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**PROMOTING SUSTAINABLE ENERGY SOLUTIONS
AND CLEAN TECHNOLOGIES IN CIS COUNTRIES**

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Introduction

This issue paper has been prepared for the First Regional Conference on Sustainable Industrial Development: “Promoting Sustainable Energy Solutions and Clean Technologies in CIS Countries”, organized by the United Nations Industrial Development Organization (UNIDO) from 22 to 23 November 2017 in Vienna, Austria to facilitate discussions during the panel sessions.

The conference aims to increase understanding and awareness among government officials and industry practitioners from the invited countries (Armenia, Azerbaijan, Belarus, Kazakhstan, Kyrgyzstan, Republic of Moldova, the Russian Federation, Tajikistan, Turkmenistan, Ukraine and Uzbekistan) about practical, innovative and cost effective instruments and ways to enhance resource and energy efficiency and to promote clean technologies. The event will bring together participants from the region of the Commonwealth of Independent States (CIS) to exchange experience, knowledge, knowhow and best practices in clean industrial technologies and outline recent trends.

In line with the conference’s objective, the paper focuses on the interlinked and crosscutting challenges posed by technological progress such as reducing the ecological and environmental footprint, cutting greenhouse gas emissions and moving to sustainable production and consumption patterns by doing more and better with less. Statements in this paper should be regarded as “food for thought”, since there is no single recipe for sustainable industrial development.

For decades, livelihoods in modern societies have been built on the economic

foundations created by the industrial transformation. Industrial development lifted hundreds of millions out of poverty over the last 200 years. In fact, there is no single country in the world which has not reached a high stage of economic development without having an advanced industrial sector. Industry-related services added further benefits to the job situation throughout the world. In addition, the last financial crisis has shown that economies with strong and diversified industries proved to be more resilient in times of crisis and afterwards.

Without any doubt, the positive effects of industrial development are the main reasons why countries wish to pursue the path of industrialization. Yet, unsustainable industrialization, with its high dependency on resources and energy inputs, negatively affects people and the environment. By utilizing renewable and non-renewable natural resources and converting them into final products, mankind has benefited from the tremendous structural changes this conversion encompassed. The final outcome of these transformative processes is in most cases a final product that requires human, financial and resource inputs, including energy and water.

“The region of Europe and Central Asia faces a number of challenges. Despite a high general level of development, inequalities are on the rise in all parts of the region, manifested in youth unemployment, exclusion of marginalized groups and lack of access to social services. In addition, the region is struggling to reduce its large ecological footprint and greenhouse gas emissions and to move to sustainable production and consumption patterns”

Source: UN Advocacy Paper “Building more inclusive, sustainable and prosperous societies in Europe and Central Asia. From Vision to Achievement of the Sustainable Development Goals - Call for Action from the Regional UN System”, 2017
<https://undg.org/wp-content/uploads/2017/01/2017-Regional-Advocacy-Paper-FINAL-19-June-2017.pdf>



Current patterns of energy generation and consumption in industry are of particular concern due to their unsustainability. The industrial sector accounts for one-third of the global energy use, 40% of the electricity demand and consumes 77% of the global coal and derivatives. As long as electricity and thermal energy continue to be generated through the conversion of fossil fuels into useful energy, negative externalities such as environmental degradation, acidification of soil and water bodies, among others, will continue to adversely affect our societies. The industrial sector contributed significantly to the greatest threat of today –global warming and its adverse climate change effects. The region of Europe and Central Asia extracts one-fifth of the world’s primary energy resources, and emits 18% of the global CO₂ emissions. This is due to the high reliance on fossil fuels, especially in Central Asia where the share of fossil is 94% of the utilized primary energy¹.

