



**TOGETHER**  
*for a sustainable future*

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# RESOURCE PRODUCTIVITY FOR CLIMATE ACTION



Mitigation and adaptation to climate change in industry starts with the productive use of all natural resources, including energy, water, materials and chemicals, through Resource Efficient and Cleaner Production (RECP). This not only serves the climate agenda, but is generally also good for business, in terms of operational cost savings and improved productivity, and the environment and society at large. The United Nations Industrial Development Organization (UNIDO) and the United Nations Environment Programme (UNEP) have established National Cleaner Production Centres (NCPCs) that foster and support technology innovation and adaptation in local industries in around 50 developing and transition countries. These combine into a global RECP network which provides a valuable platform for accelerating and scaling-up the deployment of climate-resilient technologies and practices in the industrial and related sectors.

## Climate Action in Industry

Industry will have to play a central role in global efforts to mitigate climate change. In developing, non-OECD countries, the industrial sector contributes nearly half (47 per cent) of the carbon dioxide emissions through fuel consumption and use of electricity. Globally, industry accounts for 37 per cent of global energy use and 25 per cent of global emissions of all greenhouse gases (GHGs). It is crucial that developing and transition countries ensure that their industrial growth is both decoupled from aggravating climate change and robust in terms of its likely impacts.

Climate change mitigation and adaptation necessitates the development and wide-scale application of new technologies, practices, management systems and business models. To ensure sustainable industrial growth, successful approaches need to:

- Reduce material and energy intensity of products;
- Minimize consumption of energy, in particular from high-carbon fossil energy sources;
- Minimize emissions of non-energy greenhouse gases (GHGs);
- Maximize growth with low resource consumption and low pollution; and
- Reduce dependence on water, fossil fuels, and other resources that are likely to become scarcer as a result of climate change.

An integrated approach is required that ensures that these climate objectives are aligned with and contribute to business success measured against traditional indicators for productivity, competitiveness and innovation. Resource Efficient and Cleaner Production (RECP) provides this integrated framework.

## Low Carbon and Resource Efficient Industry

The term *low carbon industry* is commonly used in a somewhat loosely fashion, giving way to narrow interpretations which ex-ante favour particular solutions, such as renewable energy or carbon sequestration and storage. For industry, low carbon is best understood as the continuous reduction of the net GHG emissions per unit of product or service delivered. Low carbon industrial approaches form the basis for addressing adaptation to the likely impacts of climate change, including economic, social, environmental and political changes, thereby enabling *climate-resilience*. Industry then becomes robust in the context of climate change.

Resource Efficiency is the key factor as efficiency gains in the use of all resources contribute individually and synergistically to climate resilience. When less materials and water are used, less energy is required to pump, heat, cool and/or process these, lowering net GHG reductions, while also relieving the pressure on water and other resources that might become less available as a result of changing weather patterns.

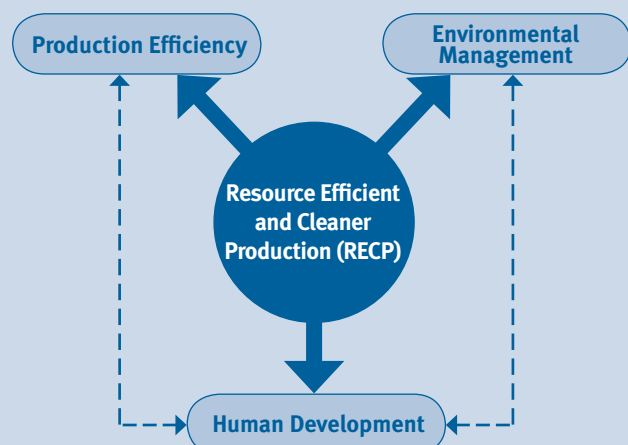


## Resource Efficient and Cleaner Production (RECP)

RECP refers to the continuous application of preventive environmental strategies to processes, products and services to increase efficiency and reduce risks to humans and the environment.

