The Kyrgyz Republic

Green Industry and Trade Assessment (GITA)

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Executive Summary

This‘’Green Industry and Trade Assessment’’ provides a sense of the problem that exists in the Kyrgyzstan in terms of the industrial environmental situation. At the same time, it provides strategic direction to the Government on what policy options could be a better choice for green industrialization. The assessment finds that resource-efficient modes of production are hardly gaining momentum over time in the country, which is leading to serious environmental damage. An international comparison reveals that the growth of both pollution (measured by the amount of CO_2 emissions and the consumption of resources (measured by material use) are relatively high in Kyrgyzstan in the manufacturing sector. Carbon Dioxide emissions increased by approximately 140% over the period 1995-2013, which exceeds the growth in upper middle-income countries. The country has also outpaced other lower-middle income countries regarding material use. Material use in manufacturing industries is inefficient and production techniques are wasteful, which suggests the need to monitor and improve the existing situation. A number of policy instruments, which are in need of implementation, have been proposed in the Green Economy Concept “Kyrgyzstan is a country of the Green Economy” The International Trade Centre has identified the untapped export potential of Kyrgyzstan at 301.2 mn USD, which could be realized through policy options for trade expansion.

Chapter 1 Introduction

Countries need to expand their industrial sector to alleviate poverty, deliver goods and services, create jobs, and improve standards of living. However, while progressing with industrial development, many countries face severe environmental degradation and resource depletion, which threaten opportunities for sustainable economic growth. Green Industry initiatives fill this gap and promote sustainable patterns of production and consumption i.e. patterns that are resource and energy efficient, low-carbon and low waste, non-polluting and safe, and produce products that are responsibly managed throughout their lifecycle. The Green Industry agenda covers the greening of industries, under which all industries continuously improve their resource productivity and environmental performance. It also aims to create green industries, that deliver environmental goods and services, including waste management and recycling services, renewable energy technologies, and environmental analytical and advisory services.

This Green Industry and Trade Assessment (GITA) evaluates the current status of industries toward green industrialization with specific focus on industrial environment pollution, resource use and use of cleaner technologies and identifies prospective ways to fill existing gaps. It also measures the potential for exporting green goods and the existing institutional capacity for supporting the export of green goods. It then it reviews whether existing public policies are conducive to green industry and green trade. The findings of the analysis identify priority areas for green industrialization and provide specific policy guidelines on how the Government can better support the transition to green industrial production.
This chapter offers definitions of green industry production and green industry trade set within the context of the green economy. It presents a brief overview of green industry and green industry trade policies. It sets this assessment within the context of other green economy activities in particular the Partnership for Action on Green Economy (PAGE). Lastly, it lists the key issues and questions that will be addressed in the assessment.

1.1 Definitions of green industry production and trade

UNIDO describes Green Industry as industrial production and development that does not come at the expense of the health of natural systems or lead to adverse human health outcomes. Green Industry is aimed at mainstreaming environmental, climate and social considerations into the operations of enterprises. It provides a platform for addressing global, interrelated challenges through a set of immediately actionable cross-cutting approaches and strategies that take advantage of emerging industry and market forces (UNIDO, 2011).

For purposes of this assessment, industry, unless otherwise stated, refers to the manufacturing sector. It is those activities which are described in Section C (manufacturing) of the International Standard Industrial Classification of All Economic Activities (ISIC), Revision 4, of the Statistics Division of the United Nations Department of Economic and Social Affairs.

Industry as used in this assessment refers exclusively to manufacturing activities; the terms industry and manufacturing are herein used interchangeably.

UNIDO states that Green Industry involves a two-pronged strategy to create an industrial system that does not require the ever-growing use of natural resources and pollution for growth and economic expansion. These two components are:

(1) *Greening of existing industry*: Enable and support all industries regardless of their sector, size or location, to green their operations, processes and products by using resources more efficiently; transforming industrial energy systems towards greater sustainability by expanding renewable energy sources; phasing out toxic substances; and improving occupational health and safety at the industrial level.

(2) *Creating green enterprises*: Establish and expand (new) green enterprises that deliver environmental goods and services. Green enterprise is a rapidly expanding and diverse sector that covers all types of services and technologies that help to reduce negative environmental impacts and resource consumption. This includes material recovery, recycling, waste treatment and management, as well as the provision of environmental and energy consulting and services, such as energy service companies and companies that provide monitoring, measuring and analysis services (UNIDO, 2011).

For purposes of this assessment, industry is focused on the manufacturing sector. It is those activities which are described in Section C (manufacturing) of the International Standard Industrial Classification.

For purposes of this assessment and in keeping with this strategic approach, green industry encompasses four activities:

- Greening industry. This refers to any activity by which the processes of manufacturing industry (1) improve their efficiency of energy, water and raw materials (2) reduce pollutant discharges to move towards compliance with environmental norms and (3) shift to the extent possible the use of renewable energy.
- Green industries. This refers to environmental goods such as the manufacture of pollution control and monitoring equipment. In addition, it includes environmental services, such as environmental engineering and auditing, are included even though they are not a direct part of industry according to ISIC 4. However, as such services are needed for greening industry, they are included within the category of green industry.
- Renewable energy industry. It is the manufacture of renewable energy technologies (e.g. solar panels, wind turbines, mini-hydro turbines). They are clearly part of industry even though there is no one specific ISIC subcategory for these technologies.
- Materials recovery and recycling industry. To the extent that these activities include transformation during production, they are part of the manufacturing subsectors where this transformation occurs (e.g. transforming scrap metals into new metals, remanufacturing car engines). If they mainly refer to sorting activities, they are classified under waste management activities or wholesale of waste and scrap. Note:

Recycling used to be classified under manufacturing in ISIC 3, but this did not well reflect its production process (PAGE, 2019).

Green industry trade: For purposes of this assessment, "sustainable or green trade has a key role to play in the interface between international trade and the transition to a green economy. While there is no universally agreed definition of sustainable trade, it broadly refers to trade that does not deplete natural resources, harm the environment or deteriorate social conditions while promoting economic growth." (UNEP, 2013).

Green trade opportunities for manufactured goods are mostly export of environmental goods and services and renewable energy technologies, in complying with quality, health and environmental standards (ISO 9000, HASP ISO 1400 and eco-labelling) to enhance export potential, in embedding sustainability as a core business strategy, in promoting the complete disassembly, recovery and re-use of individual product components (re-manufacturing) and in the greening of global supply chains.

1.2 Sustainable development Goal and Green Industrialization

One approach for monitoring the process of green industrialization in Kyrgyzstan is to assess the contribution of industry to meeting the UN Sustainable Development Goals. Out of 17 Sustainable Development Goals (SDGs), four address economic development and environmental concerns. Of the 169 targets that constitute the substance of the 17 SDGs, industry can contribute to meeting four goals and their 12 associated indicators, of which seven are environment related (Table 1). In addition to the seven indicators, one more should be added for monitoring industrial air pollution such as Total Suspended Particulate Matter or Sulfur Dioxide emissions even though is no headline goal on air pollution in the SDGs (Elder, 2016).

Table 1 SDGs and Goals to achieve for Green Industrialization

Goals	Targets	Indicators	Green Industry Goals
6. Ensure availability and sustainable management of water…	6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally	**6.3.1** Proportion of wastewater safely treated	Proportion of industry wastewater safely treated
	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	**6.4.1** Change in water-use efficiency over time	Industry water-use intensity decreased
7. Affordable, reliable and modern energy	7.2 By 2030, increase substantially the share of renewable energy in the global energy mix	7.2.1 Renewable energy share in the total final energy consumption	Use of renewable energy as percentage of total industry energy use increased

	7.3 By 2030, double the global rate of improvement in energy efficiency	**7.3.1** Energy intensity measured in terms of primary energy and gross domestic product (GDP)	Industry energy-use intensity decreased
9. Infrastructure, industrialization, and innovation	**9.4** By 2030 upgrade infrastructure and retrofit industries to make them sustainable, with increased resource efficiency…	**9.4.1** CO_2 emission per unit of value added	Industry CO_2 emission intensity decreased
12. Responsible consumption and production	**12.2** By 2030, achieve the sustainable management and efficient use of natural resources	**12.2.2** Domestic material consumption (DMC), DMC per capita and DMC per GDP	Industry material consumption intensity decreased
	12.4 By 2020, achieve the environmentally sound management of chemicals and wastes throughout their life cycle …and significantly reduce their release to air water and soil…	**12.4.2** Treatment of waste, generation of hazardous waste, hazardous management by type of treatment	Percentage of industry hazardous waste collected and safely treated

Source: UN (2016)

1.3 Linkages with National Green Economy program and Industrialization Strategy

This Green Industry and Trade Assessment is a data driven analysis undertaken through PAGE in the Kyrgyz Republic. It expands on key components of the National Green Economy programme and the Industrialization Strategy that play a critical role in identifying a set of both modified and new policies to support the transition to green industrial production and trade. It puts forward specific green industrial and trade policy recommendations, which has been used as industry chapter of the national green economy program. The Industrialization Strategy outlines short, mid and long-term policy initiatives needed to enhance the industrial development of the country. GITA acts as a supplement to the Industrialization Strategy through providing analysis and strategic guidance for greening the industrialization process while achieving the target of the industrial development.

1.4 Key Issues and Questions to be addressed

This assessment focuses on a few key issues that are most relevant to green industry and trade. These are:

- What existing policy regimes have the potential for greening industry, encouraging the manufacture of environmental and renewable energy technologies and supporting green industry trade?
- What is the current status of industry and trade, regarding priorities and environmental performance?
- What is known about industrial environmental pollution and resource use? Can green trade help to mitigate environmental pollution or reduce resource use? What modifications in or effective use of existing industrial policies could contribute to greening industry and industry trade?

- What new initiative(s) might be undertaken to accelerate the greening of industry and trade, or even aspects thereof?
- What new industry segments could offer potential for green industry and trade?
- How could the development of these green industry segments be supported?

Chapter 2: Kyrgyz Republic's policy regime for green industry production and trade.

This chapter reviews the major policies that have or could influence the greening of industry, the manufacture of environmental and renewable energy technologies and the export of manufactured goods.

The Government and the Jogorku Kenesh (Parliament) of the Kyrgyz Republic prioritize "green economy and green industry" because the development of the mining , textile, hydropower, tourism, agriculture, and food production depend on natural resources, which in turn directly related to the state of the environment. The Government intends to address the path to a green economy transition through joint efforts with the international community such as PAGE.

The Ministry of Economy has developed the report "Inclusive 'Green' Economy for the Kyrgyz Republic" with the support of PAGE. The report presents analysis of conditions, prerequisites and challenges of major economic sectors in moving toward a green economy transition and identifies measures needed to be taken by the Government for settlement of key problems. At the same time, the report identifies priority sectors and actions for achieving a just transition to green economy (PAGE, 2017).

2.1 National development framework

In 2017 the Kyrgyz Republic celebrated the implementation of the National Sustainable Development Strategy 2013-2017. The strategy was adopted in 2010 to overcome the crisis caused by global financial crisis 2008 and political revolution in 2010 through creating conditions for agreement of further national development priorities that ensure a smooth development transition.

The Government's vision for the long-term development is stipulated in the National Strategy for Sustainable Development of the Kyrgyz Republic for the period 2018-2040 approved by the Kyrgyz Republic President's Decree (GoK, 2018). The country's long-term development vision should be realized by the means of implementation of five-year strategies with annual action plans and a rational development programme. As such, the Development Programme of the Kyrgyz Republic for the period 2018-2022, "Unity, Trust, Creation," was adopted. It outlines the industrial development of the country in the chapter titled Strategic Economy Sectors Development Subchapter Environmental development, Chapter Cross-sectoral development directions, Subchapter 7.2 Environmental aspect of development. Inter-sectoral definition of environmental development plays an important role, which means that environmental issues are integrated into all sectors included into the development framework.

The concept of green economy, "Kyrgyzstan is a country of green economy," adopted in 2018 by the Parliament of the Kyrgyz Republic, includes adoption of environmental measures, stimulation measures for business to introduce and use green technologies; provision of tax breaks for entrepreneurs with "green manufacturing technologies"; stimulating the transition to "green" technologies in agriculture; and improvement of the current regulatory and legal framework for facilitating green economy transition (GoK, 2018).

2.2 National Industrial Policy

The industry sector of the Kyrgyz Republic includes 17 sectors consisting of: mining, manufacture (13 sectors), electric power, gas, vapor and conditioning air supply and water supply, waste treatment and secondary raw material conversion (PAGE, 2017).

The priorities for the development of industry in the Kyrgyz Republic are defined by the National Strategy for Sustainable Development, the Development Programme of the Kyrgyz Republic for the period 2018-2022 "Unity, Trust, Creation", the Green Economy Concept "Kyrgyzstan – the country of Green Economy", the Concept of the Regional Policy of the Kyrgyz Republic for the period 2018-2022 GoK (2017), the National Energy Programme of the Kyrgyz Republic for 2008-2010, and the Strategy of Fuel and Energy Complex development till 2025 (GoK, 2008).

The National Strategy for Sustainable Development of the Kyrgyz Republic for the period 2018-2040 prioritizes industry capacity as the priority for development in Kyrgyzstan. Chapter 5 of the strategy titled "Priorities of the Kyrgyz Republic development till 2023" states that Kyrgyzstan needs high-tech, compact and environmentally friendly industry. The same findings are stipulated in the National Strategy Investment projects by the regions of the Kyrgyz Republic with confirmed financing sources.

Green Economy Concept "Kyrgyzstan – the country of Green Economy"

The "greening" approach is set forth in the Green Economy Concept "Kyrgyzstan – the country of Green Economy" (GoK, 2018). the provisions and priorities of which have to become an integral part of all strategic documents, including the National Strategy for Sustainable Development of the Kyrgyz Republic till 2040. In accordance with the Concept, industrialization and development of the processing industry in the Kyrgyzstan is the main driving force for income growth, job creation and improvement of citizens' wellbeing. At the same time, it points out the negative externalities from industrial development (especially mining and oil processing) on republic's environment.

The priorities of green industrialization are set forth in the Green Economy Concept as follows:

- Implementation of measures related to greening of existing industry sectors;
- Introduction of environmentally sound methods of industrial production and resource efficiency;
- Maximally effective utilization of water and energy resources, large-scale waste processing and application of advanced consumption and production systems;

- Encouragement of entrepreneurs for creation of new green industry sectors, such as renewable energy sources, wastes processing plants, manufacture/production of environmentally sound industrial technologies and food stuffs;
- Formation of legislative framework for the development and extension of green technology use in the manufacturing;
- Encouragement of "green" services in the field of industry, particularly in terms of production materials utilization, water treatment, control over air pollution and wastes processing equipment, as well as consultancy services for environmental and energy efficiency matters;
- Establishment of conditions for introduction of Best Available Technique (BAT) system in the industrial production and implementation of measures against use of outdated and inefficient technologies;
- Initiation of Design for the Environment (DfE) movement within industrial sector; etc.

Moreover, the following program documents adopted by the Kyrgyz Republic are supportive to the process of green industrialization and its environmental interface:

- The Concept of development of organic agricultural production in the Kyrgyz Republic for 2017-2022[1];
- The concept of development of the green fund of the city of Bishkek 2017-2025[2];
- The Priorities for Preserving the Biological Diversity of the Kyrgyz Republic until 2024 and Action Plan[3];
- The concept of sustainable development of the Issyk-Kul ecological and economic system for the period up to 2020[4];
- Kyrgyz Republic Government Programme on proper chemical management in the Kyrgyz Republic for 2015-2017[5];
- The Program for the Development of Manufacturing Industry of the Kyrgyz Republic for 2013-2015[6];
- Program of the Government of the Kyrgyz Republic on Energy Conservation and Energy Efficiency Policy Planning in the Kyrgyz Republic[7]

The Strategy of Industrial Development of the Kyrgyz Republic for 2019-2024

The strategy has identified the following priorities for industrial development: achievement and preservation of macroeconomic stability; reduction of the budget deficit, external debt and

[1] GoK (2017), Kyrgyz Republic Government Resolution dated 2.08.2017, No 459
2 Bishkek city council No №45
3 GoK (2014), Kyrgyz Republic Government Resolution dated 17.03.2014, No 131
4 GoK (2009), Kyrgyz Republic President Order dated 10.02.2009, No 98
[5] GoK (2015), Kyrgyz Republic Government Resolution dated 2.03.2015, No 91
6 Kyrgyz Republic Government Resolution dated 14.03. 2013, No. 133
7 Terminated by KR Government Resolution dated 22.01.2018, No 49

inflation; stimulation of economic growth; attraction of external and internal investments; integration of the economy into the regional economic system; and implementation of structural reforms (UNIDO, 2019).

The draft concept of the Kyrgyz Republic Fuel and Energy Complex development till 2040

The main goals identified in the draft concept are sustainable energy development, energy security of country and regions, energy efficiency, accessibility of energy carriers for every consumer and decreasing the technological impact on environment.

2.3 National Trade policy

The Kyrgyz Republic has been member of the World Trade Organization (WTO) since 1998 (Protocol on Accession of the Kyrgyz Republic to the Marrakesh Agreement Establishing the World Trade Organization[8]), which allows it to be engaged in wider international trade.