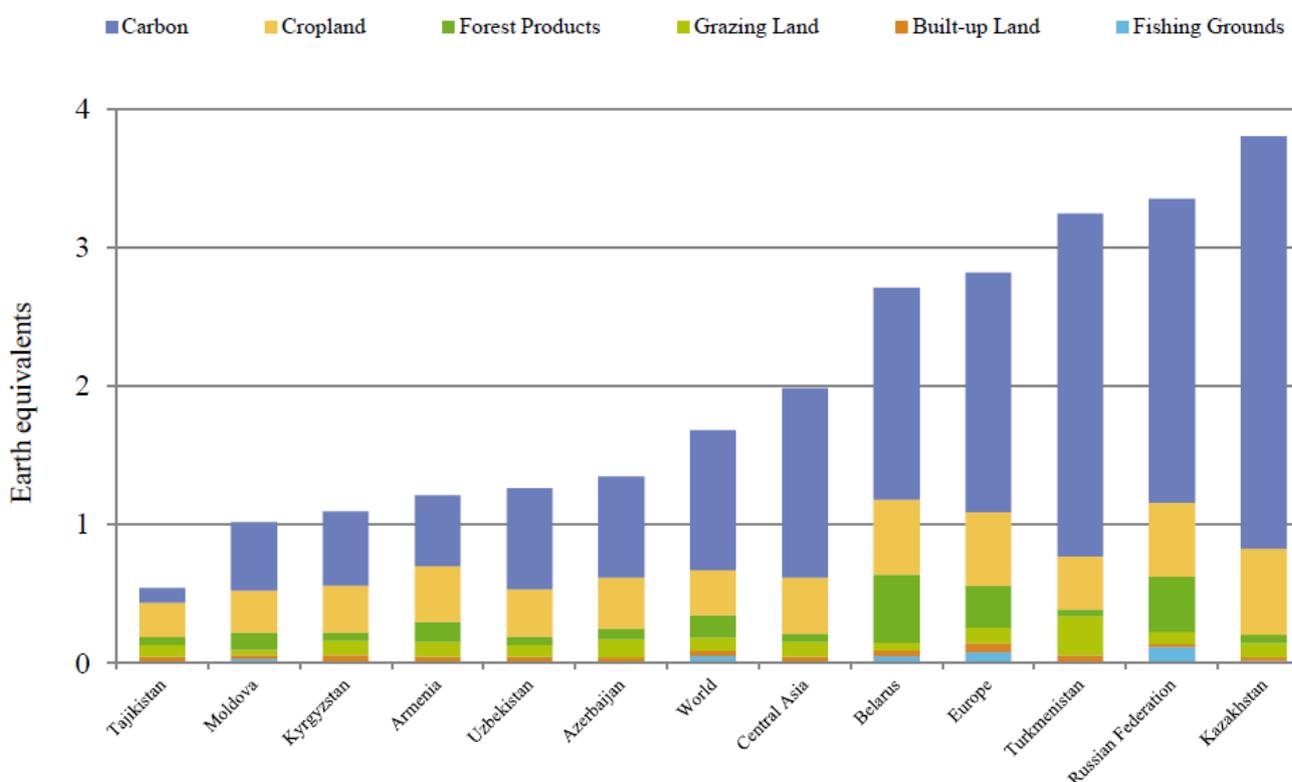


Figure 1: Ecological Footprint of Selected Countries 2013
Source: Global Footprint Network. „National Footprint Accounts.“ 2017

This high reliance on fossil fuels and their associated negative externalities is the main reason for the paradigm shift in energy production and consumption patterns. Promoting sustainable energy solutions and clean technologies is complex, multidimensional and demands the participation of diverse stakeholders.

The international community has accomplished various landmark agreements, targeting specific issues related to climate change, atmosphere, hazardous substances, environmental pollutants, marine environment, nature conservation and many more.

¹ UN Advocacy Paper, Building more inclusive, sustainable and prosperous societies in Europe and Central Asia. from Vision to Achievement of the Sustainable Development Goals- Call for Action from the Regional UN System, 2017 <https://undg.org/wp-content/uploads/2017/01/2017-Regional-Advocacy-Paper-FINAL-19-June-2017.pdf>



While mitigating the risk, abating the consequences and creating sound foundations has been and will remain the main purpose of international environmental agreements such as the Montreal Protocol on Substances that Deplete the Ozone Layer, the international community has also agreed on broader overarching environmental goals. With the Paris Agreement on climate change concluded in 2015 at the twenty-first Conference of the Parties (COP21) in Paris, and the Agenda 2030 for Sustainable Development and its seventeen Sustainable Development Goals (SDGs) launched in the same year, the world is set to pursue a new sustainable development path. Both agreements set ambitious targets, inter alia, for decoupling economic growth from our increasing environmental footprint and will guide all global, regional and national development endeavors for the years to come.

