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QUALIT'AIR 2016

AIR QUALITY, A MAJOR CHALLENGE

According to the World Health Organization, 1.3 million people die each year from air pollution: a phenomenon that is growing along with public awareness.

Morocco is not exempt from this modern problem. Its ongoing urban and industrial development has in recent years led to air pollution in the Kingdom's major cities.

The environmental and health impacts of this air quality deterioration started to be felt, and have created government concern at the highest level.

This awareness led to the establishment in the early 2000s of a deliberate policy to reduce air pollution.

Very concerned about pollution's impact on health, **Her Royal Highness Princess Lalla Hasnaa** is committed to preserving air quality. In 2002, she launched the Qualit'air program to raise awareness among public authorities, economic operators and citizens about to the need to take action on this issue. The Foundation has thus federated all stakeholders in this joint struggle to preserve the quality of the air we breathe.

QUALIT'AIR, A COMMITMENT TO CLEAN AIR

In 2002, **Her Royal Highness Princess Lalla Hasnaa**, Chair of the Mohammed VI Foundation for Environmental Protection, concerned about the impact of air pollution on health and the environment, decided to include the improvement of urban air quality among the Foundation's priority actions.

The same year, she created the Qualit'air program along with a National Committee where all the relevant public entities are represented, with the mission of defining an air pollution mitigation action plan for the large cities. Qualit'air was born.

In parallel to a long-term approach, the program started with a visible and sensitive issue that concerns citizens: automobile pollution.

Improve air quality, the first commitment

The first studies conducted in the late 1990s by the Department of Environment and the Ministry of Health showed that air pollution had reached alarming levels in the biggest cities, requiring awareness and fundamental efforts to improve the air quality.

Road traffic is the main cause of air pollution, with a rapidly growing and aging fleet. Thus, the Foundation mainly targeted vehicle emissions for the first phase of Qualit'air program.

All relevant parties were federated into an ad hoc National Committee to give the program the best chance of success. The action plan, defined by the Committee and supported by all relevant departments, was conducted between 2002 and 2006.

Passenger vehicle monitoring

The Foundation reactivated a 1998 Decree, which sets maximum vehicle emissions standards: 4.5% of CO_2 for gas vehicles and 70% of micro-particles for diesel vehicles. These standards, voluntarily conciliatory to begin with, are a first step towards the highest international standards.

In 2002, the approval of measurement instruments, such as gas analyzers and opacimeters, helped to equip inspection centers.

By the end June 2004, 164 of the 181 vehicle technical inspection centers in Morocco were equipped with monitoring devices, in partnership with the Ministry of Transportation. Emissions control was incorporated in the vehicles inspection protocols, including those for urban transport (buses and taxis).

Finally, the cornerstone of this monitoring program is the training of different stakeholders in the value chain in order to mitigate pollution caused by emissions. The Office for Professional Training and Work Promotion (OFPPT) conducted the training in 2002. It permitted the training of 100 officers of the Royal Gendarmerie, 100 officers of the Directorate General of National Security, 100 mechanics, 85 technical inspection centers, and 35 inspectors from the Ministry of Transportation.

An emissions inspection campaign was launched in February 2005 on the Kenitra-El Jadida axis, and on the Kenitra-Tangier axis in July 2005. It mobilized officers from the Royal Gendarmerie and the National Security who had just been trained and equipped with adequate equipment acquired by the Foundation, with the financial support from the Fédération marocaine des Sociétés d'Assurances et de Réassurance (FMSAR). The campaign was designed to raise awareness among motorists about exhaust pollution. It concerned 68,000 vehicles and enabled the gathering of valuable information about the status of the national fleet.

An extensive media campaign was launched in 2005 in parallel to the inspection campaign. The media campaign used diverse outreach media for motorists, associations and the media, such as information days, distribution of leaflets, broadcasting television commercials with the Boundifs cartoon characters and awareness posters.

Transportation vehicle monitoring

Urban transport is a major pollution contributor due to emissions. To assist the upgrading of these vehicles that are required by law to pass the technical inspection in centers every six months, Qualit'air established a support program with the participation of the Directorate of Utilities and Delegated Services:

- Support for progressive fleet renewal
- Import ban on buses refurbished abroad
- New specifications for public transport concessions including compliance with emissions standards, regular technical inspections of buses and limiting bus life to seven years.

Improved fuel quality

Upstream, the Foundation made efforts to improve the quality of available fuels Morocco. It began by leading the introduction of low sulfur content (350 ppm) diesel in 2002 that later resulted in the expanded distribution of 50 ppm diesel.

This action is the result of the Foundation's commitment and a partnership with Samir, the only refinery in the country at that time.

A widely supported program

Insurers grouped within the Moroccan Federation of Insurance and Reinsurance Companies provide support for the Foundation's Qualit'air program by monitoring the technical inspection reports upon delivery of the insurance premium, raising motorist awareness about the impact of proper vehicle maintenance on safety and the environment, and providing financial support to the program including funding the acquisition of 20 emissions measurement instruments (MAMDA).

Automotive distributors joined the Qualit'air program by conducting a series of awareness actions (free emissions testing, new cleaner fuels and new emissions reduction technology).

Lastly, Qualit'air enjoys international support. The program is listed among the activities conducted under the United Nations Development Programme (UNDP) Climate Change Mitigation Framework and the Global Environment Fund, which provide financial assistance.

Air quality monitoring

In parallel to this first concrete action on vehicle pollution, the Foundation started a fundamental air quality effort by working to establish a **permanent monitoring device.**

Accurate knowledge about the level of air pollution is indeed the basis of all air quality policy.

Based on a system first established in Rabat, Casablanca and Mohammedia by the Ministry Delegate in charge of Environment and the National Meteorological Directorate, and based on the National Monitoring Committee recommendations, the Foundation provided support to extend this network to all cities in the country.

