UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

# Low-Carbon and Climate Resilient Industrial Development in Africa

Impact Report


EGYPT

KENYA

SENEGAL

SOUTH AFRICA

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

The aim of this publication is to promote understanding of the need for climate adaptation in industry, and to showcase the climate-resilient development benefits for pilot companies involved in the regional "Low Carbon and Climate Resilient Industrial Development in Africa" project, funded by the Government of Japan. The project was implemented by UNIDO with the cooperation of National Cleaner Production Centers in Egypt, Kenya, Senegal and South Africa - members of the Global Resource for Resource-Efficient and Cleaner Production (RECPnet).

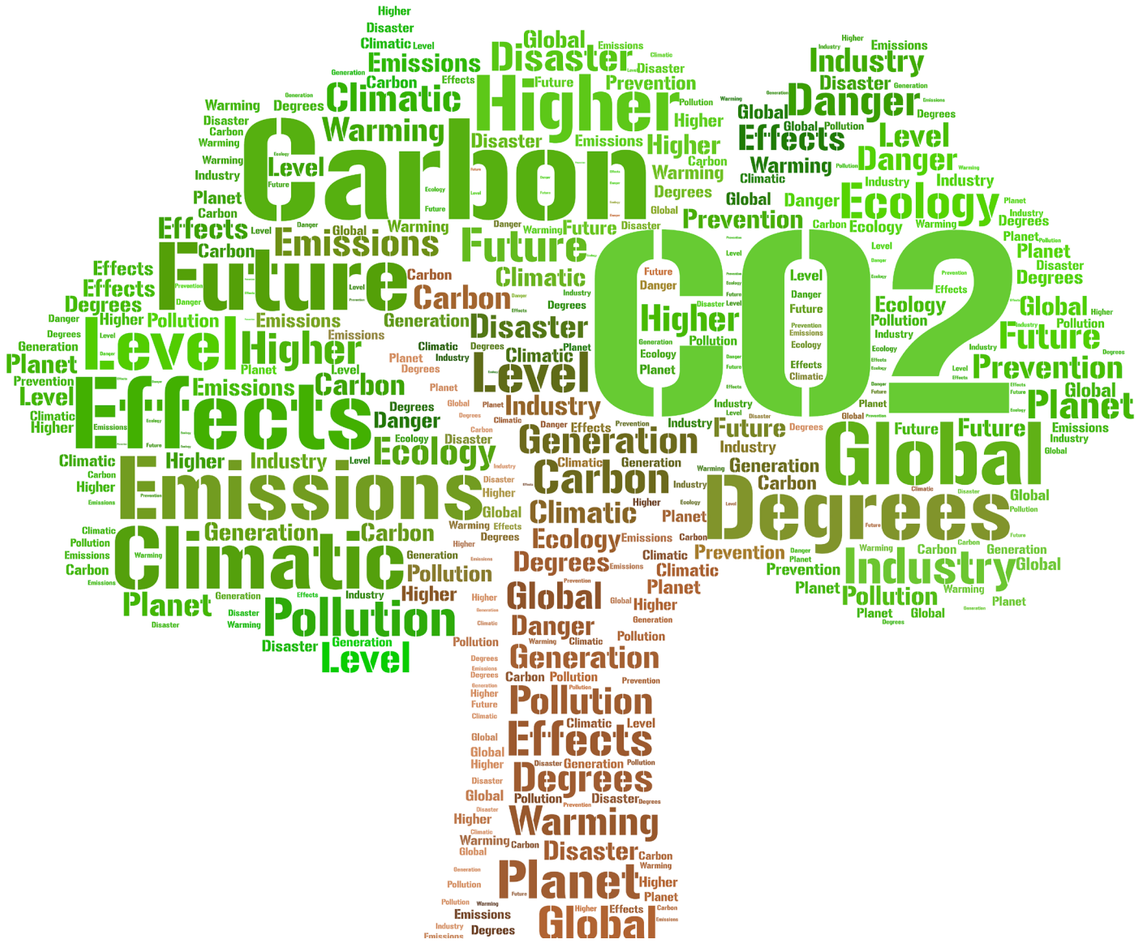
For more information about the project, please visit:

From the People of Japan



# Content






# Climate Adaptation for Industry

Since climate change was recognized as a problem in the late 1980s, the major focus has been on mitigation (reducing atmospheric greenhouse gas emissions). But as it becomes clearer that even with mitigation, climate change is inevitable, there is a growing need to adapt to the conditions of the changed climate.