The attainment of the SDGs requires concerted global and regional efforts to accelerate dissemination of existing knowledge about best-available clean technologies and to share experiences on effective approaches to foster sustainable development. UNIDO's mandate to promote and accelerate inclusive and sustainable industrial development (ISID) in Member States is fully recognized in SDG 9, which calls to "Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation". The relevance of ISID, however, applies in greater or lesser extent to all SDGs.

One of the prerequisites for industry to grow in a sustainable manner is the availability of a stable supply of affordable and clean energy, together with improved resource efficiency. Within its work in energy, UNIDO aims to improve industry's energy performance, thereby reducing greenhouse gas emissions through the promotion of energy management practices, technology trajectories and production patterns which are environmentally sustainable. UNIDO also supports countries in their environmental management efforts, including the implementation of multilateral environmental agreements. It promotes new green industries and the greening of existing supply chains, disseminates and shares best practices and clean technologies.



I. Strategies and instruments to promote green industries

Global problems require global cooperation and local action. Despite the increasing urgency, the industrial sector has been slow in greening production processes. This can be largely explained by two factors, namely the competition pressure of the marketplace and protectionist policies. The underlining misconception is that entities integrating green industry aspects may not survive the associated cost of greening. Although this step can increase the competitiveness of companies, ministries and agencies tasked with supporting companies, primarily focus on increasing the manufacturing value added (MVA²). Empirical evidence suggests that the predicted costs of environmental policy measures are often overestimated, and that delayed action is likely to lead to even higher costs, due to negative consequences such as a higher rate of occurring natural disasters³.

Combating climate change and negative externalities of unsustainable patterns of industrialization comes with a price tag. Yet, it is clear that it is not possible to continue with business as usual and change is needed. However, there is an uneven distribution of efforts across the globe: while some countries avoid investing in greener energy solutions, others develop new business sectors and manage to support the greening of their industries.

Green industry means economies striving for a more sustainable pathway of growth by undertaking green public investments and implementing public policy initiatives that encourage environmentally responsible private investments.

Greening of industry is a method to attain sustainable economic growth and promote sustainable economies. It includes policymaking, improved industrial production processes and resource-efficient productivity.

Source: <https://www.unido.org/greenindustry/green-industry-initiative.html>, UNIDO

Market failures and wrong – or ineffective – policies are the main cause for environmental degradation. Current development strategies that have been implemented to date, cannot meet the present-day challenges to concurrently address the sustainable social, economic and environmental dimensions of our planet. Eight economic sectors are especially prone to the effects of green industrial policy and environmental damage because they strongly depend on natural resource consumption and a stable climate, or because they are significant polluters of the environment: agriculture, forestry, fisheries, energy, resource-intensive manufacturing, recycling, building and transport⁴.

Circular economy is an often-cited concept which has gained popularity and has been integrated into policies in many countries across the globe. Although there are many conceptions of the circular economy, they all describe a new way of creating value, and ultimately prosperity, through extending product lifespan and relocating waste from the end of the supply chain to the beginning – in effect, using resources more efficiently by using them more than once. By and large, today's manufacturing takes raw materials from the environment and turns them into new products, which are then discarded into the environment.

It is a linear process with a beginning and an end. In this system, limited raw materials eventually run out. Waste accumulates, either incurring expenses related to disposal or pollution. Additionally, manufacturing processes are often themselves inefficient, leading to further waste of natural resources.

² 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, UNIDO.

³ Practitioner's Guide to Strategic Green Industrial Policy, UNIDO, 2016.

⁴ Ibid.



Circular economy is a new way of creating value, and ultimately prosperity. It works by extending product lifespan through improved design and servicing, and relocating waste from the end of the supply chain to the beginning - in effect, using resources more efficiently by using them over and over, not only once.