In 2018, the country became the full member of Treaty on the Eurasian Economic Union (EEU)[9]. The membership in EEU provides Kyrgyzstan with new opportunities, eliminates barriers for goods/products and services promotion, and supports new perspectives and investments for large-scale infrastructure projects, particularly in the field of energetics, transportation and agriculture.

The Kyrgyz Republic's Export Development for 2019-2022 and Action Plan[10] has been included by the Jogorku Kenesh (Parliament) in the framework of the "Unity, Trust, Creation" Development Programme (2018-2022).

The Plan aims at increasing of export of the most promising sectors, including green and innovative goods. It is expected that implementation of the Plan will facilitate an export growth two times by 2023 through market diversification and development of competitive sectors integrated into regional and global value-added chains. The state procurement policy is defined by the Green Economy Concept "Kyrgyzstan – the country of Green Economy" as purchasing goods and services that do not significantly affect the state of environment. In other words, it promotes environmentally sound goods and services as a priority.

2.4 National Environmental Policy

The overall environmental policy of the Kyrgyz Republic is formed by comprehensive National environmental legislative framework[11]. The basis of environmental framework is the Kyrgyz Republic Law "On Environment Protection" (dated 16.06.1999, No 53)[12] stipulating that nature and its components are the national heritage of the Kyrgyz Republic and one of the main factors for the sustainable social and economic development. The relationships in the field of

[8] Ratified by the Kyrgyz Republic Law dated 17.11.1998, No 146.
9 The Kyrgyz Republic Law "On Ratification of the International Agreements on accession of the Kyrgyz Republic to the Agreement on EEU (as of 29.05.2014)", dated 21.05.2015 No 111
10 Resolution of the Jogorku Kenesh (Parliament) of the Kyrgyz Republic dated 20.12.2018, No 596
[11] Compilation of laws and regulations of the Kyrgyz Republic in the field of environment protection. Volume I "Laws and Law Codes"/Compilers: J.Bekkulova, J.Kodoeva, A.Djailobaev, V.Grebnev, A.Nurbekov – Bishkek: Kirland, 2016-550 p. ISBN 978-9967-9022-3-7
[12] The last amendment as of 26.05.2018, No 55

environmental protection and sustainable nature resources use are regulated by the Foundation Law (Constitution) of the Kyrgyz Republic.

The Environmental Security Concept was adopted by the KR President's Decree[13] in 2007. The Concept puts emphasis on ecosystems capacity, environment pollution, and industrial wastes management.

The Kyrgyz Republic is a party to 13 International Environmental Conventions and related Protocols that show the country's commitment toward environmentally friendly development. The State Agency of Environment Protection and Forestry under the Government of the Kyrgyz Republic (SAEPF) is the responsible authority for 12 of them and the Ministry of Agriculture and Land Reclamation for one.

2.4.1 National Environment Legislation Framework

There is no specific law on green industrialization, but the industry and environment protection interface is regulated by a several key environmental laws[14] (Table 2).

Table 2 Environmental legislative framework

Law	Number and the date of adoption	Industrial Environmental Application of the Law
Constitution	27.06.2010	The Constitution sets forth that the land, subsoil, air space, waters, forests, flora and fauna and the other nature resources belong exclusively to the Kyrgyz Republic and they are used for conservation of integrated ecological system as the foundation of life and activity of the Kyrgyzstan citizens and specially protected by the State
Environment Protection	16.06.1999, No 53	This Law determines the policy and regulates legal relationships in the field of nature management and environment protection of the Kyrgyz Republic. The Law obliges carrying out of EIA (Environmental Impact Assessment) and introducing environmentally sound manufacturing technologies, as well as requires industrial operators to conduct self-monitoring,
Industrial Security of Hazardous Industrial Facilities	2.08.2016, No 160	This Law determines legal, economic and social basis for ensuring of safe operation of hazardous industrial facilities. It also sets forth the legal regulation in the field of industrial safety that should meet the requirements and norms in the field of population and territories protection from emergencies, ensuring of sanitary and epidemiological wellbeing, environment protection, and environmental safety.
Industrial and Consumer Wastes	13.11.2001, No 89	Law determines the state policy in the field of industrial and consumer wastes management and supports prevention of negative impact of industrial and consumer wastes on environment and human heath in the process of their management, as well as maximal wastes use in the economic turnover as additional raw material source
Renewable Energy Sources	31.12.2008, No 283	The main goal of present Law is development and use of the renewable energy sources, improvement of energetic structure, energy sources diversification, improvement of social status of population, ensuring of energy security of the Kyrgyz Republic

[13] KR President Decree dated 23.11.2007, No 506

[14] Compilation of laws and regulations of the Kyrgyz Republic in the field of environment protection. Volume I "Laws and Law Codes"/Compilers: J.Bekkulova, J.Kodoeva, A.Djailobaev, V.Grebnev, A.Nurbekov – Bishkek: Kirland, 2016-550 p. ISBN 978-9967-9022-3-7

Energy Saving	7.07.1998, No 88	The present Law sets forth legal norms for implementation of the state policy related to increasing of energy efficiency and legal norm for creation and functioning of institutional, economical and informational mechanisms for policy implementation. The Law's goal is to create conditions for increasing efficiency in the process of generating, production, processing, transferring (transportation), storage, distribution and consumption of fuel and energy resources
The State Regulation and Policy in the field of Emission and Green House Gases (GHG) absorption	25.05.2007, No 71	The law determines the basis of the state regulation, the order of activity, rights, obligations and responsibilities of the state authorities, local self-government bodies, physical and legal entities in the field of emissions and absorption of GHG on the territory of the Kyrgyz Republic
Radiation Safety of the Kyrgyz Republic Population	17.06.1999, No 58	The Law determines legal relationships in the field of radiation safety ensuring for population and environment protection from hazardous influence of ionized radiation sources
Technical Regulations on Radiation Safety	29.11.2011, No 224	The Law sets forth the requirements for ensuring of radiation safety goals of present Law is to protect human life and human/environment health from harmful impact of ionized radiation
General Technical Regulations on ensuring of Environmental Safety in the Kyrgyz Republic	8.05.2009, No 151	The Law sets forth general requirements for ensuring of environmental safety in the process of design and implementation of activities carried out in the facilities used for economic and other activities for production, storage, transportation and utilization of products.
Tailings Storage Facilities (TSF) and Mining Dumps	26.06.2001	The Law aimed at ensuring of security for nowadays and future generation, environment in the process of TSF and mining dumps management
Ozone Layer Protection	18.12.2006, No 206	The Law regulates relationships arisen in the process of activities associated with ozone-depleting substance management, including ozone-depleting substance contained in products
Atmosphere Air Protection	12.06.1999, No 51	Law establishes the set of measures that include requirements for disposition, design, construction and commissioning of enterprisers, installations and other objects, as well as requirements on atmosphere air consumption for production needs; identification of air pollutants emissions payment rates for production needs
Water	14.01.1994, No 1422-XII	The goals of present Law and water legislation of the Kyrgyz Republic is regulation of relationships in the field of water resources (waters) protection, prevention of environmentally harmful impact of economic and other activities. Law also regulates the issues of water fee. E.g. the exemption from payment of surface water consumption as natural resources is provided to waters users if they use water for electric energy generation, including renewable energy; agricultural irrigation, fish breeding etc. within the established limits.
Environmental expertise	16.06.1999, No 1999	The present Law regulates legal relationships in the field of environmental expertise and aimed at implementation of citizens' constitutional right on favorable environment through prevention of negative environmental consequences occurred in the results of economic and other activities
Order of Business Entities Inspection	25.05.2007, No 72	The Law regulates the order of environmental and industrial environment sampling in accordance with national standards, methods and procedures applied for sampling and measurements, as well as procedure of information distribution obtained based on the inspection results that relates to human health and environment security ensuring.

2.4.2 Environment Impact Assessment

The KR Law "On Environment Protection[15]" defines Environment Impact assessment (EIA) as follows: "EIA is the process of identification, analysis, assessment and accounting in design solutions of presupposed impact of planned economic and other activities causing environmental changes".

An EIA is performed for all types of activities subjected to the obligatory environmental expertise in accordance with the KR Law "General Technical Regulations on ensuring Environmental Safety in the Kyrgyz Republic". The types of activities subjected to an EIA include:

1. Power Engineering Facilities: industrial installations generating electric energy, vapor and hot water; heat- and hydroelectric stations, etc.;
2. Water-storage reservoirs;
3. Enterprisers for extraction and processing of oil, oil products, and gas;
4. Production of construction materials: cement, asphalt, asbestos-cement boards and pipes;
5. Agriculture: farming complexes, melioration and water management projects for agriculture purposes, etc.;
6. Mining industry: mining, processing, production and waste management;
7. Metal-based manufacturing industry: machine-tool production, semiconductor manufacturing, foundry and metal-rolling manufacture, etc.;
8. Glass production;
9. Pharmaceutical, biological and protein production;
10. Chemical industry;
11. Food industry;
12. Light industry: textile, leather, paper;
13. Wastewaters and gas treatment facilities;
14. Utilization, reprocessing and deposition of production and consumer wastes;
15. Others.

2.5 National Climate Change Policy

One of the key objectives of green industrialization is to assist countries in achieving climate change targets identified as nationally determined contributions. The Kyrgyz Republic is a party to the United Nations Framework Convention on Climate Change (UNFCCC) since

[15] Compilation of laws and regulations of the Kyrgyz Republic in the field of environment protection. Volume I "Laws and Law Codes"/Compilers: J.Bekkulova, J.Kodoeva, A.Djailobaev, V.Grebnev, A.Nurbekov – Bishkek: Kirland, 2016-550 p. ISBN 978-9967-9022-3-7

2000[16] and Kyoto Protocol to UNFCCC since 2003[17]. The State Agency of Environment Protection and Forestry under the Government of the Kyrgyz Republic (SAEPF) is the responsible executing state authority on implementation of obligations undertaken by the country under the UNFCCC and Kyoto Protocol[18]. The Climate Change Coordination Commission was established in 2012[19] for proper supervision and coordination of activities associated with implementation of UNFCCC obligations by the Kyrgyz Republic. The chairperson of Commission is the Vice Prime Minister of the Kyrgyz Republic.

As part of UNFCCC obligations, the Kyrgyz Republic has prepared and submitted to the UNFCCC Secretariat three National Communications (2003, 2009, and 2016). The preparation of the 4th National Communication (4NC) and the Initial Biennial Updated Report is currently ongoing with support from GEF/UNEP. The Third National Communication on Climate Change identifies "cement production" as the largest contributor to of GHG emissions in the "Industrial processes" sector (90% from the Kant cement plant).

In September 2016 the Kyrgyz Republic signed the Paris agreement[20] that regulates measures on decreasing of GHG emissions in the context of sustainable development and efforts toward poverty elimination It offers developing countries an opportunity to get additional support through a number of financial mechanisms (one of which is Green Climate Fund). The country contributions on mitigation include the following sectors: energetics, industrial processes, agriculture, land management and forestry, and wastes. The target indicator on mitigation identified by its Intended National Determined Contribution is achievement of GHG emissions of not more than 1,23 t CO_2/person, or as a limit - 1,58 t CO_2/person by 2050.

In 2013, the priority directions on climate change adaptation in the Kyrgyz Republic till 2017 were set forth and approved by the KR Government Resolution.[21] This adaptation strategy was the foundation for the following activities that are the most vulnerable to climate change: water resources, agriculture, hydraulic power industry, health care, emergencies, forestry and biodiversity, as well as education and scientific capacity. For fulfillment of KR priorities, the sectoral authorities have developed the following programmes and plans for climate change adaptation:

- Healthcare sector programme on climate change adaptation for 2011-2015[22];

- Emergencies programme on climate change adaptation for 2015-2017 and Action plan[23];

- Agriculture programme on climate change adaptation for 2016- 2020 and Action Plan;

[16] KR Law "On Accession to the United Nations Framework Convention on Climate Change and Convention on Long-range Transboundary Air Pollution" dated" 4.01.2000, No 11
[17] KR Law "On Ratification" dated 15.01.2003, No 9
[18] KR Government Resolution dated 16.01.2006, No 13-p
[19] KR Government Resolution dated 21.11.2012, No 783
[20] KR Government Resolution to approve draft Paris Agreement to UNFCC dated 29.06.2016, No 297-p
[21] KR Government Resolution dated 02.11.2013, No 549
[22] KR Ministry of Health order dated 31.10.2011, No 531
[23] KR Ministry on Emergency Situations internal order dated 07.07.2015, No 692)

- Forestry and Biodiversity programme on climate change adaptation for 2015-2017 and Action plan[24]

The Climate Dialog Platform has been created in order to raise public awareness, promotion of multilateral dialog and consultation process. In 2016, the draft concept of long-term actions on development with low GHG emissions level till 2050 was developed.

2.6. Institutions Supportive to Green Industrialization

The government institutions supporting green industrialization in Kyrgyzstan are presented in Table 3.

Table 3 Governmental institutions supporting Green Industry

#	Authority	Mandate
1.	Jogorku Kenesh (Parliament) of the Kyrgyz Republic	Implementation of the legislative/ lawmaking power and supervision function within the limits of its authority
2.	The state Committee on Industry, Energy and Subsoil Use of the Kyrgyz Republic	Development and implementation of single state policy in the field of industry, fuel and energetic complex, subsoil use and industrial security
3.	Ministry of Economy of the Kyrgyz Republic	Ensuring of social and economic progress and sustainable development of the Kyrgyz Republic through development and implementation of the state policy in the field of macro economical, foreign economical, antimonopoly, tariff, regional development, metrology, and development of free economic zones.
4.	Ministry of Agriculture, Food Industry and Land Reclamation of the Kyrgyz Republic	Development and implementation of the single state policy in the field of agro-industrial complex, including food and processing industry for ensuring of food security, agriculture manufacturing and food industry
5.	The State Inspectorate on Environmental and Technical Security under the Government of the Kyrgyz Republic	State supervision and control over adherence of requirements for environmental, industrial, energy security
6.	The Ministry of Emergency Situations of the Kyrgyz Republic	Development and implementation of single state policy in the field of civil defense, fire, radiation and hydro meteorological safety through monitoring and forecasting of dangerous natural and techno genic processes and phenomena
7.	The State Agency of Environment Protection and Forestry under the Government of the Kyrgyz Republic (SAEPF)	Ensuring of KR environmental system conservation through implementation of environmental policy. SAEPF's Laboratories (Environmental monitoring units) responsible for monitoring of anthropogenic influence on environmental objects, including from the industry sector

The State Authority responsible for compliance with environmental, industrial and energy regulatory acts and technical regulations is the State Inspectorate on Environmental and Technical Security (SIETS). It supervises observance of environmental legislation, established rules, limits, quotas and environmental management norms, norms of emissions/discharges and waste disposal into the environment.

[24] KR SAEPF order dated 17.04.2015, No 01-9/110

The State Agency of Environment Protection and Forestry (SAEPF) has the right to charge for environment pollution under the following categories:

- charges for allowable (limited) emissions, discharges of pollutants, production and disposal of wastes into the environment;

- charges for exceeding allowable (limited) emissions, discharge of pollutants and unauthorized disposal of wastes into the environment;

- charges for nature resources use;

- charges for environment damage caused by violation of environmental law; etc.

There are a number of non-governmental institutions supporting implementation of the green economy programme in the Kyrgyz Republic, such as: Association of Light Industry, Association "Soyuztextile", Business Association "JIA", free trade zones trade unions, Association of Confederation of Manufacturers and Employers, and the Chamber of Commerce and Industry of the Kyrgyz Republic (CCI).

In a nutshell, this chapter summarizes national policies and institutions that are supportive of the green industrialization process in the country. It describes the existing institutional set up and level of government commitment that have the potential to mainstream a green agenda. It is worth noting that the green economy in general and the "greening" approach toward main economic sectors in the country, including the manufacturing sector, is a new phenomenon. Nevertheless, several strategic documents - specifically emphasizing the principles of green economy have been developed by the Government. The main challenges remain to what extent the Government will be able to implement the policies and action plans that are needed to green industry.

Chapter 3: Kyrgyz Republic's manufacturing sector and trade in manufactured goods

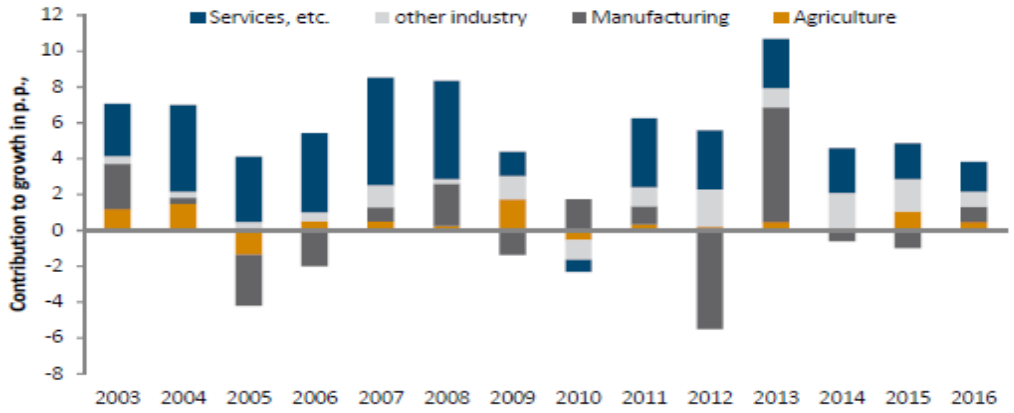
This chapter begins with an overview of industry contributions to the Gross Domestic Product (GDP) and main indicators of socio-economic development. The chapter also describes Kyrgyz Republic's import and export structure. The data on manufacturing, production and employment are taken from the National Statistics Committee and UN Statistical sources as INDSTAT (UNIDO, 2019).

