tax on waste disposal to incineration plants also (whether or not energy recovery was practised)
- A lower rate of tax than the standard (for non-inert wastes) should have been set for stabilised wastes (outputs from biological treatment plants), providing further stimulus to their adoption.

42 See Elliott, T. Landfill Tax in the United Kingdom: https://ieep.eu/uploads/articles/attachments/e48ad1c2-dfe4-42a9-b51c-8fa8f6c30b1e/UK%20Landfill%20Tax%20final.pdf?v=63680923242; and https://www.gov.uk/government/statistics/landfill-tax-bulletin/current-and-historic-lft-rates

The status of waste collection and disposal as indicated in the Green Economy Concept (section 5.1) suggests that sustainable finance remains a critical issue in much of Kazakhstan, as was observed a few years earlier in an EU Technical Assistance project and a follow-on project.[43] In the absence of adequate and sustainable finance, however, ambitious waste management aspirations cannot be achieved. Over-reliance on government budgets to help meet (subsidise) operational and maintenance costs is probably unwise, because changing budgetary circumstances and government priorities would risk the sustainability of such financing.

If raising additional sustainable financing from users of waste management services or government is constrained by affordability considerations, it may be prudent to scale down ambitions to match the available budgets. Constrained finances should be taken into consideration, therefore, when planning future infrastructural developments, whether engineered landfill sites, bio-waste treatment processes, or incineration with energy recovery plants.

## Operational Infrastructure

Infrastructural requirements depend on the waste management system adopted. They comprise the methods used to dispose of residual waste; the recovery of materials and energy from waste; the pre-treatment (e.g. sorting) prior to such recovery operations; and the associated equipment, containers and facilities for waste storage, collection and delivery to waste processing and disposal. The infrastructural needs of a modern MSW management system are extensive. To illustrate, Table 7 indicates the needs and significant issues concerning two representative systems, both requiring consumers to separate their waste into dry and wet fractions prior to collection, appropriate management of wet wastes being common to both:

- One in which the goal is to recover materials from dry waste for recycling, the residual waste being disposed of to an engineered landfill site
- One in which dry waste is fed to a waste-to-energy plant, materials recovery being a secondary consideration

Each requires sustainable financing for the operations to be carried out effectively and in an environmentally satisfactory way, although the waste-to-energy route is usually estimated to incur higher costs.[44]

***Table 7: Infrastructure needed to implement two representative MSW management systems – material and energy recovery***

| Materials Recovery and Landfill | Waste-to-Energy |
|---|---|
| Containers for collection of waste:<br>Dry waste[1]<br>Wet waste[2] | Containers for collection of waste:<br>Dry waste[1]<br>Wet waste[2] |
| Vehicles to collect and deliver dry waste | Vehicles to collect and deliver dry waste |
| Vehicles to collect and deliver wet waste | Vehicles to collect and deliver wet waste |
| Process wet waste:<br>Anaerobic digestion or composting[3]<br>Biogas recovery & use (digestion) | Process wet waste:<br>Anaerobic digestion or composting[3]<br>Biogas recovery & use (digestion) |
| Storage and the beneficial use of the processed wet waste[4] | Storage and the beneficial use of the processed wet waste[4], or its disposal to landfill |

43 Technical Assistance Project, EuropeAid/127636/C/SER/KZ, 'Development and Improvement of Policy Instruments for Environmental Protection', undertaken by Euroconsult Mott MacDonald, CSPC, FCG International and GFA (2009-2010). And FWC BENEFICIARIES 2009 - LOT 6 : Environment EuropeAid/127054/C/SER/multi, 'Developing a national waste management strategy and action plan in the Republic of Kazakhstan', undertaken 2010-2011.

44 World Bank Group (2018). Decision Maker's Guides for Solid Waste Management Technologies.

| Materials Recovery and Landfill | Waste-to-Energy |
|---|---|
| Sorting of mixed dry waste[5] to recover materials for which recycling markets may exist:<br>Paper<br>Cardboard<br>Plastics<br>Metals<br>Glass | Sorting of mixed dry waste[5] to remove recyclable non-combustible materials, for which markets may exist:<br>Metals<br>Glass<br>An alternative is to recover metals from the bottom ashes (note 10) |
| Storage and transfer of recovered materials to recycling plants, in Kazakhstan or other countries[6], for their reintroduction to the productive sectors | Storage and transfer of recovered materials to recycling plants, in Kazakhstan or other countries[6], for their reintroduction to the productive sectors |
| Transfer and disposal of residual solid waste stream to an engineered landfill site equipped with:<br>Impermeable lining[7]<br>Leachate recovery and a system to treat and dispose of the leachate generated<br>Capping of each cell once filled to prevent biogas leakage<br>Biogas recovery system and facility to flare or beneficially use the gas produced[8]<br>Monitoring of the site during its operation and after cell closures, reporting on environmental performance | Incineration of sorted dry waste[3], with:<br>Energy recovery (as steam, electricity and hot watery) and its beneficial use[7]<br>Bottom ash removal<br>Flue gas treatment system to remove particulate matter (PM)[8] (electrostatic precipitators or bag filters, scrubbers); acid gases HCl, HF, SOx (alkaline scrubbers) and NOx (de-NOx processes); and residual volatile metals, Hg and Cd especially (activated carbon adsorption);<br>Process and emissions monitoring & reporting |
| - | Fly-ash collection and its disposal to a hazardous waste landfill site[9] |
| - | Bottom ash removal and putting to beneficial use.[10] Alternatively, disposal to landfill. |
| **Notes** | |
| 1. In addition to recyclable components, dry waste contains over 20 percent of non-classified material – potentially including hazardous household items. Inefficient arrangements for the separation and collection of wet wastes will result in their contamination of the 'dry' waste. | 1. As note 1, opposite. The inclusion of batteries and other items containing hazardous substances will result in the emission of metals from the boiler (as vapour and particulate matter). Contamination by wet waste will reduce the heating value of the burnt waste and might cause operational variability. |
| 2. Wet waste comprises food waste, green waste and other organic components. Where its processing by digestion is planned, pre-treatment to remove bulky items may be needed. | 2. As note 2, opposite. |
| 3. The anaerobic digestion and composting of waste is a subject of the EC BAT Reference Document on Waste Treatment (2018). | 3. As note 3, opposite. In EU Member States, the BAT Reference Document on Waste Incineration (2019) also applies.[45] |
| 4. Use of processed wet waste (subject to regulatory requirements) can include application to agricultural land, land reclamation and landfill cover. Disposal to engineered landfill is the default alternative option. | 4. As note 4, opposite. |
| 5. Recovered materials will be contaminated - reducing the value of recovered materials - to a much greater extent than if wastes are segregated into their components at source (by households) and collected as separate streams. | 5. Sorting of dry waste prior to its combustion may be restricted to the recovery of non-combustibles such as glass and metal. Their recovery from bottom ash is an alternative option (note 9). |
| 6. In principle it is much better to recycle recovered materials in country, fostering such enterprises but, in the absence of economies of scale, the costs of recovery operations might lead to recovered materials being not competitive on price. | 6. As note 6, opposite. |
| 7. Given wet waste contamination, high-strength organic leachate can be expected to form in the (anaerobic environment of the) landfill. This needs to be collected, treated and disposed of safely to avoid water pollution. | 7. In addition to the preheating of the combustion air supply, surplus energy in the flue gases may be used to raise steam, generate electricity and produce hot water. Outlets for the recovered energy have to be secure as has payment in turn. |

45 https://eippcb.jrc.ec.europa.eu/reference/

| Materials Recovery and Landfill | Waste-to-Energy |
|---|---|
| 8. As above, the generation of biogas should be expected and the gas collected for use, or flared, to minimise GHG emissions and the risk of explosion. | 8. Particulate emissions from the boiler stage include products of incomplete production, adsorbed metals (such as Cd, Pb, Zn) that, being relatively volatile, may volatilise in the combustion chamber.<br>The operational parameters of the combustion stage (temperature, residence time, surplus oxygen levels) have to be appropriate to ensure maximal burn out of the waste. A comprehensive sequence of process clean-up steps is essential, nevertheless, to treat flue gases prior to their safe release to air, in order to protect human health. Care has to be taken to ensure that gas temperatures in the particulate material stages lie outside the range where dioxins & furans may form as a result of *de novo* synthesis. |
| - | 9. Fly ash from waste incineration plants should be regarded as a hazardous waste. Disposal to landfill cells designed to receive such waste is the norm. |
| - | 10. Metals may be recovered from bottom ash for transfer to recycling plants in Kazakhstan or other countries.<br>Followed by storage for a further 6-20 weeks, bottom ash may then be used in road construction or as an aggregate for concrete[46].<br>Disposal to landfill otherwise. |

Additionally, each system should accommodate facilities to enable the separate collection and management of wastes such as end-of-life electronic equipment, batteries, white goods and so on, and hazardous household substances (small batteries, paints, solvents, pharmaceuticals, etc.). In the absence of appropriate facilities, such wastes are likely to contaminate segregated dry waste streams.

Local civic amenity sites where citizens may dispose of unwanted items in dedicated containers offer one opportunity for the collection of wastes such as: electronic equipment, paints, light fittings, white goods (washing machines, freezers), and a wide range of other recyclable materials (paper, cardboard, glass, metals, textiles, wood and hardboard, aggregates and more). Once collected, such segregated wastes may be distributed to centralised facilities for further processing. Arrangements also need to be in place for centralised facilities where end-of-life vehicles may be brought to be disassembled into (i) components to be reused in the repair and maintenance of vehicles on the road and (ii) other materials that may be returned as feedstock into the processing and productive sectors of the economy (either nationally or in other countries).

## Markets, outlets and demand

Any waste management strategy that involves the recovery of materials or energy from collected waste depends on there being outlets or markets for the recovered material or energy streams. Without there being an active demand for these, the adopted strategy will default to disposal only. Where demand is latent (potential, but not expressed), active communication and promotion of the benefits may be required, perhaps supported by appropriate, tailored legislation.

However, some constraints cannot be disregarded. Most significant perhaps is the low national population density (6.9 persons per $km^2$ in 2019[47]). A dispersed population limits the opportunities for achieving economies of scale in materials recovery and recycling operations. Table 8 considers market outlet and demand issues for materials and energy that typically may be recovered from MSW and end-of-life products.

46 CEWEP Bottom Ash Fact Sheet. https://www.cewep.eu/wp-content/uploads/2017/09/FINAL-Bottom-Ash-factsheet.pdf
47 https://data.worldbank.org/indicator/EN.POP.DNST?locations=KZ

*Table 8: Outlets and demand considerations for various waste recovery streams*

| Waste Recovery Stream | Market Outlets | Demand Considerations |
|---|---|---|
| Energy – electricity (generated in waste-to-energy plants or from biogas) | Domestic | As waste is generated continuously, so should energy generation. However, local electricity demand may be variable. Hence power may need to be fed into the wider grid. Grid operator should coordinate with other sources of electricity supply. Prices received may fluctuate with the prices of other sources of energy. |
| Energy – steam and hot water (generated in waste-to-energy plants or from biogas) | Domestic – local to generating plant | Local sources of demand may be seasonal or otherwise intermittent. Multiple demand sources might be needed, increasing the costs of distribution infrastructure. Prices received may fluctuate with those of other energy sources. In the absence of demand, waste heat will need to be rejected. |
| Processed biowaste – digested or composted waste | Domestic – local to processing plant | Stored product might be used in agriculture, for land reclamation, capping residual waste landfill sites, and in parks and other green spaces. It is unlikely that producers will receive much if any payment. Producers will need to promote the benefits of its use and undertake quality assurance. If demand is absent the processed waste may be landfilled. |
| Food waste from public catering and institutions | Domestic | Waste food is allowed to be used as feed for livestock subject to its refrigerated storage and (for fattening pigs) thermal sterilisation. Disease transmission is a risk if food waste is not treated appropriately. |
| Materials recovered from end-of-life vehicles | Domestic and export | Road vehicles consumed by the population and business sectors are mostly manufactured elsewhere and imported into Kazakhstan. Consequently the opportunity to recover materials from end-of-life vehicles and to reintroduce them into Kazakhstan's productive sectors as feedstock may be limited.<br>The substantial development of capacity in Kazakhstan's manufacturing sector might relieve this constraint. But a more realistic objective may be to expand and develop operations for vehicle dismantling and material recovery in Kazakhstan (at least in the major conurbations). And to export recovered materials to countries where large-scale manufacturing sectors already exist. |
| Materials recovered from end-of-life electronic equipment (WEE) | Domestic and export | As above but concerning WEE. |
| Paper and cardboard | Domestic and export | Established practice and currently promoted and supported by the ban on the export of wastepaper, cardboard and recovered paper, and by the ban on disposal of wastepaper to landfill.<br>Prices paid in the market for all of these separated waste streams will fluctuate with changes in market demand and will depend on contamination levels. For instance, clear glass attracts a higher price than does coloured glass, so their mixing reduces the price to the lower level. |
| Plastics | Domestic and export | |
| Metals | Domestic and export | |
| Glass | Domestic and export | |
| Timber and hardboard | Domestic and export | |
| Aggregates | Domestic | |

## Institutional capacity

As outlined in the previous sections, an effective, modern system of waste management clearly requires a range of planning and operational skills. And the institutional challenges involved in moving from a waste management system in which much of the collected waste is dumped, to one in which materials and energy recovery play full and integral roles, and environmental protection is respected, should not be underestimated. Waste management organisations need to have adequate capacity in terms of staff numbers, skills and experience.

Those cities that already have functioning segregated waste collection and recovery operations are likely to be better positioned than those that do not. It may be beneficial, therefore, to make an appraisal of existing institutional capacities nationally, and in the regions and large cities, and to determine the specific needs for capacity strengthening across the Republic.

## 5.4 Minimising Solid Waste Generation Rates

A goal for producers, importers and suppliers should be to minimise the quantity of materials used to make and package products for supply to retailers and consumers, while retaining product quality and protection against damage in transit. They ought to do this for financial reasons, at least, although they may need encouragement to understand the potential to save costs, increase profits, and protect the environment. Extended producer responsibility (EPR) policies can strengthen the obligations placed on producers, importers and suppliers. They can do this, for example, by requiring that products placed on the market are repairable – thus extending useful product lives – and may easily be dismantled (for material recovery) when they have reached the end of their useful lives. In both cases the effective rates of waste generation are reduced. The EU's Circular Economy Action Plan embodies such a regulatory approach.

Through behavioural change, which might need to be stimulated through effective communication techniques, consumers may also exert direct and indirect influence on the rates of waste generation. For instance:

Directly, through

- Ensuring effective maintenance and repair of products, so extending their useful lives
- Choosing not to throw products away unless they are unfit for purpose. And, when disposing of still-serviceable products, passing them on to others to use, if possible
- Making full use of consumable items, e.g. using both sides of printing paper
- Amending food buying and hospitality behaviour so as to avoid generating excessive food waste

Indirectly, through

- Purchasing choices, sending market signals to producers, importers and suppliers that there is significant consumer demand for 'low waste' products

It should be noted that where the waste disposal strategy includes one or more waste-to-energy plants there will be a built-in conflict of interest regarding paper, cardboard, plastics and textile wastes. These wastes are the combustible components of MSW and a waste-to-energy-plant will be designed for a relatively narrow range of these arisings. Once designed and built there is no or limited incentive for minimising the generation of such wastes.

## 5.5 Strengthening of Waste Collection and Resource Recovery

### Target Waste Components

Certain components of solid waste should be diverted from disposal with mixed dry waste whatever national or regional waste management strategy is implemented, regardless of whether waste-to-energy plants are provided, including end-of-life electrical and electronic appliances including batteries, refrigerators, freezers and other so-called 'white-goods'; and biodegradable wet wastes including food, soil from babies' nappies and from pets; and green wastes.[48] All these wastes either contain hazardous substances, or the products of their decomposition are hazardous. The collection of such wastes separately from mixed dry waste is thus necessary to enable processing, to maximise resource recovery, and to render them safe.

Ideally, paper, cardboard, plastics, textiles, miscellaneous metal items, and glass wastes should be collected as separate, segregated waste streams. This maximises the recovery of quality materials for recycling or waste-to-energy-recovery. However, where cost and practicability considerations rule out separate collection arrangements, waste sorting is needed subsequently: (i) prior to disposal of residual dry waste to landfill, where material recovery is the objective, or (ii) prior to combustion, or of the bottom ashes removed from the combustion unit.

Clinical wastes such as infectious materials and body parts, fluids, needles, etc. (so-called 'sharps') arising at hospitals and other medical facilities, and waste pharmaceutical products arising in medical facilities and

48 Treatment needs to be undertaken in ways that are consistent with the availability of outlets for treated 'wet' waste and are compatible with regional climatic and practicability considerations.

in homes, should also be diverted from collection and their untreated co-disposal to landfill with MSW.[49] The segregation of such wastes at source is needed to enable collection, appropriate treatment and disposal, to avoid causing harm to the public and workers engaged in other waste management operations, and to avoid the contamination of other wastes from which resources may be recovered.

Hence, municipal solid waste collection systems need to be configured to allow consumers (households, institutions, hospitality and retail outlets) to dispose of their solid wastes in ways that are compatible with resource recovery and local waste management strategy. Collection arrangements may vary to an extent depending on whether household waste collection is communal or property-based. Consideration could also be given to making use or a greater use of larger-scale communal facilities – such as Civic Amenity Sites mentioned in the final paragraph of section 5.3. Households (and small businesses) may deposit multiple segregated wastes in assigned containers at such sites, which typically might serve a community population of 10,000 or more, enabling the collection of segregated wastes and their transfer to recycling centres.

Whatever the degree of waste segregation that is expected of the public, it is important that households and businesses are i) able to fulfil these expectations, and ii) do so in practice. If either of these conditions are not satisfied then cross-contamination of wastes will occur, reducing the rate of recovery of useable material resources, and increasing the quantity of residual waste sent to landfill. Where waste-to-energy is practised, then failure to separate 'wet' from 'dry' waste at source will lead to a carryover of 'wet' waste into the combustion chamber, the water content of this waste leading to a lower combustion temperature and reducing the energy recovery rate.

Consultation with the public on practicable waste collection arrangements is always desirable, and should therefore be supported through the use of effective communication messages and techniques.

## Strengthening the Markets

Table 8 in section 5.3 commented on the market outlets and demand considerations for resources recovered from solid waste. Markets exist in Kazakhstan for some recovered waste streams, such as paper, cardboard, plastics and glass. However, relatively resource-rich waste streams such as end-of-life electrical and electronic equipment (WEE) are typically disposed of to landfill at present. And the markets for recovered material resources such as composted or digested solids (from the processing of 'wet' waste), and energy recovered as biogas, electricity and heat, are immature at best. Adoption of the SCP approach in practice demands that all of the above markets are developed as far as it is reasonable to do so.

### *Waste electrical and electronic equipment and end-of-life vehicles*

Since most of the electrical and electronic equipment in use in Kazakhstan is imported, there is no ready local market for the materials that might be recovered from waste electrical and electronic equipment (WEEE). Given the size and distribution of Kazakhstan's population, and the small size and limited experience of its manufacturing capacity in this sector, it is hard to envisage this situation changing significantly. However, given the right regulatory push and infrastructural development, it may be possible to create an environment in which materials recovery from WEEE becomes established, the recovered materials being exported to neighbouring countries that have the necessary manufacturing capacity. The existing extended producer responsibility (EPR) operator, responsible for implementing the principle of extended obligations of producers (importers) in Kazakhstan, could play a major operational role here, and more importantly, its role in resource recovery from end-of-life motor vehicles could be enhanced in parallel. Actions that might stimulate the formation or strengthening of such a system could include:

- Development of a costed national strategy and plan for the enhanced collection of end-of-life appliances and equipment, their disassembly, the reclamation of resource-rich components and, using existing and planned transport infrastructure, the transfer of recovered materials to active markets for them, whether in Kazakhstan or in neighbouring countries. This strategy and plan would have to consider the characteristics and proximity to resource markets of major cities (Nur-Sultan, Almaty and Shymkent especially) and regions.
- Amendment of legislation to prohibit the disposal of WEEE to landfill sites (perhaps phased-in over e.g. 10 years); to require City and Regional authorities to provide separate containers for the deposition

49 Clinical wastes should be segregated at source adopting a risk-based approach. Some waste may be autoclaved prior to disposal to landfill. Other, more hazardous wastes including pharmaceutical waste arisings in households and dispensaries may be incinerated in high-temperature units, including waste-to-energy plants.

and collection of WEEE – in local communities and at larger scale; and, if not already provided, extending the remit of the EPR operator to include electrical and electronic equipment and end-of-life vehicles.

- Republic and Regional budget provision for investment in necessary infrastructure and establishment costs.

***Processed 'wet' waste solids***

The biodegradable components of collected 'wet' waste are amenable to treatment by composting and/or anaerobic digestion and, provided that climate-related practicability issues affecting collection and treatment are resolved, the post-treatment solids may be used beneficially in a number of land-based applications. Other potential constituents of the collected waste, however, may interfere with the treatment process or contaminate the post-treatment organic solids, reducing the quality and usefulness of the product biosolids. For instance, householders placing their 'wet' waste in a communal container might collect their waste into a plastic bag and drop the bag of waste into the 'wet' waste container, and the bags will likely interfere with mixing, aeration or other process equipment. Effective communication and providing practical household 'wet' waste containers to be emptied into communal containers are needed to help overcome such issues.

After a period of storage, both composted and digested solids may be applied to arable agricultural land, communal parkland and forested land, as a source of humus and nutrients (less so for compost), and as cover for landfill sites. These solids may also be used for land reclamation purposes and household gardening purposes where this is applicable. Quality requirements are important for those uses involving edible crops. This should be factored in when developing a marketing and outreach strategy for the composted and digested biosolids. Such a strategy should be underpinned by a testing regime and communication to effectively convey the positive benefits of using the treated biosolids. And realism will be needed when assigning a financial 'value' to what recipients of the biosolids will be willing to pay for treated biosolids.[50]

***Energy from waste***

Referring back to section 5.3, energy can be recovered from MSW components in two combinations: (i) as biogas generated in the heated anaerobic digestion of biosolids in 'wet' waste, and (ii) incineration of the combustible constituents of 'dry' waste. The biogas formed in heated anaerobic digestion systems may be burned to generate heat and electricity, but much of the heat may be needed to meet the process's heating needs. Outlets for any surplus heat energy are likely to be local and will need to be cultivated. Electricity generation, whether in waste-to-energy or digestion plants, will require that grid connections be made.

50 Analogous experience in the United Kingdom, where much of the sewage sludge generated is treated and recycled to land, suggests that recipients might pay nothing. Authority recycling operations there are undertaken as a cost to the Authority, recovered from the charges on their household and business customers.

# 6. SCP AND THE ENERGY VALUE CHAIN

## 6.1 Scope

The extraction, refining and use of petroleum (mineral oil), natural gas and coal is extensive and highly significant economically, a major driver of the economy and accounting for much of the value of Kazakhstan's exports – petroleum oil especially, while coal and natural gas fuel Kazakhstan's power/energy and heating sectors. However, legacy issues and associated inefficiencies in energy use contribute to Kazakhstan's relatively high level of carbon dioxide emissions on a per capita basis; substantial environmental damage in terms of degraded land, water pollution, and air pollutant emissions; and air pollution arising from the combustion of fossil fuels and their derivatives, in the power, heating and road transport sectors.

The extent of the energy value chain is indicated in simplified form in Figure 21, while Table 9 gives recently published energy production statistics.[51] Significant quantities of gas-derived nitrogenous fertiliser are also produced: 408,000 tonnes between January and November 2021.

***Table 9: Indicative energy production quantities (January–November 2021)***

| Resource | Product | Production (Jan-Nov 2021) | Units |
|---|---|---|---|
| Fossil Fuels | Coal | 95.8 | million tonnes |
| | Coal Concentrate | 3.59 | million tonnes |
| | Lignite | 4.30 | million tonnes |
| | Crude Oil | 66.9 | million tonnes |
| | Gas concentrate | 10.9 | million tonnes |
| | Oil-well Gas | 29.6 | billion $m^3$ |
| | Natural Gas | 19.5 | billion $m^3$ |
| Derivatives | Gasoline (road & aviation) | 4.33 | million tonnes |
| | Gas oils (diesel) | 4.57 | million tonnes |
| | Fuel oil | 2.37 | million tonnes |
| | Electricity | 104.0 | thousand GWh |
| | Heat | 76.4 | million gcal |

Much of the extractive and processing activity indicated in Figure 21 is the subject of BAT Guidance and Reference documentation published by the European Commission (Table 10). The International Green Technologies & Investment Projects Centre (IGTIPC) is currently engaged in tailoring these to Kazakh conditions. BAT documents provide a comprehensive review and statement of the measures that operators can adopt to prevent waste and environmental pollution, achieve high resource efficiency, mitigate environmental pollution, and reclaim polluted land. They are integral to Sustainable Consumption and Production (SCP) practice in the primary and secondary stages of the energy value chain.

51 Agency for Strategic Planning and Reforms of the Republic of Kazakhstan, Bureau of National statistics (January-November 2021), Socio-economic development of the Republic of Kazakhstan - Statistical Bulletin.