RECP addresses the three sustainability dimensions individually and synergistically:

- **Production Efficiency:** optimization of the productive use of natural resources (materials, energy and water);
- **Environmental management:** minimization of impacts on environment and nature through reduction of wastes and emissions; and
- **Human Development:** minimization of risks to people and communities and support for their development.



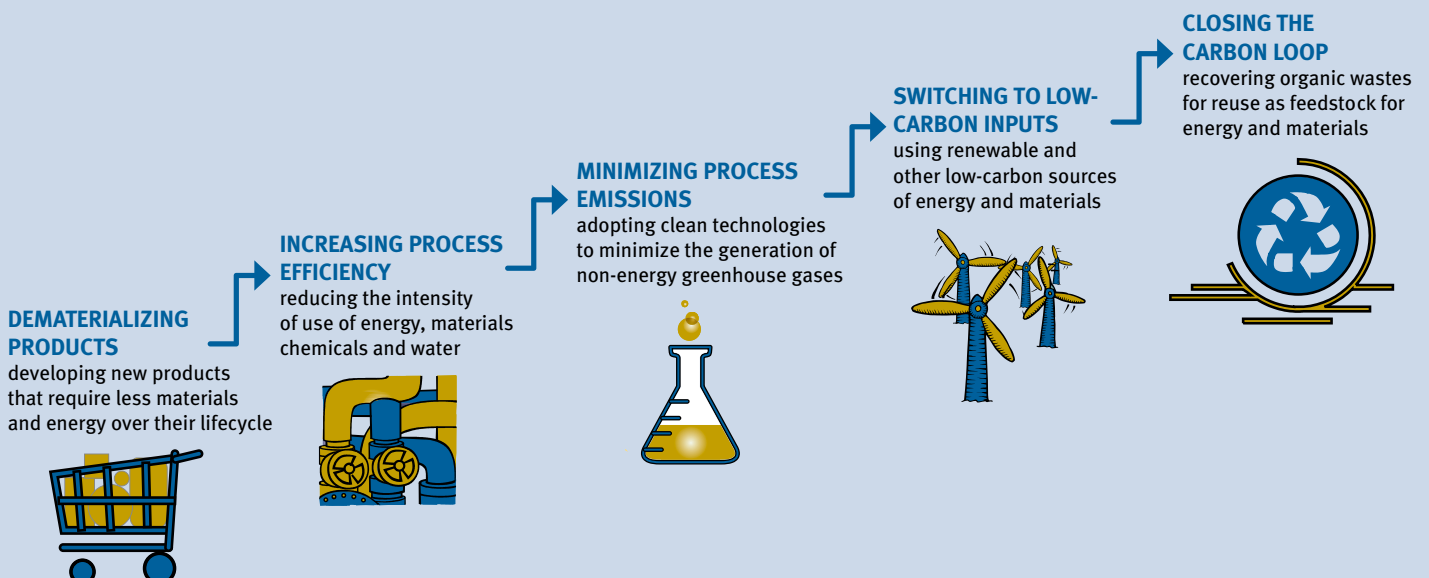
## Resource Productivity Driving Low Carbon Growth

Low carbon production builds upon and extends from RECP practices and technologies, emphasizing a life-cycle perspective. It focuses on the synergistic possibilities for gains in the productive use of energy, materials, chemicals and water in efficient and effective products and production systems.

As the figure illustrates, there are four fundamental dimensions of the contribution of RECP to low carbon industry:

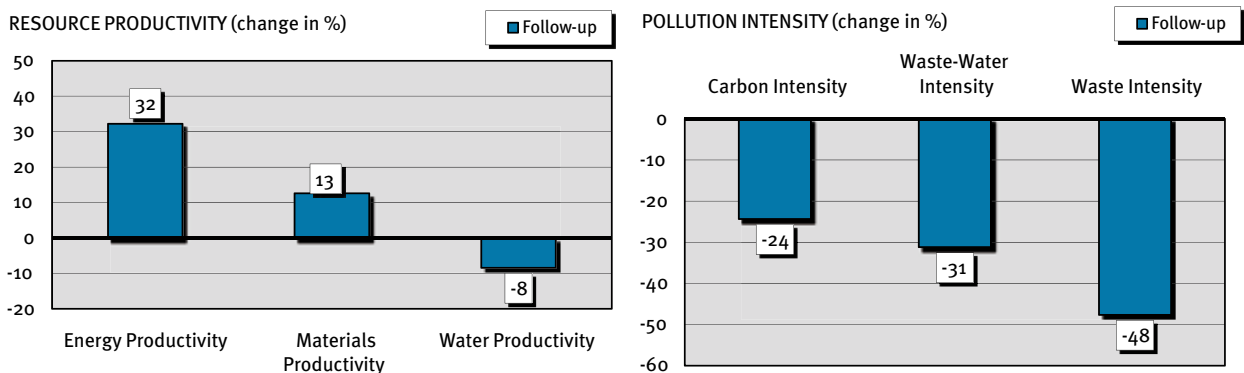
- 1. Dematerializing products:** reducing total material, energy and water intensity of products and services, minimizing life cycle GHG emissions and resource requirements;
- 2. Increasing process efficiencies:** making industrial processes more efficient in regard to their use of energy, water and materials, mitigating GHG emissions from fuel use and power consumption, and reducing the dependency on water and other feed stocks that may become less abundant as a result of the impacts of climate change
- 3. Minimizing process emissions:** adapting and adopting clean technologies and practices that reduce and, where possible, eliminate the generation of GHGs from non-energy uses, including for example emissions of nitrous oxide and methane from the chemical and food industries;
- 4. Switching to low carbon inputs:** using low carbon alternatives as substitutes for carbon-intensive fuels and materials, including renewable energy and materials, but also enhancing recovery from secondary sources, such as waste heat and municipal and other suitable wastes in industrial processes; and
- 5. Closing the carbon loop:** recovering organic wastes for reuse as feed-stock for energy and material and thereby preventing them from being released into the atmosphere as methane or carbon dioxide, and maximizing the value creation from crops and other biomass resources.

## Resource Efficient and Cleaner Production: innovation for low carbon industry



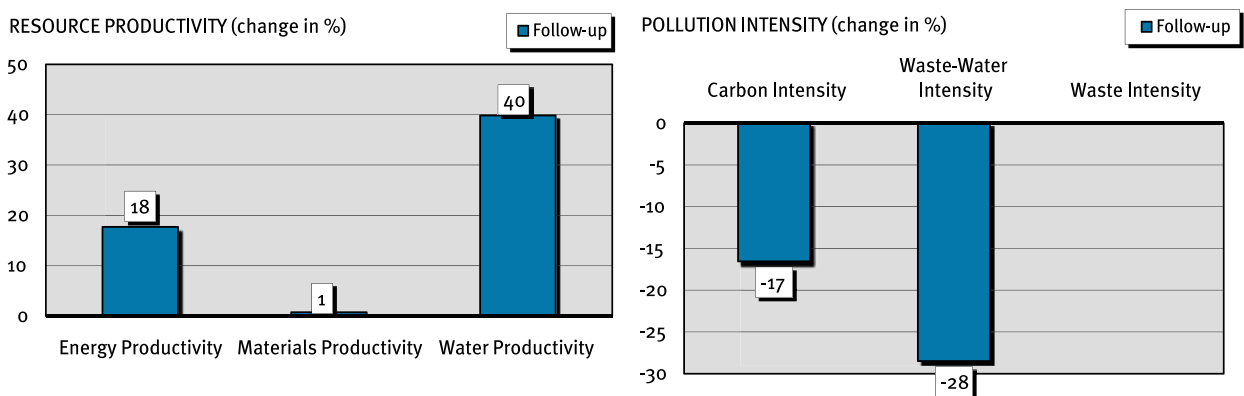
## Low Carbon Industrial Examples

**Haco Industries** in Kenya produces stationery, shavers, personal care and household hygiene products. The RECP programme achieved annual savings of more than USD 548,000. The RECP approach included establishing systems for measuring, monitoring and data analysis, as well as improved routines and maintenance. RECP contributed to improving product quality and work safety and the closed loop effluent treatment plant will contribute to further improving the company's environmental performance. Annual energy savings from RECP implementation amount to almost 300,000 kWh.