3.1 Overview

The main economic indicators for the Kyrgyz Republic as of January-March 2019 are the Gross domestic product - 104527,3 mln.KGS; the total volume of industrial production - 64145,2 mln. KGS; manufacturing industry - 46993,4 mln. KGS; and foreign trade turnover - 884,6 mln. KGS. The data demonstrate year-on-year (2018-2019/2017-2018) 14 % growth of industrial production and 19.6 % of manufacturing. The industrial production growth is due to the 40.1 % growth in basic metal production.

Looking at the Figure 1, manufacturing made a marginal contribution to GDP growth over the past 13 years. Manufacturing contributed to 0.2 percentage points (2003-2016) whereas the service sector played a significant role in driving the growth of the economy. Industrial production in the country was volatile during the period of 2000 to 2016.

Figure 1 Sector contributions to growth in Kyrgyzstan, 2003-2016



Source: (UNIDO, 2017)

The metal sector made the greatest contribution on average to manufacturing value added (MWA) over the period 2010-2016 whereas food and beverage was in second position followed by non-metallic mineral products. Interestingly the value added (VA) of other sectors significantly differs from the VA of the metal industry (Figure 2).

Manufacturing employment has similar statistics. Metal, food and beverage and non-metal sector remain among the top three., Food and beverage generates generated the greatest employment followed by non-metallic mineral products and basic metal (Figure 3).

3.2 Manufacturing sector

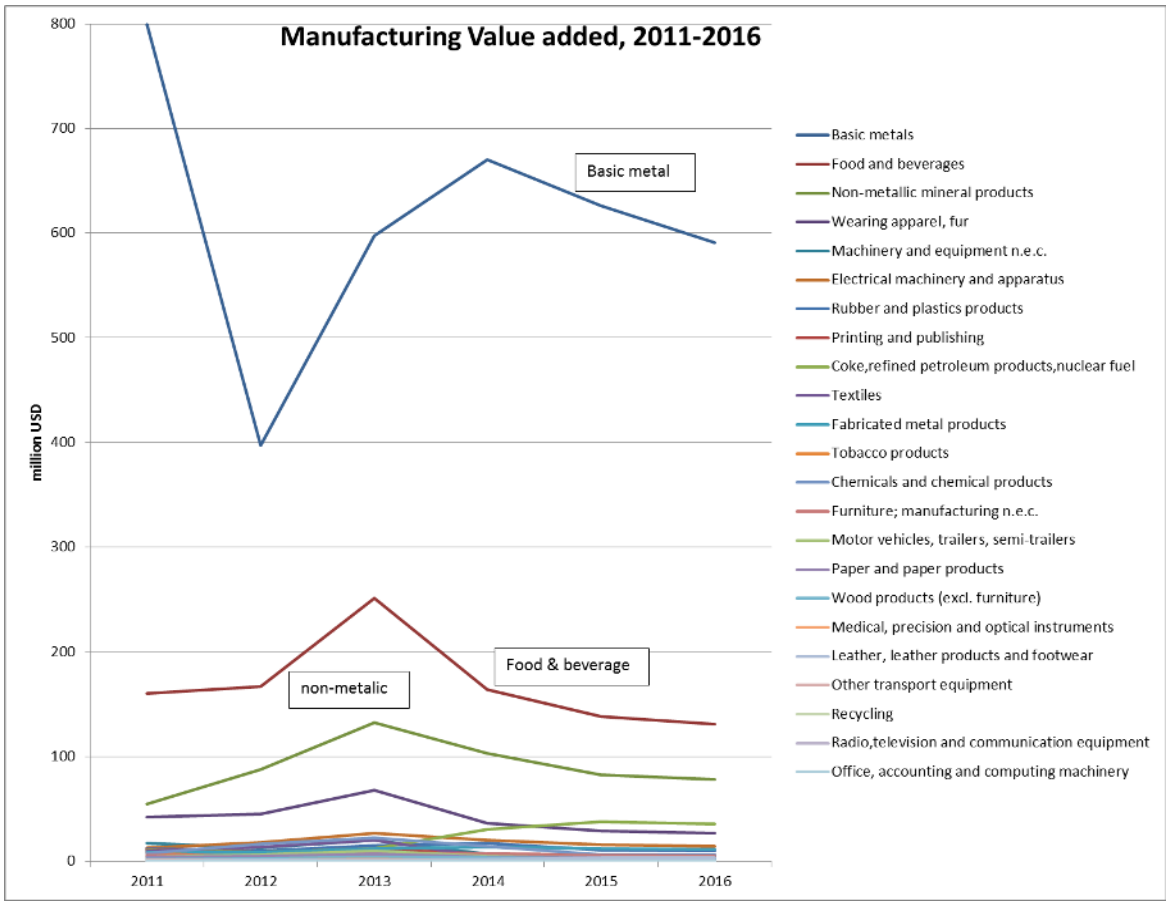
The manufacturing industry in Kyrgyzstan includes five major sectors: basic metals and finished metal products (except machinery and equipment); food products including beverages and tobacco products; rubber and plastic products; other non-metallic mineral products; coke and refined petroleum products; textiles; wearing apparel; and footwear, leather and other leather goods.[25]

According to the National Statistical Committee of the Kyrgyz Republic (2019a) the greatest growth of industrial production volume during January – March 2019 (year-on-year comparison) was due to the growth of metallic ore mining 2.2 %; coal 29.5 %; crude oil and nature gas 16.9%; production of base metals 40.1%; and apparel production 29.2 %/. Production rates decreased for the following sectors as of January-March 2019 compared to the same period in 2018 for oil products 47,3%; textile 10.9 %; rubber and plastic products 7.1

[25] Industrial Development of Kyrgyzstan: Background. Working paper 1

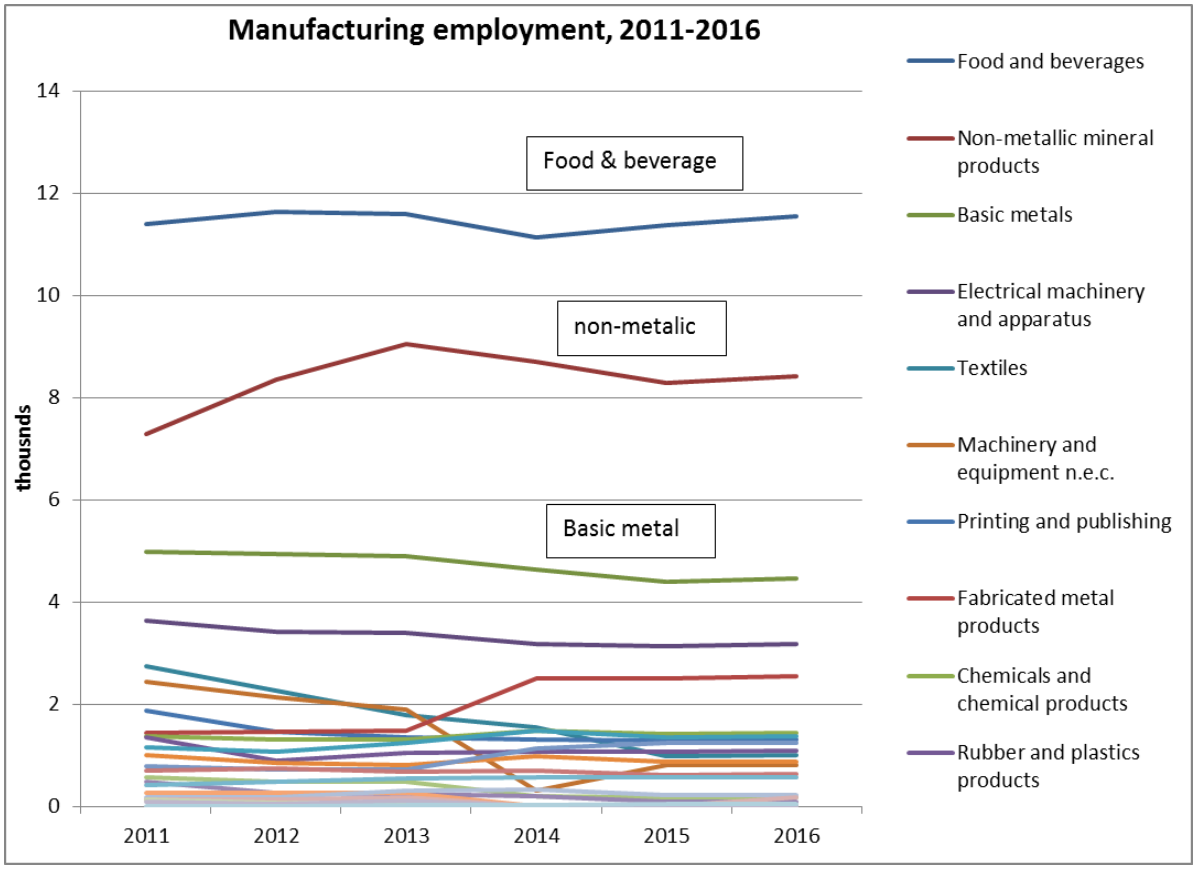
%; foodstuffs 8.1 %; wood processing, wood and cork products 8.6 %; and the electric power, gas and steam supply 3.0%. The gross value added by the main components of the economy is presented in Table 4.

Figure 2 Manufacturing value added of Kyrgyz Republic, 2011-2016



Sources: (UNIDO, 2018)

Figure 3 Manufacturing value added of Kyrgyz Republic, 2011-2016



Sources: (UNIDO, 2018)

Table 4 Gross value added by the types of economic activities

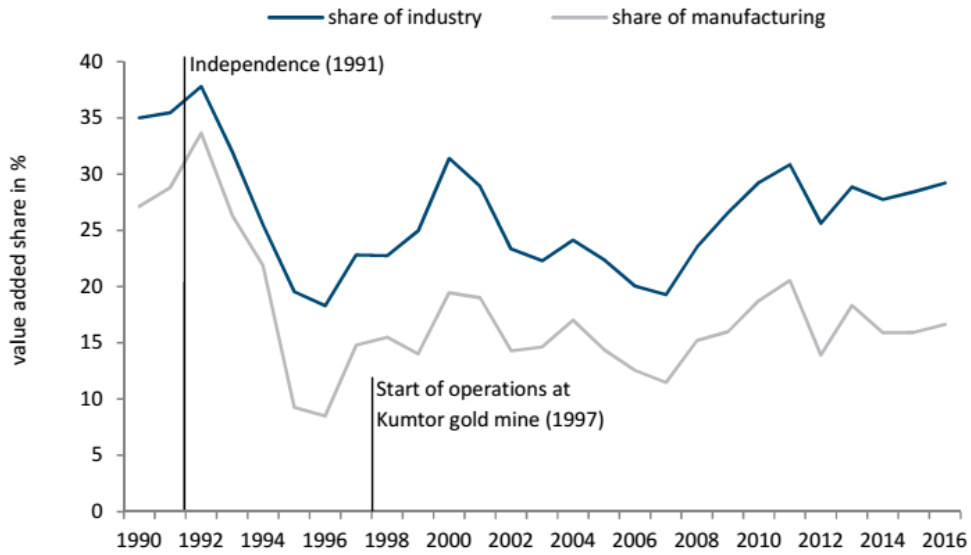
Item (Mln.KGS)	**2012**	**2013**	**2014**	**2015**	**2016**
Gross domestic product*	**310 471,3**	**355 294,8**	**400 694,0**	**430 489,4**	**476 331,2**
Gross value added	***269 723,3***	***305 879,3***	***344 762,9***	***379 762,2***	***413 799,2***
Agriculture, forestry and fishing	51 706,5	52 007,6	58 976,8	60 530,1	61 134,6
Mining	2 724,5	2 546,2	2 616,6	3 323,7	3 056,0
Manufacturing	37 479,3	56 023,2	54 799,7	60 487,1	73 518,2
Electricity, gas and steam production, distribution and supply	7 962,0	6 239,3	7 485,3	7 215,9	8 902,2
Water supply, waste treatment and secondary raw material production	769,9	992,8	1 036,8	889,7	1 099,2
* Gross domestic product = gross value added + net goods tax					

Source: (National Statistical Committee, 2019b)

The dynamics of the GDP changing and effect of industry and manufacture on it is presented in Figure 4. It demonstrates that the decline of manufacturing activity stopped in 1997 with the beginning of the commercial exploitation of the Kumtor gold mine. In addition to the

actual mining activities, the country increased its export capacity by exporting gold, mainly to Switzerland.

Figure 4 Development of Kyrgyz industry and manufacturing, 1990-2016



Note: Values are in per cent of GDP; chart plotted based on World Development Indicators (WDI).
Source: (UNIDO, 2018)

According to UNIDO, the manufacturing sector of the Kyrgyz Republic is characterized by the economic output and related industrialization process based on the manufacturing value added (MVA)[26] taking into account International Standard Industrial Classification of All Economic Activities (ISIC, divisions 15-37).

The Competitive Industrial Performance (CIP rank)[27] of the Kyrgyz Republic is 121 out of 150 countries. As of 2016, GDP was 6,266 mln USD, MVA was 819.8 mln USD, and manufacturing exports were 504.2 mln USD.

[26] Manufacturing value added (MVA) of an economy is the total estimate of net-output of all resident manufacturing activity units obtained by adding up outputs and subtracting intermediate inputs.
[27] http://stat.unido.org/country/KGZ.pdf

Figure 5 Gross industrial output and gold production, 2000-2016

Source: (UNIDO, 2018)

3.2.1 Manufacture of environmental goods and renewable energy technologies

Manufacture of environmental and renewable energy technologies is occurring in the Kyrgyz Republic on a limited scale. A joint venture called "NEW-TEK LLC Company''[28], (the joint Kyrgyz-German company), specialized in the field of solar modules manufacturing was founded in 2015. In November 2016, it constructed a plant to produce solar modules in the territory of the FEZ (Free Economic Zone) in Bishkek. The total capacity of the plant is 50 megawatts per year, equal to 200 thousand pieces of PV solar modules.

The following institutions support the manufacturing of environmental goods and renewable energy technologies:

- The Institute of Water Problems and Hydropower (the National Academy of Science) is mandated to lead environment and economy feasibility studies of water economic activities and large-scale use of hydropower capacity in order to get maximal economic benefit and ensure energy sovereignty and water-energy independence of the Kyrgyz Republic;
- Association of Renewable Energy Sources (RES) established in March 2010 with purpose to render legal assistance to the Association members, facilitation in creation of new and strengthening of existing legislation base in the field of RES, training and capacity building of Association members, promotion and distribution of advanced experience; organization and implementation of stocktaking and monitoring of projects and activities related to GHG emissions reduction; rendering of consulting service on quality standards and environmental management systems.

[28] http://newtek-schmid.com/en

- Center for Renewable Energy and Energy Efficiency Development (CREEED)[29] implement various projects under support of development partners in the field of renewable energy.

3.2.2 Employment in the manufacturing sector

A UNIDO report finds that there is substantial growth of employment in the manufacturing industries in the country though job losses were observed in fast-growing low-tech industries. Some exception is also observed, for example, decreasing employment rate in manufacturing areas such as "Metallurgical production and manufacture of fabricated metal products", "Wood processing" and "Processing of raw materials" could be explained by introduction of more advanced technologies requiring less labor. However, total output increased at the same time. Dynamics of changes in employment and GVA in the manufacturing sector of Kyrgyzstan for 2005-2014 is presented in Table 5.