*Table 10: Latest Versions of the BAT Guidance and Reference Documents Published by the European Commission*[52]

| Sector | BAT Document Title | Publication Year |
|---|---|---|
| Extractive Industries | Guidance on Upstream Hydrocarbon Exploration and Production | 2019 |
| | Reference for the Management of Waste from Extractive Industries | 2018 |
| Processing & Transformation | Reference for the Refining of Mineral Oil and Gas | 2015 |
| | Reference for Large Combustion Plants | 2017 |
| | Reference for the Manufacture of Large Volume Inorganic Chemicals – Ammonia, Acids and Fertilisers | 2007 |

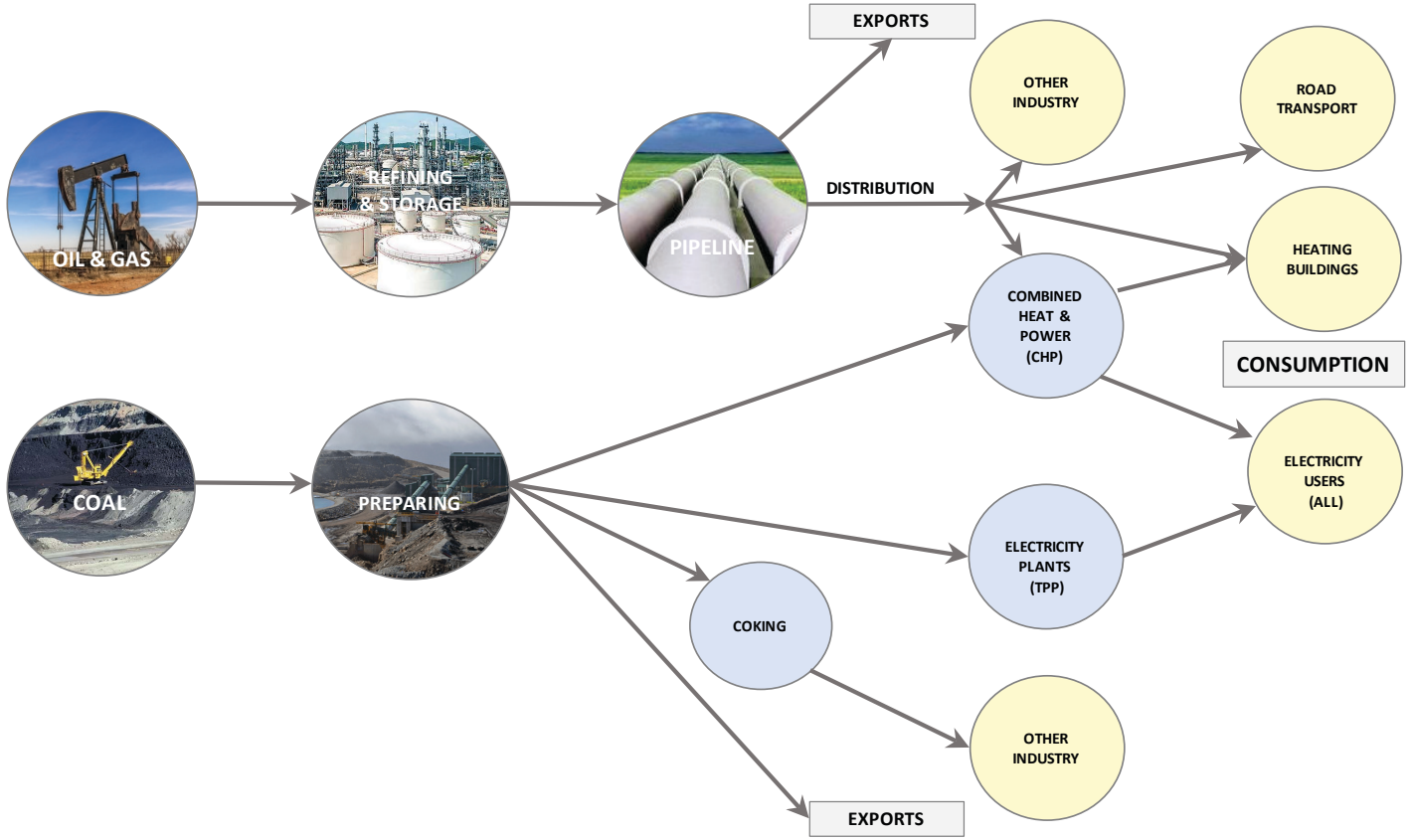



*Figure 21: Simplified mapping of the energy value chain*

52 All BAT Reference documents referred to in the table, and others, are available from: https://eippcb.jrc.ec.europa.eu/reference/

## 6.2 Petroleum (Mineral Oil) and Natural Gas

### Exploration and Extraction

Kazakhstan's oil and natural gas resources mostly occur in conjunction, principally in the western regions of the country, especially around the Caspian Sea basin. Much of the gross natural gas production (>35%) is reinjected to the wells in order to increase oil production. The Guidance document on the extraction and production of petroleum oil and natural gas (Table 10) covers both off-shore and on-shore production and identifies the major issues in this sector that degrade the environment. It suggests a risk-based approach to address the issues and identifies BAT for each one. Having an organisational Health Safety and Environment (HSE) management system is a recommendation that is common to most. The issues identified are:

- Management of drilling muds and drill cuttings including treatment, recycling and disposal
- Handling and storage of chemicals
- Handling and storage of hydrocarbons
- Energy efficiency, a whole of field-life approach to energy management (based on life-cycle analysis) recommendations
- Flaring and venting of gases
- Fugitive emissions (to air)
- Management of production water arising in the hydrocarbon reservoir and from the use of chemicals at the production facility
- Management of drainage water arising from process systems, spillages and other systems
- Facility decommissioning and aftercare
- Environmental monitoring

It is understood that the activities in this sector are among those for which the IGTIPC is preparing BAT documents tailored to the Kazakh situation. Once adopted, the relevant BAT documents should form the basis for setting future exploration and operational permits and ensuring that permit conditions are applied and complied with.

### Refining

Major oil refineries are located in Atyrau, Pavlodar and Shymkent, the remaining oil being transferred by pipeline and shipped into other countries bordering the Caspian Sea and into Russia. The Tengiz field includes a natural gas processing plant (operated by Tengizchevroil), but most of the Kashagan field's production (operated by NCOC N.V.) is exported to Russia for processing at a plant in Orenburg.

Important issues for the refining of mineral oil and gas are the emissions to air of volatile organic substances, nitrogen oxides, sulphur oxides, hydrofluoric acid, ammonia, carbon monoxide, dioxins and furans, and dust; emissions to water of oils, benzene, suspended solids, COD, nitrogen, metals (lead, cadmium, nickel, mercury); energy efficiency; and the prevention of emissions to soil and groundwater. The BAT Reference Document for the refining of mineral oil and gas addresses many aspects of refinery processing:

Alkylation
Base oil production
Bitumen production
Catalytic cracking
Catalytic reforming
Coking
Combustion of refinery fuels
Cooling
Desalting
Etherification
Gas separation
Hydrogen consuming processes
Hydrogen production
Isomerisation
Natural gas plants
Other thermal conversions
Polymerisation
Primary distillation
Product treatments
Storage and handling of materials
Waste gas treatment
Waste management
Waste water treatment

As in the previous section, it is understood that the activities in this sector are among those for which the IGTIPC is preparing BAT documents tailored to the Kazakh situation. Once adopted, the relevant BAT document should form the basis for setting future exploration and operational permits and ensuring that permit conditions are applied and complied with.

## 6.3 Coal Mining

Kazakhstan has enormous coal reserves. Reserves were reported in 2015 as comprising 37.5 billion tonnes of recoverable coal, the largest in Central Asia and representing 3.8% of the world's total reserves; one-third of the more than 400 coal deposits are classified as brown coal or lignite.[53] Traditionally, the Karaganda region has been Kazakhstan's main coal-producing region, although the Ekibastuz coalfields to the northeast large, and there are others. According to GlobalData's mining database, the five largest producers of coal in 2020 were:[54]

| Mine | Location | Type | Production in 2020 (Million Tonne) |
|---|---|---|---|
| Bogatyr Komir | Pavlodar | Surface | 43.3 |
| Vostochny | Pavlodar | Surface | 15.7 |
| Shubarkol | Karagandy | Surface | 8.5 |
| Severny | Pavlodar | Surface | 6.4 |
| Zhalyn | Karagandy | Surface | 2.0 |

Coal has fuelled all of Kazakhstan's thermal power generation plants (TPP) to date and most of the combined heat and power plants (CHP), although action (No. 33) to transition to gas-firing of CHPs in Nur-Sultan, Almaty and Shymkent is included in the GEAP to 2030. Russia is the largest export market, where it is mostly used in power plants in southern Russia.

Coal mining makes several impacts on the environment. For surface mines, the main environmental problems are large-scale land use, overburden removal and disposal, disturbance of hydrology, acid mine drainage and fugitive dust; and the dumping of overburden in piles around the mines results in its exposure to the weather and to air.[55] Apart from fugitive dust and overburden removal, acid mine drainage arising for the oxidation of pyrite (iron sulphide) and other sulphides exposed to air, and polluting wastewater, are substantial problems. As both UNECE and Alimbev et al.[56] have recommended, preventive measures are also needed, not mitigation actions alone. Operators should therefore be required to prepare comprehensive assessments of the potential environmental impact of coal mining, and plan and implement programmes for minimising those impacts. The BAT Reference documents being prepared by the International Green Technologies & Investment Projects Centre should be formulated to provide guidance to operators on how to prevent and minimise the impacts of coal mining in Kazakh conditions. To be effective, however, this document may need to be extended in scope beyond the EU's BAT Reference for the Management of Waste from Extractive Industries.

## 6.4 Power and Heat Generation – Coal and Gas-Fuelled Large Combustion Plants

A mix of energy sources is used in the generation of electricity and hot water, predominantly coal, natural gas, hydro and, more recently, solar and wind. Figure 22 provides an approximate distribution in installed capacity (MW) by installation type in Kazakhstan, although it likely underestimates the installed renewables capacity.

53 Kazakhstan's Mining Industry (2015), Engineering and Mining Journal. Available at: https://www.gbreports.com/wp-content/uploads/2015/09/Kazakhstan_Mining2015.pdf

54 https://www.mining-technology.com/marketdata/five-largest-coal-mines-kazakhstan-2020

55 UNECE. Environmental Performance Reviews – Kazakhstan, Third Review, Highlights. Available at: https://unece.org/DAM/env/epr/epr_studies/Leaflet/Highlights_3rd_EPR_Kazakhstan.pdf. See also, T. A. Alimbev et al (2019), Environmental problems in the Kazakhstan coal industry and their solutions, IOP Conf. Ser.: Mater. Sci. Eng. 663 012041: https://www.researchgate.net/publication/337610602_Environmental_problems_in_the_Kazakhstan_coal_industry_and_their_solutions

56 T. A. Alimbev et al (2019), IOP Conf. Ser.: Mater. Sci. Eng. 663 012041.Available at: https://www.researchgate.net/publication/337610602_Environmental_problems_in_the_Kazakhstan_coal_industry_and_their_solutions

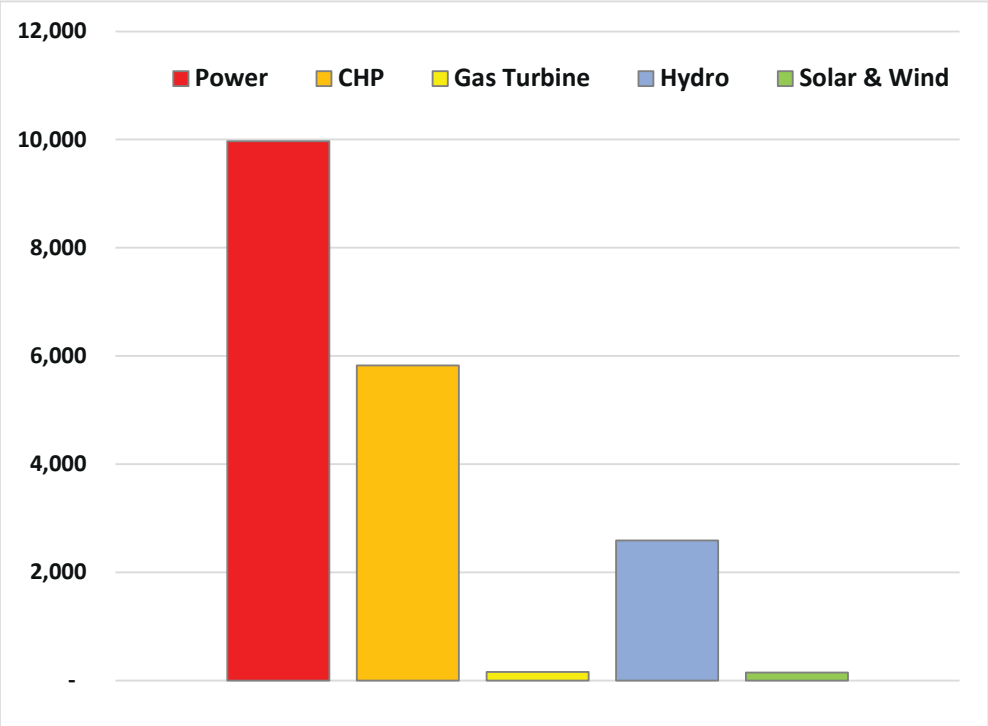



*Figure 22: Approximate distribution of installed generating capacity (MW) by type*

Coal-fired power plants form the largest source,[57] for which the average installation capacity is about 1660 MW. Combined heat and power plants (CHP), traditionally coal-fired but increasingly being converted to natural gas where economically feasible, form the second largest source, for which the average installation capacity is about 277 MW. All the thermal power plants, and about 81% of CHP plants (over 98% in terms of installed capacity), are at or above the 50 MW threshold capacity applicable in the EU to regulation as Large Combustion Plants. Such installations are subject to BAT.

Unless designed and operated to high environmental standards – embodied in BAT – such installations can emit substantial quantities of air pollutants to air. The principal pollutants of potential concern for air quality and human health are $PM_{2.5}$, $PM_{10}$, $SO_2$ (dependent on the sulphur content of the fuel and pollution abatement provided), and NOx – but there are others. It is understood that the activities in this sector are among those for which the IGTIPC is preparing BAT documents tailored to the Kazakh situation. Once adopted, the relevant BAT document should form the basis for setting future operational permits. Regarding SCP, these should embrace energy efficiency within the installation – considered in the GEAP, using water and chemicals efficiently, and maximising the productive use of solid residues – bottom ash or slag and fly ash. In addition they should require that residual wastes be disposed of safely, and that emissions to air are within the prescribed limits. Regulatory efforts must ensure that the permit conditions for such plants are applied and complied with by operators.

Considering the longer term, the dominance of fossil fuels in the generation of heat and power will have to be questioned if Kazakhstan's goal of Net-Zero GHG emissions is to be achieved, and policy strengthened to help meet this goal. Policy development should consider many issues, among which are suggested:

- The potential for increasing the power-generation role of solar and wind energy – at present there are just two significant installations (Figure 21) and the scope for expanding the use of such renewables might be significant.[58] In addition to centralised installations, the adoption of small-scale (especially solar) units on residential housing, apartment blocks, institutions, etc., should also be considered, for which incentive schemes to catalyse adoption could be designed.
- The necessity for energy storage to help navigate the peaks and troughs of renewable energy supply, and other supply disruptions. Developments in this fast-moving area of renewable energy supply should be monitored and fed into ongoing policy development.

57 As of 1 January 2019, it is understood that the installed capacity of coal-fired power plants was 13,326 MW, gas-fired plants 5700 MW, large hydropower plants 2447 MW, and renewables (including small hydropower plants) 531 MW.

58 The indicative data presented in Figure 21 may underestimate the installed solar and wind generating capacity, since other data suggest that there are over 115 renewable energy installations with an installed capacity of 1,705 MW (Annex A).

- Adoption of new nuclear power generation capacity – as the producer of about 40% of the world's uranium, this would seem to be a sensible way forward so long as the nuclear installation or installations is designed and operated to high safety and environmental standards.
- In the medium-long term, for Kazakhstan to meet its Net-Zero commitments while also using fossil fuels for large-scale power and heat generation, it is likely that carbon-capture technology will be needed. A close watch, therefore, should be kept on developments to prove the practical and economic status of such technology at full-scale.
- A potential role could be played by biogas generated in the anaerobic digestion of farm wastes and MSW 'wet wastes'. However, considering that available gas energy may be reduced by having to meet process heating requirements, the contribution of biogas to energy supply is likely to have local significance only. Nevertheless, it could make significant contribution in rural areas.
- Developments in energy efficiency in multiple areas of the economy (see below) which will act to reduce the demand for power and heat and, in turn, reduced emissions to air of both GHGs and air pollutants.

## 6.5 Energy Efficiency

There are boundless opportunities for improving energy efficiency in the economy, and many are being pursued already in industry, which collectively accounts for about 50% of energy consumption. Energy efficiency auditing is a major plank of those efforts, stimulated by the activities of organisations on the State Energy Register (GER) and the Institute for the Development of Electricity and Energy Saving. Other major energy consumer sectors include:

- Buildings: – residential, institutional, offices, retail, any others – where energy is used for heating, lighting, cooking and powering a panoply of electrical and electronic appliances
- Transport: by road, air and rail

The GEAP targets action on energy use in industrial production (monitoring, audits, enterprise action plans), systems to provide household heating (centralised heat production and distribution networks), the energy efficiency of the housing stock, and the road transport sector. Apart from action No. 27, however, the GEAP measures focus on hardware and not on the behavioural aspects that also play a major role in determining how energy is used, and help to account for the persistence of high levels of inefficiency.

Action 27 of the GEAP specifically concerns the development and approval of a national 'Roadmap for Energy Conservation and Efficiency, 2022-2026', prepared by the German Energy Agency DENA with support from the World Bank. The draft Roadmap covers five areas and proposes 46 measures: innovation (11), industry (11), transport (6) measures, public sector including construction, buildings, lighting (12), and cross-sectoral (6), and it is expected that Zhasyl Kazakhstan will absorb and supersede the Roadmap.

Annex B3.3.3 itemises the proposed measures in the Energy Conservation and Efficiency Roadmap, hence the list is not repeated here in full. All the proposed measures would make useful contributions to reducing the energy footprint of Kazakhstan, both individually and collectively, and are fully compatible with the SCP approach. Several measures in the proposed Roadmap could be undertaken by, or in partnership with, an SCP Support Mechanism as introduced in Chapter 8. In particular, note the measures here:

1.1 Conducting a comparative analysis (benchmarking) of energy efficiency of energy-producing and energy transmission enterprises of the Republic of Kazakhstan benchmarking

2.1 Conducting a comparative analysis of the specific consumption for the production of products of industrial enterprises of the Republic of Kazakhstan (benchmarking)

2.9 Development of support programs to improve energy efficiency in the industrial sector

2.11 Development of a brochure on energy saving, within the framework of a technical and economic assessment on the feasibility of implementing energy-saving measures, considering any company restructuring or production modernisation

4.11 Information campaigns and consulting services

4.12 Identification and awarding of energy-efficient institutions

5.2 Creation of an interregional competence centre on the basis of the National Institute for Development in the field of energy saving and energy efficiency

5.4 Training (training) of 10 domestic (national) specialists of large enterprises in the energy management system

5.5 Elaboration of the issue of promotion of energy saving

5.6 Various conferences on energy saving and energy efficiency

The SCP Action Plan should be consistent with the final, approved form of the energy conservation and efficiency roadmap produced within Zhasyl Kazakhstan. The energy theme of the SCP Action Plan in Chapter 9 has thus been generally framed keeping this in mind.

## 6.6 Renewable Energy – Reducing GHG Emissions

As noted in Annex A, Kazakhstan signed the Paris Agreement in 2016, and has committed itself to reduce greenhouse gas (GHG) emissions by 15% from the 1990 level (386.3 million tonnes) to 328.3 million tonnes by 2030. However, over the period from 2009 to 2018, GHG emissions grew substantially to about 402 million tonnes, approximately 4% higher than in 1990, see Figure 23. And it is understood that 2020 saw further growth. Moreover, GHG emissions per capita have also showing an increase of 21.6% over the past 10 years. Significant efforts therefore need to be made to change the emissions trajectory in line with meeting the above 2030 commitment. Those efforts should focus on reducing GHG emissions in the three leading emission sectors, i.e. energy, agriculture, and industrial processes, which contribute about 82.4%, 9%, and 5.6% respectively to the national GHG inventory.

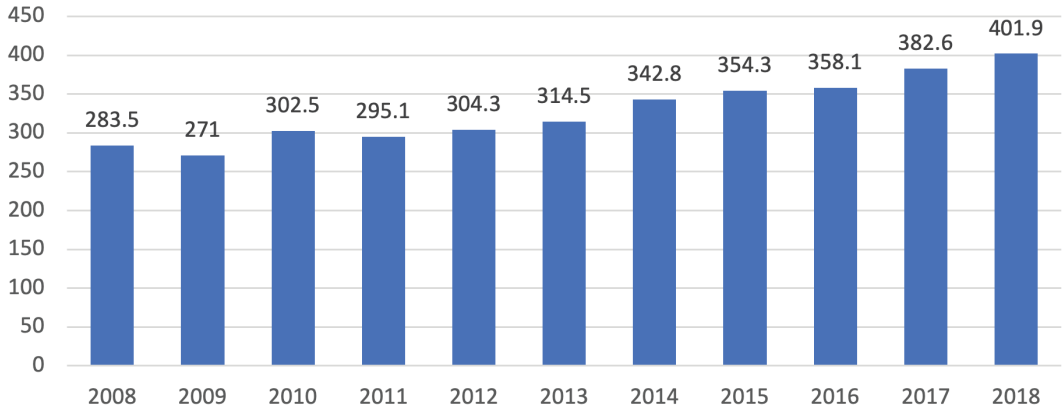



*Figure 23: Kazakhstan's Annual GHG Emissions Growth (million tonnes) 2008–2018*

Annex A2 notes that, under the Republic's obligations in the Paris Agreement, Kazakhstan is expected to introduce additional measures of carbon regulation. Updated plans for Kazakhstan's obligations (Nationally Determined Contributions, or NDCs) suggest a strengthening of the Emissions Trading System (ETS-KZ) and the introduction of a carbon tax. These would be positive moves, fully consistent with an SCP approach, but would need to be introduced with care to ensure that consumers and producers are not faced with rapid, steep hikes in costs and prices.

Strengthening of the ETS consistent with the parameters of emission trading systems in regions and countries such as the EU and China will involve:

- Development and approval of plans to reduce by 2030 free $CO_2$ emission quotas for installations and sectors of the economy
- Determining an acceptable level of carbon prices and accounting for them when determining the amount of emission allowances allocated free of charge
- Ensuring two-way communication with facility operators regarding the government's plans for the allocation of quotas and their impact on the activities of these operators
- Ensuring the functioning of exchange trading in carbon units, reducing the risks of uncertainty in the distribution of quotas
- Inclusion of other greenhouse gases in the ETS (from 2026): emissions of nitrous oxide ($N_2O$) and perfluorocarbons (PFC), methane ($CH_4$) leaks in the oil and gas industry
- It is planned to reduce the volume of distributed quotas annually, which, according to rough estimates, may lead to a maximum volume of emissions of 120 million tonnes of $CO_2$- equivalent by 2030

The possibility of introducing two types of carbon tax in Kazakhstan over the period 2023–2025 has been under discussion, carbon taxes:

1) On energy consumption, potentially affecting all stationary and mobile sources of direct GHG emissions excluding those that are subject to ETS-KZ. The tax may be included in the fuel price (VAT or excise duty).
2) To stimulate the maintenance of humus levels in arable soils. Tax for farmers in crop production with reference to the indicator of the content of humus in the soil, relative to its content in the previous year. The tax is aimed at encouraging farmers to prevent depletion of arable land.

Carbon taxes are also fully in line with the adoption of an SCP approach, But, again, care will need to be taken that their intended introduction is communicated in advance and that its scale is increased gradually, not resulting in unexpectedly steep rises, and in consideration of other measures that may have major cost implications. Moreover, the tax should be revenue neutral, i.e. there should be compensating reductions in other forms of taxation, so that the effect of the tax is to 'nudge' enterprises and people to behave differently – in ways whose effects include reducing their GHG emissions - without being a drag on the national economy. Such policy initiatives – the ETS-KZ and carbon taxes – ought to stimulate the energy efficiency drive as noted in the previous section; the more efficient use of inorganic fertilisers, and their partial substitution by treated biowastes, as noted in Chapter 3; and help to encourage the uptake of renewable energy generation at various scales (small to large).

Other financial incentives to stimulate the uptake of renewable energy and energy efficiency measures in buildings – residential and others – might also be introduced. Also worth considering are regulatory instruments such as prohibiting the placement on the market of energy-consuming appliances that do not comply with minimum performance standards (taking inspiration from the EU's Eco-Design Regulation); and the voluntary adoption of Eco-Label standards for energy efficiency, enabling consumers to take energy efficiency into account when exercising choice in their purchase of energy products. Keeping abreast of developments in the EU's Circular Economy Action Plan and its implementation is advisable, and it is recommended that these additional policy actions should be reviewed by Government, the outcome to be considered in developing a thematic strategy by an SCP Support Mechanism (Chapters 8, 9).

## 6.7 Ambient Air Quality

The GEC stated that air pollution is a severe environmental problem in urban areas of Kazakhstan, especially in the industrial zones developed as production centres in industrialised Oblasts. And, in its third Environmental Performance Review of Kazakhstan, the UNECE reported Kazhydromet monitoring data that showed in many Kazakh cities:

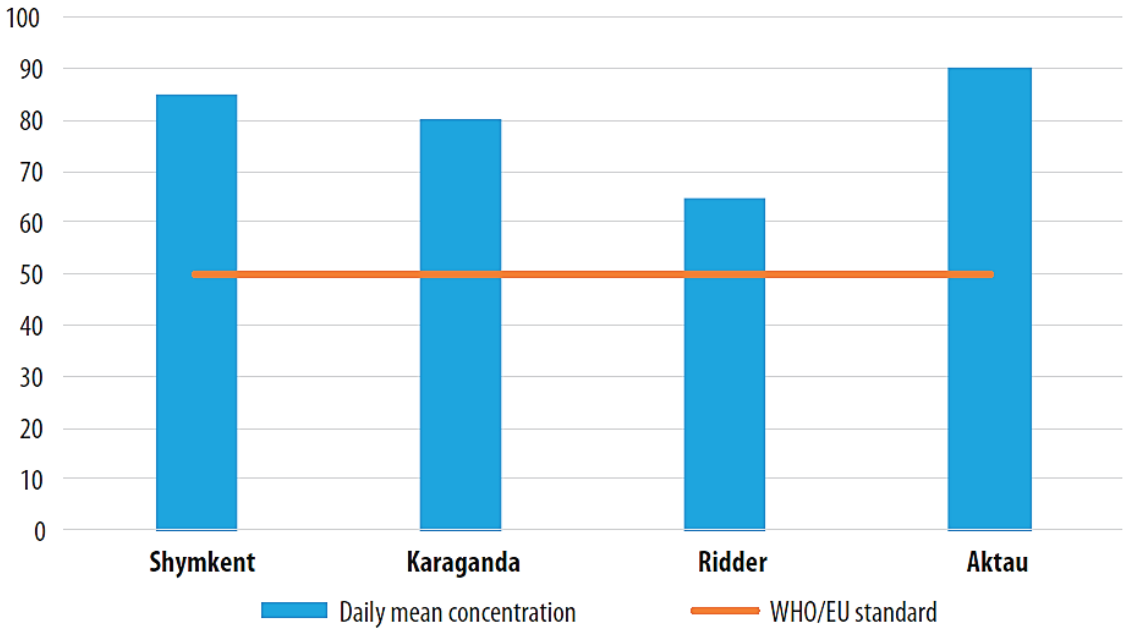
- The annual mean concentration of $PM_{10}$ was higher than EU and World Health Organization (WHO) standards
- The daily mean concentration of $PM_{10}$ in many cities in Kazakhstan in 2017 was also reported to be higher than the EU and WHO standards, see e.g. Figure 24
- The daily mean concentration of $PM_{2.5}$ in many cities in Kazakhstan in 2017 was higher than the WHO standard

Hence the 2030 Agenda's SDG target 11.6 on the adverse per capita environmental impact of cities, and SDG target 3.9 on the reduction of the number of deaths and illnesses from air pollution, are particularly relevant for Kazakhstan.