Haco Industries: Improved environmental performance from RECP implementation

RECP implementation in the tannery **La Pisqueña** in Peru led to annual savings in the region of USD 11,400, a credit reimbursement of USD 109,779, and improved product quality. The RECP approach included improving the production process through the establishment of systems for timing and measurement, water recycling, efficiency improvements, and the development and implementation of management plans. While the initial intent of the company was to address effluent problems, the RECP programme improved the company's energy productivity and reduced the quantity of GHG emissions generated per unit of production.



La Pisqueña: Improved environmental performance from RECP implementation

**Ankleshwar Industrial Estate** in Gujarat State is one of the largest chemical clusters in India. It houses over 500 small and medium chemical producers, supplying amongst others the pharmaceutical, veterinary, fertilizer, pesticide and dyestuff sectors. UNIDO supported the industry association and the Gujarat Cleaner Production Centre to identify, transfer and adapt cleaner technologies appropriate to the scale and type of chemical processes.

- About one dozen industries employ nitric acid oxidation which releases nitrous oxide (N<sub>2</sub>O), a total of 281 tons annually in the area, which is equivalent to 77,500 tons CO<sub>2</sub>eq/year. A new process technology based on the catalytic oxidation with oxygen was developed, which eliminates N<sub>2</sub>O emissions. Implementation reduced GHG emission by over 88,000 tons CO<sub>2</sub>eq/year. Moreover, the new process is less energy intensive.
- Some 40 target industries daily use approximately 400 tons of sulphuric acid to manufacture dyes, drugs, pigments, intermediates and other chemicals. This generates around 2,000 tons diluted acid per day, which is neutralized with hydrated lime or limestone. This produces almost 85,000 tons per year of toxic waste and generates 53,950 tons CO<sub>2</sub>eq/year. A new process was developed that does not require limestone and enables the recovery of acid for industrial reuse thereby eliminating the generation and landfilling of solid waste. The net GHG emission reduction is approximately 22,000 tons CO<sub>2</sub>eq/year. Moreover, the chemical recovery is a net producer of energy, providing 1,500 kWh/day in surplus power.

## Global Resource Efficiency Network

The United Nations Industrial Development Organization (UNIDO) and the United Nations Environment Programme (UNEP) cooperate to promote the transition towards sustainable and low-carbon industrial systems in developing and transition countries. Specifically, their joint programme on Resource Efficient and Cleaner Production (RECP) aims to improve overall resource efficiency and environmental performance and reduce emissions of Greenhouse Gases (GHGs) and vulnerability to the impacts of climate change.

Since 1994, UNIDO and UNEP have established and supported a global network of National Cleaner Production Centers (NCPCs) which so far covers around 50 developing and transition countries. This programme has proven successful in professional training, capacity building and advocacy, and has put sustainable production on the agenda of business and government. Moreover, participating businesses were able to reduce their consumption of energy, materials and water and their emissions of greenhouse gases, wastes and other air and water pollutants, commonly with good returns on the investments made. Moreover, the programme has been effective in the transfer of environmentally sound technologies and policy change in some countries.

The practical experience of the NCPCs confirmed that industrial development can be made climate-resilient in terms of mitigation of GHG emissions as well as in terms of adapting to the likely impacts of climate change on the availability of critical business inputs, such as water and other feed-stocks. Collectively and individually the NCPCs provide a platform for fostering climate-related technology innovation, adaptation and deployment and for facilitating the transition to resource-efficient and low carbon industries.