Source: https://www.unido.org/fileadmin/user_media/Circular_Economy_UNIDO.pdf, UNIDO

In a circular economy, however, materials for new products come from old products. As often as possible, everything is reused, re-manufactured or, as a last resort, recycled back into a raw material or used as a source of energy.

Governments are encouraging - and, in some cases, requiring - the adoption of circular economy principles that would lead to higher resource efficiency and less waste. At the global level, the SDGs include many related ambitions.

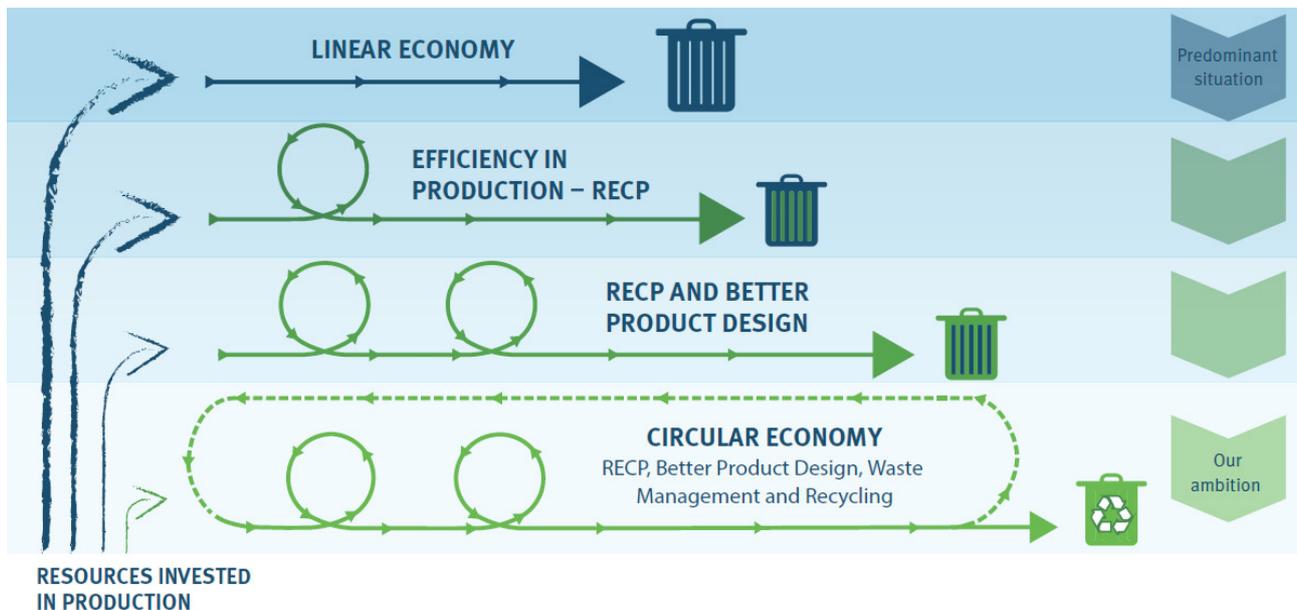


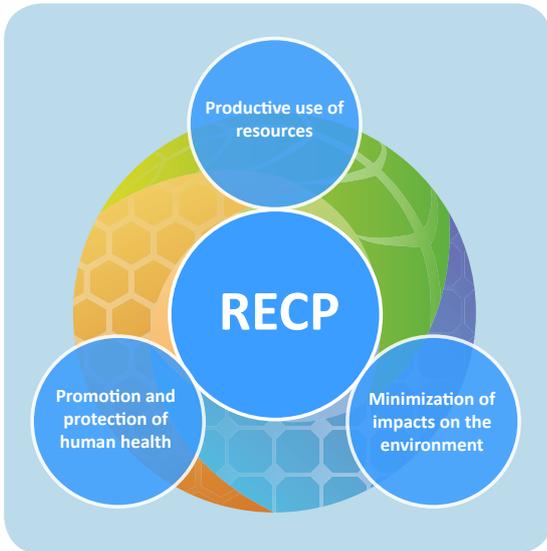
Figure 2: Improving Resource Use

Source: Circular Economy, UNIDO, 2017,

<https://www.unido.org/what-we-do/cross-cutting-services/circular-economy.html>, UNIDO