Mitigation and adaptation are conceptually complementary strategies to address climate change impacts. Creating synergies between them has multiple benefits, such as cost-effectiveness, that may not be achieved if they are addressed separately.

This is particularly true for the industrial sector, where awareness and implementation of adaptation strategies remain particularly low because adaptation is seen by stakeholders as an expense rather than an investment to tackle future climate risks. Developing countries usually have low financial, technological and institutional capacities to pursue low-carbon, climate-resilient development paths. And yet it is in developing countries, especially those of the African continent where the need for industrial sector adaptation is especially urgent, because of their higher vulnerability to climate change.

The agricultural industry is the largest economic sector in Africa, representing 15% of the continent's total GDP. For this industry, in developing countries like those in Africa, the impacts of climate change are felt not only in primary production, but also in post-harvest processes, such as processing, transportation and storage. Industry adaptation and mitigation approaches must consider sector-wide needs and should focus on post-harvest processes, where they can contribute to food security and increase the value of the final product.

**STRATEGIES TO ADDRESS CLIMATE CHANGE IMPACTS**

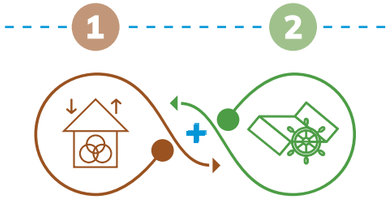
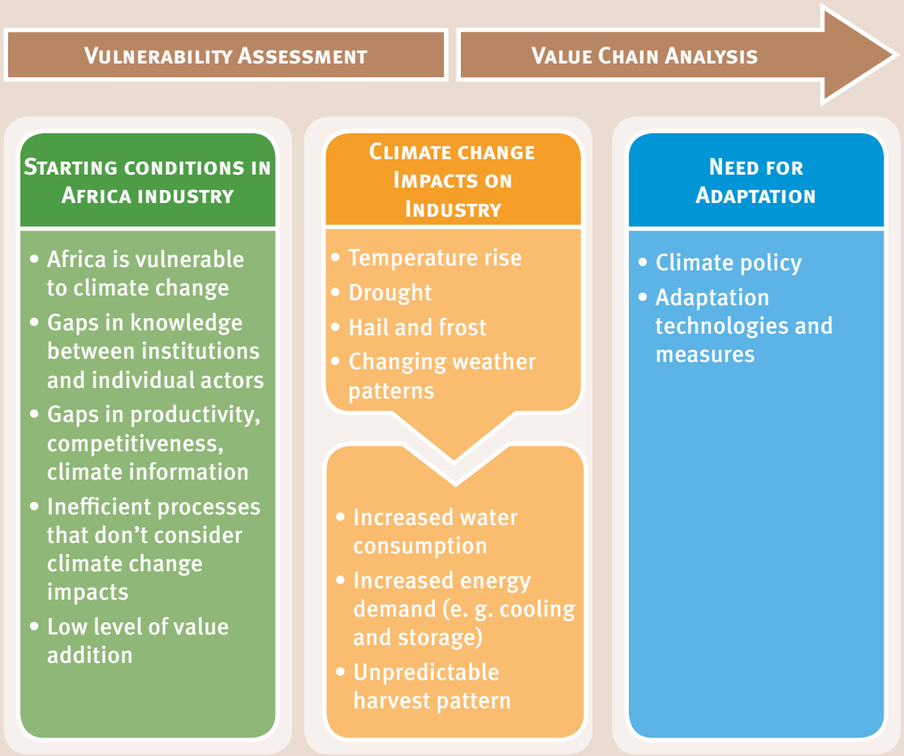



**Figure 1. Illustration of Need for Industry Climate Adaptation in Africa**




# Industry Needs and Challenges: Adaptation in Africa

Industrialization has lifted millions out of poverty, created jobs, advanced technology and increased social prosperity in countries around the world. However, industry is also one of the leading emitters of greenhouse gases (GHG). In Africa, industrial development has not been accompanied by the robust structural transformation characteristic of industries. Many industries still apply inefficient processes and low levels of value addition. This situation can be exacerbated by climate change impacts which lead to diminished raw material supplies and product quality inconsistency.