## National Cleaner Production Centres

The international community has supported cleaner production initiatives in developing and transition countries since the early 1990's. UNIDO and UNEP have adopted a multi-pronged approach combining advocacy, training, industry demonstrations, policy advice and facilitation of technology transfer and investment with institutional development, through their flagship National Cleaner Production Centres (NCPCs). In 2010 the programme included activities in 47 countries. Collectively, the NCPCs demonstrated the opportunities and benefits in numerous enterprises. A global network has been created that can now move forward to scale-up and mainstream resource efficiency and sustainable production for low-carbon and green industry and economy.

**Africa and Arab Region:** Cape Verde; Egypt; Ethiopia; Kenya; Lebanon; Morocco; Mozambique; Rwanda; South Africa; Tunisia; Uganda; United Republic of Tanzania and Zimbabwe

**Asia and Pacific:** Cambodia; China; India; Lao People's Democratic Republic; Republic of Korea; Sri Lanka; and Viet Nam

**Europe and Central Asia:** Albania; Armenia; Bulgaria; Croatia; Czech Republic; Hungary; Montenegro; Republic of Moldova; Romania; Russian Federation; Serbia; Slovakia; The Former Yugoslav Republic of Macedonia; Ukraine; and Uzbekistan

**Latin America:** Bolivia; Brazil; Colombia; Costa Rica; Cuba; Ecuador; El Salvador; Guatemala; Honduras; Mexico; Nicaragua; and Peru

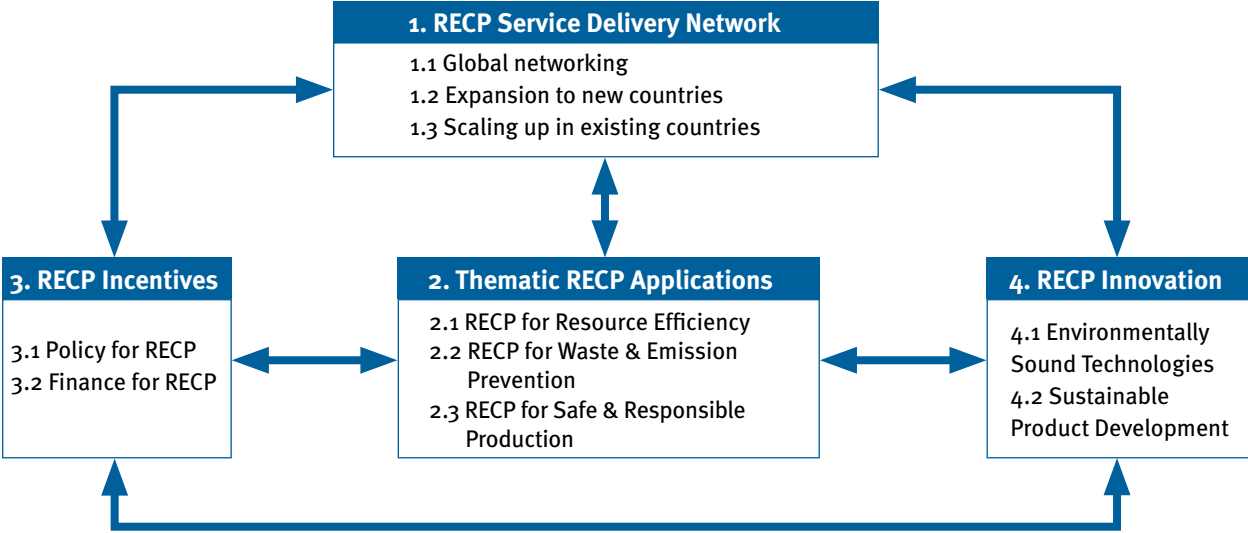
- The Viet Nam NCPC, for example, assisted over 300 industries which collectively invested USD 4.8 million to achieve annual savings of USD 9.7 million, while annually saving 43,000 tons of coal, 63,000 MWh electricity and 8 million m<sup>3</sup> water.
- The Colombia NCPC assisted ETMVA, the public transport company in Medellin, with the development of methodology and registration of Certified Emission Reductions from the extension of the city's cable car system. The lines with a total length of 16 km will daily transport 113,000 travelers and lead to the avoidance of over 120,000 tons CO<sub>2</sub> during the first 7 years of operation, while also improving air quality and generating 450 jobs during construction.