II. Adoption of resource efficient and cleaner production processes



Countries have a natural tendency to industrialize by transitioning towards more emissions-reducing high-tech sectors. The lowest environmental productivity, expressed as the value added-to-pollution ratio, is associated with medium-tech sectors. The medium-tech sectors also show the highest pollution intensity for other pollutants besides carbon dioxide (CO₂) emissions, such as particulates, sulphur dioxide (SO₂) and nitrogen oxides (total reactive Nitrogen such as NO, NO₂ and NO_x), although with lower abatement costs than other sectors. Low- and high-tech sectors have higher environmental productivity. In other words, they generate fewer emissions when producing €1 of value added. Sectoral specialization towards high-tech sectors reduces emissions intensity. In short, a natural economic tendency contributes to inclusive and sustainable industrial development⁵.

A lower environmental impact is possible without sacrificing economic prosperity. While the MVA can be increased, negative environmental externalities can be reduced through so-called decoupling.

Decoupling: the concept of “decoupling” is central to greening industries and sustainable economic growth. Essentially, the concept breaks the link between environmental ‘bads’ and economic ‘goods’. Decoupling occurs when the growth rate of an environmental pressure is less than that of its economic driving force. Decoupling can be relative or absolute. Absolute decoupling occurs when the environmental pressures are stable or decreasing while economic growth continues to increase. Relative decoupling occurs when environmental pressures are continuing, but at a lesser rate than the economic variable. Policy makers can use the decoupling concept to measure the effectiveness of resource and energy efficiency measures.

Source: https://www.unido.org/fileadmin/user_media/Services/Green_Industry/web_policies_green_industry.pdf, UNIDO

Experience from several countries, in particular from the European Union, shows that this is not just a theoretical idea but is already a work in progress, having been achieved for some years.

Resource Efficient and Cleaner Production (RECP) is a globally proven approach to improve productivity and reduce the environmental impact of enterprises. RECP is the continuous application of an integrated preventive environmental strategy for processes, products and services to increase efficiency and reduce risks to humans and the environment.

⁵ Industrial Development Report 2016. The Role of Technology and Innovation in Inclusive and Sustainable Industrial Development, UNIDO, 2015.

⁶ <http://www.unido.org/environment/resource-efficient-low-carbon-industrial-production/resource-efficient-and-cleaner-production.html>, UNIDO



Cleaner production was first launched in the early 1990s to foster a preventative approach to reduce and where possible, eliminate the generation of waste and emissions from enterprises. Since the mid-1990s, UNIDO and the United Nations Environment Programme (UN Environment) have collaborated to foster the global uptake of RECP.

Under the joint flagship RECP Programme, UNIDO and UN Environment have responded to countries' growing demand for help with the delivery of RECP services to industries by assisting organizations - especially small and medium-sized enterprises, governments, civil societies, research institutions and related stakeholders - in over 60 developing and transition economies.

RECP addresses the three sustainability dimensions individually and synergistically:

- Heightened economic performance through improved productive use of resources,
- Environmental protection by conserving resources and minimizing industry's impact on the natural environment, and
- Social enhancement by providing jobs and protecting the wellbeing of workers and local communities.⁶

Several complementary RECP techniques or practices can be applied in industrial facilities, ranging from low or even no cost solutions to high investment, advanced clean technologies, including good housekeeping, input material change, better process control, equipment modification, technology change, on-site recovery/reuse, and production of useful by-products, product modification, and others. For example, eco-innovations are crucial in adopting resource efficiency measures and clean production processes.

Eco-innovations are any form of innovations aiming at significant and demonstrable progress towards the sustainable development goals. These innovations can be achieved either by reducing the environmental impact or through a more efficient and responsible use of resources. Incremental innovations improve products, processes or organizational practices without changing the parameters of the manufacturing system. Over time, the accumulation of incremental changes can lead to substantial changes that may require the adaptation or redefinition of the whole production system. Radical innovations point to green innovations that promote paradigm shifts and system disruption, which could mean creating a new manufacturing sector, reconfiguring the whole system, introducing new products or services and profoundly changing technological systems. Technological change reduces pollution because it helps change the production process, and the production techniques used by firms to produce more output while minimizing input⁷.