Temperature rise, drought, changing precipitation patterns, hail and frost are climate change impacts observed in many countries in Africa. The rise in temperature is forecast to push up water and energy consumption. And the changing weather patterns generate unpredictable harvests, leaving many small-scale farmers and industries struggling to plan for the future. The adverse impacts of climate change are recognized, but the concept of adaptation less so, particularly in the industrial sector.

Gaps in knowledge between institutions and individual actors, as well as poor access to climate information, add to the challenge of raising adaptation approach awareness across the continent. Attempts to do so must also contend with the low income levels in African developing nations, which consequently have the lowest financial, technological and institutional capacities to pursue low-carbon, climate-resilient development initiatives.

Supportive national policies, including for example PV or biomass subsidization, or a prohibition on tree-cutting for firewood, can help foster climate adaptation awareness. Vulnerability assessments and value chain analyses are required to identify exact intervention needs and appropriate technologies to address vulnerability at factory level. That's what happened in Kenya, where the UNIDO project helped the Kiamokama tea factory install more efficient air blower technology to better control withering - the most energy-intensive processes in tea production. The pioneering technology reduced energy consumption, and thus production costs. Such actions foster awareness and demonstrate the opportunities and benefits of enhanced climate resilience and low-carbon growth in the productive industries.

**Figure 2. UNIDO's Green Industry Initiative - a two-pronged strategy**

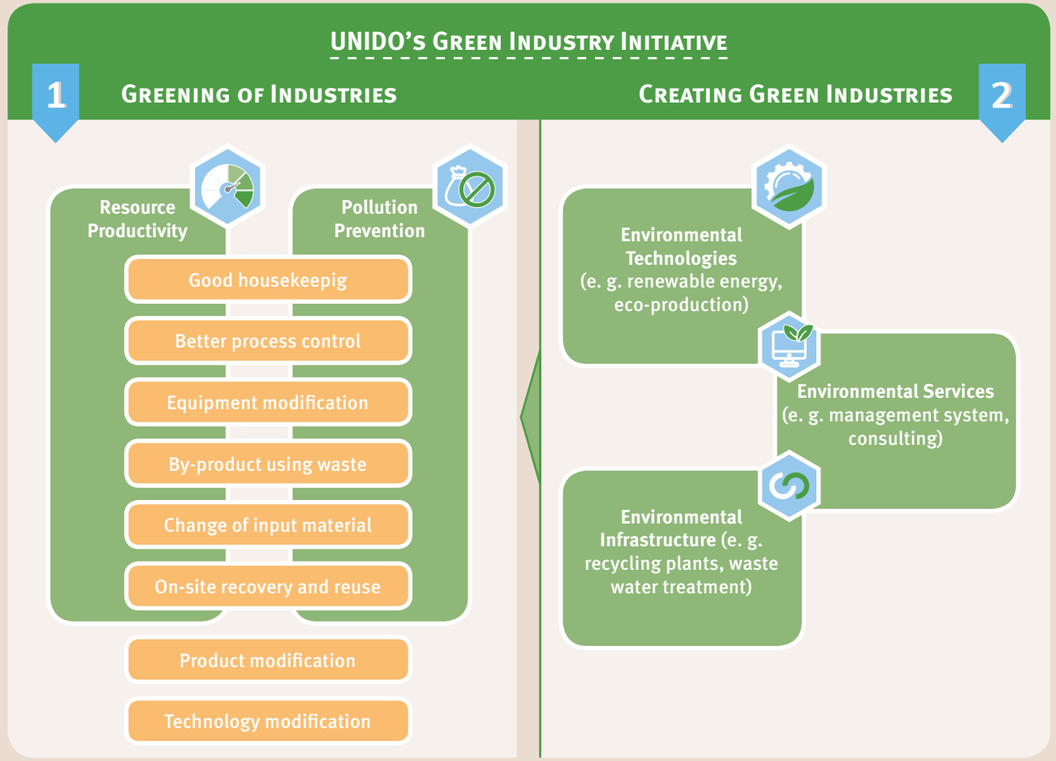
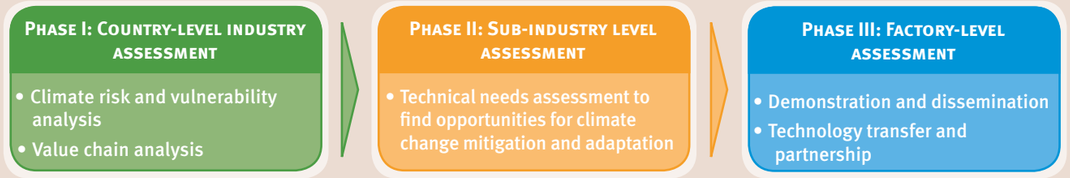