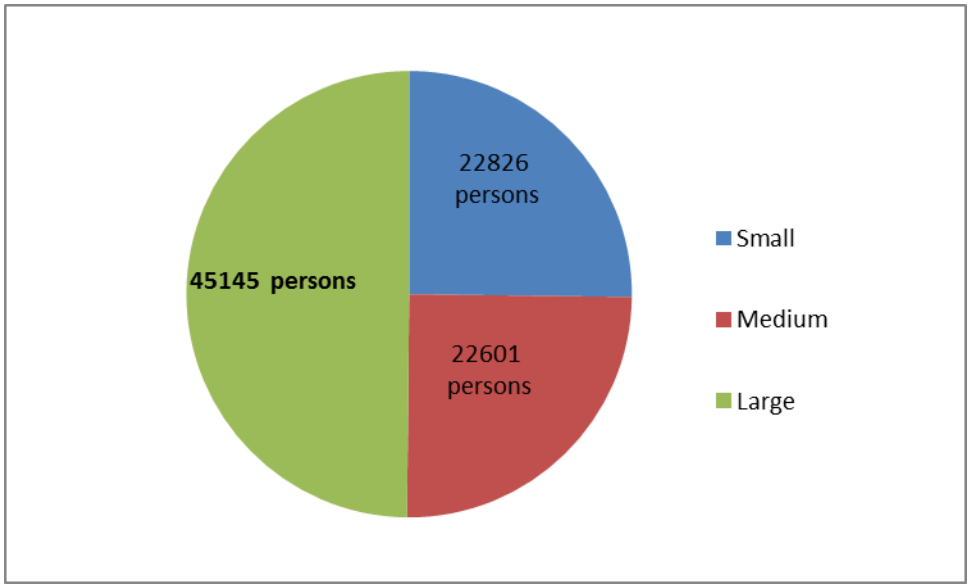
Table 5 Intensity of changes in employment and GVA in the manufacturing sector of Kyrgyzstan

Types of manufactures	Employment (thousand people)			Annual growth rate of employment (in %)	Annual growth rate of GVA (in %)
	2005	2009	2014	2005-2014	2005-2014
Manufacture of food products, including	14.1	12.1	11.8	-1.9	2.3
Textile and clothing manufacture	6.7	3.9	2.6	-9.9	5.7
Manufacture of leather, leather goods, and footwear	0.3	0.3	0.3	1.4	4.6
Wood processing and manufacture of wood products	1.1	0.6	0.5	-8.2	8.3
Pulp and paper industry; publishing activity	3.7	3.4	2.0	-6.5	-6.1
Manufacture of petroleum products	1.0	1.2	0.7	-4.1	-3.9
Chemical production	2.5	1.8	1.3	-6.8	-0.9
Manufacture of rubber and plastic products	1.5	1.4	1.0	-3.7	-1.6
Manufacture of other non-metallic mineral products	9.1	7.6	9.0	0.0	5.6
Metallurgical production and manufacture of fabricated metal products	7.0	6.0	6.4	-1.0	7.7
Manufacture of machinery and equipment	4.8	3.0	1.9	-9.7	-20.0
Manufacture of electrical, electronic and optical equipment	6.1	3.6	3.8	-5.1	-4.1
Manufacture of vehicles and equipment	0.7	0.6	0.7	0.3	7.6
Processing of raw materials	27.9	23.6	23.4	-1.9	3.2
Low-technology production	16.4	12.8	11.1	-4.3	6.8
Medium- and high-tech production	14.0	9.1	7.7	-6.4	-5.2

[29] http://creeed.net/

Employment data in manufacturing sector by size of company are presented in Figure 6. The data show that there are about an equal number of employees in large enterprises as there are in small and medium enterprises.

Figure 6 The number of staffs in small, medium and large manufacturing enterprisers in the Kyrgyz Republic for 2014-2017



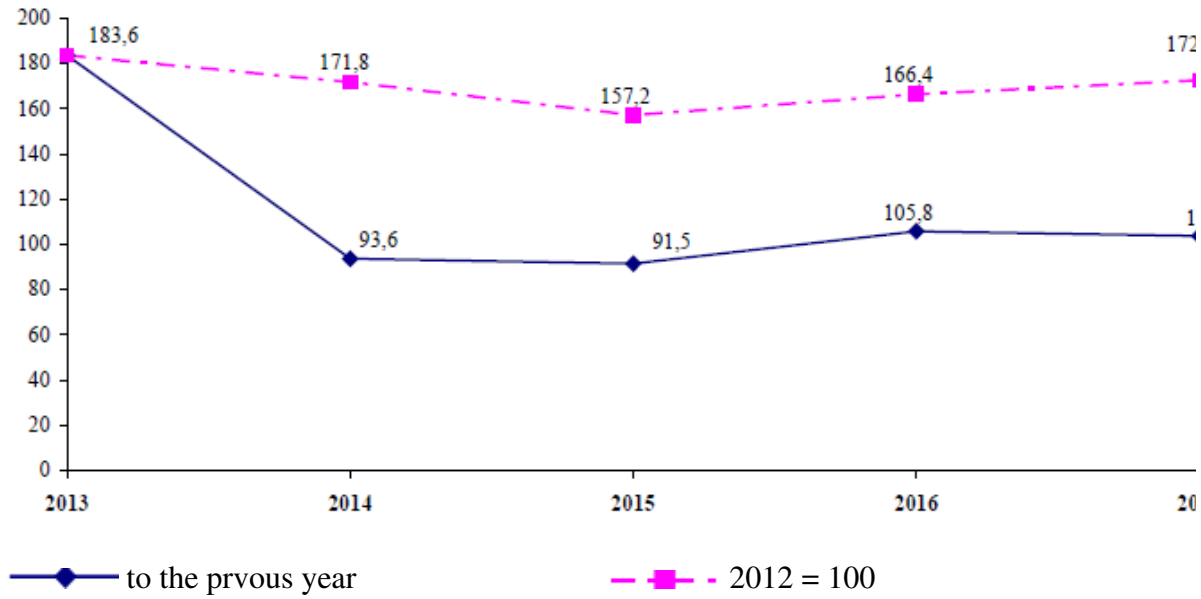
Source: National Statistical Committee[30]

3.3 Metal industry in Kyrgyzstan: A case study

The enterprisers of metal industry in Kyrgyz republic include large, medium, and small-size enterprisers as well as joint enterprisers and subsidiary producers held in inventory. In 2017, the share of basic metals and ready-made metal goods producers was 45 % of total volume of industrial products in Kyrgyzstan which is a slight decrease from 50 % of total industrial production accounted in 2013. According to the National Statistical Committee[31], the growth of production volume for 2013-2017 has been observed comparing with the growth level as of 2012. This growth is mainly caused by increasing of production output of basic metals producers. In 2017, industrial enterprisers received more than 11 bln KGS of balance income; in 2016 - about 25 bln. KGS. In 2017, the financial result of industrial sector was formed on account of basic metals and ready-made metal goods producers that amounted to 15550, 9 mln. KGS. The following Figure 7 demonstrates the indexes of physical volume of basis metals and ready-made metal production (in %).

[30] http://www.stat.kg/en/opendata/category/1932/
[31] Industry of the Kyrgyz Republic 2013-2017 - Bishkek: NSC of the Kyrgyz Republic, 2018. – 330p., ISBN 978 -9967-26 -907 -1

Figure 7 Indices of the physical volume of production of base metals and finished metal products (in percents)



Source: National Statistical Committee (2019)

The main indicators of metal industry development are presented in Table 6.

Table 6 Production of basic metals and ready-made metal goods without machinery and equipment

Indicator	Measurement unit	Year				
		2013	*2014*	*2015*	*2016*	*2017*
Number of industrial enterprisers	Items	107	104	94	101	101
Volume index of industrial products	% to the previous year	183,6	93,6	91,5	105,8	103,7
Production volume	Mln KGS (total)	169 829,4	171 108,9	181 026,7	209 812,0	237 225,3
	Mln KGS	84 847,1	80 938,3	82 212,5	101 327,0	106 740,0
	In % to the total industrial production volume	50,0	47,3	45,4	48,3	45,0
Electric energy consumption	Mln kWh	190,1	82,5	87,8	96,4	120,2
Average monthly salary of personnel	KGS	60 497,6	68 050,2	70 691,8	80 114,0	81 434,6
Income of profitable enterprises	Mln KGS	10 267,9	7 770,5	9 753,9	16 187,1	15 913,2
Losses of unprofitable enterprises		241,1	197,6	2 021,0	229,6	362,3

Source: (National Statistical Committee, 2018c)[32]

[32] Industry of the Kyrgyz Republic 2013-2017 - Bishkek: NSC of the Kyrgyz Republic, 2018. – 330p., ISBN 978 -9967-26 -907 -1

The above table indicates that the percent of metal production to the total industrial production volume has been increasing and it is a substantial part of the industrial production. On the other hand, the metals and metal products manufacturing sector is an energy-intensive, particularly in the early, first processing activities. Metal industry is one of the top three energy consuming industry sector of the country in terms of manufacturing production (table 7) which might be associated with higher volume of production.

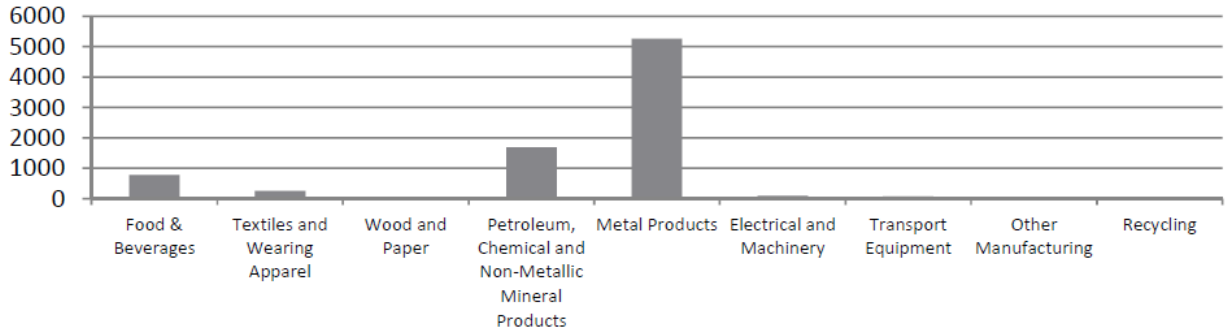
Table 7 Electricity consumption by industrial product categories

Srl.	Items	2013	2014	2015	2016	2017
	Total Processing production	958.6	902.9	852.3	809	975.1
1.	Production rubber and plastic products, other non-metallicmineral products	397.5	394.7	371.1	330,8	383.4
2.	Production food products (including drinks) and tobacco products	191.1	206.1	186.7	175.7	265.4
3.	Production major metals and finished metal products, exc eptmachines and equipment	190.1	82.5	87,8	96.4	120.2
4.	Provision (supply) of steam and air-conditioned by air	173.7	205.5	189.1	175.5	192,4
5.	Production chemical products	44.7	40.5	31.3	18.5	18
6.	Textile production ; production clothes and shoes , leather and other leather products	40.9	49,8	44.2	40.6	27.9
7.	Production electric equipment	35.5	35.5	32.6	28.9	27.4
8.	Production wooden and paper products ; poly graphic activity	23.8	24	22,8	25.7	32.9
9.	Other production , repair and installation machines and equipment	16.4	16.6	16.3	17.7	19
10.	Production transport funds	9	9.3	8.6	9.8	10.5
11.	Production peeled oil products	4.4	39	46.3	61.1	66.6
12.	Production machines and equipment	4.3	3.9	3.4	2.6	2.7
13.	Production pharmaceutical products	0.7	0.8	1	1	1.1
14.	Production gas; distribution gaseous fuel through systems gas supply	0.6	3.2	0.6	0.8	0.8
15.	Production computers, electronic and optical equipment	0.3	0.1	0.2	0.1	0.1

Source: (National Statistical Committee, 2018)

On the other hand, the metal industry is the top user of natural resources and has a high material intensity which can be seen in the following figure 8.

Figure 8 Material use intensity in Kyrgyzstan for the 2013 by industry sub-sector



Source: EORA MRIO (2016) as cited in UNIDO (2018)

Innovation activity in the metal industry, which means transformation of industrial processes - based on scientific investigations, developments or achievements - into technologically new or improved process used in practices, is presented in Table 8.

Table 8 Innovatively active industrial enterprisers - basic metals and ready-made metal goods producers without machinery and equipment in 2017

Items	**Innovatively active**					
Number of surveyed enterprisers	Total	Innovation process:		The number of enterprisers producing innovation goods	Innovation goods volume	Volume of innovation goods export
		Competed	At the stage of implementation		*Thousand KGS*	
48	3	1	2	1	138 196,5	138 196,5

Innovation products are products subjected to technological changes at the different innovative levels for the last three years. As of 2017, the main technological innovations among surveyed enterprisers in the Kyrgyz Republic related to procurement of machinery and equipment for two enterprisers (23 023,9 thousand KGS). All innovation products are exported to CIS countries. The innovation mainly depends on importing foreign innovations in the form of machinery, equipment and technologies.

In a nutshell, metal is the largest sector in terms percentage of metal in industrial production which is on average 50 %. In addition, the volume of electric energy consumption for basic metals and ready-made metal goods production in processing industry takes third place after rubber, plastic, other non-metal mineral goods production and foodstuffs production including beverages and tobacco products. Industry is found as a top in term of material intensity production. Hence, this combination of findings provides support for a resource efficiency demonstration in the metal sector.

3.4. Cement industry in the Kyrgyz Republic: A case study

Developing countries are the major producer of cement globally; China is the largest cement producer followed by India[33]. The production volume and number of plants has also been increasing in country. As mention earlier cement production is highly energy- and CO_2 - intensive. The potential for energy efficiency improvements is technically about 40% (Worrell, E., et. al, 1995). A study of the US cement industry has identified 30 opportunities for energy saving in the cement production with 11% economic potential of energy savings and 5% emissions reductions (Worrell et al., 2000b; Worrell and Galitsky, 2005). This subsection identifies the status of cement industry in the Kyrgyz Republic in terms of production, export and potential for competitiveness.

Data of the State Committee on Industry Energy and Subsoil Use of the Kyrgyz Republic states that there are eight plants in the cement sector. Three of the plants are CJSC South-Kyrgyz Cement, JSC Kant Cement Plant, and LLC Southern Combine of Building Materials (Table 9). One company called "TechnoLin" LLC has stopped operation due to non-profitability. Four others are at the initial stage of production or limited production. (Table 10).

Table 9 Top cement producers in Kyrgyzstan

Name of enterprise/ location	Contribution to the country's treasury*	Main products	Capacity **	Environmental compliance
CJSC South-Kyrgyz Cement, *Batken Province* [34]	420.9 mln. KGS	Portland cement (ЦЕМ 1 42,5Н; М400 Д-20) Sulphate-resisting portland cement (ССПЦ 400 Д-20 ГОСТ 22266-94); Portland cement with mineral additive (ЦЕМ II/А-П 32,5 Н)	1000 thousand ton of cement/ year	Production technology is - "dry" cement production. The dry cement production contributes to decreasing of fuel and electric energy consumption. Under the "dry" cement production, the volume of kiln waste gases is 35-40% lower. The main benefit of "dry" cement production technology is higher production capacity with lower energy consumption. CJSC South-Kyrgyz Cement sets itself up as the leading environmentally friendly construction materials producer in Kyrgyzstan. It uses the most advance technological solutions allowing substantial decrease of harmful industrial emissions against the norm.

[33] http://www.globalcement.com/magazine/articles/1054-global-cement-top-100-report-2017-2018
[34] https://www.ykc.kg

JSC Kant Cement Plant, *Chui Province* [35]	62.4 mln. KGS	Portland cement (ПЦ-400 Д20); Blended slag/portland cement (ЦЕМ III/А32/5Н)	1290 thousand ton of cement/ year	Two Lab are available at the plant for quality assurance/ quality control (QA/QC): 1. The cement production laboratory is responsible for quality of raw materials (slag, gypsum, limestone, ferriferous components, etc.), and calculation and testing of raw mixture chemical composition and control over its preparation; analysis of clinker quality characteristic; current control over final product – cement against the state standards (GOST) 2. The Coal Lab, equipped with advanced laboratorial equipment LECO. The lab is responsible for analysis of quality characteristic of used fuel resources. Analyses include humidity, volatile-matter content; ash content; sulfur; carbon; calorific capacity and other quality characteristics. Since 2013 the labs are accredited by the Kyrgyz Center of Accreditation (competence was confirmed in 2018).
LLC Southern Combine of Building Materials, *Osh province* [36]	115.6 mln. KGS	Portland cement (ПЦ-400-Д20); Portland cement with slug (ЦЕМ II-А–Ш-32,5Н); Portland clinker (КлПЦ)	300 thousand ton of cement/ year Note: based on modernization results the capacity since 2018 should be 1000 thousand ton of cement/ year	For cement good production phosphoric slag is used as an active mineral admixture. The following components are used for cement production: limestone, paddy field soil, gypsum, active agents, fluorite, and iron ore.

Note. * Internet-based Cement Industry review portal** SCIESU (2019)

[35] http://www.kantcement.kg/
[36] http://aaagroup.kg/

Table 10 Status on newcomer cement producers

	Producer	Capacity	Operational status
1	"TechnoLin" LLC	320 thousand ton of cement/ year	Operational permit is revoked due to unprofitability
2	"Ak-Sai Cement" LLC	40 thousand ton of cement/ year	Seasonal producer especially based on demand/order availability, aimed only at local market
3	"Kadamzhai Cement Plant" LLC (Kyrgyz-China Joint Venture)	n/a	Currently produces only lime
4	"Siz-Dzi-Prim" LLC	300 thousand ton of cement/ year	Commissioned in June 2018
5	"Shamshykal-Ata" LLC	planned capacity is 1,3 mln ton of cement/ year	based on investment agreement the preliminary commissioning of plan – the end of 2019

Source: SCIESU (2019)

3.4.1 Environmental implication of Cement production

There are various technologies used to produce cement, each of which requires different amounts of fuel (heat), electric energy and natural resource consumption. The production of cement causes the emission of a range of pollutants that have a negative impact on the environment:

- Dust and Gas emissions (NOx, SO_2, CO_2, VOC, etc.)
- Heavy metals such as mercury are evaporated together with other industrial gases in the process of oxidizing ore burning (700-800^{0}C). Also, mercury is found in charcoal that is used for clinker burning.

The Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade do not consider cement production as hazardous considering that gaseous emissions of mercury are low.

The common characteristics of cement production cycle impact to the environment are presented in Table 11.

Table 11 Main cement production emissions through whole production cycle

#	Cycle phase description	Pollutants emission/environmental impact
1	Storage and preparation of raw materials and fuels	Dust
2	Clinker burning	Dust, acid gases, organic substances, volatile metals, dioxins, noise
3	Cement grinding	Dust, noise
4	Cement storage, packaging and dispatch	Dust, noise

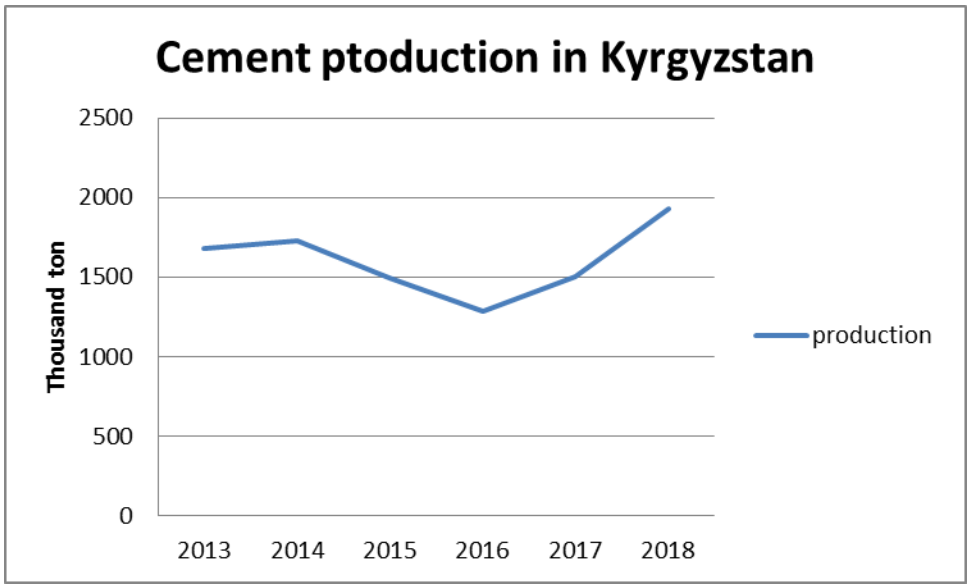
Source: Cement industry in the Eurasian Economic Union[37]

[37] The cement industry in Russia, Belarus, Kazakhstan, Armenia and Kyrgyzstan in 2014–15. © 2016 Ernst & Young Valuation and Advisory Services LLC

Cement production and international trade

The growth of total cement production in the country is on upward trend (Figure 9). Cement production in 2017 represents a 16.6 per cent year-on-year rise. In 2016, it was a 13.9 per cent decrease from an output of 1,496,400 in 2015.

Figure 9 Cement production in Kyrgyzstan



Source: National Statistical Committee (2018); SCIESU (2019)

Export and import of Cement from Kyrgyzstan

The value of Kyrgyzstan export and import of construction materials, including cement is presented in Table 12.

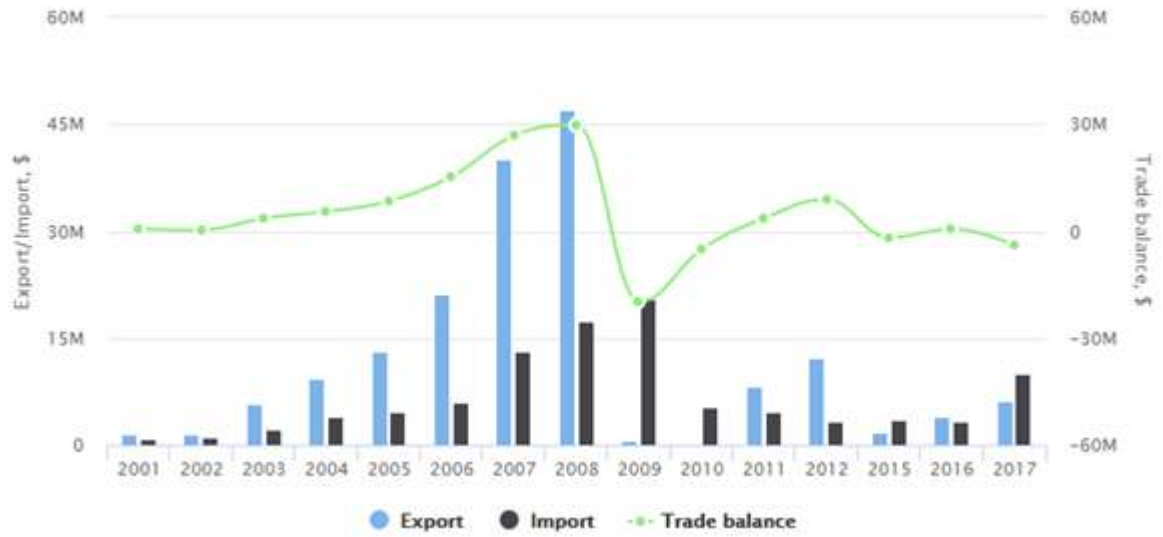
Table 12 Cement export, import and trade balance of Kyrgyzstan

Product label	Kyrgyzstan's exports to world, thousand USD			Kyrgyzstan's imports from world, thousand USD			Trade balance, thousand USD		
	2016	2017	2018	2016	2017	2018	2016	2017	2018
Salt; sulphur; earths and stone; plastering materials, lime and cement	9225	8745	28684	17611	27909	34199	-8386	-19164	-5515
Articles of stone, plaster, cement, asbestos, mica or similar materials	5353	4109	3866	19568	18402	15335	-14215	-14293	-11469

Source: (ITC, 2019)

For the last three years, Kyrgyzstan imported a greater value than it exported meaning that it has a trade deficit. The status of Kyrgyzstan Cement Market Outlook according to the Merchant Research & Consulting Ltd. (2019) is presented in Figure 10.

Figure 10 Cement trade in Kyrgyzstan



Source: Market Publishers[38] (2019)

The most obvious finding to emerge from the analysis is that there is need for enhancing the competitiveness of cement production through reducing cost and improving efficiency. This study did not investigate all options for improving efficiency in production so a resource efficiency demonstration in selected cement plants could be useful for identifying the additional savings.

In a nutshell, three plants account for most of cement production. One plant uses the more environmentally sound "dry" production technology that decreases fuel and electric energy consumption. Under the "dry" cement production, the volume of kiln waste gases is 35-40% lower. The main benefit of "dry" cement production technology is higher production capacity with lower energy consumption (2900-3700 kJ/kg against "wet" technology (5450-6800 kJ/kg).

3.5. International Trade of Kyrgyzstan

3.5.1 Export status

In order to get a more comprehensive picture of the growth level of the industrial sector, the export status of manufactured goods has been assessed based on official statistical information available from international sources. As of 2017, total foreign trade volume increased from 25.1 % to 28.2% since 2013. According to the International Trade Statistics (ITC)[39], exports from the Kyrgyz Republic are comprised mainly of gold, re-exported oil, agricultural goods, and light industry.

The Observatory of Economic Complexity tool[40] ranked Kyrgyzstan as the 133rd largest exporter in the world in 2017 based on exports of 1.92 bln USD. Since 2012, the exports of

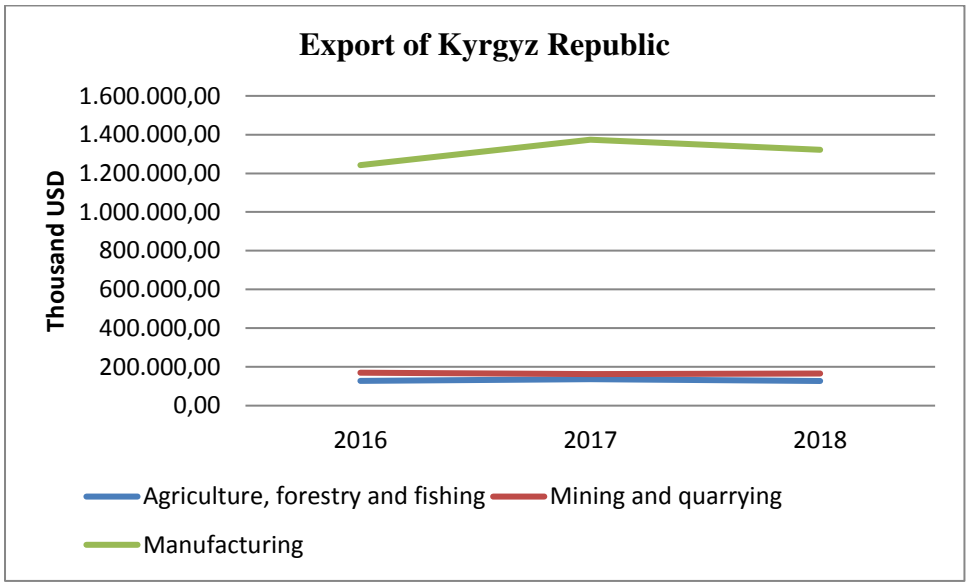
[38] https://marketpublishers.com/report/building_raw_materials-fillers/cement/kyrgyzstan-cement-market-outlook.html
[39] http://www.intracen.org/itc/market-info-tools/trade-statistics/
[40] https://atlas.media.mit.edu/en/profile/country/kgz/

Kyrgyzstan have increased at an annualized rate of 5.4%, from 1.68 bln USD to 1.92 bln USD in 2017. The most recent exports are led by gold (37% of the total export).

3.5.1.1 Composition and destination of Kyrgyzstan Export

According to the National Statistical Committee, in 2017, the export of goods (without gold) compared with 2016increased by 22.1 % and amounted to 1063,9 million USD. The share of gold in the total export volume in 2017 was 39.7%, which is a 4.9% decrease from 2016. The total export of goods including the exports supplied by individuals in 2017 was 1764,3 mln. USD in 2017 and 1764,6 mln USD in 2018. The national statistical data on export by the types of economic activities shows that the greatest export is from manufacturing sector (Figure 11).

Figure 11 the volume of goods export

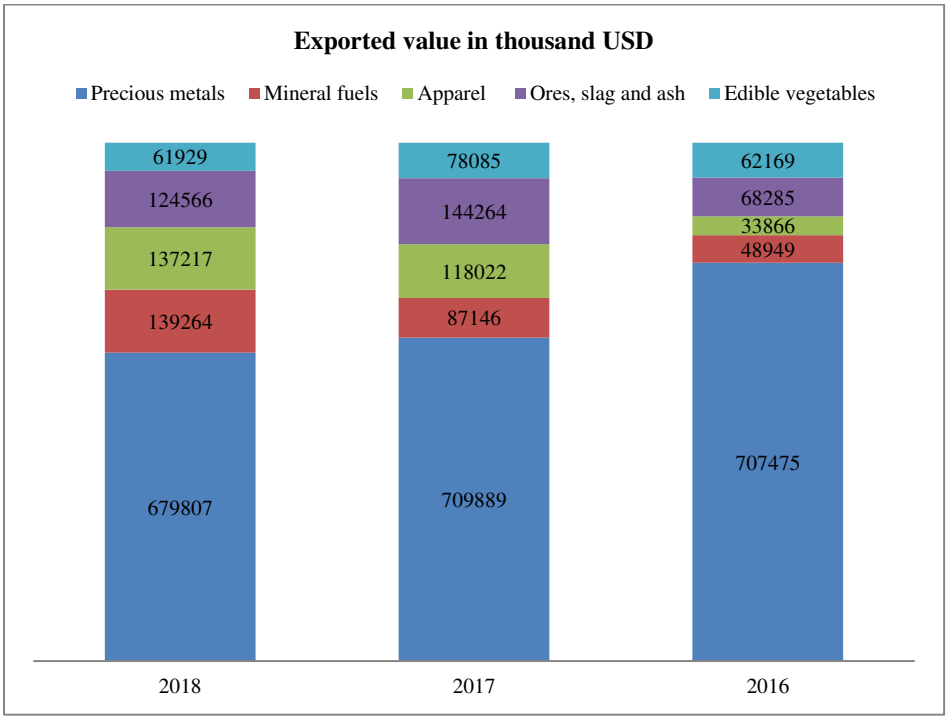


Source: National Statistical Committee[41]

In the same time period, the greatest export in monetary equivalent was gold. Its export value in 2018 was 679807 thousand USD, a slight decrease compared to 2016 and 2017 when it was 707475 thousand USD and 709889 thousand USD respectively. Precocious s metal export is followed by mineral fuels; apparel; ores, slag and ash; and edible vegetables, the exported value of which in 2018 were 139264 thousand USD, 137217 thousand USD, 124566 thousand USD, and 61929 thousand USD correspondingly. The top op five exported products are presented in Figure 12.

[41] http://www.stat.kg/ru/statistics/vneshneekonomicheskaya-deyatelnost/

Figure 12 Exported value of Kyrgyzstan for 2016-2018, thousand USD



Source: (ITC, 2019)

The highest volume of exported goods in physical terms was for construction materials such as cement, including Portland cement and fuel - coal (Table 13).

Table 13 Basic commodities exported by the Kyrgyz Republic

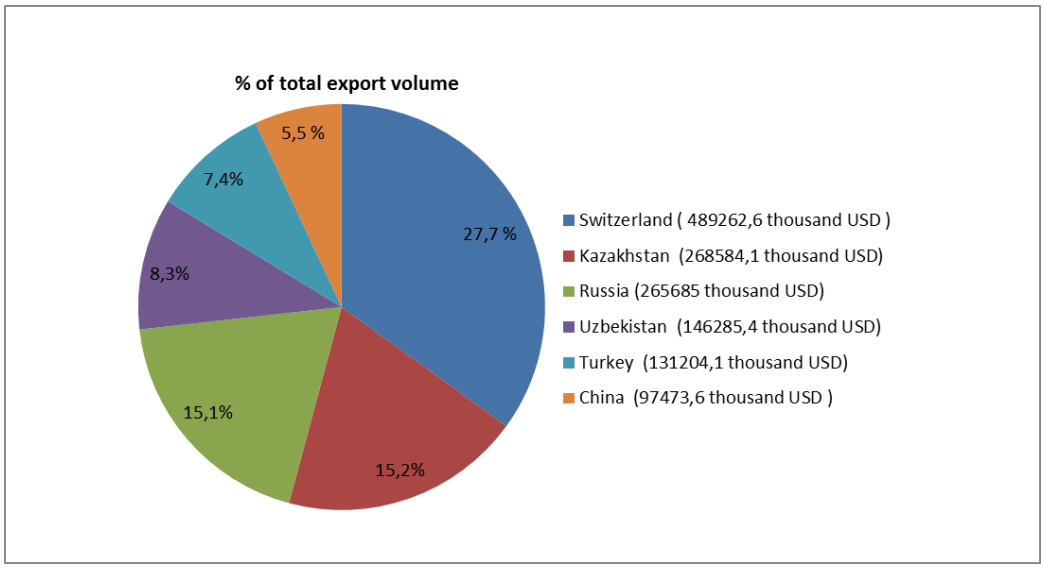
Description of goods	2016		2017		2018	
	Thousand USD	***Tons***	***Thousand USD***	***Tons***	***Thousand USD***	***Tons***
Cattle*	397,6	7529	403,3	859	741,1	1149
Milk and dairy products	22610,7	19704,3	23801,3	23916,7	33971,0	25522,0
Vegetables	92823,8	177625,5	75209,8	113411,3	62440,3	97142,2
Fruits	31428,8	21020,7	34241,0	29439,4	29130,6	33647,7
Sugar	4,1	6,1	260,2	357,4	10398,3	19326,7
Tobacco	3188,6	1472,4	688,9	459,5	1356,0	748,1
Cigarettes and cigars**	12507,0	1721,2	22110,8	2782,1	10529,7	1204,9
Cement, Portland cement	3975,4	64654,3	6159,9	146195,5	25409,3	518844,7
Coal	5176,6	249653,2	5139,0	207907,4	11032,3	394483,7
Crude oil	2644,5	7229,0	4706,2	14693,2	17257,8	70431,1
Electricity***	97,0	199,1	24622,8	1215,3	16339,2	754,6
Skins of cattle****	1350,4	542,1	1133,2	445,6	357,5	1467,7
Skins of sheep and goats****	71,1	115,0	32,4	73,9	48,3	107
Wool	576,3	1633,5	769,4	-	1267,5	2704,9
Wool yarn	24,2	3,2	26,5	8,8	342,8	26,7

Cotton yarn	20515,5	15349,7	24692,2	16100,4	37572,3	23164,0
Cotton fabrics*****	1617,6	1043,5	851,1	325,9	14,7	38,9
Carpets ******	350,8	125,9	263,7	84,4	114,0	45,3
Rolled metal	8053,1	10032,7	8089,2	-	5125,7	4950,3
Metal pipes	661,6	439,3	326,9	84,5	474,3	75,8
Glass ******	14852,7	6333,3	27480,2	10063,4	29381,3	10857,2
Metal scrap	24620,4	16570,5	26874,4	15570,8	87064,7	25816,8
Incandescent lamps**	8266,5	71,1	5981,1	55,3	7360,5	64
* items ** mln.items *** mln Kw/hour **** thsd.units ***** thsd.m2						

Source: National Statistical Committee[42]

In 2017, the Kyrgyz Republic exported goods to 87 countries. The main destination points for export are presented in Figure 13.