⁷ Industrial Development Report 2016. The Role of Technology and Innovation in Inclusive and Sustainable Industrial Development, UNIDO, 2015.



III. Enhancing industrial energy efficiency and energy management systems

Energy efficiency continues to gain momentum as a key resource for economic and social development across all economies and understanding its real value is increasingly important. Local enterprises, in particular small and medium enterprises (SMEs), play a vital role in national economies. Energy costs have risen considerably in recent years, placing greater strain on national economies and all businesses, especially SMEs. Energy is a controllable resource – using it efficiently helps to increase profits by reducing costs. Enhancing energy efficiency and implementing sustainable energy management systems has the potential to not only increase the competitiveness of economies but to create much needed high-value green jobs.

The four subsectors of manufacturing which use the most energy are:

- a) Smelting and pressing of ferrous metals;
- b) Manufacturing of raw chemical materials and chemical products;
- c) Manufacturing of non-metallic mineral products, and
- d) Processing of petroleum, cooking and processing of nuclear fuel.⁸

ISO 50001: Taking stock of the good results achieved through national EnMS standards in various countries, UNIDO initiated the process that subsequently led to the publication on 15 June 2011 of the international standard ISO 50001:2011, Energy management systems – Requirements with guidance for use. The international industry standard is a voluntary certification for EnMS. ISO 50001 offers a framework for organizations to:

- Establish an energy policy;
- Allocate resources and create teams to effectively implement an energy management system;
- Conduct energy reviews;
- Identify opportunities for improving energy performance;
- Establish baselines and energy performance indicators for tracking progress;
- Set energy performance improvement targets; and
- Implement action plans to achieve those targets.

Source:

https://www.unido.org/fileadmin/user_media_upgrade/What_we_do/Topics/Energy_access/11._IEE_EnMS_Brochure.pdf
UNIDO

Before 2009, the CIS region experienced industrial energy efficiency improvements. After the financial crisis, this process slowed down significantly and the affected countries require further policy incentives to reduce energy intensity.⁹

Energy management systems (EnMS) and standards such as ISO 50001 represent proven tools and policy instruments to advance sustainable energy efficiency in industry as well as other sectors. EnMS in line with ISO 50001 offer industrial enterprises a systematic approach to identify and tackle opportunities for energy savings and energy performance improvement, setting a framework to drive and sustain improvements over time.

⁸ Practitioner's Guide to Strategic Green Industrial Policy, UNIDO, 2016.

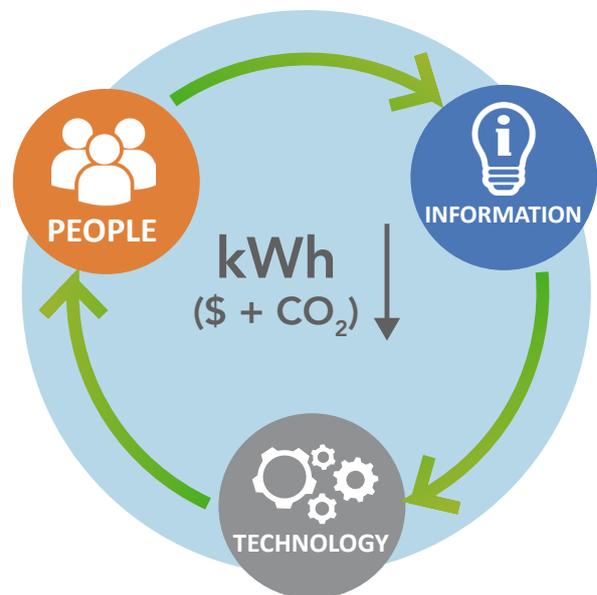
⁹ Accelerating Energy Efficiency Initiatives and opportunities in Eastern Europe, Caucasus and Central Asia, Center for Energy Efficiency (CENef), 2015.