**Figure 3. Three Phases of LCCR Project**



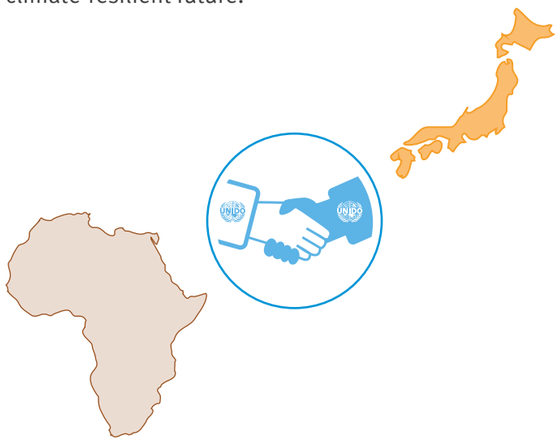

# UNIDO's Contributions - and How they Help

Japan has funded the Low Carbon and Climate Resilient Industrial Development project (LCCR), on which UNIDO is collaborating to create awareness and demonstrate the opportunities and benefits of low-carbon growth and climate-resilient development in the manufacturing and processing industrial sectors. Inherent to the project is application of the combination of Green Industry (GI) principle and Resource Efficient and Cleaner Production (RECP) practices to overcome climate vulnerability in industry. GI development is based on best practice concerning resource efficiency and climate-friendly technology, and requires a change of philosophy, re-organization of industrial production and a shift towards green products and services.

UNIDO largely takes two approaches to implement the GI concept: "greening of industries" and "creating of green industries". The first refers to the improvement of existing industries through proven methods and techniques in order to achieve a reduction of GHG emissions and an increase of resource efficiency. The second targets the development, practical implementation and market introduction of green technologies, products and services. In this context, the LCCR project promoted **business partnership** between Africa and Japan, with UNIDO playing a bridging role to find technology suppliers from Japan that match the adaptation needs of the factories in the target countries. The green industries approach also aims at jobs creation and wage increases, both of which lead to poverty alleviation. Ultimately, GI aims to minimize climate-induced risks by increasing industry resilience and avoiding potential future costs.

The LCCR project targeted the four African countries Egypt, Kenya, Senegal and South Africa, and engage da wide range of stakeholders to assess national policy towards climate change, to identify vulnerabilities of selected sub-industries, and to tackle adaptation needs through low-carbon technology installations and demonstrations at factory-level. As such, the project in three different phases, with the LCCR methodology applied in a narrowing scope, starting from the national level, passing by a selected industry sector for each country, and finally targeting specifically selected factories and facilities.

Building on longstanding experience in safeguarding the environment, UNIDO takes a holistic approach to facilitate the transformation of industries in developing countries and economies towards a low-emission and climate-resilient future.