Figure 13 Destinations of export in 2017



Source: NSC [43]

3.5.1.2 Export of environmental goods

The national classification does not include "Environmental Goods". This means that the enterprises do not provide information about the purpose of their manufactured goods. Producers still produces goods used for pollution control, wastewater management, and renewable energy for export. The Foreign Trade Department of NSC applies Foreign Economic Activity Commodity Nomenclature of the Customs Union (FEACN of the CU)[44] that is developed based on the experience in international trade and provisions of the International

[42] http://www.stat.kg/ru/statistics/vneshneekonomicheskaya-deyatelnost/
[43] B 60. Foreign trade of the Kyrgyz Republic for 2013-2017: statistical compendium – NSC KR- Bishkek, 2018, 186 p. SBN 978-9967-26-883-8
[44] https://tnved.info/TnvedTree?Code=8479820000

Convention on the Harmonized Commodity Description and Coding System[45]. Thus, the FEACN of the CU is based on the nomenclature of the Harmonized Commodity Description and Coding System and the Combined Nomenclature of the European Community. The first six digits of the product code correspond to the Harmonized system (HS)[46] nomenclature, the seventh and eighth digits – to the Combined Nomenclature of the European Community, the ninth digit – to the FEACN of the CIS. The tenth digit of the product code is designed for detailing of goods at the national level. The information on environmental goods export in Table 14 is based on the APEC classification using the Harmonized Systems of the European Community.

Table 14 Value of Environmental Goods exported by Kyrgyzstan in 2016-2018 according to the classification of APEC (Asia-Pacific Economic Cooperation) [47]

Code	Product label	APEC, HS Code Description	Environmental benefit	Thousand USD		
				2016	2017	2018
Category: 84 Machinery, mechanical appliances, nuclear reactors, boilers; parts thereof						
'8411	Turbojets, turbopropellers and other gas turbines	Other gas turbines of a power exceeding 5,000 kW.	Gas turbines are used for electrical power generation from recovered landfill gas, coal mine vent gas, biogas or national gas. Lower emission of pollutants compared with traditional fire power generation methods	3588	2491	3306
'8479	Machines and mechanical appliances having individual functions, not specified or included elsewhere in this chapter; parts thereof	Mixing, kneading, crushing, grinding, screening, sifting, homogenising, emulsifying or stirring machines; Waste sorting, screening, crushing, grinding, shredding, washing and compacting devices. Agitator for wastewater treatment; flash mixer and flocculator; Dosing and mixing equipment for water treatment); Recycling equipment for waste plastics /rubber /broken tire	Used to prepare waste for recycling; mixing of wastewater during treatment; preparing organic waste for composting; (composting can minimise the amount of waste going to landfill as well as recovering the valuable nutrient and energy content of the waste).	739	168	996

[45] http://www.eurasiancommission.org/en/act/tam_sotr/departament/KlassPoTNVED_TS/Pages/default.aspx
[46] Harmonized system – a commodity nomenclature that includes commodity items and subitems, relevant digit codes divided into groups and sections based on certain criteria, notes and fundamental rules of interpretation of the Harmonized System. The Harmonized System is the first international nomenclature that takes into account the requirements of foreign trade statistics.
[47] https://www.apec.org/Meeting-Papers/Leaders-declarations/2012/2012_aelm/2012_aelm_annexC.aspx

'8412	Engines and motors (excluding steam turbines, internal combustion piston engine, hydraulic turbines, water wheels, gas turbines and electric motors); parts thereof	Engine and motor parts	Parts thereof wind turbines. Parts used for repair and maintenance of wind turbines with the attendant benefits	1880	1965	913
'8419	Machinery, plant or laboratory equipment whether or not electrically heated (excluding furnaces, ovens and other equipment of heading 8514), for the treatment of materials by a process involving a change of temperature such as heating, cooking, roasting, distilling, rectifying, sterilising, pasteurising, steaming, drying, evaporating, vaporising, condensing or cooling (excluding those used for domestic purposes); instantaneous or storage water heaters, non-electric; parts thereof	Instantaneous or storage water heaters, non-electric (other than instantaneous gas water heaters).	Used for water heating through solar energy which is regenerative and clean compared to burning fuel.	160	321	563

'8474	Machinery for sorting, screening, separating, washing, crushing, grinding, mixing or kneading earth, stone, ores or other mineral substances, in solid, incl. powder or paste, form; machinery for agglomerating, shaping or moulding solid mineral fuels, ceramic paste, unhardened cements, plastering materials or other mineral products in powder or paste form; machines for forming foundry moulds of sand; parts thereof	Machinery for sorting, screening, separating, washing, crushing, grinding, mixing or kneading earth, stone, ores or other mineral substances, in solid (including powder or paste) form; machinery for agglomerating, shaping or moulding solid mineral fuels, ceramic paste, unhardened cements, plastering materials or other mineral products in powder or paste form; machines for forming foundry moulds of sand. Crushing or grinding machines, mixing or kneading machines	Used for solid waste treatment or recycling	1191	584	474
'8417	Industrial or laboratory furnaces and ovens, non-electric, incl. incinerators (excluding drying ovens and ovens for cracking operations)	Industrial or laboratory furnaces and ovens, including incinerators, nonelectric, and parts thereof: Other, except parts.	These products are used to destroy solid and hazardous wastes. Catalytic incinerators are designed for the destruction of pollutants (such as VOC) by heating polluted air and oxidation of organic components	304	0	101
'8404	Auxiliary plant for use with boilers of heading 8402 or 8403, e.g. economizers, superheaters, soot removers and gas recoverers; condensers for steam or other vapour power	Auxiliary plant for steam, water and central boiler	These are soot removers and components of industrial air pollution control plant, which minimise the release of pollutants into the atmosphere. This equipment is also used to support waste heat recovery processes in waste treatment or	42	39	16

	units; parts thereof		renewable energy resource recovery applications			
Category: 85 Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles						
'8501	Electric motors and generators (excluding generating sets)	AC generators (alternator), of an output exceeding 750 kVA	Used in conjunction with boiler and turbines to generate electricity in renewable energy plants. Must use these turbines and generators in combination to produce electricity from renewable fuels (e.g., biomass).	4871	1881	2370
'8504	Electrical transformers, static converters, e.g. rectifiers, and inductors; parts thereof	Electric generating sets and rotary convertors: Wind-powered	Some heat exchanges are specifically designed for use in relation to renewable energy uses such as geothermal energy. Electricity generation from a renewable source (wind)	1680	2102	1844
'8502	Electric generating sets and rotary converters	Biogas generator sets; Gas Generator	Electricity generation from renewable resources.	2	102	405
'8514	Industrial or laboratory electric furnaces and ovens, incl. those functioning by induction ...	Industrial or laboratory electric furnaces and ovens (including those functioning by induction or dielectric loss); other industrial or laboratory equipment for the heat treatment of materials by induction or dielectric loss: resistance heated furnaces and ovens	These instruments are used to measure, record, analyse and assess environmental samples or environmental influences	3	10	107
'8541	Diodes, transistors and similar semiconductor devices; photosensitive semiconductor devices, ...	Photosensitive semiconductor devices, including photovoltaic cells whether or not assembled in modules or made up into panels; light emitting diodes. Solar Cells	Generate electricity in an environmentally sound manner (with no emissions or noise generated). Solar batteries are eco-friendly(emission-free, noiseless,non-hear generation)and are especially applicable for power supply in remote area.	1	53	97

'8503	Parts suitable for use solely or principally with electric motors and generators, electric ..	Parts suitable for use solely or principally with the machines of heading 8501 or 8502.	Parts and accessories for electricity generation from renewable resource.	0	500	2
Category: 90 Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; parts and accessories thereof						
'9033	Parts and accessories for machines, appliances, instruments or other apparatus in chapter 90, ...	Parts and accessories (not specified or included elsewhere in this Chapter) for machines, appliances, instruments or apparatus of Chapter 90.	Parts used in maintenance and repair of the liquid, electricity, radiation and measurement instruments listed above with the attendant environmental benefits.	2742	3888	70
'9031	Measuring or checking instruments, appliances and machines not elsewhere specified in chapter ...	Other measuring and checking instruments, appliances and machines, not specified or included elsewhere in this chapter: ..Other optical instruments, appliances and machines elsewhere specified for measuring or checking (903149).Other instruments, appliances and machines, not elsewhere specified in heading 90.31 (903180). Parts and accessories [M] of the instruments and appliances and machines of 9031 (903190).	Equipment used in the measurement, recording, analysis and assessment of environmental samples or environmental impact.	543	248	42
'9032	Regulating or controlling instruments and apparatus (excluding taps, cocks and valves of heading ...	Automatic regulating or controlling instruments and apparatus (excluding thermostats, manostats and hydraulic types), nesoi (903289). Parts and accessories of automatic regulating or controlling instruments and apparatus (903290).	These include other automatic voltage and current regulators which have renewable energy applications as well as other process control instruments and apparatus for temperature, pressure, flow and level, and humidity applications.	489	18	37
'9026	Instruments and apparatus for measuring or checking the flow, level, pressure or other variables ...	Instruments for measuring or checking the flow, level, pressure or other variables of liquids or gases(902610). Instruments and apparatus for measuring or checking pressure of liquids or gases, nesoi (902620).	Meters, which check and record the level and/or flow of liquids or gases, are routinely used during complex auditing and testing to ensure the efficient operation of environmental systems such as water and	167	175	13

		Parts of liquid and gas measurement/ test instrument	wastewater treatment plants, air pollution control systems, and hydroelectric facilities. These instruments are used to measure, record, analyse and assess environmental samples or environmental influences.			

Source: ITC [48]

3.5.1.3 Products with Export potential and Potential Market for Kyrgyz Export

Kyrgyzstan's export potential was estimated with assistance of the Export Potential Map[49] that is an open access tool developed for converting of economic analysis into practical trade information using the ITC export potential and diversification assessment methodology. The total untapped export potential is 301.2 mn. USD. The products with greatest export potential are gold (semi-manufactured for non-monetary purposes), kidney beans "Phaseolus vulgaris" dried & shelled, and Float glass. in non-wired sheets. Float glass in non-wired sheets shows the largest absolute difference between potential and actual exports in value terms, leaving room to realize additional exports worth 41.4 mn USD (Figure 14).

A potential export market for Kyrgyzstan also was identified with assistance of the Export Potential Map tool and presented in Figures 15. The ITC export potential and diversification assessment methodology shows that the markets with greatest potential for Kyrgyzstan's export of gold (semi-manufactured, for non-monetary purposes) are United Kingdom, China and Turkey. Kyrgyzstan has the closest export links with Kazakhstan and the United Kingdom is the market with the highest demand potential for gold.

3.5.2 Import

The total import of goods in the Republic in 2017 was 4 494,7 mln. USD. Compared with 2016, import has increased 12,4 % mainly on account of increasing imports from Commonwealth of Independent States (CIS) – on 18,2% (2083,2 mln. USD) and from non-CIS countries – on 7,3 % (2411,5 mln. USD). In 2017, the Kyrgyz Republic traded with 139 countries; and imported goods from 128 countries.

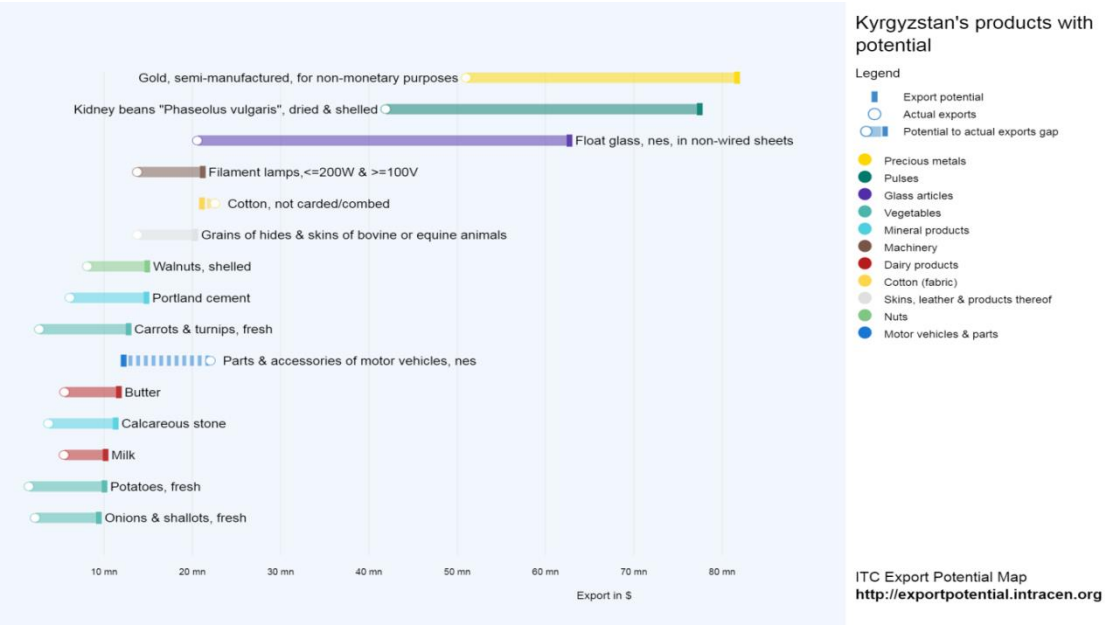
The total import of goods in the Republic in 2017 according to the Observatory of Economic Complexity was 5.99 bln USD, which differs from the data of NSC. The Observatory of Economic Complexity tool ranks Kyrgyzstan as the 117th largest importer in the world in 2017. Since 2012, the imports of Kyrgyzstan have decreased at an annualized rate of -1.4%, from

[48]https://www.trademap.org/(S(4cuuun0wbkaoodsyzcgoj3ew)X(1))/Product_SelCountry_TS.aspx?nvpm=1%7c417%7c%7c%7c%7c84%7c%7c%7c4%7c1%7c1%7c2%7c2%7c1%7c1%7c1%7c1

[49] https://exportpotential.intracen.org/#/home

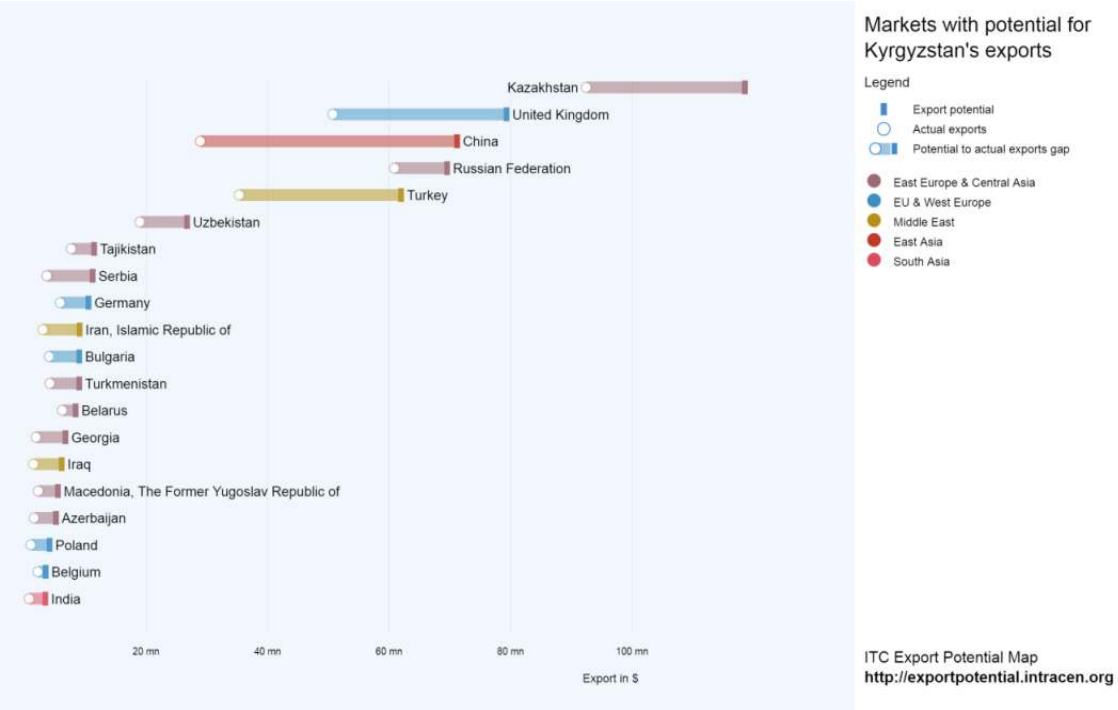
6.42 bln USD to 5.99 bln USD in 2017. The greatest percentage of imports are rubber footwear (12.3% of the total import) s followed by refined petroleum (9.9% of total imports),