In combination, measures taken to adopt BAT at large combustion plants and industrial processes, improve energy efficiency wherever energy is used, and to substitute renewable energy sources for fossil fuels, should reduce the emission of air pollutants such as $PM_{2.5}$, $PM_{10}$, $SO_2$, NOx and others resulting from fossil fuel combustion. Ammonia ($NH_3$) emissions arise predominantly from agricultural operations, however, although the production of synthetic nitrogenous fertilisers, ammonia, nitric acid and other nitrogenous substances can give rise to substantial point source emissions. Moreover, many factors combine to determine the ambient concentrations of air pollutants. They include:

- The location of air pollutant emission sources, both geographically and their heights above ground
- Topographical and meteorological factors, affecting pollutant dispersion and transport
- Background concentrations arising from regional and transboundary pollutant transport
- The formation of secondary pollutants from primary emissions. For instance, secondary $PM_{2.5}$ may form through the reaction of ammonia with other air pollutants such as $SO_2$, NOx and NMVOCs (non-methane volatile organic compounds), catalysed by sunlight (UV). Such secondary particulate material can form a significant fraction of the $PM_{2.5}$ present in air, inhalation of which is known to be a significant risk to human health.

Consequently near-ground, high concentration sources can also be major contributors to air pollution, not only major point-source loads that tend to be emitted through high stacks. Residential heating (single family dwellings, and multiple-family apartment blocks) using coal-fired stoves and boilers, diesel and petrol driven road vehicles, and agriculture, therefore, can be major local sources emissions that contribute significantly to poor air quality, especially in urban areas.




Source: Kazhydromet, 2017.
Note: Daily mean values: WHO Air Quality Guideline: 50 µg/m˜; EU Air Quality Standard: 50 µg/m˜.

***Figure 24: Daily mean ambient air concentration of $PM_{10}$ in selected cities in 2017***

European countries adopt a common approach in addressing the issue of air pollution and air quality. The EU's Clean Air Package comprises a considerable number of several interlocking policy instruments that form part of the EU's environmental *acquis*.[59] The Industrial Emissions Directive of which BAT is a core element is one such policy instrument. Another is the preparation of a National Air Pollution Control Programme (NAPCP) which requires Member States to show how they will achieve their emission reduction commitments for $SO_2$, NOx, NMVOCs, $NH_3$ and $PM_{2.5}$. Its preparation involves the projection of national (primary) emissions into the future – the first NAPCPs undertook emission planning to the year 2030 – under three policy-based scenarios. NAPCP preparation also requires that an assessment be made of the impacts on air quality and compliance with air quality standards, a further element of the Clean Air Package, under each policy-scenario. Implicitly, this requires the use of air quality modelling as a necessary tool to assess the impacts of existing and projected emissions on air quality, although this was not a mandatory requirement in the guidance for preparing the first NAPCPs in 2019.[60]

Functional national emissions inventories, for major air pollutants (and GHGs), ought to be able to capture historic trends in national emissions year-by-year. Coupling a reliable historic emissions inventory with the capacity to project emissions into the future then forms a powerful policy tool.

59 Note: the EGD assumes the *environment acquis* as a given. While the Clean Air Package, National Air Pollution Control Programme, emissions inventories and projections underpin and contribute to their delivery, they are not mentioned in the EGD.
60 Although the use of air quality modelling for assessing air quality compliance under the policy scenarios was voluntary, it may be considered likely that this becomes mandatory in future.

Such a tool enables Government to better examine the effects of alternative or complementary policies and measures to achieve energy efficiency, emissions reduction and air quality goals. Although not ratifying any of the protocols to the CLRTAP (Convention on Long-Range Transboundary Air Pollution), Kazakhstan is a party to the convention and reports emissions data for the Inventory Briefing Report and to the Centre for Inventories and Projections. Furthermore, under a law of December 2019 (No. 279-VI 3PK), the Ministry of Energy, Ministry of National Economy and Ministry of Finance should provide detailed data on the amount and type of pollutants emitted by different categories of enterprises. Hence, action to review and strengthen the national emissions inventories and the capacity for preparing emissions projections is included in the SCP action plan (Chapter 9).

It is usual in Europe that emission inventories and projections are prepared by or for the Ministry that is responsible for the environment. Since the management of pollutant emissions to air and air quality is very much a cross-cutting issue, whichever Ministry or Ministries in Kazakhstan takes responsibility must ensure close cooperation with other Ministries in order to achieve the common goals.

## 6.8 Future Considerations

In the short-to-medium term the adoption and implementation of international good and best practices in the oil, gas and coal exploration, extraction and processing sector is the right way to go, regarding SCP. However, in parallel there is also a need to look further ahead to what may potentially be a very different future. With most countries of Europe committed to net zero GHG emissions by 2050, for instance, Europe's delivery on that commitment could change the nature and geographical focus of demand quite considerably in the medium-to-longer term.

Such a development and related developments in other regions and worldwide, could transform the very nature of the energy value chain in future. This observation should not be taken as negative for the future exploitation of Kazakhstan's very significant energy reserves, but it would have substantial implications for the transformation of extracted fossil fuels, for their decarbonisation – the generation of 'blue' hydrogen, for instance – and for ancillary processing.

It is suggested, therefore, that the Government consider the policy and investment implications for Kazakhstan of a world in which the decarbonisation of energy supply and its use becomes substantial reality and not just a goal. And based on its analysis and deliberations, take appropriate policy decisions and other actions.

# 7. SCP AND THE METALS VALUE CHAIN

## 7.1 Scope

As noted earlier, the mining of metallic ores and their downstream processing are extensive and economically significant at a national level. However, ferrous and non-ferrous ore extraction and processing is directly responsible for substantial environmental damage in terms of degraded land, accumulated rock and spoil waste, water pollution, and significant GHG and air pollutant emissions to air. The metals value chain is indicated schematically in Figure 25, and Table 11 gives recently published metals production quantities.[61]

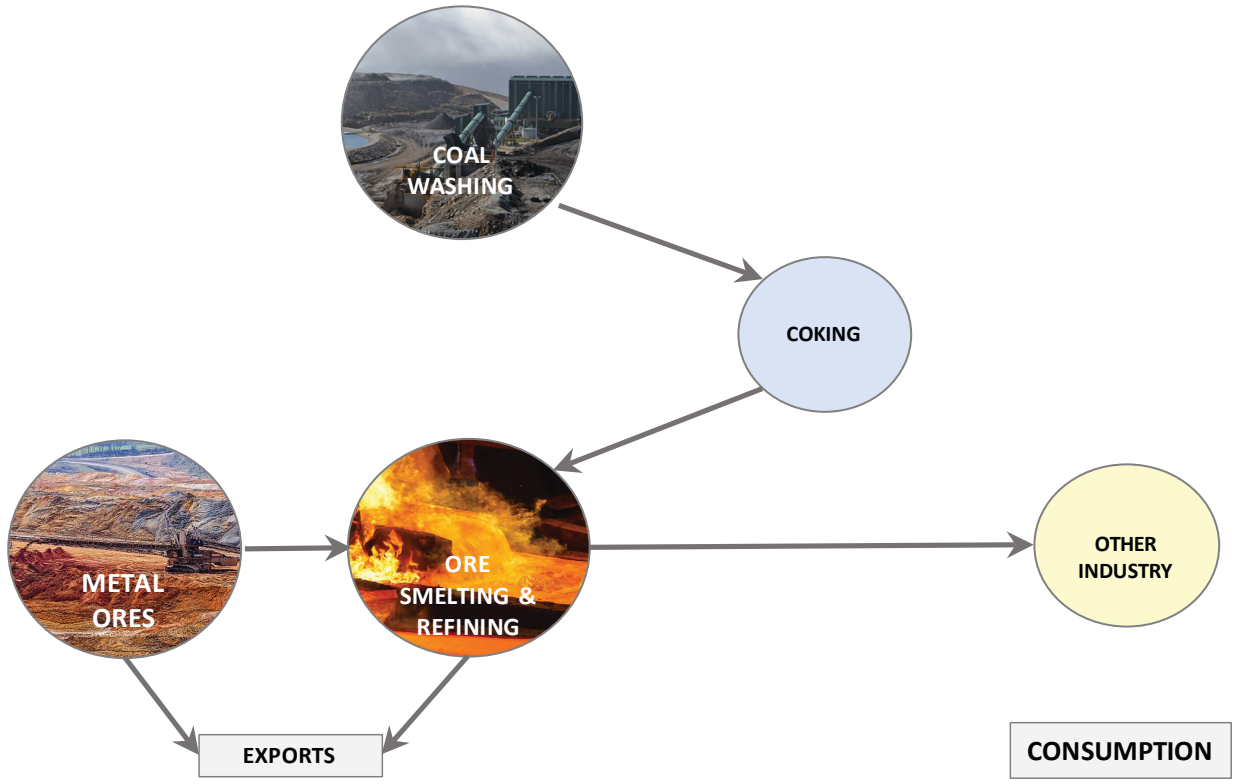



*Figure 25: Simplified mapping of the metals value chain*

*Table 11: Indicative metal production quantities (January–November 2021)*

| Resource | Product | Production (Jan-Nov 2021) | Units |
|---|---|---|---|
| Metal Ores | Iron | 58.6 | million tonnes |
| Metals | Steel - unrefined | 4.11 | million tonnes |
| | Flat-rolled products | 2.71 | million tonnes |
| | Ferro-alloys | 1.88 | million tonnes |
| | Aluminium - unwrought & oxide | 1.44 | million tonnes |
| | Zinc unwrought | 0.299 | million tonnes |
| | Copper – refined, raw, alloy | 0.395 | million tonnes |

Much of the extracted metal ores and refined metals is exported from Kazakhstan. Producers and exporters should of course take into consideration the pressures faced by importers and their requirements. Those requirements may include the energy consumption and GHG emissions associated with imported materials

61 Agency for Strategic Planning and Reforms of the Republic of Kazakhstan, Bureau of National statistics (January-November 2021), Socio-economic development of the Republic of Kazakhstan - Statistical Bulletin

and goods. In future years, for instance, it is possible that the EU may impose a carbon border taxes on imports to the EU as a part of its Net Zero climate change policy.

Holding about 12% of the world's known resources of uranium, it is general knowledge that Kazakhstan also currently produces about 40% of the world's supply of this heavy metal. Production quantities have increased significantly since 2009, when it became the world's leading producer: a major plant makes nuclear fuel pellets and a goal is to sell value-added fuel, not just uranium.[62]

## 7.2 Mining and Refining of Metal Ores

As in the primary and secondary stages of the energy value chain, the extractive and processing activities indicated in Figure 25 are the subject of BAT Guidance and Reference documents published by the European Commission (Table 12), which the International Green Technologies & Investment Projects Centre is tailoring to Kazakh conditions. BAT documents provide a comprehensive review and statement of the measures that operators can adopt to prevent waste and environmental pollution, achieve high resource efficiency, mitigate environmental pollution, and reclaim polluted land. They are integral to Sustainable Consumption and Production practice in the primary and secondary stages of the metals value chain.

***Table 12: Latest versions of the BAT guidance and reference documents published by the European Commission[63]***

| Sector | BAT Document Title | Publication Year |
|---|---|---|
| Extractive Industries | Reference for the Management of Waste from Extractive Industries | 2018 |
| Processing & Transformation | Reference for Iron and Steel Production | 2013 |
| | Reference for the Ferrous Metals Processing Industry (Final Draft) | 2021 |
| | Reference for the Non-Ferrous Metals Industries | 2017 |
| | Reference for Smitheries and Foundries[64] | 2005 |

Consequently, the SCP Action Plan for this aspect of the metals value chain focuses on the medium-term preparation and roll-out of relevant BAT Reference documents, and their implementation in practice.

## 7.3 Metal-Working and Engineering Sectors

The engineering sector in Kazakhstan includes the manufacture of some electrical equipment, machinery, vehicles and trailers. However, considering the 11-month period January to November 2021, its economic value (1392 billion tenge) is small compared to that of ore mining (2933 billion tenge) and metallurgical processing (6847 billion tenge).[65] Energy efficiency, emissions to air and solid waste management and recycling are among the SCP issues to be addressed, although the overall impact of this sector might be considered minor relative to those of others. Hence, specific SCP actions are not proposed at this time. The future preparation of a thematic strategy concerning the metals value chain would provide an opportunity to revisit this sub-sector and develop appropriate SCP actions.

However, there may be opportunities to develop this sector as an economic activity through the dismantling and preparation of end-of life products (vehicles, electrical and electronic appliances, etc.) in the waste management sector; see Chapters 5 and 9.

62 https://www.gbreports.com/wp-content/uploads/2015/09/Kazakhstan_Mining2015.pdf

63 All the BAT Reference documents referred to in the table are available from: https://eippcb.jrc.ec.europa.eu/reference/

64 Under review, the report of the kick-off meeting held in the autumn of 2019 for the revision of the Smitheries and Foundries BAT Reference Document is available from the eippcb website.

65 Agency for Strategic Planning and Reforms of the Republic of Kazakhstan, Bureau of National statistics (January-November 2021), Socio-economic development of the Republic of Kazakhstan - Statistical Bulletin

# 8. A MECHANISM TO HELP STIMULATE SCP UPTAKE IS NEEDED

## 8.1 Why a Mechanism is Needed

The national SCP Action Plan has, at its heart, further effort by central Government to strengthen Green Policies and ensure that both existing and strengthened policies are applied in practice by regional governments and all relevant stakeholders. Such policies may involve implicit requirements that the productive sectors of the economy make greener investments. For instance, as a result of the Government's application of BAT to large combustion plants, stricter pollutant emission limit values would likely be set, to be complied with by a specific date; and existing installations would likely have to make appropriate investments. Table 13 presents a range of areas where 'hard-edged' policy adjustments could be beneficial. Several, such as the economic pricing of consumed resources and an extension of the producer and supplier responsibility, would act to strengthen the enabling environment for SCP without necessarily requiring major investments. Figure 26 represents the twin-track approach of the SCP Action Plan to national policy development and its application, including an SCP support mechanism.

***Table 13: 'Hard-edged' Areas for policy development to support SCP uptake***

| Areas for Further Development of 'Hard-Edge' Policies to Support SCP | |
|---|---|
| Pricing of consumed resources<br>– Energy, Water, Materials, Landfill volume | Limits on annual volumes of freshwater abstraction<br>– Specific to water-stressed basins |
| Extended Producer Responsibility<br>– Producers and suppliers of manufactured products such as electrical and electronic goods, motor vehicles, refrigerators, etc.<br>– Facilities for receiving end-of-useful-life goods and their dismantlement to enable material resources to be recovered and returned to market | Green Products in the Marketplace<br>– Mandatory minimum product performance standards (e.g. energy and water efficiency) for specified types of goods to be sold in the market<br>– Ecolabelling of goods, enabling consumer choice<br>– Green purchasing codes |
| Cost-recovery financing of solid waste management operations, from collection through to treatment and disposal<br>– Consistent with resource recovery | Applying BAT as a regulatory principle in specified sectors, e.g.<br>– Energy, Chemicals, Metallurgical, Food, Drink and Milk industries, Textiles |
| National emission inventories, projections and commitments<br>– GHGs and Air Pollutants<br>– Ratify CLRTAP Gothenburg Protocol | Decarbonising the energy system in the long-term<br>– Use of renewable energy resources<br>– Carbon capture and storage (CCS)<br>– Hydrogen (blue and green) |

Presented in detail in Chapters 2 and 5, there are several strands to an SCP enabling environment, the most notable being a consistent legislative and regulatory framework, institutional capacity and capability, operational infrastructure, sustainable finance, a culture of compliance, and efficient and supportive markets/ outlets. All apply equally strongly when considering SCP in the context of resource recovery from solid waste, but their relative significance may vary depending on sector-specific characteristics.

Common to all sectors and cross-sectors, however, is the need for adequate institutional and stakeholder capability and capacity. This itself comprises many aspects, but critical to SCP uptake is the stimulation of behavioural change, whether people are acting as householders or in an enterprise or institutional setting. The importance of behavioural change stems from the fact that the application of SCP in practice depends often on stakeholders and actors taking ***voluntary action.*** Hence people first must first be ***aware***, and then ***motivated***, **and** ***have practical tools and guidance tailored to their specific needs***. In the short-to-medium term, a mechanism to stimulate behavioural change is needed, distinct from a regulatory approach mandating stakeholder action, and complemented by adjusting the curricula of primary, secondary and tertiary levels of education. SCP could be introduced into the curricula through, for instance, including appropriate examples to illustrate aspects of physical and life-science subjects.

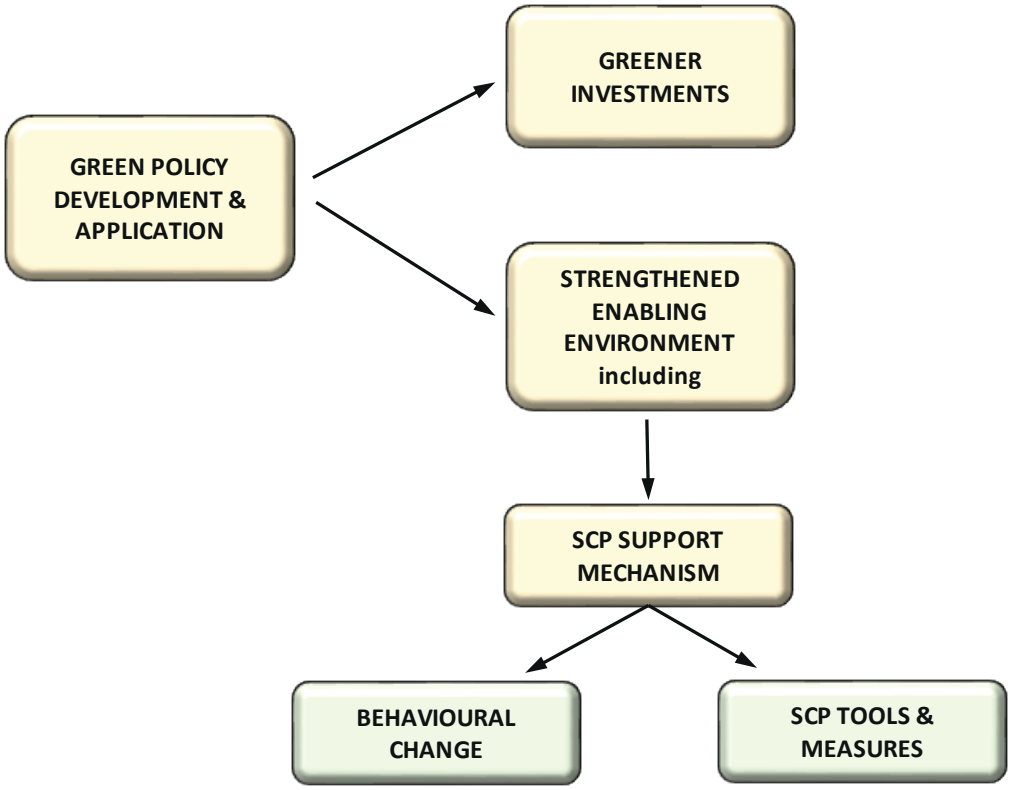



*Figure 26: Twin-track representation of the SCP Action Plan, indicating the role of an SCP Support Mechanism*

Prompting behavioural change is not easy. For every individual in a household, business or institution that is aware and mindful of the need to change from the old ways of doing things, many more may see no need for change or are unwilling to do so. And simply telling them that change is needed may not work. People can be stubborn. In tackling this resistance to change, effective and sustained communication in which people's concerns are identified and addressed with practical arguments and clear messages is an essential tool. Effective communication can also mean the provision of practical guidance, information and support to motivated consumers and producers. This can help to shift them from a situation in which they are aware but unsure what they can do, or how to do it, to one where they are not only aware but feel empowered.

Many models of behavioural change exist, but all share the same or similar characteristics. A useful illustration is provided in Figure 27. The green buttons represent five behavioural states on a pathway ranging from unawareness on the far left to fully empowered and active on the far right. Progression along this behavioural pathway is not automatic, however; effort is required to help people move along the path. The kinds of action needed to drive this progression – essential for voluntary SCP action to follow – is indicated in the boxes above the curve.

Making that effort requires that senior managers in enterprises and institutions, and the heads/ influencers within households, are aware of SCP and either drive or are supportive of efforts to adopt an SCP approach. But even being aware and supportive is not enough. Without appropriate external support, there are limits to what they can do. An external mechanism that can inject enthusiasm, stimulate action and provide support is needed. The underlying principles for such a mechanism are provided in section 8.2 below. The national Government should apply these in considering their options and determining an appropriate mechanism and its institutional 'home'.

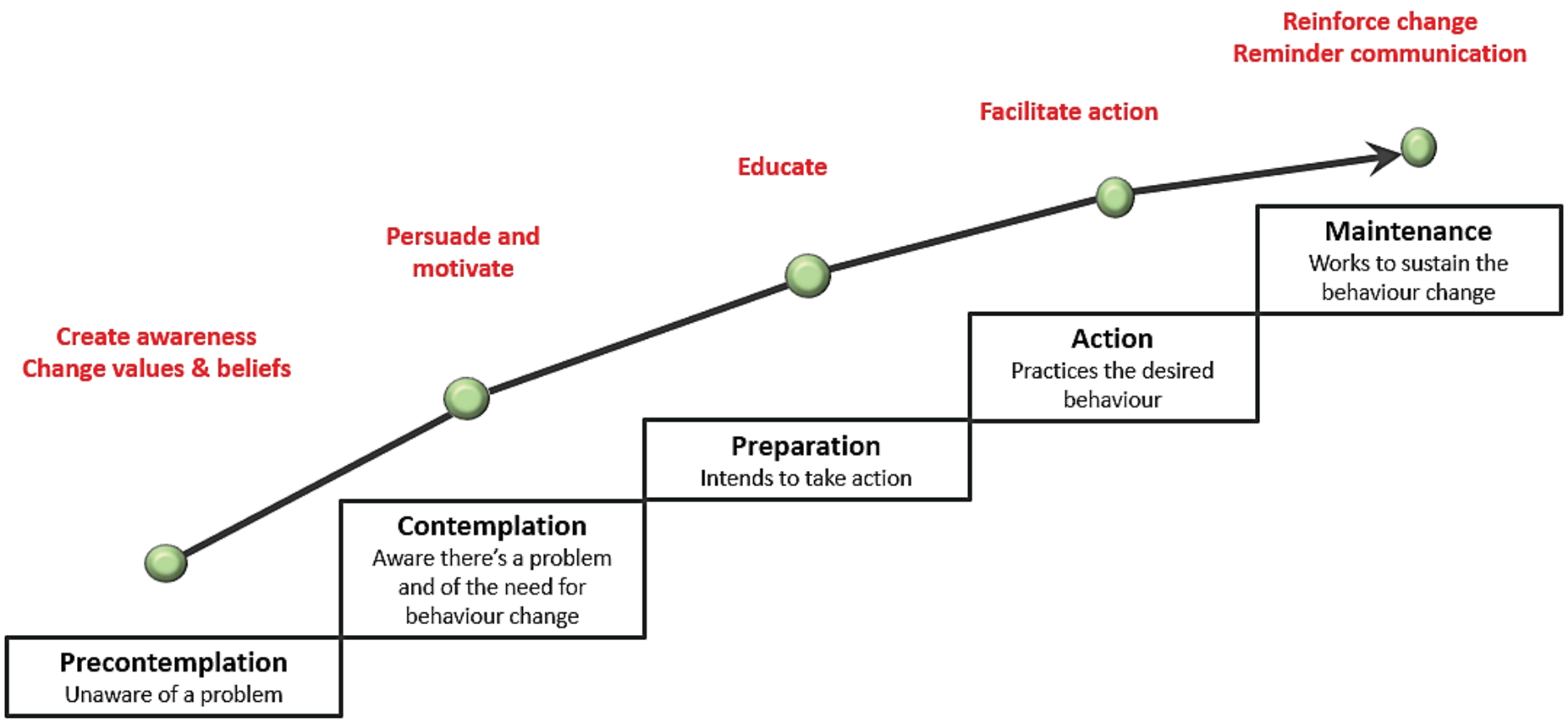



*Figure 27: A model for promoting behavioural change that may be adopted to stimulate SCP action*

## 8.2 SCP Support Mechanism: Principles for Effectiveness and Good Governance

An SCP Support Mechanism, effective in raising awareness and stimulating both behavioural change and the active adoption of an SCP approach, should rest on the following principles.

1. The mechanism should receive the full endorsement of the national Government and, ideally, regional governments.
2. Its goals should be to raise awareness of SCP, to stimulate SCP action by stakeholders in the production and consuming branches of the economy, and to transmit SCP tools, information and guidance to stakeholders, to enable their adoption of SCP.
3. The mechanism adopted should focus on promoting the uptake of SCP in the areas covered by the present SCP Action Plan, phased in recognition of Government priorities and initial capacity and capability constraints, i.e. (i) agriculture and agri-products, energy, and metals value chains; and (ii) the cross sectoral areas of freshwater conservation and efficiency of water use, reducing GHG emissions, ambient air quality, and the recovery of resources from municipal solid wastes.
4. Sufficient time will be needed for the mechanism to achieve the goals set. Assuming its establishment in 2022-2023, the mechanism should be operational until 2030 – coincident with the termination of the current Green Economy Action Plan – at which time consideration may be given to its extension and revising its remit.
5. Applying the mechanism will require the commitment of financial and human resources. In principle these might be provided via a network of national experts, partially supported perhaps by national and international donors. But the formation, management and financing of that network would be challenging and the risks of waning initial enthusiasm and financial disruptions might be considerable. A more sustainable commitment of resources to enable a functioning mechanism might be to establish an SCP support mechanism within an existing institution – governmental or otherwise – funding and human resources to be 'guaranteed' by central Government so far as that is possible. The institutional 'home' for such a mechanism would need to be determined by Government.
6. If Government decides to establish an SCP support mechanism within an institutional home, it will need to establish management and operational procedures that allow Government Ministries to exercise strategic supervision without becoming involved in day-to-day management.
7. Engaging international donor support (Technical Assistance) for establishing an SCP support mechanism, and developing both the SCP capability and capacity of the mechanism, would accelerate the national uptake of SCP.