EnMS enable industrial enterprises to effectively bring together and manage the three key factors that underpin long-term sustainability of energy efficiency in industry: people, information and technology. EnMS allow enterprises to capture the substantial missed opportunities for operational improvements that exist at all levels, and to maximize productivity and value of existing as well as new assets.

Third-party certification on an energy management system can also bring additional benefits. This can be particularly true for companies that are part of global supply chains or that want to be more export-oriented. In many cases, third-party certification is also used to portray a “greener image” of companies, in order to follow or meet expectations of customers in purchasing “green” products or services.

THE 3 PILLARS OF INDUSTRIAL ENERGY EFFICIENCY



IV. Public-private partnership (PPP) for development and promotion of sustainable energy solutions and clean technologies

In a nutshell, public-private partnerships (PPPs) are voluntary and collaborative relationships between various parties, both public and non-public, in which all participants agree to work together to achieve a common purpose or undertake a specific task and, as mutually agreed, to share risks and responsibilities, resources and benefits. The purpose of PPPs is to achieve common objectives in the field of sustainable industrial development and to leverage financing for medium- to large-scale projects. These partnerships can involve two or more parties, including government, business and industry, academia, non-governmental and intergovernmental organizations. PPPs will be a fundamental part of creating multi-stakeholder financial platforms. These platforms have the potential to multiply current funding for clean energy projects by demonstrating public commitment and risk mitigation.

PPPs bring the technology, expertise, and capital needed to tap into the unrealized potential of sustainable energy sources and practices. Private investment in clean technologies, in particular technologies that use renewable energy sources for energy production or increase energy-efficiency as well as carbon capture and storage technologies can help promote economic growth sustainably. The regulatory environment defined by the public sector is highly instrumental in attracting private actors and making clean energy business models successful. Moreover, resource-efficient and innovative financing solutions allow for the upscaling of public and private sector financing for sustainable energy investments. As countries adapt energy policies to encourage the use of renewable energy sources and the uptake of energy efficiency measures, they are also looking to different financing, legal and commercial frameworks to leverage private capital and expertise to support the deployment of the various sustainable energy projects. In this context, many countries are already successfully using PPPs to develop sustainable energy projects.



PPPs can also be useful for the integration of environmentally-friendly technologies which are not yet cost-effective. Some technologies such as different designs of photovoltaic cells, air pollution control measures, wind turbines etc. reached their competitive state today with the assistance of PPP or similar mechanisms at earlier stages of technological development. PPPs also proved to be successful for research and development, enhancing the countries' market position in a certain technology.

Solutions for successful financing of innovative business models:

- Agile regulatory environments defined by the public sector are highly instrumental in attracting private actors and making clean energy business models successful.
- Supporting local banks and credit institutions with the assessment of technology, project risks and the design of suitable financial products.
- Business models of frugal energy solutions that focus on capacity building and the inclusion of marginalized low-income people.

Source:

https://www.viennaenergyforum.org/sites/default/files/VEF%202017%20Final%20Forum%20Report_PRINT%20WEB%2011.08.2017.pdf,
UNIDO

Eco-industrial parks represent good examples of successful PPPs. An eco-industrial park is a confined space where companies cooperate with each other and the local community. The goal in such parks is to reduce waste, pollution, efficiently share resources and help achieve sustainable development, with the intention to augment economic gains and improve environmental quality. A positive net economic effect is made by many environmental investments and services because they make manufacturing more efficient, i.e. decrease in waste, increase in energy efficiency and reduced loss of materials. They also lower the costs of environmental compliance. Where benefits are properly shared between the park management and its tenant companies, all parties can benefit. The park manager can recover some of the costs made for environmental management services by charging fees to tenant companies. Some environmental services can also be provided by private contractors which can charge a fee which is lower than the costs saving.¹⁰

¹⁰ Assessment of Eco Industrial Parks in Developing Countries, Global RECP Programme

https://www.unido.org/fileadmin/user_media_upgrade/Resources/Publications/Environment/2016_Unido_Global_Assessment_of_Eco-Industrial_Parks_in_Developing_Countries-Global_RECP_programme.pdf, UNIDO.