Figure 14 Kyrgyzstan top 15 products with Export potentials



Source: ITC (2019)

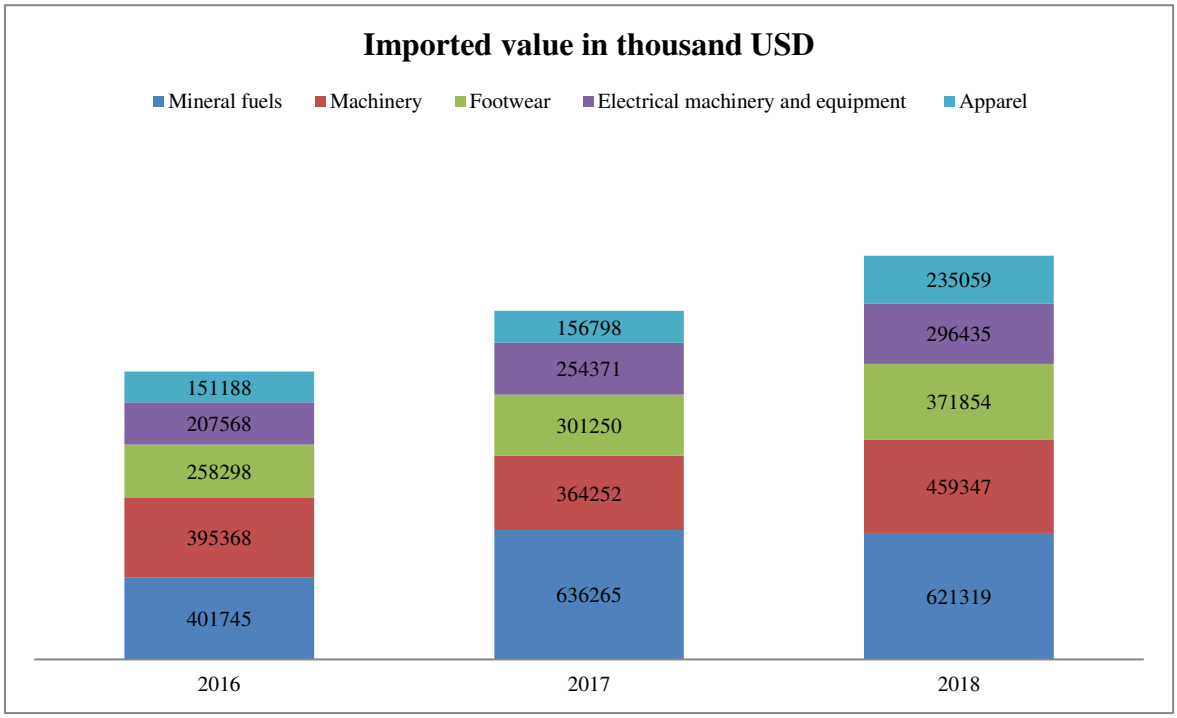
Figure 15 Market with potential for Kyrgyzstan's Export



3.5.2.1 Composition and destination of Kyrgyzstan Import

Mineral fuels, mineral oils and products of their distillation are the top imported product in the country. Top five products imported to Kyrgyzstan are presented in Figure 16.

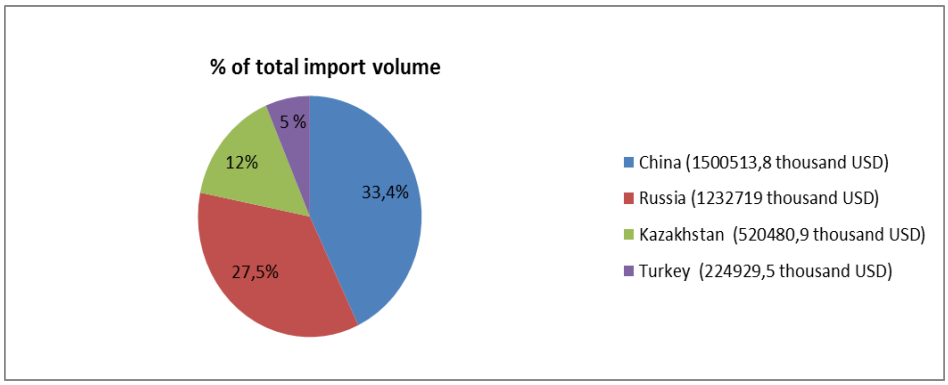
Figure 16 Imported value of Kyrgyzstan for 2016-2018, thousand USD



Source: ITC [50]

The main import partners of the Kyrgyz Republic in 2017 were Russia, Kazakhstan, Turkey and China. More detailed information is presented in Figure 17.

Figure 17 Sources of import in 2017



Source: NSC [51]

[50] https://www.trademap.org/(S(4cuuun0wbkaoodsyzcgoj3ew))/Product_SelCountry_TS.aspx?nvpm=1%7c417%7c%7c%7c%7cTOTAL%7c%7c%7c2%7c1%7c1%7c1%7c2%7c1%7c1%7c1%7c1

[51] B 60. Foreign trade of the Kyrgyz Republic for 2013-2017: statistical compendium – NSC KR- Bishkek, 2018, 186 p. SBN 978-9967-26-883-8

3.5.2.2 Kyrgyzstan and its industry in the Central Asia context

Notwithstanding the classification of Kyrgyzstan as Low-Middle income country (LIMIC), it remains the second poorest in the Central Asian (CIS coverage) region after Tajikistan.

In this chapter, comparison of industrial performance is made based on indices such as Global Competitiveness Index (GCI)[52], the Competitiveness Industrial Performance Index (CIP)[53], and Environmental Performance Index (EPI)[54]. In terms of Environmental performance Index, in 2018, Kyrgyzstan ranks 99 among 180 countries and took the second position among Central Asian countries. It demonstrates how well country performs on high-priority environmental issues in two broad areas: protection of human health from environmental harm and protection of ecosystems. The EPI 2018 ranks countries on 24 performance indicators across ten issue categories covering environmental health and ecosystem vitality. These metrics provide a gauge at a national scale of how close countries are to established environmental policy goals.

The UNIDO Competitiveness Industrial Performance Index ranked Kyrgyzstan 121 out of 144 countries. The index focuses on industrial performance, which reflects a country's actual wealth creation. The ranks of CA countries, including Global Competitiveness Index are presented in Table 15.

Table 15 GCI and CIP ranking, 2018

Country	GCI (140 ranks)	CIP (144 ranks)	EPI (180 ranks)
Afghanistan (non CIS)	Non-ranked	144	168
Kazakhstan	59	65	101
Kyrgyzstan	97	121	99
Tajikistan	102	133	129
Turkmenistan	Non-ranked		38
Uzbekistan	Non-ranked		136

Source: WEF (2018), Environmental performance index (2018), UNIDO (2019)

Chapter 4: Industrial environmental pollution and resource use.

4.1 Industrial Environmental Pollution and resource use

The section provides information on the industrial environmental situation of the country in terms of industrial air and water pollution, waste management strategy, status of material and energy efficiency, opportunities for using renewable energy and cleaner technologies in the industrial production[3].

4.1.1 Industrial Pollution, emissions and material use

Material efficiency in Kyrgyzstan

The country has outpaced other lower-middle income countries regarding material use (Figure 18). The material use in manufacturing industries is inefficient and production techniques are wasteful which suggests monitoring and enhancement of the existing situation. In addition, the

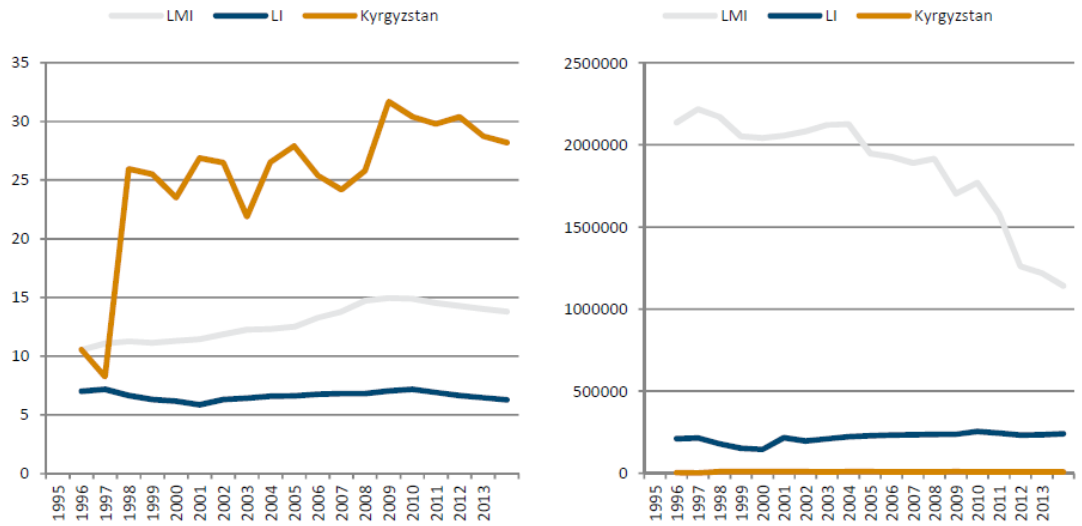
[52] http://reports.weforum.org/global-competitiveness-report-2018/competitiveness-rankings/
[53] http://stat.unido.org/cip/
[54] https://epi.envirocenter.yale.edu/downloads/epi2018policymakerssummaryv01.pdf

mitigation from using more resource-efficient modes of production is hardly gaining momentum over time which might lead to serious environmental damage.

Figure 18 Material efficiency in Kyrgyzstan

a. Per capita material use

b. material intensity in manufacturing industry



Note: LMI=Lower middle income countries; LI = Lower income countries
Source: EORA database as cited in UNIDO (2018)

Industrial Air Pollution

Air pollution from stationary sources for the year 2017 was 49 thousand tons, which is 36 % higher than air pollution in 2011 (Table 16). The largest volumes of pollution emissions come from the thermal power plant (67%), manufacturing sector (27%) and mining sector (6%). These three sectors collectively emit about 94.4% of total pollutants into the atmosphere. Substances such as particulate matter, sulfur dioxide, carbon monoxide, nitrogen oxides and hydrocarbons dominate the emissions from stationary sources (Atadjanov Sabir, T. N. et. al., 2012).

Table 16 Industrial Air pollution

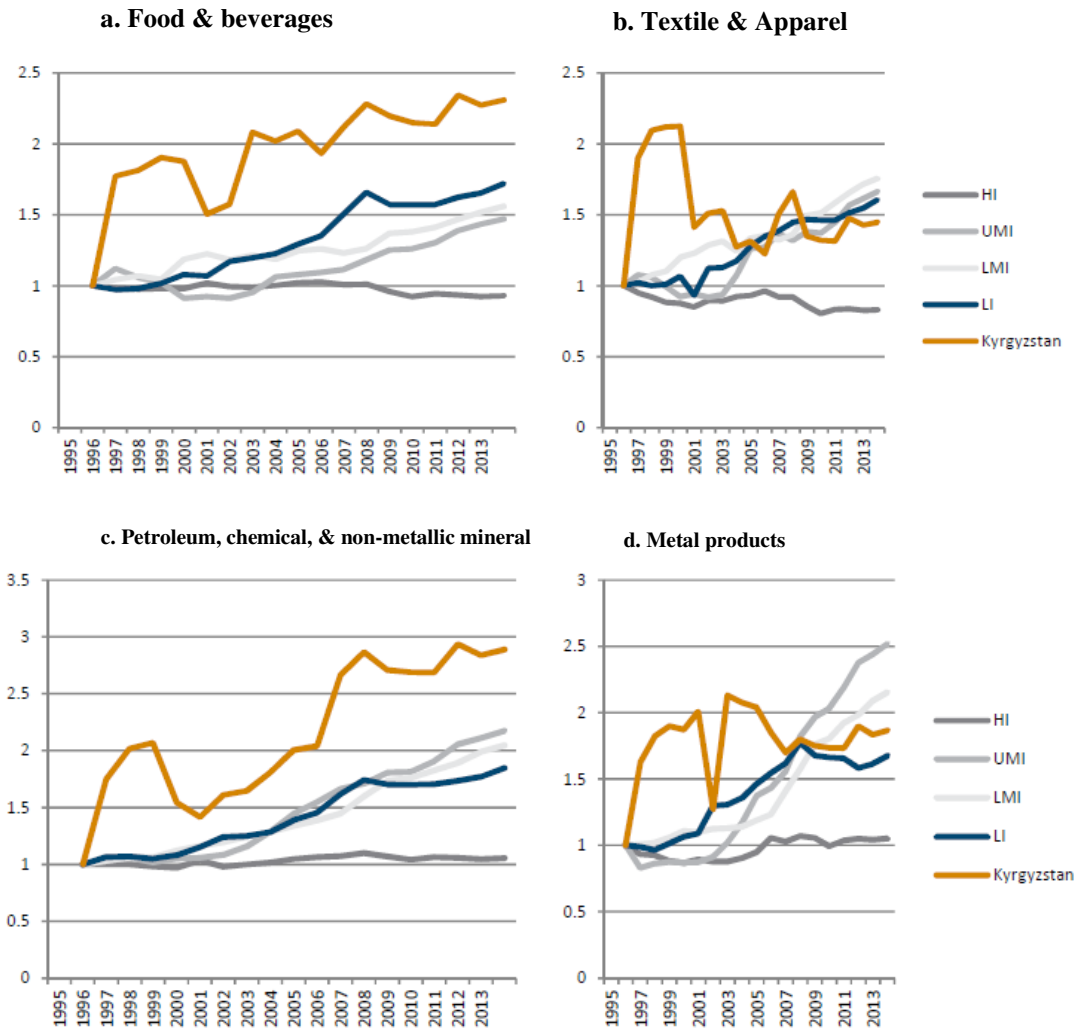
Items (thsd. tonns)	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Installations for capture and detoxifying of harmful substances from gas emissions	288	273	369	479	419	338	366
Air polluting emissions Stationary sources	36	37	39	61	61	53	50
Total Emissions from Stationary sources	324	310	408	540	478	390	415
% of emissions treated	89	88	90	89	87	86	88

Source: National statistical committee (2018)

Total emissions from stationary sources into the atmosphere increased from 2006 to 2009. In 2010, there was a decrease in the total mass emissions of 21% compared to 2009, due to a decline in production in some economic sectors such as mining, the petroleum industry, food industry, leather and leather products and wood processing[5]. In 2011, emissions increased by 1.2 times compared to 2010. There is also an increase on from 2011 to 2017 period. Of the total volume of emissions, on average 88% of total emissions are treated in the facilities in the period of 2011 to 2017, and about 12% of pollutants are emitted without any treatment (Atadjanov Sabir, T. N. et. al., 2012).

An international comparison reveals that the growth of both pollution (measured by the amount of CO_2 emissions and the consumption of resources (measured by material use) are relatively high in Kyrgyzstan in the manufacturing industry. In fact, CO_2 emissions increased by approximately 140% over the period 1995-2013 which exceeds even the growth in upper middle-income countries (UNIDO, 2018). The following figure 19 shows that petroleum, chemical, & non-metallic mineral cluster are the top CO_2 emitters within the manufacturing industry followed by food and beverage, metal and textile industry.

Figure 19 CO2 emissions by industry sub-sector (volume, 1995=1))



Note: HI= High Income countries, UMI= Upper middle-income countries, LMI=Lower middle income countries; LI = Lower income countries
Source: EORA database as cited in UNIDO (2018)

4.1.2 Industrial waste

Industrial waste has increased on average 5.7 % during the period of 2010 -2017 (Table 17). The volume of toxic waste in 2017 was 120,933 thousand tons which 7.3 % higher than the year 2016. A jump of 15 % increase of waste in 2013 compared to 2012. Interestingly, the intensity of industrial waste has also been increasing at a rate of 7 % on average. Out of the total toxic wastage from enterprises, an incredibly significant amount is harmful, which pose serious environmental risk for the country if the trend continues in the long run.

Table 17 Volume of toxic production waste[6]

Items (thsd. tonns)	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Enterprises waste, at the beginning of year	83081	88923	9369 2	10833 0	10276 6	10934 8	112,670	120,93 3
Enterprises waste intensity	561	577	860	694	690	729	767	
Number of waste, in reporting year	5745	5876	4771	7957	10040	10498	12,377	12653
Fully harmless, processed and/or utilized waste	0.2	33	0.2	0.3	0.1	0.3	0.3	0.5

Source: National statistical committee (2018)

4.1.3 Industrial water use

Water resources of the country are threatened by chemical and organic pollution which stem mainly from numerous dumps (untreated) and waste tailings from mining enterprises. Industrial water use is only 0.67 % of total water resource use (Table 18) Industrial water intensity is 2.19 in 2017 which is 27 % higher than the intensity of previous year and 11 % higher from the year 2011.