Annex D provides examples of how SCP and SCP-related support mechanisms have evolved in one European country – the United Kingdom – and summarises their remits. It also provides indicative Terms of Reference for an institutional unit – should that be the route that Government pursues – and indicative human resourcing levels. Much experience has been gained in East and South-East Asia also, through the Switch-Asia programme, which could help to inform the Government's decision making.

# 9. SCP ACTION PLAN: 2022–2030

The SCP Action Plan adopts the principles set out in Chapter 2 and, regarding an SCP Support Mechanism, those set out in Chapter 8. Hence the Action Plan shown schematically in Figure 28, and elaborated in Table 14, comprises:

1. SCP awareness raising and capacity development for Government officials, building on the introduction provided in June 2022 (Action 0.1)
2. Integrating the SCP approach into a revised Green Economy Concept (Action 0.2)
3. Policy areas for national Government consideration, where policy development and amendment could strengthen the enabling environment for SCP uptake, and help to reinforce the incentives for consumer and producer stakeholders to take action. Chief among these are:
    - Commitment to establishing an SCP Support Mechanism (SCP-SM) in line with the principles stated in Chapter 8, for which advice via international Technical Assistance would be beneficial (Actions 0.3 and 0.4)
    - Ensuring the effective operation of the SCP-SM until 2030, subject to performance review. Dependent on the situation prevailing in 2030, the Government may then decide either to extend the SCP-SM's operation or terminate it (Actions 0.5 to 0.8)
    - Policy analyses whose recommendations, if acted upon, could further incentivise changes in consumption and production behaviour in line with the SCP approach. Table 13 in Chapter 8 and Table 14 identify the policy areas of current potential significance, where effort might be focused (Action 0.9)
4. Government to amend legislation, if and where shown to be necessary, to enable the implementation of SCP actions in the value chains and cross-sectoral themes presented in Chapters 3 to 7 inclusive. One means of identifying implementation barriers – potentially solvable by legislative amendment – would be thematic activities of the SCP-SM (Action 0.10)
5. Inclusion of SCP-related topics in educational curricula, tailored for use in primary, secondary and tertiary settings to raise the awareness of the coming generations (0.11)
6. Actions relating to a thematic strategy to promote SCP and achieve SCP uptake in the agriculture and agri-product value chain, in which the SCP-SM would play a major role (Actions 1.1 to 1.13)
7. As above, but concerning the cross-sectoral theme of water use efficiency and water conservation (Actions 2.1 to 2.11)
8. As above, but concerning the cross-sectoral theme of resource recovery from municipal solid waste (Actions 3.1 to 3.13)
9. As above, but concerning the energy value chain and the cross-sectoral themes of GHG emissions reduction and ambient air quality (Actions 4.1 to 4.12)
10. As above, but concerning the metals value chain (Actions 5.1 to 5.7)

Figure 28 also shows the International Green Technologies and Investment Projects Centre's activity in preparing BAT documentation. This is referred to in the SCP Actions addressed by points 6, 8, 9 and 10 above and in relevant chapters.

Also shown is the role of regional governments, enterprises, institutions and households in taking SCP action as prompted by the roll-out of SCP-SM thematic strategies and other routes. These actions are not specified as such in the SCP Action Plan.

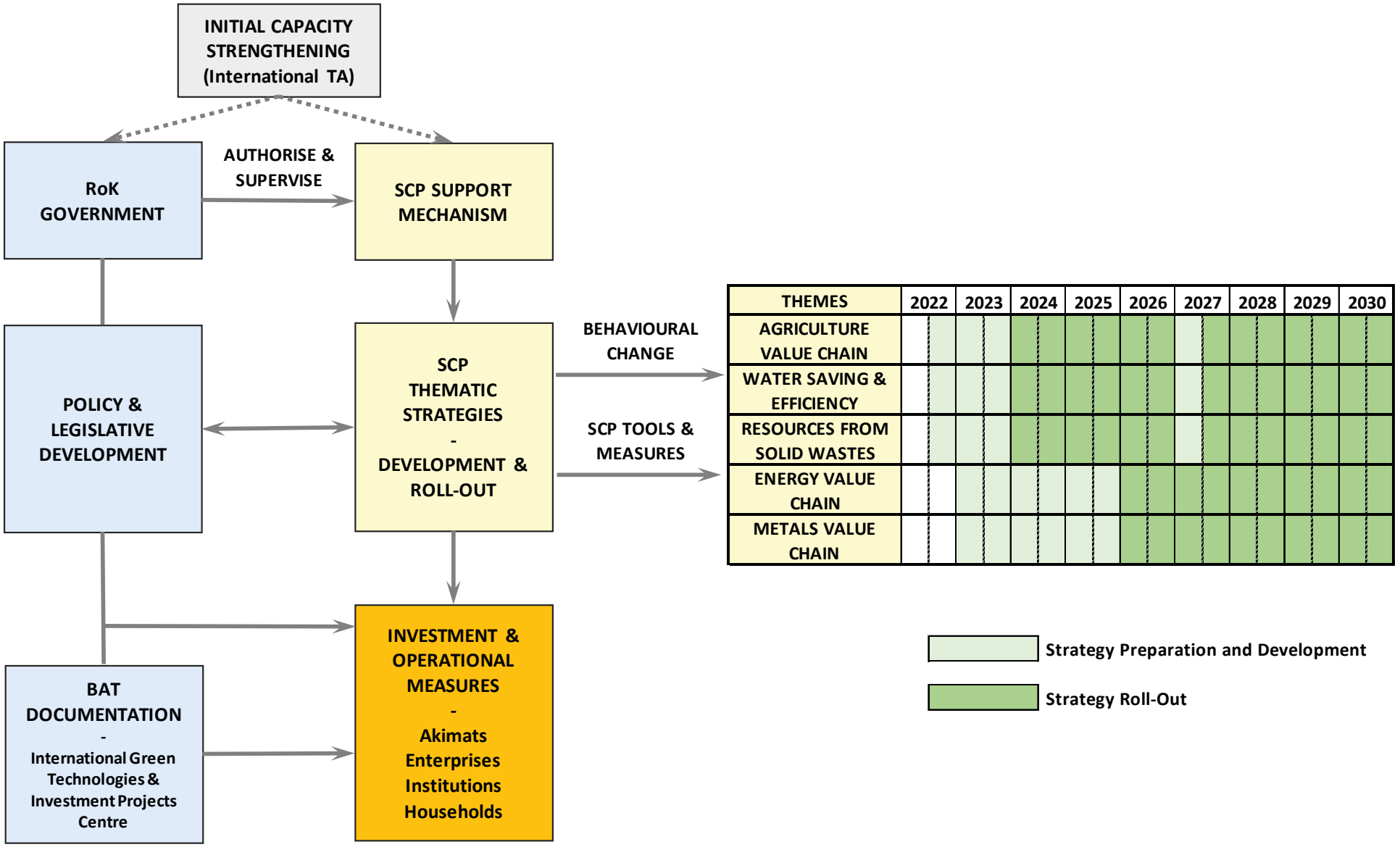



*Figure 28: Scope and Structure of the SCP Action Plan*

*Table 14: National SCP Action 2022–2030*

| No. | ACTION | RESPONSIBLE INSTITUTION/S | PERIOD |
|---|---|---|---|
| **THEME 0: NATIONAL GOVERNMENT OF REPUBLIC OF KAZAKHSTAN** | | | |
| 0.1 | Capacity building for the Government to enhance government's understanding of the SCP approach. | Ministry of Economy (with the support of other relevant Ministries) | 2022 |
| 0.2 | Integrate the SCP approach into a revised, updated version of the Green Economy Concept. | Ministry of Economy (with the support of other relevant Ministries) | 2022 |
| ESTABLISH AND MAINTAIN A MECHANISM FOR PROMOTING SCP AND ITS ADOPTION | | | |
| 0.3 | Commit to establishing a funded national SCP Support Mechanism (to promote and enable SCP action in themes 1 to 5 inclusive, and to ensure its funding over the period 2023 to 2030 inclusive, subject to a performance review midway (2026/27) through the period. | Ministry of Economy (with the support of other relevant Ministries) | 2022 |
| 0.4 | Secure international assistance to: (i) help prepare detailed Terms of Reference for an SCP-SM that reflect international good practice, (ii) identify the detailed staffing and budget needs of the SCP-SM, and (iii) provide targeted capacity building for staff in relevant Ministries and the SCP-SM. | Ministry of Economy (with the support of other relevant Ministries) | 2022–2024 |
| 0.5 | Establish a funded national SCP-SM, to promote and enable SCP action in the targeted value chains and cross-sectoral themes. The SCP-SM will provide a focus for raising awareness and the development of knowledge and tools on SCP and their communication. It will engage with sources of practical experience and knowledge in Kazakhstan, the Central Asia region, and worldwide. | Ministry of Economy (with the support of other relevant Ministries) | 2023 |
| 0.6 | Provide regular strategic supervision of the SCP-SM's operation and progress. | Ministry of Economy (with the support of other relevant Ministries) | 2023–2030 |
| 0.7 | Decide whether to (i) split the SCP-SM into two parallel differentiated operating mechanisms having distinctive themes and (ii) add further, additional themes for action. | Ministry of Economy (with the support of other relevant Ministries) | 2026 |
| 0.8 | Review the performance of the SCP-SM up to 2030 inclusive and decide whether there is then value in extending the programme or, if not, to close it down. | Ministry of Economy (with the support of other relevant Ministries) | 2030 |
| POLICY ANALYSIS AND DEVELOPMENT | | | |
| 0.9 | Further analysis with the objective of recommending policy measures to stimulate actors to make sustainable changes in consumption and production behaviour, such changes to result in improved resource efficiency and conservation. Suggested policy areas are:<br>– Pricing of freshwater abstraction for the use of agriculture, industry, power generation, and public supply utilities. Also, the potential roles that other financial instruments might play.<br>– Setting volumetric limits on the annual volumes of freshwater abstracted from respective water basins whose conservation is under threat.<br>– Strengthening the financing of MSW management systems in order that modern systems for collection, resource recovery, processing and residual waste disposal may be conducted in a sustainable manner and consistent with household affordability. | Ministry of Economy supported by other Ministries (as relevant)<br>(to either undertake the analysis or commission it) | 2022–2028 |

| No. | ACTION | RESPONSIBLE INSTITUTION/S | PERIOD |
|---|---|---|---|
| | – Scope for strengthening green product procurement practice, including the labelling of appliances according to energy efficiency and or water use efficiency, and prohibiting the sale of appliances that fail to meet minimum technical performance criteria regarding energy efficiency, water efficiency, recyclable content, etc.<br>– Measures to stimulate the formation and / or development of facilities in large conurbations to (i) receive and dismantle end-of-life vehicles and waste electronic equipment, (ii) recover materials, and (iii) the utilisation of such recovered materials, whether in Kazakhstan or by exporting to third-party countries where they may be used as feedstock in the productive sectors.<br>– Measures that could be taken to further develop and promote the work of the Extended Producer Responsibility (EPR) Operator in Kazakhstan.<br>– The potential for using financial instruments, including a landfill tax, to support the delivery of the Government's objectives regarding waste management; and the conditions necessary for the successful introduction of those instruments having the potential to deliver results.<br>– Pricing of energy (electricity, natural gas, hot water) supplied to consumers (industry, tertiary business sectors, institutions and households) and its potential to stimulate consumers to use energy wisely. And other financial instruments that may help to overcome potential associated household affordability issues.<br>– The long-term future of the fossil-fuel extraction and power/ heat generating sectors and how they may be integrated into a carbon-neutral future, including decarbonisation of energy use, consistent with meeting international Climate Change commitments. The analysis should include a consideration of the vision expressed in a revised Green Economy Concept (action 0.2).<br>– Transitioning to decarbonised road transport – electricity and or hydrogen-powered vehicles.<br>– Ratification of the protocols to the Convention on Long Range Transboundary Air Pollution (CLRTAP) (see section A).<br>– Ministry responsibilities for preparing national air pollutant and GHG emissions inventories and emission projections. | | |
| LEGISLATIVE DEVELOMENT | | | |
| 0.10 | Amend legislation as required: (i) to enable the implementation of agreed actions in themes 1 to 5 inclusive, (ii) in response to findings from implementing the action plan, and (iii) to implement agreed policy measures identified from the policy analysis undertaken in action 0.9. | Relevant Ministries | 2022–2028 |
| EDUCATION | | | |
| 0.11 | Develop educational curricula and teaching materials tailored for use in primary, secondary and tertiary education, with the aim of informing future generations on why resource efficient agriculture, efficient water use, waste minimisation, energy conservation, efficient energy use, and environmental protection in mining areas is needed; and what individual people can do to contribute. | RoK Ministry of Education and Science | 2025–2030 |
| **THEME 1: AGRICULTURE AND AGRI-PRODUCT VALUE CHAIN** | | | |
| FIRST SCP THEMATIC STRATEGY | | | |
| 1.1 | Collate and review published benchmark information, good practice documentation, guides, and SCP case studies that may be relevant to the agricultural value chain in Kazakhstan. Also establish contact with organisations active in this field in other countries. | SCP-SM<br>(with international assistance) | 2022–2023 |

| No. | ACTION | RESPONSIBLE INSTITUTION/S | PERIOD |
|---|---|---|---|
| 1.2 | Develop the value chain in a quantitative sense based on the prepared qualitative description and on information held by the Ministries of Agriculture and others. Use this analysis, together with the material collated in action 1.1, as a basis for preparing an initial, priority-driven 3 to 4-year thematic strategy to promote and facilitate the application of SCP tools and measures. Its scope may include guidance on, and examples of, good practice; addressing each of the primary, secondary, tertiary and consumption stages of the value chain; and adoption of features of the EU's Farm-to-Fork Strategy appropriate to Kazakhstan's situation. Suggested priority areas are:<br>– Water demand in crops production – making the best use of the available resources;<br>– Food waste – minimising waste arisings at all stages of production and consumption; and, for those wastes that do occur, giving guidance on the necessary infrastructure (and its operation) for their collection, treatment, storage and beneficial use;<br>– GHG emissions from animal rearing, and digestion of wastes to produce biogas;<br>– Nutrients (N, P) management in the primary production stage – growing crops & animal rearing;<br>– Pesticides use – to be minimised; and less hazardous substances to be used where possible;<br>– Organically produced food;<br>– Packaging of food and drink products – to be reduced and made more recyclable;<br>– Citizen behaviour change. | SCP-SM – calling on Kazakh centres of knowledge, and international assistance<br>Ministries of Economy, Agriculture, Environment, and others – to review and approve proposed programme of work | 2023 |
| 1.3 | Engage with third parties to prepare benchmark reports, good practice guides, case studies, market intelligence reports, etc. as identified in the thematic programme (action 1.2). SCP-SM staff to review, edit and require revisions as appropriate before approving a final output. SCP-SM to disseminate outputs through a tailored communication programme. | SCP-SM – commissioning and production<br>External bodies – prepare drafts | 2023–2026 |
| 1.4 | Prepare impact assessments on the uptake and effectiveness of major thematic outputs, reporting the assessments back to the Ministry of Agriculture, other Ministries and to the SCP-SM. | External institutions | 2024–2026 |
| SECOND SCP THEMATIC STRATEGY | | | |
| 1.5 | Prepare a second-stage, prioritised 3 to 4-year thematic strategy to further promote and facilitate the application of the SCP approach in this value chain; for review and, after necessary revisions, Government approval. Some continuation of first-stage activity may be undertaken but new areas not covered in the first stage may also be addressed. | SCP-SM<br>RoK Ministry of Economy, Ministry of Ecology, Geology and Natural Resources (MEGNR) with the Ministry of Agriculture | 2026–2027 |
| 1.6 | Implement the second-stage strategy, disseminating outputs through a communication programme (as in action 1.3), and conduct further impact assessments. | SCP-SM<br>and external institutions | 2027–2030 |
| OTHER ACTIONS | | | |
| 1.7 | Undertake trials, as necessary, to evaluate and demonstrate the beneficial uses of treated food wastes in agriculture and other land-based applications; prepare code of good practice and promote its use to farmers and others. | Ministry of Agriculture with the assistance of the SCP-SM and technical institutes | 2023–2030 |

| No. | ACTION | RESPONSIBLE INSTITUTION/S | PERIOD |
|---|---|---|---|
| 1.8 | Provide the necessary resources and infrastructure to enable: (i) the collection and processing of food wastes arising from households, the hospitality and food retail sectors, and food and drink production sectors; and (ii) and the beneficial use of treated food wastes. | City and Regional Governments (Akimats) | 2023–2030 |
| 1.9 | Enterprises engaged in the food and drink production and retail sectors to raise their individual and collective awareness of priority issues in the value chain - as identified in the thematic strategy. And establish voluntary business partnerships to take effective steps to achieve pre-set improvement targets concerning priority issues in the value chain. (This action to be stimulated by national and city/regional Government, the SCP-SM, the media, and the voices of citizens and citizen organisations.) | Advanced farms, major producers and retailers of food & drink products | 2023–2030 |
| 1.10 | Enterprises engaged in the hospitality sector (restaurants, hotels etc) to respond positively to Governmental, SCP-SM, media, and NGO messaging on the need to reduce food waste, how this can be done, and the changes in behaviour needed to achieve it. Take necessary practical steps, including investments if appropriate, to reduce food waste and collect efficiently wastes arising. | Hospitality Sector & City/Regional Governments | 2023–2030 |
| 1.11 | Enterprises engaged in the hospitality sector (restaurants, hotels etc) to respond positively to Governmental, SCP-SM, media, and NGO messaging on the need to reduce food waste, how this can be done, and the changes in behaviour needed to achieve it. Take necessary practical steps, including investments if appropriate, to reduce food waste and collect efficiently wastes arising. | Hospitality Sector & City / Regional Governments | 2023–2030 |
| 1.12 | Households and Institutions (Hospitals, Educational establishments, Prisons, Government offices, Technical Institutes etc) where food and drink are consumed to respond positively to Governmental, SCP-SM, media and NGO messaging on the need to reduce food waste, how this can be done, and the changes in behaviour that can help the collection and treatment of the food wastes that do occur. | Consumers and Institutions | 2023–2030 |
| 1.13 | Provide training and capacity strengthening to all stakeholders in the Agriculture and Agri-products value chain | SCP-SM, NGOs and Training Institutions (international assistance) | 2024-2030 |
| **THEME 2: WATER RESOURCES AND WATER USE** | | | |
| FIRST SCP THEMATIC STRATEGY | | | |
| 2.1 | Collate and review published benchmark information, good practice documentation, guides, and SCP case studies that may be relevant to the efficient use of water by consumers (households and institutions), in primary and secondary production and in tertiary business sectors. (Water use in agriculture to be considered in parallel in Theme 1.) Establish contact with organisations active in this field elsewhere. | SCP-SM<br>(with international assistance) | 2023 |
| 2.2 | Prepare an initial, priority-driven 3 to 4-year thematic strategy to promote and facilitate the application of SCP tools and measures to conserve water and use it wisely (efficiently). The thematic strategy should complement and parallel that for the Agriculture and Agri-products value chain, addressing water use in the primary, secondary, and tertiary business sectors and for household and institutional consumption. (Water use for growing agricultural crops may be handled in Theme 1.) | SCP-SM – calling on Kazakh centres of knowledge, and international assistance<br>Ministries of Economy, Industry and MENR – to review and approve the thematic programme | 2023–2024 |
| 2.3 | Engage with third parties to prepare benchmark reports, good practice guides, case studies, etc as identified in the thematic programme (action 2.2). SCP-SM staff to review, edit and require revisions as appropriate before approving a final output. SCP-SM to disseminate outputs via a tailored communication programme. | SCP-SM – commissioning and production<br>External bodies – prepare drafts | 2023–2026 |

| No. | ACTION | RESPONSIBLE INSTITUTION/S | PERIOD |
|---|---|---|---|
| 2.4 | Prepare impact assessments on the uptake and effectiveness of major thematic outputs, reporting the assessments back to MENR, the Ministry of Industry and to the SCP-SM. | External institutions | 2024–2026 |
| SECOND SCP THEMATIC STRATEGY | | | |
| 2.5 | Prepare a second-stage, prioritised 3 to 4-year thematic strategy to further promote and facilitate the application of SCP for improved water use efficiency; for review and Government approval. Some continuation of first stage activity may be undertaken but new areas not covered in the first stage may also be addressed. | SCP-SM<br>Ministry of Economy, MENR, and Ministry of Industry | 2026–2027 |
| 2.6 | Prepare new and revised products, disseminate them through a communication programme (as in action 2.3), and conduct further impact assessments. | SCP-SM and external institutions | 2027–2030 |
| OTHER ACTIONS | | | |
| 2.8 | Enterprises engaged in the processing and manufacturing industries (secondary production) to: (i) raise their awareness of the need to use water wisely and efficiently, as identified in the thematic strategy, and (ii) adopt available SCP tools to help them identify water saving and efficiency measures. (This action to be stimulated by national and city / regional Governments, the SCP-SM, the media, and the voices of citizens and citizen organisations.) | Enterprises | 2023–2030 |
| 2.9 | Households, institutions (Hospitals, Educational establishments, Prisons, Government offices, Technical Institutes etc), enterprises engaged in the hospitality sector (restaurants, hotels etc), all business offices, and such like, to respond positively to Governmental, SCP-SM, media, and NGO messaging on the need to improve water use efficiency, how this can be done, and the changes in behaviour that may achieve it. Take necessary practical steps, including investments where appropriate, to reduce water waste. | All consumers of water - households, institutions, and enterprises in tertiary business sectors | 2023–2030 |
| 2.10 | Engage actively in Citizen Behaviour Change initiatives in support of the SCP-SM, focusing on the promotion of the actions that individuals acting alone and as members of households, institutions and enterprises can take to use water wisely. | NGOs and the Media | 2023–2030 |
| 2.11 | Provide training and capacity strengthening on why and how to save water: targeted at users of water in the primary, secondary and tertiary business sectors and in institutions. | SCP-SM, NGOs and Training Institutions (international assistance) | 2024–2030 |
| **THEME 3: RESOURCE RECOVERY FROM MUNICIPAL SOLID WASTES** | | | |
| THEMATIC STRATEGY ACTIONS | | | |
| 3.1 | Develop Best Available Techniques (BAT) documentation for new waste incineration plants (including waste to energy) – BAT provisions to apply in full to any such plants planned in 2022 and beyond. | International Green Technologies & Investment Projects Centre | 2022–2023 |
| 3.2 | Review Kazakh and international practice for the collection and processing of the ‘wet waste’ component of MSW in regions where winters are extremely cold, e.g. Canada, Russia, and northern Scandinavia. And make appropriate recommendations for consideration in the context of regional approaches to MSW management and resource recovery in Kazakhstan. | MENR | 2022–2023 |
| 3.3 | Collate and review published benchmark information, good practice documentation, guides, and case studies relevant to SCP and the management of MSW and End of Life Products (vehicles, electronic appliances, etc). Also, establish contact with organisations active in this field in other countries and keep abreast of ongoing developments in the EU’s Green Deal and Circular Economy Action Plan. | SCP-SM<br>(with international assistance) | 2023 |

| No. | ACTION | RESPONSIBLE INSTITUTION/S | PERIOD |
|---|---|---|---|
| 3.4 | Prepare an initial, priority-driven 3 to 4-year thematic strategy to promote and facilitate the application of the SCP approach and use of good practice to reduce the net disposal of MSW to landfill. To be achieved mainly through maximising the recovery of recyclable materials (and or energy) – including potentially the separate collection of waste electrical and electronic devices and their deposition at large-scale community sites. But also through reducing packaging use to a minimum, and other measures to minimise MSW generation.<br>This strategy will need to take into consideration potential proposals to build waste-to-energy installations at cities in Kazakhstan; and the outcome of a review of 'wet waste' collection and management (action 3.2). Paralleling the Agricultural value chain and Water thematic strategies, it should cross-reference to, and be consistent with these: a coordinated approach will be necessary. The initial strategy might need to be amended depending on the outcome of policy analyses undertaken as suggested in action 0.9; alternatively, the results of policy analysis might be incorporated in a second-stage strategy, 2026-2030 (action 3.6).<br>In developing the solid waste thematic strategy, consideration should also be paid to the ongoing EU's Green Deal and Circular Economy Action Plan, especially:<br>– Sustainable Product Policy Framework (section B.2 in Annex B);<br>– Policy Initiative: Less Waste, More Value (section B.2 in Annex B);<br>– Farm to Fork Strategy (section B.2 in Annex B). | SCP-SM – calling on Kazakh centres of knowledge, and international assistance<br>Ministries of Economy, Industry, MENR – to review and approve the thematic strategy | 2023–2024 |
| 3.5 | Implement the strategy and undertake independent impact assessments (analogous to actions 2.3 and 2.4) | SCP-SM<br>External institutions (draft outputs, impact assessments) | 2023–2026 |
| 3.6 | Prepare and implement a second-stage thematic strategy, incorporating independent assessments of the impacts of key outputs - as in the initial strategy (actions 3.4 and 3.5). | SCP-SM<br>Ministry of Economy, MENR, Ministry of Industry<br>External institutions (draft outputs, impact assessments) | 2026–2030 |
| OTHER ACTIONS | | | |
| 3.7 | Provide the necessary resources and infrastructure to enable: (i) the separate collection of wet wastes, dry wastes and end-of-life appliances arising at households, institutions and tertiary business sectors; (ii) the processing of each separate waste stream; (iii) the transfer of recovered resources to markets for recycling or use; and (iv) the disposal of residual wastes to engineered landfill. | City and Regional Governments (Akimats) | 2023–2030 |
| 3.8 | Provide regulatory and other market support, as required, to enable enterprises engaged in waste recycling to operate sustainably (environmentally, supply and demand, and profitably). | Government – National, City and Regional (Akimats) | |
| 3.9 | Enterprises engaged in the processing and manufacturing industries, including those engaged in waste recycling, to raise their individual and collective awareness of priority issues in solid waste management - as identified in the thematic strategy. And to take effective steps to achieve voluntarily-set improvement targets. (These actions to be stimulated by national and city/regional Government, the SCP Support Unit, the media, and the voices of citizens and citizen organisations.) | Enterprises | 2023–2030 |