## Joint UNIDO-UNEP RECP Programme

UNIDO and UNEP incorporated the lessons learned from the NCPCs in their joint RECP Programme strategy which is being implemented since 2009. It addresses the challenge to scale-up the application of proven RECP methods and practices so that they become common practice rather than isolated initiatives in a few selected enterprises. The RECP Programme is implemented through four main intervention modules, which each include several key activities and outputs:

- 1. RECP Service Delivery Network:** expanding, strengthening and further developing the network of NCPCs into a global network for climate innovation and RECP implementation. This includes intensive networking and knowledge management, expansion of RECP to new countries and supporting existing NCPCs to scale-up their activities and impacts;
- 2. Thematic RECP Applications:** implementation of RECP in enterprises and other organizations and monitoring and promotion of results in particular on resource efficiency, GHG mitigation, waste and emission prevention and safe and responsible production;
- 3. RECP Incentives:** mainstreaming RECP into government policy and enterprise finance, to further incentivize enterprises and other organizations to implement RECP; and
- 4. RECP Innovation:** strengthening and/or creating national innovation capacities to support the adaptation and adoption of Environmentally Sound Technologies and sustainable product developments that are appropriate in the national industry context.

## Intervention Modules of the UNIDO-UNEP RECP Programme



### Outlook

Businesses are well-placed to take profitable actions to mitigate GHG emissions and start to adapt to the likely impacts of climate change, as demonstrated by NCPCs in a wide range of enterprises covering multiple industry sectors in over 45 developing and transition countries. GHG and other emissions, effluents and wastes have been reduced, the use energy, materials, chemicals and water was decreased, and work places and communities have become safer. Typically this was beneficial for the enterprises themselves, as costs reduced, and productivity and product quality increases. This is good news for the climate, environment and society at large!

The scale of the RECP achievements, however, does not yet match the scale of the climate change and resource challenges in a sustainable and equitable manner. It is imperative to scale up from isolated demonstrations to wide-spread implementation and replication of low carbon and resource efficient methods, practices and technologies. Approaches need to increasingly focus on involving substantively larger numbers of enterprises, for example, through the use of cluster, sector and value chain approaches and the implementation of new innovative tools and methods. Innovation, development, adaptation, transfer and adoption of state-of-the art Environmentally Sound Technologies, sustainable product designs and innovative business models needs to be stimulated to ensure that options for deep cuts in emissions and resource use are implemented.

Such a transition requires incentives to be in place, including policy and enforcement where necessary. Furthermore, technology, knowledge and finance need to be made available in ways that are appropriate and accessible for enterprises in developing and transition countries. No single initiative or policy is likely to succeed in this undertaking. Joint efforts of governments, development partners, international organizations, the business sector and civil society provide a foundation for success. The NCPCs and the global RECP-Net are a natural partner and platform for launching and implementing such cooperative initiatives. The Joint UNIDO-UNEP RECP Programme offers developing and transition countries and their development partners and important vehicle to facilitate the required technology innovation and deployment mechanism for transition towards low carbon, climate-resilient and resource efficient industry and economy.



## CLIMATE INNOVATION CENTRES

Climate Innovation Centres are considered as a new technology mechanism to facilitate the transfer, development, and deployment of innovative climate technologies in developing countries. The experience of the National Cleaner Production Centres (NCPCs) demonstrates that strengthening institutional capacities and developing skills can foster needs-driven transfer, adaptation and adoption of clean technologies. This requires a comprehensive approach including professional training, industry outreach and advocacy, technology assessment and demonstrations, each of which benefits from the involvement of equipment manufacturers and suppliers, financial institutions and government. Existing institutions can often play a role, calling for customized approaches for setting up Climate Innovation Centres so that existing capacities are strengthened and built upon. The NCPCs and their global Resource Efficient and Cleaner Production (RECP) network stand ready to contribute to the realization of a global climate innovation network targeting industry and related sectors.

### National Cleaner Production Centres and Programmes Worldwide



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