Table 18 Protection and rational use of water resources

Items *(million m^3)*	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Water consumption	4864	4863	5114	4768	5224.5	4668.7	5072.4
For production needs (Industrial Water use)	78	82	40	81	87	67	69.1
Industrial water intensity	1.97	1.33	3.90	1.84	1.72	2.19	
For irrigation and agricultural water supply	4634	4482.6	4543.6	4530.5	4922.2	4435.3	4821.6
Wastewater	116	115.7	113.5	103.6	99.9	100.0	101.6
Purified according to standards water	109	109	103	104	94	93	95
Wastewater discharge (without treatment or not enough treated)	4	4	5	2	2	2	2

Source: National statistical committee (2018)

4.1.4 Greenhouse gases emissions

The main sources of emissions are the energy sector (74%), agriculture (16.1%), waste (5.5%), industrial processes (4.2%), land use, land use change and forestry (0.2%). In addition to greenhouse gas emissions, from an environmental point of view, emissions of precursor gases

also play a significant role. The distribution of precursor gas emissions is similar to the distribution of those of greenhouse gases. The energy sector (82.9%) plays a dominant role, followed by industry (9.8%), agriculture (6.8%), solvents, and land use change[7].

4.1.5 Existing initiatives supportive of environmental compliance

Pollution charges are levied on the emission of pollutants to air from mobile and fixed sources, discharges to water and disposal of waste. However, the environmental monitoring system is inadequate within the national environmental authority due to the lack of appropriate infrastructure and an analytical laboratory and financial constraints. One of the major institutional challenges of compliance assurance in Kyrgyzstan comes from restrictions on access industrial sites. The Law on Environmental Protection urges industrial operators to conduct self-monitoring, but self-monitoring is not being systematically implemented as required by law. This accelerates the risk of accidents and persistent non-compliance – damaging the rule of law – and a poor understanding of actual environmental performance (UNECE, 2009).

Environmental management systems (EMS) in enterprises were encouraged by the government in the early 2000s. ISO 14001 was issued as a national standard in 2002. ISO 14003 and ISO 14005 were adopted later. In addition, ISO 50001 (Energy management systems) was also introduced to ensure energy efficiency, energy security and energy consumption. The Center for Standardization and Metrology under the Ministry of Economy is the lead for EMS implementation, which creates conditions for the consistent and targeted protection of the environment from the negative impact of the enterprise (Kyrgyzstandart , 2018). The capacity and scope of the program needs to be extended to a larger extent.

A national cleaner production center was recommended by a Finnish-sponsored project during 2004–2006 to handle integrated permitting, cleaner industrial production and environmental management issues, but as of now no centre has been established (UNECE, 2009).

4.1.6 Free economic zones

Economic zones are expected to function as a driver for the country's economic growth. Five free economic zones are functioning in the Kyrgyz Republic: the Bishkek FEZ, the Maimak FEZ, the Naryn FEZ, the Karakol FEZ and Leilek FEZ. Zones are required to operate in accordance with general country legislation, The Naryn FEZ intends to encourage the manufacture of environmentally clean products. There is no environmental management programme for the zones (ADB, 2018). The volume of FEZ industrial products manufacturing is presented in table 19.

Table 19 Industrial production of FEZ in Kyrgyzstan

FEZ name	**2013**	**2014**	**2015**	**2016**	**2017**
Bishkek FEZ, mln. KGS	3 403,2	4 431,4	4 400,7	4 424,7	4 365,5
Karakol FEZ, mln. KGS	20,8	4,5	0,7	0,7	0,6
Naryn FEZ, mln. KGS	9,9	12,9	41,2	54,9	38,8
Total, mln KGS	**3 434,0**	**4 448,7**	**4 442,6**	**4 480,3**	**4 404,8**

Source: National Statistical Committee (2018)[55]

The share of FEZ production in the total volume of industrial production in the Kyrgyz Republic for the last five years is presented in Table 20.

Table 20 Percentage of industrial production in FEZ

FEZ name	2013	2014	2015	2016	2017
Bishkek FEZ, %	10,2	12,8	12,5	12,7	10,9
Karakol FEZ, %	0,0	0,0	0,0	0,0	0,0
Naryn FEZ, %	0,8	0,8	2,1	2,4	1,6

Source: National Statistical Committee (2018)

4.2. Industrial Energy Assessment

Electricity consumption per capita has increased by more than 30% during the period 2010-2015. The residential sector is the largest consumer of energy (37%), followed by industry (34%) and transport (29%)[56]. In total, the domestic energy production covers 45% of the country's needs so Kyrgyzstan needs to import the remaining 55% on average.

4.2.1 Industrial energy use

An industrialization policy should be based, inter alia, on reliable and sufficient supply of energy, and in particular, electricity. However, despite significant potential for energy generation, Kyrgyzstan still lacks a reliable energy supply. Power outages are frequent. All these factors speak to the urgent need for further deployment of electricity generation capacities to guarantee reliable energy supply for future r industrial development and deployment of industrial enterprises, especially energy intensive enterprises such as cement and machinery. Coal is the largest contributor contribution to total final energy consumption (40%) by industry. It is followed by oil (25%) and electricity (25%) as well as by natural gas (10%).

4.2.2 Existing strategies

The Concept of Development of the Heating and Energy Complex in Kyrgyzstan for 2017-2030 speaks about the need to deploy renewable energy sources and energy efficiency measures. According to estimations of the State Committee of Industry Energy and Subsoil use, the potential of hydro is 5-8 billion kWh per year, wind of 44.6 million kWh per year, solar of 490 million kWh per year, biomass 1.3 milliards tons per year[57] which could potentially be used as clean energy source for the industries.

55 National Statistical Committee (2018) Industry of the Kyrgyz Republic 2013-2017. - B.:NSC KR, 2018. – 330p. ISBN 978 -9967-26 -907 -1

[56] https://www.unece.org/fileadmin/DAM/energy/se/pdfs/gee21/projects/FinalReport_KG.pdf

[57] Обучающий семинар по Зеленой Экономике, Бишкек 16-17 июня 2018 года

4.2.3 Existing and potential initiatives for resource efficiency measures

4.2.3.1 Existing strategies

In the draft concept of the development of the fuel and energy complex for the period up to 2030[58], it is planned to ensure energy efficiency through reducing the energy consumption of the Kyrgyz economy by introducing market prices for energy use. The technical potential for energy efficiency in industry is about 11% of yearly consumption of energy. For comparison, the technical potential in housing sector is up to 80% of yearly consumption. The potential of energy efficiency measures with the projected growth of energy consumption by 150% by 2020 and by 210% by 2030 and the GDP growth of 197% by 2020 and 320% by 2030, according to the data in the Concept of Development of The Heating and Energy Complex of the Kyrgyz Republic for the period 2017-2030, will make for 20% reduction of energy intensity of GDP between 2015 and 2030[59]. The growth of energy intensity should also remain below the economic growth which will help to save energy in the volumes of 3.65-4.1 billion kWh by 2030.

4.2.3.2 Existing projects

One example is the program KyrSEFF, which has been in operation since 2013 by the UNISON Group. Over time, the programme has supported 968 energy efficiency projects in housing and business activities, contributing to a saving of more than 150.000 MWh and reducing the equivalent to more than 35.000 tons of CO_2 emissions. KyrSEFF provides credits and grants to increase energy and resource-efficiency in the housing sector and for industrial buildings. The program is based on best practices through the Programme on financing of sustainable energy (SEFF) of the European Bank of Reconstruction and Development, SEFF includes credit lines for commercial enterprises from a couple of hundred up to 2 million US dollars. Kyrgyzstan has enormous potentials for implementation of energy efficiency measures in the industry. According to different estimates, implementation of energy efficiency measures can contribute to a 40%-46% reduction of the overall energy demand and a 11% reduction of energy demand in industry[60].

4.2.3.4 Barriers for deployment of energy efficiency

The World Bank identified the following barriers for transformation of the energy sector in Kyrgyzstan and deployment of energy efficiency measures: overlapping roles and responsibilities in policy-making, ownership and regulation of the sector, sub-optimal contractual and settlement arrangements, which impeded transparency and accountability of flow of funds and electricity, and undermined incentives for sector companies to improve operational and financial performance, unpredictable expenditure planning, done on a year-to-year basis, and largely in a reactive manner rather than by prioritizing investments based on transparent criteria and forward-looking sector planning and an ambiguous regulatory environment.

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[58] Концепция развития топливно-энергетического комплекса КР на 2017-2030годы. Проект

[59] Презентация ГКПЭН КР «Энергосбережения в КР»

[60] http://www.kyrseff.kg

Chapter 5: Priorities and policies for ensuring green industrialization

Four recommendations have emerged from the findings of the analysis in order to promote green industrialization and achieve SDG targets related to industry. They are: (1) improving industrial environmental regulation; (2) demonstrating the potential of resource efficiency program in the basic metals industry and cement industry (3) assessing and enhancing the environmental performance of the five economic zones; and (4) establishing a UNIDO/UNEP national cleaner production centre. The expected outcome of the proposed interventions are (a) improvement of energy, water, and material efficiency in the industry, (b) reduction of industrial air and water pollution and hazardous waste in industrial production, (c) expanded environmental management in free economic zones, (d) effective implementation of industrial environmental regulation. Annex table outlines an action plan and indicators matrix to be implemented during the period of 2019-2021.

5.1 Improving industrial environmental regulation

An effective traditional command and control regulatory programme is essential for industrial environmental management. This programme consists of four activities: standards, licenses, compliance monitoring and enforcement. A dated but still informative OECD evaluation of the command and control programme in the Kyrgyz Republic found serious problems in the design and operation of the environmental compliance assurance system.These include favoring companies short term interests over the negative environmental impacts; distorted mission of enforcement authorities, too frequent reforms and confrontational relationships with the regulated community (OECD, 2005). In this context, the state agency for environmental protection and forestry can take several actions under environmental regulations: (1) revising the environmental standards with an establishment of emission limit values based on economic and technical criteria; (2) ensuring regular self-monitoring and self-reporting by industries with the support of industries own operational budget and ensuring periodical inspection by public authorities with the state budget:(3) provide adequate power and autonomy to the inspecting authority and inspectors to oversee environmental compliance, at the same time, it needs to be ensured that inspectors are carrying out inspections in a transparent and accountable manner; and (4) provide an adequate budget to the inspection authority in order to monitor and report on a regular basis on the industry compliance with environmental standards.

5.2 Identifying resource efficiency potentials in energy and water intensive industry

Given the high rate of emissions and material use in the manufacturing sector especially in the metal industry and cement industry, resource efficiency demonstrations are needed to show the cost savings potential of introducing resource efficiency measures. Data on the main inputs and outputs of the industry, casting and rolling would be collected in a systematic way to calculate the energy used in production and to analyse factors such as technology, productivity, process stability, resource efficiency and scrap quality. The analysis would include a broader life cycle review of energy efficiency as well as calculations of greenhouse gas emissions. Insights would be drawn by comparing performance among the Kyngyzstan plants and also by reference to global good practice standards. Because new technology alone cannot ensure good

practice or increased efficiency, priority would be placed on increasing the sector's capabilities for 'digesting' new technology and achieving systematic improvements in productivity and efficiency from existing equipment. An initial analysis would be conducted for a limited number of plants and then extended to all related facilities using a simple spreadsheet model developed especially for UNIDO as a self-evaluation tool. The outcome of the demonstrations would provide policy guidelines to government for adopting efficiency policies at the national level.

5.3 Improving Industrial environmental management and enhancing industrial symbiosis in free economic zones

Kyrgyzstan currently has five economic zones which do not have industrial environmental management plans (IEMP) that would move them towards compliance with national and international standards. A new Eco-Industrial Park (EIP) framework is an innovative approach for formulating an IEMP; it covers legal compliance as well as socio-economic, environmental and management standards. Such standards provide benchmarks for assessing existing industrial parks, planning retrofitting measures for existing parks, or better planning new industrial parks with the end goal of meeting SDG targets. The EIP framework contains prerequisites and performance requirements which are described in the UNIDO/World Bank/GIZ "An International Framework for Eco-Industrial Parks (2017). The framework is complemented by an implementation handbook and user friendly software packages.

5.4 Introducing resource efficient and cleaner production measures through the establishment of National Cleaner Production Centre (NCPC)

The Government could assist the industrial sector in meeting industry-related environmental SDG targets set out in Table 1 by funding a NCPC. An NCPC would advise the Government on innovative policies, such as economics incentives needed to encourage industries to meet the SDG targets and assist industrial plants in identifying the most cost-effective ways to improve their resource efficiency and comply with environmental standards. The assistance would enable enterprises in Kyrgyzstan to know about and move toward best-practice international benchmarks for energy, water and material use. A new NCPC in Kyrgyzstan would be able to draw on the experience of 50 plus UNIDO/UNEP NCPCs around the world that are advising governments and assisting industries. Most of these NCPCs are embedded in existing institutions and carry out four functions- information dissemination and awareness creation; training; technical assistance and in-plant assessments; and policy advise.

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Appendix I

Action Plan for the Green Industrialization for 2019-2021

Goals	Actions/measures	Implementation period	Expected results (product)	Responsible executors (implementers)
Title of section: Green Industry				
Improving industrial environmental regulation	Revision of the existing environmental standard with an establishment of an emission limit value with economic and technical criteria. Ensuring regular Self-monitoring and self-reporting by industries with the support of industries own operational budget and ensuring periodical inspection by public authority with state budget. Government provides adequate power to the existing inspecting authority and inspector to carry out regular industrial inspection Government provides adequate budget to the inspection authority Ensure that inspectors are carrying out inspection on a transparent and accountable manner through a standard code of ethics	Q3 2019- Q4 2021	Effective industrial environmental regulation	SAEPF/ State Inspection Office for Environmental and Technical Safety
Identification of resource efficiency potentials in energy and water intensive industry	Industrial resource efficiency policy and programme demonstration in the industry	Q2 2019-Q2020	Potentials to reduce energy, material and water use in the industry sector are identified Options to increase use of renewable energy are identified Proposed policy and programme are identified	State Committee of Industry, Energy and Subsoil Use of the KR

Improving Industrial environmental management and enhancing industrial symbiosis in free economic zones	Establishment and strengthening environmental management plan in five free economic zones	Q3 2019-Q4 2021	1. Improve environmental management in free economic zones. 2. Industries are engaged in industrial symbiosis and collective pollution reduction measures	The Ministry of Economy, Industrial Parks authority
To introduce resource efficient and cleaner production measures through the establishment of National Cleaner Production Centre (NCPC)	Establishment of National Cleaner Production Centre	Q42019-Q4 2021	1. Operational National Cleaner Production Centre 2. In plant demonstration of resource efficiency program are carried out. 3. Resource efficiency and cleaner production opportunities are identified through demonstration	State Committee of Industry, Energy and Subsoil Use of the KR

Appendix II

Matrix of Indicators for measuring Green Industrialization Progress for 2019-2021

№	Indicator	Unit of measure	Baseline year	Intermediate indicators (annual)		Final indicators (targets)	Responsible executors (implementers)	Data source
			2018	2019	2020	2021		
	Title of section: Green Industry							
	Aim of section: To promote resource efficiency and cleaner production measures in industrial production in the Kyrgyz republic.							
Improving industrial environmental regulation	A functional inspection authority	Inspection authority	Existing status of the authority	Strengthening inspection authority		Increased number of manpower and activities of inspection authority	SAEPF/ State Inspection Office for Environmental and Technical Safety	
	Number of operational discharge permits	Number of permit issued	Existing number of permits	30 % increase of operational discharge permit		All major discharges with operational permits		
	Number of has internal and	Number of firms	Existing number of firms	10% of the firms are internally and		20% of the firms are internally and		

	external inspection			externally inspected	externally inspected.		
	Wastewater treatment plant	Operational wastewater treatment plant	Operational status	Operational improvement	Compliance with environmental standards.		
	Waste collection and disposal system	Operational waste collection and disposal system	Operational status	Operational improvement	Compliance with environmental standards.		
Identification of resource efficiency potentials in energy and water intensive industry	Energy, material and water intensity	kJ/MVA, Material mass/MVA, m^3/MVA	Current intensities	Reduced intensity by 10 % on average by 2019, 20 % by 2020	Reduced intensity by 30 % on average	State Committee of Industry, Energy and Subsoil Use of the KR	National Statistical Committee
	CO_2 pollution intensity	CO_2e	Current intensities	Reduced intensity by 10 % on average by 2019, 20 % by 2020	Reduced intensity by 30 % on average		
	Renewable energy as percentage of total industry energy use	Percentage of total industry energy use	current Percentage	Increase 5 % by 2020	Increase 10 % by 2020		
Improving Industrial environmental management and enhancing industrial symbiosis in free economic zones	Environmental Management plans in Economic Zone	Number of firms engaged in industrial symbiosis	Number of firms.	1 % of firms engaged in industrial symbiosis by 2019, 5 % by 2020	10 % of firms engaged in industrial symbiosis by 2021	The Ministry of Economy, Industrial Parks authority	
		Operational wastewater	Operational status	Operational improvement	Compliance with environmental standards.		

		treatment plant					
		Operational waste collection and disposal system	Operational status	Operational improvement	Compliance with environmental standards.		
To introduce resource efficient and cleaner production measures through the establishment of National Cleaner Production Centre (NCPC)	Establishment of NCPC	NCPC	No NCPC	Planning and fund raising for NCPC	NCPC established	State Committee of Industry, Energy and Subsoil Use of the KR	