| No. | ACTION | RESPONSIBLE INSTITUTION/S | PERIOD |
|---|---|---|---|
| 3.10 | Tertiary sector businesses, and institutions, to respond positively to Governmental, SCP Support Unit, the media, and NGO messaging on the need to reduce MSW arisings, how this can be done, and the changes in behaviour that can be made to achieve it. Take necessary practical steps, including investments where appropriate, to reduce waste and to collect efficiently such wastes that do arise. | Tertiary Enterprises, Institutions & City/Regional Governments | 2023–2030 |
| 3.11 | Households to respond positively to Governmental, SCP-SM, the media and NGO messaging on the need to reduce solid waste arisings, how this can be done, the separation of wastes at source, and the changes in behaviour that can help achieve this. | Consumers | 2023–2030 |
| 3.12 | Engage actively in Citizen Behaviour Change initiatives in support of the SCP-SM, focusing on the promotion of what individuals acting alone and as members of households, institutions and enterprises can do to minimise the generation of MSW, its effective separation at source into distinct fractions, and to maximise the recovery and recycling potential of the generated wastes.. | NGOs and the Media | 2023–2030 |
| 3.13 | Provide training and capacity strengthening for all stakeholders on why and how to minimise waste arisings and maximise the recovery of resources form those wastes that do arise. | SCP-SM, NGOs and Training Institutions (with international assistance) | 2024–2030 |
| **THEME 4: ENERGY VALUE CHAIN** | | | |
| IMPLEMENTING BAT | | | |
| 4.1 | Develop BAT documentation for the energy value chain (mineral oil and natural gas, coal and lignite), their coverage to include: (i) resource extraction; the management of rock waste, spoil and muds arising, and site aftercare, considering water pollution, solid waste and emissions to air; (ii) the refining and storage of oil and natural gas; (iii) the preparation, storage and transport of coal; (iv) coke production; and (v) coal and natural-gas fuelled large-scale combustion plants for the generation of power, combined heat and power, and heat. | International Green Technologies & Investment Projects Centre | 2022–2027 |
| 4.2 | Issue permits to operate to activities subject to BAT regulation subject to the requirements laid out in action 4.1. | MENR (permitting department) | 2023–2030 |
| 4.3 | Operate, maintain and self-monitor activities subject to BAT regulation in accord with permit conditions (laid down in action 4.2), making investments to implement BAT in accordance with the set timescales. | Enterprises - engaged in extraction and refining/processing operations, and large combustion plants | 2024–2030 |
| 4.4 | Monitor and inspect enterprises subject to BAT regulation, enforcement actions to be taken in the event of non-compliance. | MENR (inspection & enforcement department) | 2024–2030 |
| THEMATIC STRATEGY ACTIONS | | | |
| 4.5 | Collate and review published benchmark information and good practice documentation on energy efficiency in the processing and manufacturing industries, energy-using appliances, and buildings. Collate case studies on how energy efficiency can be increased and GHG emissions reduced by other means, including the use of renewable energy. Establish contact with organisations active in this field in other countries and keep abreast of ongoing developments in the EU's Green Deal and Circular Economy Action Plan. | Ministry of Energy - supported by the Institute for the Development of Electricity and Energy Saving, and SCP-SM (together with international assistance) | 2024–2025 |

| No. | ACTION | RESPONSIBLE INSTITUTION/S | PERIOD |
|---|---|---|---|
| 4.6 | Prepare and implement a priority-driven thematic strategy to promote energy efficiency and energy conservation to all consumers, and the use of renewable energy resources where available and appropriate. The strategy must draw on the energy efficiency road map being developed under the national project Zhasyl Kazakhstan 2021-2025. It must also reflect the law 'On Amendments and Additions to Certain Legislative Acts of the Republic of Kazakhstan on Energy Saving and Energy Efficiency Improvement', issued as a draft in March 2021 (see section A.1, Annex A of the present document). The thematic strategy should also consider ongoing developments in the EU's Green Deal and its implementation. It may also consider the earlier proposed 'National Roadmap for Energy Conservation and Efficiency 2022-2026' prepared with Technical Assistance from the World Bank and German Energy Agency DENA (action 27 of Kazakhstan's Green Economy Action Plan – see section B.3, Annex B of the present document). | SCP-SM – partnering as appropriate with the Institute for the Development of Electricity and Energy Saving, and other Kazakh centres of knowledge<br>Ministries of Economy, Industry, Environment – to review and approve the thematic programme | 2024–2030 |
| OTHER ACTIONS | | | |
| 4.7 | Building on a recent capacity strengthening initiative (2019-2020) and the preparation of a national emissions inventory report to CLRTAP for 2019 (see section A.2, Annex A), prepare updated annual national inventories for GHG emissions, and for air pollutants ($PM_{2.5}$, $SO_2$, NOx, NMVOCs, $NH_3$). Regarding air pollutants only, also prepare separate emissions inventories for major city regions that experience air pollution or might do so in future e.g. Nur-Sultan, Almaty, Shymkent. In addition to their annual updating, a policy of continuous improvement should be adopted, the inventories incorporating planned methodological improvements. Seek further capacity strengthening support from international sources for undertaking this activity, if appropriate. | MENR in partnership with other Ministries<br>Kazhydromet | 2023–2030 |
| 4.8 | Building on action 4.7, prepare national emissions projections to 2030 and beyond for both GHGs and air quality pollutants – and projections for air quality pollutants in major city regions. Prepare these biannually (2024, 2026, etc) for defined scenarios including at least (1) assuming existing policies and measures and (2) assuming additional policies and measures to meet goals and objectives. The preparation of emission projections, enables the impacts of proposed policies and measures on emissions to be assessed – independently and in combination. Projections are valuable tools that aid policy design and development. It also serves as a valuable opportunity to develop inter-Ministry cooperation and collaboration. Seek further capacity strengthening support from international sources for undertaking this activity, if appropriate. | MENR in partnership with other Ministries<br>Kazhydromet (with international assistance) | 2024–2030 |
| 4.9 | Enterprises engaged in the processing and manufacturing industries (secondary production) to: (i) raise their awareness of the need to use energy wisely and efficiently, (ii) adopt available SCP tools to help identify energy saving and efficiency measures, and (iii) make investments in the identified measures. This action may be stimulated by national and city/regional Governments, the SCP-SM, media, and the voices of citizens and citizen organisations. | Enterprises | 2024–2030 |
| 4.10 | Households, institutions (Hospitals, Educational establishments, Prisons, Government offices, Technical Institutes etc), enterprises engaged in the tertiary business sectors including retail outlets, hospitality (restaurants, hotels etc), and all business offices, to respond positively to Governmental, SCP-SM, media, and NGO messaging. This messaging to focus on the need to improve energy conservation and efficiency, how this can be done in practice, and the changes in behaviour that can achieve it. Take practical steps, including investments where appropriate, to reduce energy waste. | Households, Institutions, Tertiary sector Businesses, and all offices - consumers of energy | 2024–2030 |
| 4.11 | Engage actively in Citizen Behaviour Change initiatives in support of the SCP-SM, focusing on the promotion of actions that individuals can take to use energy more efficiently – whether acting alone or as members of households, institutions and enterprises. | NGOs and the Media | 2024–2030 |

| No. | ACTION | RESPONSIBLE INSTITUTION/S | PERIOD |
|---|---|---|---|
| 4.12 | Provide training and capacity strengthening on energy conservation and improving energy efficiency, targeting users of energy in primary, secondary and tertiary businesses and institutions. | SCP-SM, NGOs and Training Institutions (international assistance) | 2024–2030 |
| **THEME 5: METALS VALUE CHAIN** | | | |
| IMPLEMENTING BAT | | | |
| 5.1 | Develop BAT documentation for the metals value chain, coverage to include: resource extraction and the management of rock waste and spoil arisings; the storage, processing and refining of metal ores; steel production; forging of ferrous and non-ferrous metals; and the post-mining management and aftercare of mining and rock storage sites, tailing ponds etc. It may consider water pollution, solid wastes and emissions to air. In preparing this documentation, consideration should be given to the ongoing developments in the EU's Green Deal, in particular the objective to 'mobilise industry to achieve a clean, climate neutral and circular economy' (EGD 2.1.3 in section B.1, Annex B of the present document) | International Green Technologies & Investment Projects Centre | 2022–2027 |
| 5.2 | Issue permits to operate to activities subject to BAT regulation subject to the requirements laid out in action 5.1. | MENR (permitting department) | 2023–2030 |
| 5.3 | Operate, maintain and self-monitor activities subject to BAT regulation in accord with permit conditions (laid down in action 5.2), making investments to implement BAT in accordance with the set timescales. | Enterprises in the ore mining, ore processing & refining, and foundries & smitheries sectors | 2024–2030 |
| 5.4 | Monitor and inspect enterprises subject to BAT regulation, enforcement actions to be taken in the event of non-compliance. | MENR (inspection & enforcement department) | 2024–2030 |
| THEMATIC STRATEGY ACTIONS | | | |
| 5.5 | Prepare and implement a priority-driven thematic strategy to promote resource efficiency (materials and energy) in the processing and refining of metal ores and alloys, and in the manufacture of metal goods. This must take into consideration the current status and planned growth in the metals refining and metal goods manufacturing sectors and should acknowledge ongoing developments in the EU's Green Deal, in particular the Circular Economy Action Plan and its implementation. SCP-SM to disseminate outputs from the thematic strategy via a communications programme. | SCP-SM – calling on Kazakh centres of knowledge<br>Ministries of Economy, Industry, and MENR – to review and approve the thematic programme. | 2024–2030 |
| OTHER ACTIONS | | | |
| 5.6 | Enterprises engaged in the metals processing and manufacturing industries to: (i) raise their awareness of the need to make efficient use of material and energy resources, (ii) adopt SCP tools to help identify efficiency measures in the value chain, and (iii) make investments in the identified measures. This action to be stimulated by national and city/regional Governments, the SCP-SM, the media, and the voices of citizens and citizen organisations. | Enterprises | 2024–2030 |
| 5.7 | Provide training and capacity strengthening on why and how to improve resource efficiency and incorporate cleaner design and other SCP techniques integral to a circular economy. Training and capacity strengthening to be targeted at enterprises in the metals processing and metal good manufacturing sectors. | SCP-SM, NGOs and Training Institutions (international assistance) | 2024–2030 |

# ANNEX A: NATIONAL POLICIES, REGULATIONS, INTERNATIONAL COMMITMENTS AND INSTITUTIONAL ARRANGEMENTS RELEVANT TO KAZAKHSTAN'S GREEN ECONOMY ACTION PLAN (GEAP)

## A.1 National Policies, Plans and Regulations

### Kazakhstan–2050: New political course of an established state

A national strategic document of particular relevance for SCP is the Strategy 'Kazakhstan–2050: New political course of an established state', set forth in the Address of the President of the Republic of Kazakhstan to the people of Kazakhstan on December 14, 2012. In particular, the Strategy places emphasis on the development of environmentally friendly production.

### Concept for the transition of the Republic of Kazakhstan to a 'Green Economy'[66]

In 2013, the country approved a concept for the transition of the Republic of Kazakhstan to a 'green economy'. With the aim of transition to a 'green economy', a number of laws and by-laws were adopted in the field of energy conservation and the development of renewable energy sources. The Green Economy Concept identified eight goals and fourteen target indicators. The goals are:

1. Elimination of water scarcity at the national level
2. Elimination of water resources deficit at the basin level
3. Increase in productivity and labour in agriculture by 3 times
4. Reducing the energy intensity of GDP relative to the level in 2008: 30% reduction by 2030, 50% reduction by 2050
5. The proportion of alternative sources in electricity generation to reach 50% in 2050
6. Gasification of the regions of northern and eastern Kazakhstan
7. By 2050, the carbon dioxide emissions from the electric power industry to decrease by 40% relative to the emissions in 2012
8. The proportion of the treated waste to reach 50% in 2050

The main priority tasks facing the country in transitioning to a green economy were seen as:

1) Increasing the efficiency of the use of resources (water, land, biological, etc.) and their management
2) Modernisation of the existing and construction of new infrastructure
3) Improving the well-being of the population and the quality of the environment through cost-effective ways to mitigate pressure on the environment
4) Improving national security, including water security

The Concept envisaged three stages for implementation, involving a total investment estimated at about $3–4 billion per year on average from 2014 to 2050, most of the funding to be raised from private investors. The three time-bound stages are:

**2013–2020**: optimising the use of resources and increasing the efficiency of environmental protection, as well as creating a 'green' infrastructure (Еру кушпре еукь шы ишщдщпш)

**2020–2030**: transformation of the national economy focused on the careful use of water, encouraging and stimulating the development and widespread introduction of renewable energy technologies, as well as the construction of facilities based on high standards of energy efficiency

**2030–2050**: the transition of the national economy to the principles of the 'third industrial revolution', requiring the use of natural resources, provided they are renewable and sustainable

66 Decree of the President of the Republic of Kazakhstan dated May 30, 2013, No. 577

***GEC Action Plan: First-Stage Implementation: 2013–2020***

Several sectoral policy documents formed the basis for undertaking the first stage:

- Program for the development of the agro-industrial complex in the Republic of Kazakhstan for 2013–2020 'Agrobusiness–2020
- State program for accelerated industrial and innovative development of the Republic of Kazakhstan for 2010–2014
- Adjustment of educational programmes
- Territorial development programs, strategic plans of state bodies

To implement the first stage of the concept, the government approved an Action Plan for 2013–2020, in which these measures were included

- Regulatory, institutional and staffing issues
- The sustainable use of water resources
- Developing sustainable and highly productive agriculture
- Energy-saving and energy efficiency
- Development of the electric power industry
- Improvement of the waste management system
- Reduction of air pollution
- Activity to develop and conserve the sustainable use of biological resources
- Development of the hydrometeorological service
- Foreign policy measures aimed at highlighting the progress of the implementation of the Concept of the transition of the Republic of Kazakhstan to a 'green economy'
- Pilot projects concerning: the creation of pilot 'green' areas in the field of electricity and energy efficiency; pilot in agriculture and water management; pilots in waste management and air pollution abatement; and pilots in effective ecosystem management
- Conversion of vehicles to environmentally friendly fuels, including the introduction of electric vehicles and the creation of appropriate infrastructures
- Implementing the treatment of emissions from thermal power plants and the widespread saving of electricity based on the latest technologies in production and everyday life
- Proving state support for the development of domestic science in the field of renewable natural resources

Unfortunately, the progress and outcomes of this first stage implementation are uncertain.

***GEC Second-stage Action Plan 2021–2030***

An Action Plan for 2021–2030 was approved in July 2020, establishing the scope of policies and measures for the second stage of the Green Economy Concept's implementation. The plan includes measures to achieve the goals of the Concept of Transition to a Green Economy in the following eight priority areas for development:

1. Water resources
2. Agriculture
3. Energy efficiency
4. Reducing the level of carbon dioxide emissions in the electric power industry
5. Air pollution
6. Collection, removal, utilisation, processing and disposal of waste
7. Conservation and effective management of ecosystems
8. Formation of ecological culture

Measures will be implemented using funds provided from Republic-level and local budgets. Implementation responsibility lies with sectoral ministries, local authorities, and quasi-state institutions such as JSC 'Electric energy and energy saving development institute', RSE Kazhydromet, International financial centre Astana, JSC 'Zhasyl Damu'. There are no quantitative or qualitative indicators in the GEAP.

## Environmental Code of the Republic of Kazakhstan[67]

On January 9, 2007, the Environmental Code of the Republic of Kazakhstan was adopted. The first version of the Code had a positive influence on environmental regulation, and it became a good basis for solving environmental issues at that time. However, about eighty amendments have been made to it in 13 years.

On January 2, 2021, a new Environmental Code was adopted, which came into force on July 1, 2021. The new version of the code includes the best practices of the countries of the Organization for Economic Cooperation and Development (OECD) and the countries of the European Union. The main directions of the Code are:

1. adoption of the 'polluter pays' principle
2. targeted use of budget funds for environmental protection measures
3. introduction of the best available technologies (BAT)
4. tightening of environmental requirements, considering international best practices
5. introduction of an automated monitoring system
6. improvement of industrial and consumer waste management, implementation of the 'Waste to Energy' principle

From 2022, according to the new Code, local executive bodies will have to invest in environmental protection measures in the region for emissions into the environment. The polluter pays principle implies that it is more profitable for a polluting enterprise not to pollute the environment than to pay fines. However, in the event of contamination, the facility must take all necessary actions to restore the original environment.

Large enterprises will implement the best available technologies (BAT) in accordance with the program of environmental efficiency. Since 2019, based in the International Green Technologies & Investment Projects Centre (a non-profit Joint Stock Company), a specialised structural unit has been created, the BAT Bureau. Starting from the beginning of 2021, the BAT Bureau began to develop BAT reference books. For this purpose, the centre is conducting a comprehensive technological audit at 50 enterprises from the oil and gas, mining and metallurgical, chemical and electric power industries, which account for 80% of pollution volumes. The audit will make it possible to comprehensively assess the readiness of the industry for the transition to BAT, as well as determine the feasibility of introducing advanced resources, energy-saving, waste-free technologies at enterprises, and will serve as the basis for the development of the BAT reference books.

Within the framework of the Environmental Code, a number of norms of the Entrepreneurial, Criminal, Water Codes, and about 140 regulatory legal acts have been revised:

- for exceeding the norms of emissions into the environment, the administrative fine increased by 10 times
- for non-compliance with the requirements for the protection of atmospheric air and fire safety during storage or incineration of waste, the administrative fine increased up to 5 times
- measures of criminal liability for individuals and legal entities are being strengthened
- where enterprises do not satisfy BAT requirements, emissions payments will increase over time: 2x from 2025, 4x from 2028, and 8x from 2031
- automated monitoring systems are to be used at stationary sources of emissions with an emission volume of more than 500 t/year from one source, and the four main emissions to be continuously monitored are nitrogen oxides (NOx), sulphur dioxide ($SO_2$), carbon monoxide (CO), and particulate matter (PM). From 2023, Operational Category I installations are obliged to introduce automated monitoring systems at the main stationary sources of emissions

67 Code of the Republic of Kazakhstan dated January 2, 2021, No. 400- VI 3PK

To systematically address the issues of illegal dumps, the new Code provides for licensing for enterprises engaged in waste processing and disposal, a notification procedure for waste disposal organisations has been introduced, with a requirement to install satellite navigation systems and sensors on waste disposal vehicles.

In order to reduce the volume of waste accumulation, it is envisaged to introduce energy waste utilisation to generate electricity.

A register of closed (decommissioned, liquidated) and abandoned (ownerless) waste storage facilities from the mining industry, which cause significant negative impact, is being maintained.

## National Project Zhasyl Kazakhstan (Green Kazakhstan)

This National Project was approved by the Decree of the Government of the Republic of Kazakhstan dated October 12, 2021, No. 731. The Project Passport states the Project's goal as creating a favourable living environment for the population and improving the environmental situation, including:

- Improving the quality of atmospheric air
- Efficiently handling production and consumption waste
- Efficient and careful use of water
- Preserving the ecosystems of Lake Balkhash and the Northern Aral Sea
- Preserving biological diversity by increasing the number of rare and endangered species of animals and ichthyofauna, as well as the creation of specially protected natural areas
- An increase in the area of green spaces
- Instilling a respectful attitude to nature and the animal world
- Modernisation of the ecological consciousness of the population

## Improvement of legislative norms in the field of energy saving and energy efficiency

In March 2021, a draft law 'On Amendments and Additions to Certain Legislative Acts of the Republic of Kazakhstan on Energy Saving and Energy Efficiency Improvement' was issued. The main directions are the State Energy Register, energy audit, state control, budgetary sector and regional policy.

The draft law stipulates that, at large enterprises (consuming more than 1500 tonnes of coal equivalent per year), responsible persons on energy conservation issues should be identified and that they will act as energy managers.

Within the framework of the energy register, it is proposed to optimise the list of information for the private sector and for the public sector: to expand it, supplementing it with information on equipping with an automated heating unit and other information in order to further compare with best practices (benchmarking) and prepare recommendations.

Energy efficient government procurement will be introduced to reduce energy consumption in government agencies.

The establishment of energy consumption standards, monitoring of their observance, benchmarking and issuance of appropriate recommendations for energy efficiency are provided.

As a result of the adoption of the bill, the following positive legal and socio-economic consequences are expected:

1) Reducing the energy intensity of GDP
2) Improving the energy efficiency of the public sector
3) Improving the quality of energy audit
4) Increase in the share of energy efficient equipment on the market

The implementation of the draft Law will not require additional financial costs from the national budget.

## National Project for the Development of the Agro-Industrial Complex of the Republic of Kazakhstan for 2021–2025

The 'State program for the development of the agro-industrial complex for 2017–2021' has expired and has been replaced by the 'National Project for the Development of the Agro-Industrial Complex of the Republic of Kazakhstan for 2021–2025'. This Project was approved by the Decree of the Government of the Republic of Kazakhstan dated October 12, 2021, No. 732. According to the press release on the approval of the National Project:

'*This draft resolution of the Prime Minister of the Republic of Kazakhstan ('the Draft') provides for the adoption of the National Project for the Development of the Agro-Industrial Complex for 2021-2025. The project developer is the Ministry of Agriculture of the Republic of Kazakhstan.*

*The basis for the adoption of the project is the message of the Head of State Tokayev K.K. to the people of Kazakhstan from September 1, 2020 'Kazakhstan in a new reality: time for action.'*

*The adoption of the National Project will allow achieving such goals as:*

- *Saturation of the domestic market with socially significant foodstuffs;*
- *A stable increase in the income of 1 million rural residents;*
- *Increase in labour productivity by 2.5 times;*
- *An increase in the export of processed products of the agro-industrial complex by 2 times.*

*The adoption of the draft resolution will not entail negative socio-economic, political, legal, environmental, demographic and other consequences*.'

## Climate change

Central Asia is one of the most vulnerable regions to climate change. The main reasons are the sharply continental climate, the presence of mountainous landscapes, water scarcity and the agricultural orientation of national economies. Among the main climatic threats that pose a particular threat to the region are an increase in the number of extreme weather events, a decrease in water availability, land degradation, and an increase in pressure on pastures.

Considering the vulnerability of the region, in 2016 the Program on Adaptation to Climate Change and Mitigation of its Impacts in the Aral Sea Basin (CAMP4ASB) was initiated.

One of the main challenges facing the project was the creation of a common and comprehensive knowledge platform on climate-change issues. To this end, the development of the Central Asia Climate Information Platform (CACIP) has been initiated to help stakeholders access, analyse and visualise publicly available data to support their awareness-raising activities, as well as assessment and decision-making procedures. The platform will act as a kind of 'one-stop shop' for climate knowledge at both national and regional levels. The information will be available free of charge to everyone.

In order to consolidate resources in the region, a Memorandum was signed in 2019 on the creation of the Central Asian Climate Network of Public Organizations. The network included national networks working on the environment, sustainable development and climate change, among them: the Eco-Forum of NGOs of Kazakhstan, the Climate Network of Kyrgyzstan, the Climate Network TajCN of Tajikistan, the Nature Conservation Society of Turkmenistan and the Ecological Movement of Uzbekistan.

The main goal of this network is to unite the efforts of national public organisations and civil society networks for a more effective coordinated implementation of climate change policies in the countries of Central Asia.

## A.2 International Commitments

The main international conventions/protocols/agreements in the field of environmental protection that have been signed or ratified by the Republic of Kazakhstan are noted below.

| No. | Convention, protocol and agreement | Document of the Republic of Kazakhstan on accession/ratification |
|---|---|---|
| 1 | The Convention on the Prohibition of Military or any Other Hostile Use of funds impacts on the environment (Geneva, May 18, 1977) | Resolution of the Supreme Council of the Republic of Kazakhstan on accession from 20.02.1995, No. 301 - XIII |
| 2 | Convention on Long-range Transboundary Air Pollution (Geneva, 13 November 1979) | Law of the Republic of Kazakhstan on accession of 23.10.2000, No. 89 - II |
| 3 | Vienna Convention for the Protection of the Ozone Layer (Vienna, 22 March 1985) | Law of the Republic of Kazakhstan on accession dated 30.10.1997 No. 177-1 |
| 4 | Montreal Protocol on Substances that Deplete the Ozone Layer (Montreal, September 16, 1987) | Law of the Republic of Kazakhstan on ratification of 06.04.2011 g. |
| 5 | Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (Basel, March 22, 1989) | Law of the Republic of Kazakhstan on accession dated February 10, 2003, No. 389 - II |
| 6 | Convention on Environmental Impact Assessment in a Transboundary Context. Espoo (Finland, February 25, 1991) | Law of the Republic of Kazakhstan on accession from 21.10.2000. No. 86- II |
| 7 | The International Convention on Civil Liability for damage from pollution by oil in 1992 city of (the Convention on responsibility of 1992) | Resolution of the Cabinet of Ministers of the Republic of Kazakhstan on accession from 04.03.1994, No. 244 |
| 8 | Framework Convention for the OH on Climate Change of 9 May 1992 | Decree of the President of the Republic of Kazakhstan on ratification of 04.05.1995 No. 2260 |
| 9 | Convention on Biological Diversity (Rio de Janeiro, June 5, 1992). | Approved by the Resolution of the Cabinet of Ministers of the Republic of Kazakhstan dated 19.08.1994, No. 918 |
| 10 | Convention I of the United Nations to Combat Desertification (Paris, June 17, 1994) | Law of the Republic of Kazakhstan dated July 7, 1997, N 149-1 |
| 11 | Energy Charter Treaty (Lisbon, December 17, 1994) | Ratified by Presidential Decree No. 2537 of 18.10.1995 |
| 12 | The Kyoto Protocol to the Framework Convention Personal OH on changing climate (Kyoto, 11 December 1997) | Law of the Republic of Kazakhstan on ratification of March 26, 2009, No. 144 - IV |
| 13 | Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (Aarhus, 25 June 1998) | Ratified by the Law of the Republic of Kazakhstan dated October 23, 2000, No. 92 - II |
| 14 | Cartagena Protocol on Biosafety to the Convention on Biological Diversity (Montreal, January 29, 2000) | Ratified by the Law of the Republic of Kazakhstan dated June 17, 2008, No. 43 - IV |
| 15 | Stockholm Convention on Persistent Organic Pollutants (Stockholm, May 22, 2001) | Law of the Republic of Kazakhstan on ratification of June 7, 2007, No. 259 |

| | | |
|---|---|---|
| 16 | Framework Convention for the Protection of the Marine Environment of the Caspian Sea (Tehran, November 4, 2003) | Ratified by the Law of the Republic of Kazakhstan dated December 13, 2005, No. 97 - III. Entered into force on August 12, 2006. |
| 17 | Agreement on Cooperation in the Field of Environmental Protection of the Member States with NG (Minsk, May 31, 2013) | Approved by the Decree of the Government of the Republic of Kazakhstan dated May 30, 2013, No. 559 |
| 18 | Paris Agreement (Paris, 12 December 2015) | Decree of the President of the Republic of Kazakhstan dated July 20, 2016, No. 301 |

## Convention on Long-range Transboundary Air Pollution (CLRTAP)

In 1979, the Convention on Long-Range Transboundary Air Pollution was signed in Geneva. The objective of the Convention is to limit and, as far as possible, gradually reduce and prevent air pollution, including long-range transboundary air pollution.