# PROJECT COVERAGE

## 4 AFRICAN COUNTRIES

EGYPT

SENEGAL

KENYA

SOUTH AFRICA

# Egypt

## Resource Efficiency in the Face of Climate Change: Egyptian Food Production Industry Goes Low-Carbon, Climate-Resilient

Climate change is hitting Egypt's industries hard. Extended summers, higher temperatures, extreme weather peaks, and unpredictable weather changes have led to higher refrigeration costs, cooling system failure, crop wipe-outs through disease, ad hoc harvest date shifting, higher waste, and loss of business. Add to this a government plan to increase electricity prices to an international-standard level by 2022 and it's easy to see how daunting a challenge Egyptian companies face. But it's not an unclimbable mountain. Thanks to UNIDO's project, Egyptian companies are embracing smart low-carbon climate-resilient technology – and reducing costs.

## More Efficient Cooling Means Lower Costs, for Frozen Foods Producer Frozena

Climate change means rising temperatures in Egypt. **Frozen** foods however need to be kept cold, very cold. This explains why as a result of the climate impact leading Egyptian frozen foods producer Frozena was using more and more electricity for its chillers. In fact, electricity accounted for over 60% of the company's energy costs, including gas and fuel. A 2018 tariff rise – more than doubling the early 2015 tariff – pushed up Frozena's total electricity costs by a whopping 145%. As electricity rates – and costs - rose, so did Frozena's concern.

Frozena needed to bring down electricity use while maintaining quality and productivity. That's why it is replacing two single-stage compressors with compound two-stage screw compressors from Japanese industrial refrigeration manufacturer **Mayekawa**, creating a more efficient cooling system with a cooling capacity of at least 450 kW. This will reduce power demand by 40kW, at current cooling demand and production volume. Assuming 24-hour operation, that means energy savings of almost 600,000 kWh per year.

## A Climate-Friendly Refrigerant with no Global Warming and Ozone Depletion Potential

The refrigerant for the new chillers is ammonia, which has a number of benefits: It can be applied at a broad range of temperatures – important in the food and beverage industry; it's energy-efficient, especially in combination with $CO_2$; it's one of the world's most environmentally friendly refrigerants, with zero global warming and ozone depletion potential; although toxic

and flammable at certain concentrations, its characteristic odour means leaks are easily detected[1]; the pipe sizes and heat transfer area required are smaller; it's inexpensive; and it's readily available.

Frozena is so happy about the energy savings generated by the project and the positive effects of the Resource Efficient and Cleaner Production (RECP) approach, it plans to adopt a heat recovery system and solar photovoltaic plant, to meet future energy needs while actually increasing production. So, the energy savings are actually allowing the company to invest *more* in strengthening climate resilience.

## Fruit Producer Blue Skies Harnesses the Sun's Energy – and Reaps the Cost Benefits

Climate change has brought with it challenges for Egyptian fruit salad and juice producer **Blue Skies**. Extended summers, higher temperatures, extreme weather peaks and unpredictable weather patterns have driven up refrigeration costs, cooling systems have failed in 50°C+ temperatures, and crops have been damaged by disease. Nights that are like energy, need to come down. Because if quality is compromised, business opportunities may be lost.

But Blue Skies sees opportunity where others may see pitfall. It's setting up a solar photovoltaic (PV) plant, whose roof-shading panels, manufactured by Japan's iconic **Mitsubishi Electric**, reduce heat gain in the fruit-handling building, to counter increased electricity consumption from refrigeration and cooling. The innovative climate change adaptation technique will allow the factory to cover part of its energy requirements through electricity generated by the PV plant instead of from the grid.

Egypt's yearly irradiation, at around 2,400 kWh/m², means favourable conditions for a solar energy solution like this. It's going to save an estimated 240,000 kWh per year and bring down annual $CO_2$ emissions by 120,000 Kg – according to calculations based on data from the Photovoltaic Geographical Information System - as the PV panels from the project would generate 120,000 kWh per year and partially replace electricity from fossil fuel production. A bonus effect is that payback periods for further PV plant investments in the coming years will shorten as the cost of PV panels continues to drop globally.

Through a series of awareness campaigns, the company plans to highlight the benefits of its Low Carbon and Climate Resilient Industrial Development Project.

A wind of renewables change is blowing through Egypt and if this renewable energy development impetus is maintained, and other companies emulate its strategy, Blue Skies sees no reason why Egypt shouldn't become a regional energy exporter, transporting power to its neighbours.