V. Financing opportunities for clean technologies and energy efficient industries

Pioneering clean technologies and innovative energy programmes require appropriate business models and financing to achieve the needed scale of global change and sustainable development. Scaling up investment in clean energy creates a wide range of opportunities and benefits. One of the key messages from the 2017 Vienna Energy Forum, co-organized by UNIDO, sets out that sustainable technologies and energy solutions depend on innovative and inclusive business models that can be scaled up, replicated, and are self-sustaining. These business models already exist and are ripe for financing by financial institutions, development banks, as well as private investors. The financial resources necessary to accomplish SDG 7 on affordable and clean energy and the Paris Agreement also exist, yet the appropriate instruments are not being applied in a way that enables new businesses to blossom and large-scale projects to move forward. This represents a collective opportunity for collaboration and partnerships between the public and private sector to provide such solutions.

Consistent with their diverse characteristics, the development and deployment of clean energy technologies face widely differing market barriers. Economic barriers include high development and capital costs; limits on access to financing, aside from cost considerations; shortages of technical expertise; technology risks that are difficult to mitigate in regular financial markets, leading, inter alia, to the “valley of death” in commercialization; lack of internalization of environmental externalities of competing, high-emission energy sources; policy barriers (such as fossil fuel subsidies) that artificially reduce the competitiveness of new technologies; and various types of inertia associated with incumbent technologies.¹¹

The most important barrier to obtaining adequate financing relates to the size of investment risks and inability to insure against them. This is important in the transition from basic technology development to pilot commercial deployment and for subsequent scale-up. Clean energy technologies are often particularly challenged when seeking private capital due to a cascade of risks and uncertainties from the perspective of some of the largest sources of financing -- large, risk-averse institutional investors (UNEP and partners 2009). Other barriers to clean financing include fossil-fuel subsidies, not priced- negative externalities to current technologies, inefficient or low carbon tax and Emission Trading Schemes (ETS), changing policy and regulatory environments, project size – which reduces the incentive for financial stakeholders to invest in various smaller projects instead of one larger and high upfront costs at the early stages of the project pipeline.

A manifold of financing sources for green energy projects already exist, including clean energy funds, green bonds, (clean energy) project bonds, funding from international development banks and other funds from institutional investors such as pension funds, insurance companies and wealth managers.

¹¹ Promotion of New Clean Energy Technologies and the World Bank Group, the World Bank, http://siteresources.worldbank.org/INTESC/Resources/Clean_tech_background_paper.pdf



VI. Conclusion

Industrial transformation in the CIS region has created modern societies and built sound economic foundations. At the same time, the industrial sector is responsible for one-third of global primary energy use and two-fifths of global energy-related CO₂ emissions. It is therefore essential that action is taken to accelerate the shift to resource efficient and cleaner technologies and sustainable energy solutions. These solutions must not only be environmentally-friendly and create new jobs, but must also make business sense.

Global awareness about the numerous benefits of sustainable energy solutions and clean technologies is rapidly increasing. Both governments and the private sector are able to stimulate sustainable, commercially viable and innovative production practices by demonstrating strong commitment and setting ambitious targets to provide incentives to realize this goal.

Clean technologies are central for sustainable development. New concepts and game-changing technologies are being introduced, but the level of readiness remains uncertain. This is the first generation that has the technology to solve climate change and related issues of sustainability. Current development strategies need to be continuously updated to reflect newly available technological innovations.

In view of the current challenges faced by the CIS region, there is a strong momentum to foster valuable networking opportunities between government officials and industry practitioners. This will allow the building of mutually beneficial partnerships for advancing innovative and cost effective solutions to enhance resource and energy efficiency and to promote clean technologies. Through sharing national experience, exchanging knowledge, knowhow and best practices in clean industrial technologies, while benefitting from UNIDO technical expertise, the participants of the regional conference will facilitate the development of a regional perspective and identification of common trends in addressing the challenge of sustainable industrial development.

It is expected that the regional conference on sustainable industrial development will generate insightful conclusions applicable to the regional context and will provide useful guidance to all partners, including UNIDO on the way forward towards scaling up successful solutions and practices.