Kazakhstan joined the convention on October 23, 2000. However, it has not ratified any of the protocols to the Convention. This limits the ability of Kazakhstan to participate in UNECE cooperation programs and receive financial and technical support for the implementation of programs under the Convention.

During 2004–2007 Kazakhstan participated in the UNECE project 'Capacity building for air quality management and the application of clean coal combustion technologies in Central Asia', the first component of which included the development of a concept, a program to improve air quality management in Kazakhstan and an action plan.

To support Kazakhstan in ratifying and implementing the Convention, assistance was provided in the development of emission inventories and analysis of national legislation. In 2016, Kazakhstan submitted its emission inventories and inventory information report for the first time.

At the end of 2019, Kazakhstan took part in the sessions of the Executive Body of the Convention. In 2019–2020, national experts were trained and emissions forecasts were developed. As part of the obligations under the Convention, a national emission report for 2019 was submitted. The report makes recommendations at the national level to ratify and implement the protocols of the Convention on Long-range Transboundary Air Pollution (the EMEP Protocol will continue to accede to the three most important Protocols: Protocol to Abate Acidification, Eutrophication and Ground-level Ozone (Gothenburg Protocol), Protocol on Heavy Metals and Protocol on Persistent Organic Pollutants.

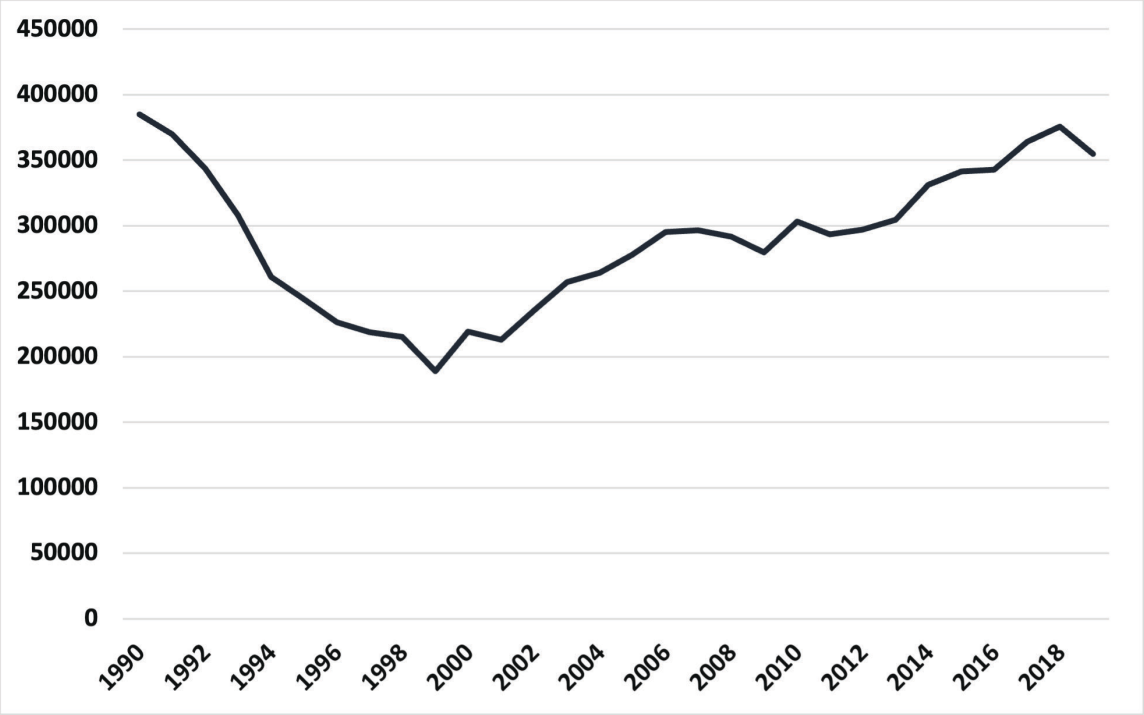
## Paris Agreement

Kazakhstan signed the Paris Agreement in accordance with the Decree of the President of the Republic of Kazakhstan dated July 20, 2016, and on October 27, the Parliament of the Republic of Kazakhstan ratified this agreement.

Under the Paris Agreement, under the UN Framework Convention on Climate Change, Kazakhstan has committed itself to reduce greenhouse gas (GHG) emissions from the 1990 level (386.3 million tonnes) by 15% by 2030 (328.3 million tonnes).

However, emissions have tended to grow substantially since 1999, though they dipped somewhat in 2019 relative to 2018 – see Figure 29. The energy sector accounts for the largest share of greenhouse gas emissions at about 82.5% in 2018-2019, agriculture and industrial processes contributing about a further 10% and 6% respectively to total national emissions. The constant growth of energy generation based on coal technologies (about 80% of the total), is a major factor in the growth of emissions since 1999, contributing to a 21.6% increase in GHG emissions per capita over the past 10 years. Given these dynamics, Kazakhstan's implementation of the Paris Agreement is under review.

*Figure 29: Total national greenhouse gas* **emissions (thousand tonne $CO_2$-Eq/y) 1990 to 2019** *in the Republic of Kazakhstan excluding* **land use, land use change and forestry sector** *emissions*




*Source: Data provided in Table 2.6 of the National report of the Republic of Kazakhstan on the inventory of anthropogenic emissions from sources and removals by sinks of greenhouse gases not regulated by the Montreal Protocol for 1990-2019. Report prepared by the Department of Climate Policy and Green Technologies of MEGNR.*

Currently, there are over 115 renewable energy facilities in the Republic with an installed capacity of 1705 MW. By the end of 2020, the generation of green energy amounted to 3.24 billion kWh, or 3% of the total electricity production. There is practically no accounting for the reduction in GHG emissions resulting from the use of renewable energy sources, however, and the GHG trading system is not operational. Nevertheless, the Ministry of Ecology, Geology and Natural Resources of RoK plans to restart the trading system from 2022, and the rules of state regulation in the field of emissions and reduction of GHGs are being developed. In connection with the obligations of the Republic under the Paris Agreement, the country is expected to introduce additional measures of carbon regulation. Decisions on the exact timing and starting configuration of these measures have not yet been made, but recently updated plans of Kazakhstan to fulfil its obligations (Nationally Determined Contributions, or NDCs) suggest the forthcoming strengthening of the Emissions Trading System (ETS-KZ) and the introduction of a carbon tax in Kazakhstan. Strengthening of the ETS consistent with the parameters of emission trading systems in regions and countries such as the EU and China involves:

- Development and approval of plans to reduce by 2030 free $CO_2$ emission quotas for installations and sectors of the economy
- Determining an acceptable level of carbon prices and accounting for them when determining the amount of emission allowances allocated free of charge
- Ensuring two-way communication with facility operators regarding the government's plans for the allocation of quotas and their impact on the activities of these operators
- Ensuring the functioning of exchange trading in carbon units, reducing the risks of uncertainty in the distribution of quotas
- Inclusion of other greenhouse gases in the ETS (from 2026): emissions of nitrous oxide ($N_2O$) and perfluorocarbons (PFC), methane ($CH_4$) leaks in the oil and gas industry
- It is planned to reduce the volume of distributed quotas annually, which, according to rough estimates, may lead to a maximum volume of emissions of 120 million tonnes of $CO_2e$ by 2030

The possibility of introducing a carbon tax in Kazakhstan in 2023–2025 is being discussed. Two types of carbon tax are considered:

1) **Carbon tax on energy consumption**. It is assumed that it will be paid for by all stationary and mobile sources of direct GHG emissions, whose emissions are not quoted under the ETS-KZ. The tax will be included in the fuel price (by type of VAT or excise duty). It is planned to exempt such areas as electricity production, the residential sector (basic energy consumption) and natural gas vehicle (NGV) fuel for transport from the carbon tax.
2) **Carbon tax to stimulate the maintenance of humus levels in arable soils**. Tax for farmers in crop production with reference to the indicator of the content of humus in the soil, relative to its content in the previous year. The tax is aimed at encouraging farmers to prevent depletion of arable land.

Risks:

1) The cost of producing natural gas in Kazakhstan is much higher than that of coal. Operating costs and the corresponding cost of electricity from gas-fired power plants will be higher than for coal-fired power plants. This can lead to an additional increase in the price of electricity.
2) Energy producing organisations that introduce BAT will incur additional costs, at least initially. For large combustion plants, in accordance with the EU BAT principles, dust cleaning technologies should be provided and removal of sulphur oxides (SOx) and nitrogen oxides (NOx) in the flue gas ducts. The corresponding cost items will also increase the cost of electricity.

## Biodiversity

Kazakhstan joined the UN Convention on Biological Diversity in 1994. In 2010, in Nagoya, Japan, the parties to the convention adopted the Strategic Plan for Biodiversity Conservation and Sustainable Use, including the 20 Aichi Biodiversity Targets 2011–2020. The countries of the convention were obliged to develop revised and updated national strategies and action plans for biodiversity conservation within two years on the basis of a common international framework.

However, such a strategy has not yet been adopted in Kazakhstan. Accordingly, there is no purposeful state policy for the conservation of biodiversity, and the obligations are not being fulfilled.

The new Environmental Code implements Kazakhstan's obligations under the Convention on Biodiversity (CBD), and the Convention to Combat Desertification and Drought. According to the objectives of the CBD at the global level, it is planned by 2020 to ensure public awareness of the value of biodiversity and measures for its conservation and sustainable use, and to introduce the value of ecosystem services into national strategic documents and legislation. In this regard, in the Environmental Code states that:

- In order to implement the ecosystem approach, the following concepts have been introduced: 'Ecosystem', 'Ecosystem approach', 'Ecosystem services', 'Ecological network (Econet)', 'Ecological corridors', defined the basic rights and obligations of the subjects of regulation
- Within the framework of the environmental impact assessment (EIA), the obligation to assess the impact on ecosystems and biodiversity is considered
- It is envisaged to supplement the Environmental Action Plans with nature restoration measures
- There are provisions for the implementation of the mechanism of compensation for the loss of biodiversity and ecosystems, accounting for the value of ecosystem services for the purposes of environmental insurance
- In order to involve the private sector in biodiversity and ecosystem conservation, economic mechanisms such as payments for ecosystem services are fixed

## Cooperation with the EU

The Enhanced Partnership and Cooperation Agreement with Kazakhstan became the legal basis for bilateral relations between the EU and Kazakhstan, coming into force in 1999. In November 2006, a Memorandum of Understanding on energy cooperation between the EU and Kazakhstan was also signed.
In 2015, the European Union and Kazakhstan launched a project to support Kazakhstan's transition to a green economy model. The Concept will be implemented in three stages:

1) 2013–2020: optimising the use of resources and increasing the efficiency of environmental protection, as well as creating a 'green' infrastructure
2) 2020–2030: rational use of natural resources, introduction of renewable energy based on high technologies
3) 2030–2050: the transition of the national economy to the principles of the 'third industrial revolution', which is based on the use of natural resources in the event of their renewability

The project was funded by the European Union and implemented by the United Nations Development Program (UNDP). On 31 October 2018, the final conference of the project 'Supporting Kazakhstan´s transition to a green economy model' was held.

The new version of the Environmental Code contains norms on a phased transition from sanitary and hygienic standards to environmental standards adopted and used in the EU and OECD countries:

- EU Directive 2013/39/EU on priority substances in the field of water policy
- EU Directive 2008/59/EC 'On ambient air quality and cleaner air for Europe'
- Protocols on Heavy Metals, on POPs, on EMEP (Long-term Financing of the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe), Gothenburg Protocol to the Convention on Long-Range Transboundary Air Pollution

The Enhanced Partnership and Cooperation Agreement came into force on March 1, 2020. The European strategy is to bring Kazakhstan and Central Asia closer to Europe. The term 'connectivity' embraces transport, energy, roads, air traffic and humanitarian ties. The European Union is ready to support specific projects in the field of ecology and provide assistance to the Fund for the Saving of the Aral Sea.
Improving energy efficiency in Central Asia can be an important area of cooperation. New technologies for renewable energy sources and energy conservation techniques are needed in order to mitigate GHG emissions.

## Sustainable Development Goals (SDG)

The Sustainable Development Goals are a universal call to action to end poverty, protect the planet and improve the lives and prospects of everyone, everywhere. These 17 goals were adopted by all UN member states in 2015 as part of the 2030 Agenda for Sustainable Development. Annex C indicates those SDGs that are closely related to SCP action.

To monitor and review the implementation of 17 Goals and 169 targets of the new agenda, a system of global indicators developed by the Inter-Agency and Expert Group on Sustainable Development Goals Indicators (IEG-SDGs) is used in Kazakhstan.

# ANNEX B: COMPARATIVE ANALYSIS OF PRIORITIES: THE EU'S CIRCULAR ECONOMY ACTION PLAN (CEAP) VS THE REPUBLIC OF KAZAKHSTAN'S CONCEPT FOR TRANSITION TO A GREEN ECONOMY

## B.1 The EU's CEAP is a Component of the EU Green Deal

It should be appreciated that establishing a Circular Economy is an aspect of the EU's ambitious European Green Deal (EGD), which was published in December 2019 as the **'Communication on the European Green Deal' (EGD), COM/2019/640 final** (Communication).[68] The EGD is a wide-ranging strategy addressing the climate and environment-related challenges that are defining the tasks of the present generation. It aims to transform the EU's economy so that (i) economic growth is decoupled from resource use, (ii) net emissions of greenhouse gases (GHGs) are zero in 2050, (iii) the EU's natural capital is protected, conserved and enhanced, and (iv) and the health and well-being of citizens are protected from environment-related risks and impacts.

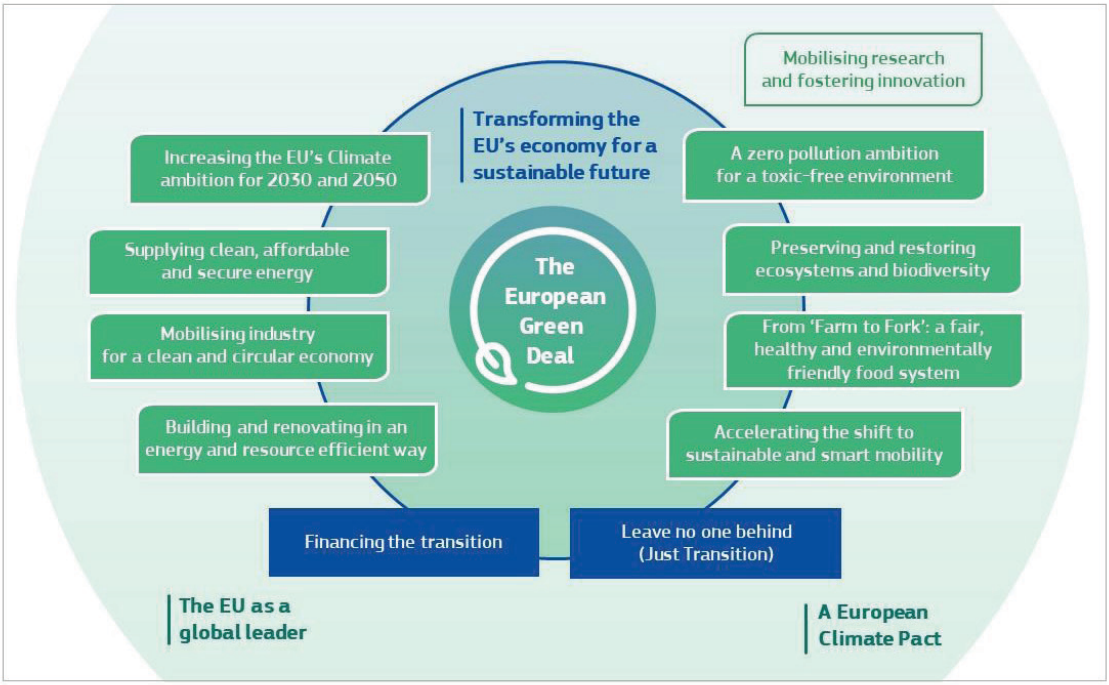



*Figure 30: The European Green Deal*

The EGD builds upon a comprehensive, existing set of environment-related policies and measures (the *acquis*), whose full and effective implementation by EU Member States (MS) is assumed. The 2019 Communication notes, therefore, that the European Commission (EC) will work with MS to step up their efforts to enforce and implement all current legislation and policies relevant to the EGD. And it states that delivering the EGD will require the development and implementation of **transformative policies in eight areas**:

**EGD 2.1.1 Increasing the EU's climate ambition for 2030 and 2050**: transitioning to a net-zero GHG emissions economy by 2050, noting that the policies in place in 2019 would only reduce GHG emissions by 60% (relative to 1990) by 2050. Based on scenario analyses, the EU has identified strategic pathways and seven priority building blocks for achieving its ambition:[69]

1) Maximise the benefits from energy efficiency including zero-emission buildings
2) Maximise the deployment of renewable energy sources and the use of electricity to fully decarbonise Europe's energy supply
3) Embrace clean, safe and connected mobility

68 https://ec.europa.eu/info/sites/default/files/european-green-deal-communication_en.pdf
69 'A Clean Planet for All': available at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52018DC0773&from=EN

4) A competitive EU industry and the circular economy as key enablers to reduce GHG;
5) Develop an adequate smart network infrastructure and inter-connections
6) Reap the full benefits of bio-economy and create essential carbon sinks
7) Tackle remaining $CO_2$ emissions with Carbon Capture and Storage (CCS)

Additional, related proposals are (i) to establish a carbon border adjustment mechanism, for selected sectors, to reduce the risk of carbon leakage – this will be dependent on the level of climate ambition shown worldwide, and (ii) adopting a new, more ambitious EU strategy on adaptation to climate change.

**EGD 2.1.2 Supplying clean, affordable and secure energy**: involving action in five key fields:

1) Further decarbonising the energy system is critical
2) Member States to present revised energy and climate plans, setting out ambitious national contributions to EU-wide targets
3) Involving consumers in the clean energy transition, and ensuring the transition is beneficial to consumers
4) Addressing the risk of energy poverty
5) Use of smart infrastructure to enable the transition to climate neutrality

**EGD 2.1.3 Mobilising industry to achieve a clean, climate neutral and circular economy**: resource extraction and the processing of materials, fuels and food account for about 50% of total GHG emissions and over 90% of biodiversity loss and water stress. Industry in the EU accounts for 20% of the EU's GHG emissions while only 12% of the materials it uses come from recycling. Noting that it takes a generation (25 years) to transform an industrial sector and all its related value chains, the Communication stated that, to be ready in 2050, decisions and actions would need to be taken in the next five years regarding:

1) Adoption by the EC of an **EU industrial strategy** to address the identified challenges, noting that the transition to a climate-neutral and circular economy presents an opportunity to expand sustainable and job-intensive economic activity
2) Development of a new **circular economy action plan** (CEAP)[70] and its implementation, noting that energy-intensive industries such as steel, chemicals and cement supply several key value chains and therefore, it is stated, are indispensable. Key points flagged by the Communication included:
    - Inclusion of a 'sustainable products' policy to support the circular (cleaner) design of products based on a common methodology and principles and strengthening of the existing 'extended producer responsibility'
    - While the CEAP will guide the transition of all sectors, action will focus on resource-intensive sectors, such as textiles, construction, electronics and plastics
    - Measures to encourage businesses to offer, and to allow consumers to choose, products that reusable, durable and repairable
    - The EC's commitment to propose further legislation and guidance on green public purchasing
3) Promoting new forms of **collaboration** with industry **and investments in strategic value chains**
4) Exploring the potential of **digital technologies** such as artificial intelligence, 5G, cloud and edge computing, and the internet of things to accelerate and maximise the impact of policies dealing with climate change and environmental protection

**EGD 2.1.4 Building and renovating in an energy and resource efficient way**: noting that (i) the building sector (construction, use and renovation) consumes significant energy and mineral resources, e.g. 40% of the EU's energy consumption, (ii) annual rates of renovation of the building stock in MS range from 0.4% to 1.2%, and that this rate needs to double, at least, to reach the EU's energy efficiency and climate objectives, while (iii) 50 million consumers struggle to keep their homes adequately warm. Addressing the challenges of energy efficiency and affordability will require action:

70 https://ec.europa.eu/environment/pdf/circular-economy/new_circular_economy_action_plan.pdf

1) MS should engage in a 'renovation wave' of public and private buildings
2) EC rigorous enforcement of the legislation related to the energy performance of buildings, starting with an assessment of MS national long-term renovation strategies, launching work on the possibility of including emissions from buildings in European emissions trading, and a review of the Construction Products Regulation to ensure that the design of new and renovated buildings is in line with the circular economy
3) The EC to work with stakeholders on a new renovation initiative. Aims would include the organisation of renovation efforts into larger blocks to benefit from better financing conditions and economies of scale, paying particular attention to the renovation of social housing to help households who struggle to pay their energy bills and the renovation of schools and hospitals, enabling financial savings from improving energy efficiency to be diverted to support education and public health

**EGD 2.1.5 Accelerating the shift to sustainable and smart mobility**: noting that a 90% reduction in transport emissions is needed for the EU to achieve climate neutrality by 2050, and that road transport contributes substantially to ambient air pollution, especially in cities. Proposed actions include:

1) Adopting a strategy for sustainable and smart mobility: putting users first and providing them with more affordable, accessible, healthier and cleaner alternatives to current mobility practice
2) Boosting multimodal transport: involving (i) a substantial shift from inland freight transport away from roads onto railways and navigable waters, and (ii) an increasing role for automated and connected systems, such as smart systems for traffic management and infrastructure, to reduce traffic congestion and air pollution, especially in cities
3) Ensuring that the price of transport reflects its impacts on the environment and on health: involving (i) an end to fossil-fuel subsidies, (ii) a proposal to adjust the scope of the EU Emissions Trading System (to include the maritime sector) and reduce the allowances allocated free to airlines, and (iii) fresh consideration to be given to how effective pricing for road use may be achieved in the EU
4) Ramping-up the production and deployment of sustainable alternative transport fuels
5) A combination of measures will be required for transport to become drastically less polluting, especially in cities. Measures proposed may include more stringent pollutant emissions standards for combustion-engine vehicles and revision of the legislation on $CO_2$ emission performance standards for cars and vans

**EGD 2.1.6 From 'Farm to Fork': designing a fair, healthy and environmentally friendly food system**: an aim is for European food to become the global standard for sustainability. Key actions and aspects include:

1) The Commission to present the 'Farm to Fork' Strategy as a platform for stakeholder debate, paving the way to formulating a more sustainable food policy
2) The Commission to work with Member States and stakeholders ensure that national strategic plans for agriculture fully reflect the ambition of the EGD and the Farm to Fork Strategy
3) National strategic plans will need to reflect an increased level of ambition to reduce significantly the use and risk of chemical pesticides, and the use of fertilisers and antibiotics
4) **Contributing to developing a circular economy** through actions to reduce resource consumption and environmental impacts in the (production), transport, storage, packaging and waste of food
5) Stimulate sustainable food consumption and promote affordable, healthy food for all

**EGD 2.1.7 Preserving and restoring ecosystems and biodiversity**: ecosystems provide essential services such as food, fresh water, clean air and shelter but the EU is not meeting important objectives such as the Aichi targets under the Convention on Biological Diversity (CBD). Commitments and actions to be taken under this component include:

1) The Commission to prepare an EU Biodiversity Strategy to 2030 and present this to the 15th Conference of the Parties to the CBD, to be followed up by specific actions[71]
2) All EU policies should contribute to preserving and restoring Europe's natural capital: this includes the

71 EU Biodiversity Strategy to 2030. Communication from the European Commission COM (2020) 380 final 20 April 2020.

**Farm to Fork Strategy** which, among other things, addresses the use of pesticides and fertilisers in agriculture

3) A new EU forest strategy whose key objectives will be effective afforestation, and the preservation and restoration of Europe's forests

**EGD 2.1.8 A zero pollution ambition for a toxic-free environment**: noting more action is needed to prevent pollution from being generated, in addition to measures to clean up and remedy pollution. Among other things this will involve better monitoring, reporting, prevention and remedial actions, which will require the EU and MS to look more systematically at all policies and regulations. Commitments and actions to be taken under EDG component 2.1.8 include:

1) The Commission's adoption of a zero-pollution action plan for air, water and soil
2) Restoration of the natural functions of ground and surface water in order to preserve and restore biodiversity and to prevent and limit damage from floods:
   - Implementation of the Farm to Fork Strategy will contribute to this aim through reducing nutrient inputs to these waters
   - The Commission will also propose measures to address pollution from urban runoff and from pollutants such as micro plastics and chemicals including pharmaceuticals
3) Drawing on the lessons learnt from the evaluation of current air quality legislation the Commission will propose strengthening the provisions for air quality monitoring (including digital opportunities), air quality monitoring and air quality plans to help local authorities achieve cleaner air. Notably, the Commission will propose to revise ambient air quality standards to align them more closely with World Health Organization (WHO) recommendations
4) The Commission will review EU measures to address pollution from large industrial installations. The sectoral scope of the legislation will be examined and opportunities to make it fully consistent with climate, energy and circular economy policies will be explored
5) The Commission will present a chemicals strategy for sustainability, of which one aspect will be to simplify but strengthen the legal framework.

Additionally, the EGD sets out a number of **proposals (EGD 2.2) for mainstreaming sustainability in all EU policies**. These include:

- EGD 2.2.1 Pursuing green finance and investment and ensuring a just (equitable) transition
- EGD 2.2.2 Greening national budgets and sending the right price signals
- EGD 2.2.3 Mobilising research and fostering innovation
- EGD 2.2.4 Activating education and training
- EGD 2.2.5 A green oath; 'Do no harm'

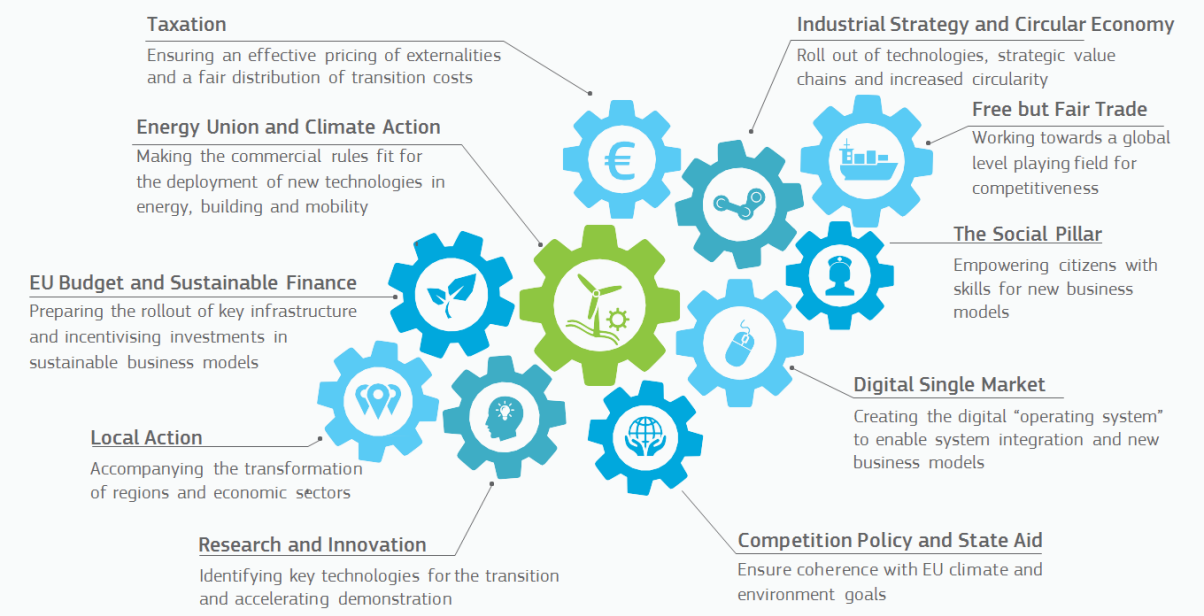



*Figure 31: Enabling framework. Source: EPSC*

## B.2 Scope of the EU's Circular Economy Action Plan (CEAP)

Forming a significant component of the Green Deal, the EU's CEAP makes the case for two major policy initiatives. First, a ***Sustainable Product Policy Framework*** that addresses (i) designing sustainable products, (ii) empowering consumers and public buyers, and (iii) circularity in production processes. Action on key product value chains is integral to the practical implementation of this policy. ***Key value chains*** identified in the CEAP are ***electronics and ICT***; ***batteries and vehicles***; ***packaging***; ***plastics***; ***textiles***; ***construction and buildings***; and ***food, water and nutrients*** to which the Farm-to-Fork strategy (EGD 2.1.6) is expected to make a significant contribution.

CEAP's second major policy initiative concerns ***Less Waste, More Value***. This focuses on (i) enhancing waste policy in order to support waste prevention and circularity, (ii) enhancing circularity in a toxic-free environment, (iii) creating a well-functioning market for secondary raw materials, and (iv) addressing waste exports, with the aim of ensuring that the EU does not export its waste challenges to third countries.

The above policy initiatives are explained below. CEAP also proposes actions to ensure that circularity works for people, regions and cities; and to develop and adopt crosscutting measures for strengthening the role of circularity in achieving climate neutrality, getting the economics right, and driving the transition through research, innovation and digitalisation.

### Policy Initiative: Sustainable Product Policy Framework

#### *Designing sustainable products*

Since up to 80% of a product's environmental impacts are determined at the design phase, a key plank of the proposed policy framework is to strengthen the drivers for designing sustainable products. This will build on existing legislation such as the Ecodesign Directive that regulates the energy efficiency and some circularity features (resource efficiency and waste reduction) of a range of energy-related products placed on the commercial market. It will also build on instruments such as the EU Ecolabel and green public procurement (GPP) that are broader in scope but whose overall impacts are limited owing to their adoption being voluntary. Accordingly, ***sustainable product policy legislation*** is proposed with the aim of establishing a comprehensive set of requirements ***to ensure*** that ***all products placed on the EU market become*** increasingly ***sustainable and 'circular'***. In essence, the legislative package aims to:

- Widen the scope of the Ecodesign framework beyond energy-related products to the broadest possible range of products and to ensure that circularity is developed, i.e. to ensure the default adoption of cleaner design principles

- Establish, after due consideration, sustainability principles to enable regulation and to ensure:
  - Improving product durability, reusability, upgradability and repairability while increasing their energy and resource efficiency and addressing (reducing) the presence of hazardous substances in products
  - Increasing the recycled content in products while ensuring performance and safety
  - Enabling remanufacturing and high-quality recycling
  - Reducing carbon and environmental footprints
  - Restricting single-use and countering premature obsolescence
  - Banning the destruction of unsold durable goods
  - Incentivising product-as-a-service and other models where producers retain ownership of a product or responsibility for product performance through its lifecycle
  - Mobilising the potential of product information digitalisation
  - Rewarding products based on their different sustainability performance

Action will prioritise product groups in the key value chains identified in CEAP (see above) but will also address furniture and high-impact intermediate products such as steel, cement and chemicals.

***Empowering consumers and public buyers***

The empowerment of consumers and their access to trustworthy, relevant information prior to purchase is seen as ***a key building block*** of the sustainable product policy framework. The CEAP proposes two main strands. One that addresses consumer rights in general, and another that utilises the major purchasing power of public authority procurement, representing 14% of the EU's GDP.

Regarding ***consumer rights***, the European Commission is proposing to:

- Revise EU consumer law to ensure that consumers receive trustworthy and relevant product information at their point of sale, such information to include and cover:
  - Product lifespan
  - Availability of repair services, spare parts and repair manuals
- Consider further strengthening consumer protection against premature obsolescence, and set minimum requirements for sustainable labels/logos and information tools in order to safeguard against 'greenwashing'
- Work towards establishing a new 'right to repair' and consider new consumer rights regarding, for instance, the availability of spare parts and access to repair

Regarding ***green public procurement***, the EC proposes to:

- Introduce minimum, mandatory GPP criteria and targets in sectoral legislation
- Phase in compulsory reporting to monitor the uptake of GPP while not creating unjustified administrative burdens on public buyers
- Continue to support capacity building with guidance, training and the dissemination of good practices
- Encourage public buyers to participate in a 'Public Buyers for Climate and Environment' initiative, which will facilitate exchanges among buyers committed to the implementation of GPP

***Circularity in production processes***

In synergy with the objectives laid out in the EU's Industrial Strategy, the EC proposes to enable greater circularity (of resource use) in industry by:

- Assessing options for promoting circularity in its review of the Industrial Emissions Directive. Options include integrating circular economy practices in Best Available Techniques reference documents
- Developing an industry-led reporting and certification system to enable industrial symbiosis
- Using Bioeconomy Action Plan implementation to support the sustainable and circular bio-based sector

- Promoting the use of digital technologies for tracking, tracing and mapping of resources
- Registering the EU Environmental Technology Verification scheme as an EU certification mark

The new SME Strategy will foster circular industrial collaboration among SMEs building on training, advice under the Enterprise Europe Network on cluster collaboration, and on knowledge transfer via the European Resource Efficiency Knowledge Centre.

### Policy Initiative: Less Waste, More Value

Despite all efforts to date, the quantities of waste generated are not going down and the decoupling of waste generation from economic growth will require significant additional effort across all value chains and in every home. Complementing the sustainable product policy, the EU aims to strengthen its waste laws and their implementation. Proposals include:

- Revision of EU legislation on batteries, packaging, end-of-life vehicles, and hazardous substances in electronic equipment to better prevent waste, increase recycled content, promote safer and cleaner waste streams, and ensure high-quality recycling which relies on the effective separate collection of waste
- Aiming to halve the amount of residual (non-recycled) municipal waste by 2030 through:
  - Declaring waste reduction targets for specific waste streams
  - Enhance implementation of recent requirements for extended producer responsibility schemes
  - Incentivise and encourage the sharing of information and good practice in waste recycling
- Harmonise separate waste collection systems in order to help the better separation of waste for recycling, considering:
  - The density and accessibility of separate collection points
  - Regional and local conditions
  - Harmonised bin colours and product labelling
  - Information campaigns and economic instruments
  - Standardised use of quality management systems to assure the quality of collected waste streams destined for use in products

Noting that the safety of secondary raw materials (recovered from waste streams) can be compromised by hazardous substances in the recycled feedstock, CEAP proposes to improve confidence in the use of secondary materials through a range of other legislative amendments, administrative and technical measures.

### Farm to Fork Strategy (EGD 2.1.6)

Agriculture, food and drink processing, retailing, consumption and the management of residual wastes forms one of the key value chains envisaged in the CEAP. The EU's 'Farm to Fork Strategy for a fair, healthy and environmentally-friendly food system'[72] targets actions at this value chain and complements the broader scope of CEAP. The strategy published in May 2020 is outlined below.

Though the transition to more sustainable systems has begun, food production still results in air, water and soil pollution. This:

- Contributes to the loss of biodiversity and climate change;
- Consumes excessive amounts of natural resources.

At the same time, significant quantities of food are wasted while low-quality diets contribute to obesity – with associated health impacts that include a susceptibility to Covid-19 and diseases such as cancer. Forming part of the EU's Green Deal, it is the EU's ambition that the 'Farm to Fork' strategy will enable European food (production and consumption) to become the global standard for sustainability, by:

72 https://ec.europa.eu/food/horizontal-topics/farm-fork-strategy_en

- Strengthening the efforts of European farmers and fishers to manage the transition, noting that the Commission's proposals for the common agricultural policy (CAP) for 2021 to 2027 stipulate that at least 40% of the CAP's overall budget would contribute to climate action;
- Ensuring that national strategic plans for agriculture fully reflect the ambition of the Green Deal and the Farm to Fork strategy;
- National strategies for agriculture that reflect an increased level of ambition to reduce significantly the use and risks associated with chemical pesticides, and the use of fertilisers and antibiotics;
- Contributing to achieving a circular economy through the food processing and retail sectors taking action on transport, storage, packaging and food waste; and
- Striving to stimulate sustainable food consumption and promote affordable, healthy food for all – noting that food imports that do not comply with relevant EU environmental standards are not allowed on EU markets.

The principal scope of the Farm to Fork strategy is given below.

**1. Ensuring sustainable food production**

- Human and financial investment
- New, green business models
- Circular bio-based economy
- Production of renewable energy and investing in anaerobic digesters for biogas production from agricultural wastes
- Taking additional action to reduce by 50% the overall use of chemical pesticides and, also by 50%, the use of more hazardous pesticides by the year 2030
- Enhance the provisions on integrated pest management (IPM)
- An integrated nutrient management action plan
- Take measures to reduce GHG emissions from agriculture, primarily generated by the animal sector
- Take action to reduce overall sales of antimicrobials for farmed animals and in aquaculture by 50% by 2030
- Better animal welfare on farms
- Seed security and diversity including access to quality seeds for plant varieties adapted to the pressures of climate change
- Promotion of organic farming
- Resourcing and implementation of 'eco-schemes'

**2. Ensuring food security**

- Ensuring that the key principles enshrined in the European Pillar of Social Rights are respected
- Stepped-up coordination of a common European response to crises affecting food systems
- Develop a contingency plan for ensuring that food supply and security are in place at times of crisis.

**3. Stimulating sustainable food processing, wholesale, retail, hospitality and food services practices**

- Develop an EU Code of conduct for responsible business and marketing practice, accompanied by a monitoring framework
- Prepare an initiative to improve corporate governance framework, which will include a requirement for the food industry to integrate sustainability into corporate strategies
- Seek opportunities to facilitate the shift to healthier diets and stimulate the reformulation of products, including by establishing nutrient profiles to restrict the promotion (via nutrient or health claims) of foods high in fat, sugars and salt

- Scale-up and promote sustainable and socially responsible production methods and circular business models in food processing and retail – including for SMEs especially
- Revise the legislation concerning food contact materials to improve food safety and public health and to support the use of innovative and sustainable packaging solutions using environmentally friendly, reusable, and recyclable materials
- Revise marketing standards to provide for (i) the uptake and supply of sustainable agricultural, fisheries and aquaculture products and (ii) reinforce the role of sustainability criteria to consider the possible impacts of these standards on food loss and waste
- Strengthening the legislative framework on geographical indications to include, where appropriate, specific sustainability criteria

**4. Promoting sustainable food consumption and facilitating the shift to healthy, sustainable diets**

- Reversing the rise in the rates of overweight and obesity across the EU may be helped by moving to a more plant-based diet with less red (beef, lamb/mutton, pork, deer meat) and processed meat, and more fruits and nuts, because this would reduce risks to life from unhealthy diets
- Empowering consumers to make informed, healthy and sustainable food choices
- Improve the availability and price of sustainable food and promote healthy and sustainable diets in institutional catering
- Tax incentives to drive the transition to a sustainable food system and encourage consumers to choose sustainable and healthy diets

**5. Reducing food loss and waste**

- Tackling food loss and waste is key to achieving sustainability while the recovery and redistribution of surplus food has an important social dimension
- The Commission is committed to halving per capita food waste at retail and consumer levels by 2030; it will set a baseline and propose legally binding targets to reduce food waste across the EU
- The Commission will integrate food loss and waste prevention in other EU policies including a review of date marking (‘use by’ and ‘best before’ dates) that can lead to food waste

## B.3 Comparison: GEAP vs the EU’s EGD and CEAP

Introduced in Annex A, Kazakhstan’s Green Economy Action Plan (GEAP) comprises 62 actions, addressing eight priority areas:

1. Water resources (16 actions)
2. Agriculture (5 actions)
3. Energy efficiency (9 actions)
4. Electricity industry – reducing GHG emissions (4 actions)
5. Air pollution (3 actions)
6. Waste management (10 actions)
7. Conservation and effective management of ecosystems, i.e. biodiversity (10 actions)
8. Forming an ecological culture (5 actions).

The first six priority areas are the focus of the following analytical comparison with the EGD including the CEAP component.

### Water Resources

Containing 16 specific actions, the water resources sector holds the most extensive set of measures in the GEAP, divided across four themes: (i) extending the provision of water (and wastewater) services to the

public, (ii) water conservation in agriculture, (iii) development, maintenance and modernisation of the water-infrastructure, and (iv) the conservation and restoration of river water basins and groundwater resources. Many of the actions involve capital expenditure to extend or reconstruct/modernise water supply. However:

- Action 3 in theme (i) refers to measures to reduce water losses from water supply networks
- All five actions in theme (ii) concern the adoption of techniques to improve water use efficiency and reduce water losses from agricultural production
- Actions 15 and 16 in theme (iv) address water quality and ecological monitoring of water bodies

The EGD does not address the water sector specifically as existing EU policies, exemplified by the Water Framework Directive, substantially address this sector. However, efficient water use is implicit in the Farm to Fork strategy (EGD 2.1.6) and in the preservation and restoration of ecosystems and biodiversity (EGD 2.1.7). Also, the CEAP identifies food, water and nutrients as a key value chain, noting that the new Water Reuse Regulation[73] will encourage circular approaches to (treated wastewater) reuse in agriculture; and that the European Commission will facilitate water reuse and efficiency, including in industrial processes. However, details as to how the Commission will facilitate water reuse and efficiency are not available at the present time.

Agriculture is the major sectoral user of water in Kazakhstan, accounting for about 80% of the annual volume of abstracted water, with industry and the public sector accounting for about 5% each. Distribution losses are understood to be considerable and water prices low.

Generically, the EGD identifies consumers as having a significant role to play as members of value chains, including food, drink and their waste, while its cross-cutting proposals EGD 2.2.1 to EGD 2.2.4 inclusive seek to mainstream sustainability in all EU policies. Among other things, these proposals cover sending the right price signals (market-based instruments), research and innovation, and education and training.

Although in 2018 the Ministry of Agriculture of the Republic of Kazakhstan provided rules for reimbursing part of the investment costs of the agro-industrial complex, and action 8 of the GEAP calls for improving the mechanism for stimulating the introduction of water saving technologies, the GEAP is relatively light on the cross-cutting areas identified in the EGD. Given that water prices are understood to be low in Kazakhstan, the absence of any mention in the GEAP of water pricing as a mechanism to encourage water saving, and the lack of detail on how water saving is to be stimulated and introduced in practice in Kazakhstan is especially notable. The role of water pricing, incentivising the take-up of water saving techniques, good practice and technology transfer, the role of the consumer in contributing to water saving, and the roles that may be played by communication and marketing activities are largely missing in the GEAP. They may all be addressed in Kazakhstan's SCP Action Plan.

Policy measures concerning the setting of limits on the volume of water abstracted from defined river basins, catchments and groundwater aquifers are also absent from the GEAP. This issue should also be addressed in a holistic SCP action plan.

### Agriculture and the Rural Economy

A focus of the GEAP's actions in this area is the introduction of modern methods of organic farming, attracting modern technologies and good agricultural practices, and the implementation of mechanisms to ensure sustainable land use and resources. For instance, field work has begun at pilot sites in five regions on the adaptation of salt and drought-resistant crops, resource saving technologies, practices for the reclamation of saline soils, and for the management/restoration of pasture-land for the production of pasture and fodder crops. Activities are also under way to train government officials, farmers and a wide range of agricultural professionals in advanced water management, drought forecasting, no-till and other approaches that are supportive of environmental sustainability in agricultural landscapes prone to drought and salinity.

Other GEAP actions concern the analysis of degraded lands and implementing measures for watering pasture-land, the latter being key for the efficient use of transhumant pastures. For instance, by July 2020 about 59% of the 180 million hectares of pasture-land were watered, and investment subsidies have been introduced to cover up to 80% of the costs of creating water supply infrastructure to stimulate the development of rangelands.

73 Regulation (EU) 2020/741 of the European Parliament and of the Council of 25 May 2020 on minimum requirements for water reuse. Available at: https://ec.europa.eu/environment/water/reuse.htm

In essence, the GEAP's focus in this sector is on agricultural production and producers. There is little to no consideration given to the food value-chain through to the consumer, and food waste minimisation, as envisaged in the EU's CEAP and Farm to Fork Strategy. Food processors and consumers are largely ignored in the GEAP, yet the latter's dietary and retail choices may have a major bearing on agricultural practice and production and their impacts. Nor is explicit consideration given to GHG and ammonia emissions to air from agricultural practices; nutrient (N and P) pollution of surface water and groundwater from the use of fertilisers and the management of animal manures; pesticide use (other than in organic farming); or other impacts of agriculture on biodiversity. All these implicit omissions should be addressed in a holistic SCP action plan.

## Energy Saving and Efficiency

The GEAP's actions target energy use in industrial production (monitoring, audits, enterprise action plans), systems to provide household heating (centralised heat production and distribution networks), the energy efficiency of the housing stock, and the road transport sector. Specifically, action 27 concerns the development and approval of a national 'Roadmap for Energy Conservation and Efficiency, 2022–2026', which is to be prepared by the end of 2021 with Technical Assistance from the World Bank and the German Energy Agency DENA. The proposed Energy Saving and Efficiency Roadmap covers five areas for action, comprising a total of 46 measures: Innovation – 11 measures; Industry – 11 measures; Transport – 6 measures, Public Sector (construction, buildings, lighting) – 12 measures; and Cross-sectoral – 6 measures. Table 17 itemises the proposed measures in each area, omitting the indicative implementation responsibilities.

However, the national project Zhasyl Kazakhstan 2021–2025 also includes a requirement to develop roadmaps for energy conservation and energy efficiency by Local Executive Bodies, and it is expected that Zhasyl Kazakhstan will absorb the outputs from the DENA activity.

***Table 15: Proposed scope of the Energy Saving and Efficiency Road Map 2022–2026 (DENA)***

| | |
|---|---|
| **1 - Innovative Energy** | |
| 1.1 | Conducting a comparative analysis of energy efficiency of energy-producing and energy transmission enterprises of the Republic of Kazakhstan benchmarking |
| 1.2 | Updating of energy consumption standards approved by the Order of the Minister for Investment and Development of the Republic of Kazakhstan dated March 31, 2015, No. 394 |
| 1.3 | Energy audit by energy producing and transmission enterprises |
| 1.4 | Development and approval of an action plan based on the results of the energy audit by energy producing and transmission enterprises |
| 1.5 | Implementation of the energy management system at energy producing and transmission enterprises |
| 1.6 | Annual reduction of energy resources consumption per unit of production by energy producing and transmission enterprises |
| 1.7 | Monitoring of compliance with the annual reduction in the volume of energy resources consumption per unit of production to the values determined by the results of the energy audit by energy producing and transmission enterprises |
| 1.8 | Implementation of BAT by energy producing and transmission enterprises according to the Energy Efficiency Handbook |
| 1.9 | Implementation of a platform for the exchange of experience between energy companies |
| 1.10 | Study of the issue with the authorised body, carrying out management in the relevant areas of natural monopolies, on the inclusion of measures for energy saving and energy efficiency in the investment programs of subjects of natural monopolies |
| 1.11 | Attraction of international financial institutions to finance energy saving measures |
| **2 - Energy Efficient (EE) Industry** | |
| 2.1 | Conducting a comparative analysis of the specific consumption for the production of products of industrial enterprises of the Republic of Kazakhstan (benchmarking) |
| 2.2 | Updating of energy consumption standards approved by the Order of the Minister for Investment and Development of the Republic of Kazakhstan dated March 31, 2015, No. 394 |
| 2.3 | Energy audit by industrial enterprises |

| | |
|---|---|
| 2.4 | Implementation of the energy management system at industrial enterprises |
| 2.5 | Annual reduction of energy resources consumption per unit of production to the values determined by the results of energy audit by energy producing and transmission enterprises |
| 2.6 | Development of an online platform for industrial enterprises for the purpose of international exchange of experience |
| 2.7 | Implementation of BAT by industrial enterprises according to the Energy Efficiency Handbook |
| 2.8 | Dialogue of the Minister with the main experts of industrial enterprises on energy saving and EE |
| 2.9 | Development of support programs to improve energy efficiency in the industrial sector |
| 2.10 | Attraction of international financial institutions to finance energy saving measures |
| 2.11 | Development of a brochure on energy saving, within the framework of which a technical and economic assessment is carried out on the feasibility of implementing energy-saving measures, considering the restructuring of the company or the modernisation of production facilities |
| **3 - Energy Efficient Transport** | |
| 3.1 | Conducting an analytical study on the transport sector |
| 3.2 | Conducting voluntary and mandatory technical inspections (audits) of transport organisations, fleets |
| 3.3 | Improving the energy efficiency of railway transport |
| 3.4 | Organisation of events for the disposal of old cars |
| 3.5 | Installation of GPS trackers on public and official transport |
| 3.6 | Provide for public procurement of transport equipment (cars) with low specific fuel consumption |
| **4 - Energy Efficient Public Sector** | |
| 4.1 | Research, adaptation, updating of existing ST RK, SNiP, orders in the field of energy efficiency and energy saving in construction |
| 4.2 | Development of an interactive map of energy efficiency of all buildings of the Republic of Kazakhstan |
| 4.3 | Adaptation, development of new standards of the public sector |
| 4.4 | Implementation of energy management system in the public sector |
| 4.5 | Introduction of energy-saving procurement in public institutions and quasi-public sector entities |
| 4.6 | Installation of automatic heat points |
| 4.7 | Modernisation of indoor and outdoor lighting |
| 4.8 | Installation of metering devices for electricity, gas, heat |
| 4.9 | Refund mechanism |
| 4.10 | Ensuring energy efficiency requirements at all stages of construction, including the study of the issue of building construction only with energy efficiency class ‘A’ and ‘B’ |
| 4.11 | Information campaigns and consulting services |
| 4.12 | Identification and awarding of energy-efficient institutions |
| **5 - Cross-Sectoral** | |
| 5.1 | Attraction of foreign universities and energy efficiency centres for cooperation |
| 5.2 | Creation of an interregional competence centre on the basis of the National Institute for Development in the field of energy saving and energy efficiency |
| 5.3 | Development and approval of Roadmaps for energy saving and energy efficiency of regions, Nur-Sultan, Almaty and Shymkent cities |
| 5.4 | Training (training) of 10 domestic (national) specialists of large enterprises in the energy management system |
| 5.5 | Elaboration of the issue of promotion of energy saving |
| 5.6 | Various conferences on energy saving and energy efficiency |

As in the water resources and agriculture sectors, the GEAP gives no explicit consideration to the design of sustainable products or of empowering consumers and public buyers – both key aspects of the sustainable product policy framework of the EU's CEAP. Specifically, the GEAP doesn't address issues such as household attitudes and behaviour (regarding heating and the use of energy-related and energy-consuming appliances), energy pricing and other financial instruments to stimulate energy conservation and efficiency, the role of communication, and consumers. Nor are the measures for strengthening energy monitoring and auditing in industrial enterprises specified. Explicit targets for energy consumption and energy efficiency improvement are also lacking in the GEAP. It is assumed that the Zhasyl Kazakhstan energy efficiency Roadmap will supersede GEAP action 27 and will address these issues. The SCP Action Plan and Roadmap should be in alignment.

Improvements in energy efficiency at points of generation, distribution and consumption, together with the adoption of renewable energy sources, cleaner fuels, and a range of emission control measures, ought to result in national reductions of GHG and air pollutant emissions and improvements in air quality. Functional national emissions inventories – for GHGs and major air pollutants – ought to be able to capture the trend in national emissions, year-by-year. Coupling a reliable historic emissions inventory with the ability to project emissions into the future provides a powerful policy tool. Such a tool enables government to better examine the effects of alternative or complementary policies and measures to achieve energy efficiency and emission reduction goals. This observation is relevant also to the priority areas of electricity generation and air quality. Hence, action to strengthen the national emissions inventories and the capacity for preparing emissions projections is recommended for inclusion as a cross-cutting measure in the SCP action plan for Kazakhstan.

## Reducing GHG Emissions from Electricity Generation

GEAP action in this area targets the electricity and combined heat and power generating sector, shifting from the use of coal to natural gas, modernising existing boilers and installing/constructing new boilers and thermal power plants. This may be sensible for Kazakhstan looking to the medium-term. However, the contrast with the ambitions of the EU's EGD is quite stark. For instance, the EGD looks to maximise the deployment of renewable energy sources; further decarbonise the energy system; and involve consumers in the clean energy transition, ensuring that the transition is beneficial to them. The GEAP fails to mention any of these aspects of a green economy, although the potential to do so might be significant. For example, of the operational power plants supplying electricity and /or heat, while 6 are hydroelectric, one is powered by wind and one by solar, yet 34 plants burn fossil fuels.

While Kazakhstan's energy and GHG emissions policy lies beyond the remit of the SCP action plan, measures to improve energy conservation and efficiency have the co-benefit of reducing GHG emissions. All of the actions indicated above, therefore, will contribute to the broader goal of mitigating climate change and GHG emissions reduction. However, a sensible action for inclusion in the SCP action plan, referring to cross-sectoral energy conservation and efficiency, could be to extend the communication and marketing activities to cover the small-scale use of renewable energy sources.

## Ambient Air Quality

GEAP actions target ambient air quality monitoring, setting regional targets for air quality and compliance with international protocols for air pollutant emissions from major point sources. While these procedural actions are necessary, no actions contain specific measures to achieve compliance with identified air quality limit values. Such actions are delegated to regional akimats, specified city governments, and major emitting enterprises. Although road transport emissions, NOx and particulate matter (PM) especially, may make a significant contribution to air pollution in cities, road transport is not mentioned specifically in the GEAP, nor is the general public's role.

The EGD sets an ambition for a zero-pollution, toxic-free environment. Referring to air quality, this translates into (i) strengthening air quality monitoring and local planning (to deliver compliance with limit values), (ii) revising ambient air quality standards to align them more closely with WHO recommendations, and (iii) reviewing measures to address air pollution from large industrial installations. Accelerating the shift to sustainable and smart mobility (EGD 2.1.5) also addresses air pollution, especially in cities. Measures that might be proposed in future include more stringent pollutant and $CO_2$ emissions standards for vehicles.

Kazakhstan's policies on ambient air quality also lie beyond the remit of the SCP action plan, although measures to improve energy conservation and efficiency also have the co-benefit of reducing air pollutant emissions. Hence, all of the actions indicated above will contribute to the broader goal of achieving cleaner air. However, a sensible action for inclusion in the SCP action plan, referring to cross-sectoral energy saving and efficiency, could be to extend the proposed communication and marketing activities to (i) raise awareness of air quality and its links to human health, (ii) address the roles that households and vehicle drivers may play in achieving cleaner air through behavioural change e.g. the choices made by households in their heating, household products, driving practices, vehicle maintenance and choice of vehicle. In the medium to long-term, many countries are looking to the increased use of all-electric cars, phasing out the production of diesel and petrol-fuelled cars, which should result in cleaner air. Analysis of scenarios for what that shift might mean for Kazakhstan could usefully be included in the SCP action plan, prepared as a policy guidance document to the RoK Government.

## Waste Management

The character and scope of the GEAP regarding solid wastes management is rather traditional, considering three household waste themes:

1. Waste management strategy and its implementation:
   - Develop Concept of State Program for Waste Management, one of the themes of Zhasyl Kazakhstan for 2021-2025
   - Organise separate waste collection in populated settlements, and
   - Construction of energy from waste disposal facilities
2. Operation and construction of landfill sites compliant with legislative norms:
   - Disposal of solid waste in accordance with the norms
   - Construction of new landfills, and
   - Eliminate illegal (operating) landfills, removing deposited waste to sorting and processing points
3. Increase waste recycling:
   - Special support measures to develop the waste management industry, including separate collection, waste sorting, recycling, and waste processing such as incineration
   - Develop/construct processing facilities for biodegradable household waste - biogas plants
   - Construct processing facilities for sewage sludge (sewage treatment plants) and poultry manures (intensive farms) - biogas plants, and
   - Eliminate historic waste (generated by enterprises that no longer exist)

The actions to organise separate waste collection and provide unspecified support to the waste recycling industry are the only measures that begin to address the issues raised in the EU's EGD and Circular Economy Action Plan. The CEAP is more comprehensive and launched two major policy initiatives.

First, the ***Sustainable Product Policy Framework*** which includes the design of sustainable products, empowering consumers and public buyers, and ensuring greater circularity in production processes. The CEAP also identifies the ***key value chains*** where policy implementation should focus: electronics and ICT; batteries and vehicles; packaging; plastics; textiles; construction and buildings; and food, water and nutrients. The EGD also includes the Farm to Fork Strategy, separate to the CEAP, but supportive of the CE approach applied to the food, water and nutrients value chain.

***Less Waste, More Value*** is the second policy initiative of CEAP. Its objective is to strengthen existing waste laws and their implementation with the aims of (i) ensuring high quality, cleaner waste streams for recycling, (ii) halving the quantity of residual municipal solid waste for disposal, (iii) harmonising separate waste collection systems in order to improve the separation of waste for recycling, and (iv) other legislative and administrative measures to improve the confidence of producers in the quality of recycled feedstocks.

There is considerable scope, therefore, for introducing selected ideas from CEAP into the SCP Action Plan, to complement and strengthen the achievements expected from the GEAP.

## Recommended Issues for the SCP Action Plan to Address

The collected issues identified in the above gap analysis is presented below:

| GEAP Priority Area | Recommended Issues for SCP Action |
|---|---|
| **Water Resources** *(cross-sectoral)* | – Policy and limits on water abstraction at Basin/catchment level<br>– Water pricing and financial instruments – considering all major water consuming sectors<br>– Incentivising the adoption of water saving techniques<br>– Transfer and introduction of good practice techniques<br>– Benchmarking of water consumption in significant sectors and branches, including setting internal benchmarks through the use of monitoring and targeting<br>– Consumer awareness and motivation<br>– Communication and marketing of awareness raising activities/information, good practice guides, benchmarking and case studies. |
| **Agriculture & Rural Economy** | – Exploiting the value-chain approach from production, through processing, retail, hospitality and household consumption, to wastes management (crop residues, manures, food wastes)<br>– Transfer and introduction of good practice techniques regarding crop selection, water saving, animal feeding and manure management, use of fertilisers, pesticides and herbicides<br>– Benchmarking of water consumption (in significant economic sectors and branches, including setting internal benchmarks through the use of monitoring and targeting<br>– Consumer awareness and motivation<br>– Communication and marketing of (awareness raising activities/information, good practice guides, benchmarking and case studies) tailored to significant segments of the food and drink value chain |
| **Energy Saving and Efficiency** *(cross-sectoral)* | – Transfer and introduction of good practice techniques (including BAT) for energy conservation and energy efficiency<br>– Energy pricing and financial instruments – considering all major energy consuming sectors<br>– Benchmarking of energy consumption (electricity, fuel, steam, hot water etc) in significant economic sectors and branches – including setting internal benchmarks through the use of monitoring and targeting<br>– Energy labelling of consumer appliances<br>– Communication and marketing of (awareness raising activities/information, good practice guides, benchmarking and case studies) tailored to major energy consuming sectors<br>– Strengthening the national inventories of emissions to air (GHGs and air pollutants) and emission projections capacity as an aid to policy setting and tracking the impacts of energy saving and emissions reduction measures. |
| **Reducing GHG emissions from Electricity Generation** | As for energy saving and efficiency but:<br>– Extend the communication and marketing activities to address the local, small-scale use of renewable energy sources. |
| **Air Quality** *(cross-sectoral)* | As for energy saving and efficiency but:<br>– Extend the proposed communication and marketing activities to<br>▪ Raise awareness of air quality and its links to human health<br>▪ Address the roles that behavioural change by households and vehicle drivers may play in achieving cleaner air<br>– Analyse the implications for Kazakhstan of the expected international shift to all-electric powered vehicles, using the analysis as a basis for preparing policy guidance to Government |

| | |
|---|---|
| **Waste Management** *(cross-sectoral)* | – Identify key value chains in Kazakhstan<br>– Strengthen existing legislation – if and where appropriate – to strengthen the requirements to reduce waste minimisation at source and to facilitate and improve waste reuse and recycling<br>– Set targets for reducing biodegradable waste quantities disposed of the landfill, monitor performance and enforcement<br>– Introduce producer responsibility obligation, where appropriate, on manufacturers in key value chains<br>– For products not manufactured in Kazakhstan, explore the options for recovering clean waste streams for export as feedstock for production elsewhere<br>– Set targets for waste reuse and recycling in key value chains<br>– Introduce a widely-drawn Ecodesign framework for products placed on the market<br>– Good practice guidance on applying cleaner design principles and the circular economy approach in practice – including case studies<br>– Develop and introduce or strengthen green public procurement (GPP) requirements, criteria and targets<br>– Appropriate pricing and financial instruments to help achieve the waste reduction goals set by government/s<br>– Communication and marketing activity tailored to significant segments of key value chains, household, public and other consumers, the waste management industry, and all levels of government - content to include awareness raising activity/information, good practice guides, benchmarking and case studies |
| **Education – Secondary and Higher** (cross-sectoral) | – Curricula for use in secondary schools and higher levels of learning that include green economy and SCP concepts<br>– Develop the capacity of schoolteachers and lecturers such that they may teach to their respective curriculum effectively (‘teach the teachers’) |
| **Legislative & Regulatory** | – Incorporate the SCP Action Plan into a further revision of the Environment Code<br>– Incorporate the SCP Action Plan into Concept for Kazakhstan’s transition to a green economy |
| **Non-Financial Mechanisms** (cross sectoral) | – Establishment of a funded SCP Support Unit whose role would be to undertake cross-sectoral and sectoral actions to facilitate and stimulate activity in all of the above-mentioned areas |

# ANNEX C: UN SUSTAINABLE DEVELOPMENT GOALS RELEVANT TO SCP

The principal SDG relevant to an SCP Action Plan is Goal 12, '*Ensure sustainable consumption and production patterns*', although there are others as well, as indicated in Table 16. To facilitate the monitoring of progress in implementing national measures and achieving the goals and objectives of the SDGs at the national level, each UN Member State may establish national indicators in addition to the global indicators.

Kazakhstan has nationalised the global SDG indicators and the monitoring system includes 280 indicators, of which 205 are global and 75 are national indicators.

***Table 16: Sustainable Development Goals and Targets relevant to the GEAP and SCP***

| Sustainable Development Goal and Selected Targets | |
|---|---|
| **SDG.02** | End hunger, achieve food security and improved nutrition and promote sustainable agriculture |
| **SDG.03** | Ensure healthy lives and promote wellbeing for all at all ages |
| 3.9 | By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination. |
| **SDG.06** | Ensure availability and sustainable management of water and sanitation for all |
| 6.3 | By 2030, improve water quality by reducing pollution, eliminating dumping and minimising release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally |
| 6.4 | By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity |
| 6.5 | By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate |
| 6.6 | By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes |
| 6.a | By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies |
| **SDG.07** | Ensure access to affordable, reliable, sustainable and modern energy for all |
| **SDG.08** | Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all |
| 8.4 | Improve progressively, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation, in accordance with the 10-year framework of programmes on sustainable consumption and production, with developed countries taking the lead |
| **SDG.09** | Build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation |
| 9.2 | Promote inclusive and sustainable industrialisation and, by 2030, significantly raise industry's share of employment and gross domestic product, in line with national circumstances, and double its share in least developed countries |
| 9.4 | By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries acting in accordance with their respective capabilities |
| 9.5 | Enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, in particular developing countries, including, by 2030, encouraging innovation and substantially increasing the number of research and development workers per 1 million people and public and private research and development spending |

| Sustainable Development Goal and Selected Targets | |
|---|---|
| 9.b | Support domestic technology development, research and innovation in developing countries, including by ensuring a conducive policy environment for, inter alia, industrial diversification and value addition to commodities |
| **SDG.11** | Make cities and human settlements inclusive, safe, resilient and sustainable |
| 11.6 | By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management |
| 11.b | By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels |
| **SDG.12** | Ensure sustainable consumption and production patterns |
| 12.1 | Implement the 10-year framework of programmes on sustainable consumption and production, all countries acting, with developed countries taking the lead, considering the development and capabilities of developing countries |
| 12.2 | By 2030, achieve the sustainable management and efficient use of natural resources |
| 12.3 | By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses |
| 12.4 | By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimise their adverse impacts on human health and the environment |
| 12.5 | By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse |
| 12.6 | Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle |
| 12.7 | Promote public procurement practices that are sustainable, in accordance with national policies and priorities |
| 12.8 | By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature |
| 12.a | Support developing countries to strengthen their scientific and technological capacity to move towards more sustainable patterns of consumption and production |
| 12.b | Develop and implement tools to monitor sustainable development impacts for sustainable tourism that creates jobs and promotes local culture and products |
| 12.c | Rationalise inefficient fossil-fuel subsidies that encourage wasteful consumption by removing market distortions, in accordance with national circumstances, including by restructuring taxation and phasing out those harmful subsidies, where they exist, to reflect their environmental impacts, taking fully into account the specific needs and conditions of developing countries and minimising the possible adverse impacts on their development in a manner that protects the poor and the affected communities |
| **SDG.13** | Take urgent action to combat climate change and its impacts |
| 13.2 | Integrate climate change measures into national policies, strategies and planning |
| 13.3 | Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning |
| **SDG.15** | Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification; halt and reverse land degradation, and halt biodiversity loss |

# ANNEX D: INTERNATIONAL EXPERIENCE OF SCP SUPPORT MECHANISMS AND ILLUSTRATIVE TERMS OF REFERENCE

Three examples of good international practice are summarised below. They illustrate the evolution of operational SCP-related support mechanisms (units) in the UK since the first of these mechanisms was established in the 1990s. Each aimed to stimulate producers and, increasingly, consumers to adopt an SCP-related approach. Their remits initially were rather technocratic and narrow in scope, confined first to energy efficiency and then to waste reduction. But in the past decade and more the scope of the remaining mechanism now extends to cover broader aspects of SCP, the Circular Economy and climate neutrality (net-zero GHG emissions). Its role in catalysing informal group activity and voluntary partnerships has grown also.

## D.1 UK - 1: Energy Efficiency Best Practice Programme (EEBPP)

The UK Government initiated the EEBPP to encourage the spread of energy efficient technologies and techniques throughout UK industry and the national building stock. By the year 2000 it had stimulated annual savings worth €957 million (1990 prices[74]) – equivalent to a reduction in carbon dioxide emissions of about 18 million tonnes per year. This represented excellent value for an annual expenditure of only €24 million of public money.

The EEBPP formed a bridge across which knowledge and application experience passed effectively from the 'haves' to the 'have nots', adopting a systematic approach that:

- Identified the relevant knowledge needed by the target audience or audiences
- Prepared, packaged and disseminated the knowledge appropriately for that audience
- Continually assessed the programme's impact, making changes as necessary

Technical input on all aspects relating to buildings was provided by the UK's Building Research Establishment (BRE) and by the UK's Energy Technology Support Unit (ETSU) for industrial energy use. Where lack of knowledge was the primary barrier to improved performance – delivering higher profits for business, or providing affordable warmth for low-income households – the Best Practice approach was shown to play a key role. It provided help and advice through telephone helplines, the internet, publications[75], seminars, workshops and conferences, site energy surveys, and building-design advice consultancies. The programme made it easier for those responsible for energy use and energy efficiency to get the information needed to save energy, money, and reduce carbon dioxide emissions. Typical examples of how organisations and individuals in the buildings sector benefitted from the programme included:

- A local government's investment in energy efficiency measures for their housing stock improved living conditions and reduced tenants' heating bills by 45%
- A city general hospital saved €83,700 a year by using combined heat and power (CHP)
- Industrial buildings in the UK saved an additional 0.5 million tonnes of carbon a year as a result of the programme

The EEBPP was successful mainly because it formed a cooperative partnership with business-sector associations, professional institutions and the many consultants and sub-contractors who worked on the programme. Other reasons for success included:

- The approach appealed to senior management as structured, effective, and complementary to good management practice
- The information provided was useful, impartial, authoritative, and available free of charge
- It provided a route whereby good Research and Development (R&D) projects were supported and then encouraged to market

74 Adopting a GB Pound to Euro exchange rate of €1 to £0.83605 (17 January 2022)
75 https://www.cibse.org/knowledge/knowledge-items-(1)/knowledge-archive/energy-efficiency-best-practice-programme-archive

The power of the Best Practice approach was confirmed by the fact that other sectors in the UK economy, such as the construction industry, adopted this method of improving their performance. As did other countries, including Canada, South Africa, New Zealand, and Australia. By 2004, responsibility for the EEBPP in the UK transferred to the Energy Saving Trust[76] (for housing issues) and the Carbon Trust[77] (for all other areas).

## D.2 UK 2: Envirowise

Jointly funded and overseen by two Government Departments, one responsible for the Environment, Food and Rural Affairs (DEFRA) and the other for Trade and Industry, the UK Government established the Environmental Technology Best Practice Programme in 1994, later rebranded as 'Envirowise'. Its initial remit was to achieve the goal of delivering annual savings of €191 million for industry within six years. Total funding for the period 1994–2000 was set at about €19 million at 1994 prices.

Designed along similar lines to the EEBPP, the Envirowise Programme was hosted by ETSU and implemented under contract to the UK Government. Quarterly progress reports were prepared for Departmental representatives, and meetings held at which proposals for new thematic strategies and deliverable outputs were also reviewed. The programme was dedicated to putting the sustainable use of resources at the heart of UK business practice. Envirowise provided free practical advice to help UK businesses increase profits and reduce their environmental impact. The promoted benefits to business of increasing resource use efficiency included:

- Increased productivity
- Greater return on investment
- Staying competitive
- More effective use of resources to generate profits
- Reduced operating costs
- Improved environmental performance

Envirowise offered a range of free services to help companies improve their resource efficiency, including free advice from Envirowise experts through a Help Line; best practice events and practical workshops that offer an ideal way to examine resource efficiency issues and discuss opportunities; and a variety of publications that provided up-to-date information on resource efficiency issues, advice and successes. Over the years until 2009 when it was subsumed into the Waste and Resources Action Programme (WRAP), Envirowise addressed many business sectors. They ranged from those engaged in manufacturing and food processing, for instance, to the retail supply chain and offices. In parallel, generic cross-sectoral themes were also covered, including solid waste minimisation, packaging, water saving, and cleaner design.

## D.3 UK 3: Waste and Resources Action Programme (WRAP)

Established as a not-for-profit company in 2000, WRAP became a charity in 2014, its goal, 'a world where resources are used sustainably'.[78] Based in the UK and with projects around the world, it works with businesses, governments, citizens and charities to make the planet a healthier, safer place. WRAP's evidence-based approach inspires action in areas that create the most waste. In striving for a circular economy, it works with like-minded partners to cut waste, promote sustainability, and share knowledge.

The 2008/2009 financial crisis resulted in operational budget cuts leading to the Envirowise Programme and other DEFRA funded 'green' programmes[79] to be subsumed in 2009 into WRAP. Thus streamlining operations and achieving economies of scale in backroom (overhead) activities. WRAP's core funding is from the UK's DEFRA (Department for Environment, Food and Rural Affairs), the devolved governments of Northern Ireland, Scotland, and Wales, and from the EU. Also, some of the revenues raised from the UK's Landfill Tax (see section 5.3) have been allocated to WRAP. And further funding is provided by Charitable Trusts and initiative-based corporate sponsorship and partnership working.

76 https://energysavingtrust.org.uk/
77 https://www.carbontrust.com/
78 https://wrap.org.uk
79 Other programmes subsumed into WRAP were the National Industrial Symbiosis Programme (NISP), the Centre for Remanufacturing and Reuse, the Construction Resources and Waste Platform, Action Sustainability, and the Business Resource Efficiency and Waste (BREW) centre for local authorities.

Aspects of WRAP's approach and activities are rooted in the earlier work of EEBPP and Envirowise, but the approach has been modernised and greater emphasis is now placed more on citizen and corporate behaviour, and rather less on the relatively more technocratic stance of earlier programmes. Table 14 provides a profile of WRAP's current activities, sectors, services, and the resources it makes available.[80] A good example of WRAP's approach is its toolkit to help businesses implement 'Whole Chain Food Waste Reduction Plans' (WCPs), a key deliverable of a Food Waste Reduction Roadmap and contributing to meeting Target 12.3 of the UN's Sustainable Development Goals (Annex C). Figure 29 indicates the systematic, cyclical approach.


*Figure 29: Five-stage process for WCPs and developing a culture of continuous approval – food waste*

*Table 17: Profile of WRAP's target sectors, services, activities, and the resources it makes available*

| Sectors | Issues - Taking Action |
|---|---|
| Farmers and Growers | Climate Change – Circular Economy |
| Hospitality & Food Services | |
| Local Authorities (Governments) | Plastic Packaging |
| Manufacturers | |
| National Governments & Departments | Food and Drink |
| Non-Governmental Organisations (NGOs) | |
| Packaging Producers | Textiles |
| Retailers & Brands | |
| Textile Producers & Designers | Waste Collection & Recycling – Delivering for Government, Key Operational Areas, Collection Consistency, Markets & Materials, Technical Support |
| Trade Associations | Citizen Behaviour Change – Clear on Plastics, Love Food Hate Waste, Love Your Clothes, Recycle Now |
| Waste Management & Reprocessors | |

80 The WRAP website provides full details.

| WRAP Works By | Services Provided | Resources Made Available by WRAP |
|---|---|---|
| Gathering evidence | Business Voluntary Agreements | Reports |
| Collaboration | Citizen Behaviour Change | Guides |
| Facilitation and delivery | Technical Support | Case Studies |
| Evaluation | Grants and Investments | Tools |
| | Policy and Insights | Campaign Assets |

## D.4 Indicative Terms of Reference for SCP Support Mechanism

The national SCP Support Mechanism should promote the SCP approach and stimulate SCP action in Action Plan themes 1 to 5 inclusive. Targeting the Government's priorities, the SCP-SM will provide a focus for the development of knowledge and tools relevant to SCP and their communication. The Unit will engage with sources of practical experience and knowledge in Kazakhstan, the Central Asia region, and worldwide, to identify and develop SCP know-how, which will be communicated and applied through (renewable) three-to-four-year thematic strategies. Each thematic strategy should include the preparation of materials and undertaking of activities selected from the following indicative, non-exclusive list:

- Web-pages on an SCP-SM website
- Benchmark reports on resource consumption and resource efficiency – within Kazakhstan (anonymising the information) and between Kazakh and international performance levels
- Guides to good practice in key areas
- Guides to the practical use of selected, relevant SCP tools, including step-by-step guidance manuals on how to apply the techniques
- Short, practical training sessions in the use of selected SCP tools
- Case studies that demonstrate where good practice techniques and SCP tools have been applied in Kazakhstan or, failing that, in other countries, preferably those having broadly similar and relevant characteristics
- SCP awareness raising for producers, consumers, and institutions
- Updated thematic intelligence reports, e.g. on markets for recovered waste materials, and legislative status and changes affecting consumers and producers
- Digital videos demonstrating the use of selected guides and tools
- A 'Helpline' that might be manned by members of staff (on a rota) of the SCP-SM, providing a means for consumers and producers make contact with the SCP-SM: to raise questions, seek information, and request publications (ideally downloaded from the SCP-SM website)
- Access to limited staff advice and support to stakeholders on request
- Marketing and disseminating thematic 'products' through tailored communication activities, e.g. website, newsletter, news updates, 'information flyers' alerting stakeholders to the availability of Guides, etc, promotion via seminars, workshops, roundtables, training and other physical or virtual events
- Impact assessment made by an independent body to estimate uptake and resource savings made, etc, identify lessons learnt, and provide feed-back to the responsible Ministries

The SCP-SM should report on a regular basis to the Ministry of Economy, perhaps providing progress reports on a quarterly or half-yearly frequency. Prior to undertaking work on a thematic strategy, the SCP-SM should prepare a draft proposal for the scope of the strategy and submit it to the Ministry of Economy (and other relevant Ministries), for review, and only starting work once approval has been granted.

The preparation of thematic products such as indicated above (good practice guides and case studies, benchmarking reports, digital videos, awareness raising, and training) may be undertaken by third-party institutions (businesses, consultants, R & D institutions, NGOs, etc.) under contract to the SCP-SM. In which case, the SCP-SM occupies the role of commissioner and editor. If third-party preparation is not feasible

in practice, the SCP-SM will need to undertake such activity in-house, its capacity first bolstered through international Technical Assistance.

## Indicative Staffing Needs

SCP-SM staffing levels will depend on the scope of its remit, namely the number of themes covered and whether materials are developed in-house or externally. Table 18 indicates staffing levels based on the assumption that five thematic strategies are covered and that dissemination materials are commissioned and edited by SCP-SM staff, but drafted externally by institutions having specific sectoral expertise. Actual staffing and budgetary needs will need to be identified through detailed analysis. An action to make this analysis is included in the SCP Action Plan.

*Table 18: Illustrative initial staffing levels for an SCP Support Mechanism*

| Staff | Numbers |
|---|---|
| Manager | 1 |
| Deputy Manager | 1 |
| Technical Officers | 6 |
| Marketing & Communication Officers | 3 |
| Website development and management | 1 |
| Support Staff: Secretarial, IT, technical editing, general | 3 |

## Future Arrangements and Scope of the SCP Support Mechanism

After an initial operational period of, say, four years, allowing the growth of SCP experience and development of SCP capacity, it might be appropriate to split the Support Mechanism operation in two. The areas of responsibility might then be subdivided as shown in Table 19 below: provision for a decision point in 2026 is included in the action plan. Potentially, subject to need and the availability of funding, the remit of the Mechanism(s) could be expanded at any time to address other sectors of the economy.

*Table 19: Potential future sub-division of an SCP Support Unit*

| Themes Covered | Government Sponsoring Ministries |
|---|---|
| Agriculture and Agri-products value chain<br>Water Use Efficiency & Conservation Use<br>Waste Management | Ministries of:<br>Economy; Ecology, Geology and Natural Resources; Agriculture; Industry |
| Energy value chain<br>GHG emissions reduction – cross-sectoral<br>Air quality - cross-sectoral<br>Metals value chain | Ministries:<br>Economy; Ecology, Geology and Natural Resources; Energy; Industry; Transport |

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