Creating a monitoring network

An **ad hoc committee** was created composed of delegates from the Ministry Delegate in charge of Environment, the National Meteorological Directorate and the Directorate General of Local Authorities. This committee conducted an inventory on air quality studies, piloted the acquisition of measuring stations, and designed a coordination, management and maintenance system.

29 immovable stations were acquired: The Mohammed VI Foundation for Environmental Protection acquired 13 stations; the National Meteorological Directorate, 9 stations; the Ministry Delegate in charge of Environment, 5 stations; and the Greater Casablanca area, 2 stations. The Foundation and the Moroccan National Meteorological Directorate each acquired

a mobile station, for a total of 2 mobile stations. In total, **the monitoring network includes 31 stations.**

These stations enable access to information that is transmitted in the form of **weekly newsletters on air quality** established by the National Directorate of Meteorology, which set up **an air quality index, Atmo Morocco** that is calculated daily for each measuring station. It takes into account the major pollutant concentrations: maximum hourly concentrations and averages, hourly trends in SO2, NO2 and O3, and daily evolution of PM10 suspended particles.

This deployment was carried out between 2001 and 2012. It permitted reliable and accurate information on air quality and enabled the transition to a new phase of the Qualit'air program: evaluating the impact of the pollutants in the atmosphere on the health of citizens and the establishment of a permanent tool to monitor health risks due to air pollution.

An eco-epidemiological study has been launched

To achieve this goal, the Foundation aimed to develop a model, and as such, decided to launch a **major eco-epidemiological** study in Casablanca.

In January 2009, under the Chair of **Her Royal Highness Princess Lalla Hasnaa**, the Foundation signed a partnership agreement with the Ministry of Health and the Ministry Delegate in charge of Water and Environment. This agreement initially planned to evaluate the impact of air pollution by first launching an eco-epidemiological study in the Greater Casablanca area.

The study, coordinated by the Foundation, was conducted in partnership with the Ministry of Health, the Ministry Delegate in charge of Environment and the Wilaya of Greater Casablanca. It relied on Moroccan expertise, based on methodological models proven abroad, with support from the World Health Organization.

The principle was to compare the data collected by the air quality monitoring stations in Casablanca with all the available medical data in order to measure the link between pollution and health risks.

It was interested in all the diseases potentially related to air pollution such as respiratory diseases, cardiovascular diseases, ENT and ophthalmological pathologies, by carefully counting the medical consultations and number of deaths linked to these types of illness.

It mobilized 600 doctors, 11 public hospitals, and 52 medical centers: 35 out of 140 health centers, six social security polyclinics, eleven communal health offices, and four schools. 10,000 pieces of data were collected. The study revealed a **significant correlation between air pollution and consultations for respiratory infections, pneumonia, asthma, conjunctivitis, and death.**

This pilot study aimed to establish **health indicators, statistical modeling, and a set of measurement and decision-making tools** and make them available to the public authorities and local stakeholders for the management of air quality.

National and regional governance

Awareness and training of the Regions for air quality management will enable them to manage their new responsibilities resulting from the regionalization process.

In this sense, in December 2012, the Foundation signed an agreement on air quality management with the Directorate General of Local Authorities to support three pilot regions: Marrakech-Safi, Rabat-Salé-Kenitra and Sous-Massa-Draa.

In 2016, the greater Casablanca region will pioneer this new governance. It signed the eco-epidemiological agreement at the Qualit'air day on February 11, 2016, along with the Ministry of Health, Ministry Delegate in charge of Environment, Ministry Delegate in charge of Water, Directorate General of Local Government, National Directorate of Meteorology, Greater Casablanca local government, and of course the Foundation.

VOLONTARY CARBON OFFSETTING

The mitigation of global warming has become a question of humanity's survival. Faced with this global challenge, each country and each individual are called to participate. The Foundation is dedicated to raising this awareness among both individuals and economic operators.

Since 2009, the Foundation deploys a climate program that is, above all, an outreach effort. But it requires the availability of all tools that can enable awareness about the carbon footprint in order to offset it or preferably, reduce it.

The greenhouse effect is well known: sunlight warms Earth's surface. A portion of the energy received from the sun is reflected into space in the form of infrared rays. Naturally occurring gases present in the atmosphere, such as CO_2, trap a part of the reemitted radiation and warm the atmosphere. These are greenhouse gases.

These gases were initially in equilibrium in the atmosphere. However, their presence in the atmosphere has increased dramatically with modern human activity and the massive use of fossil fuels (coal, oil, natural gas). In less than two centuries, the proportion of CO_2 has increased from a stable level between 275 and 285 ppm to reach the symbolic level of 400 ppm in 2015.

The natural equilibrium has been altered. The climate is warming and harmful consequences appear: increased sea levels, changes in the rainfall cycle, and increased violent weather events. In the short term, our life is disrupted. In the long term, our survival is threatened.

Climate change is a global problem and requires a global and concerted solution by every country.

At the 1992 Rio Summit, 154 countries signed a United Nations Framework Convention on Climate Change (UNFCCC). This is the starting point for a climate monitoring process. Since 1995, UNFCCC members have met every year under the aegis of the UN COP and in 1997 the Kyoto Protocol signatory countries pledged to reduce their CO_2 emissions.

In 1995, Morocco ratified the UNFCCC and the Kyoto Protocol in 2002. In October 2009, it adopted a National Climate Change Mitigation Plan (PNRC) within the framework of the Territorial Plans to Mitigate Global Warming (PTRC).

The Foundation established an Air and Climate program to help Morocco contribute to mitigating local air pollution and global warming.

The program's main objectives are to educate citizens, civil society, business and government about the impacts of the greenhouse effect and climate change, to encourage companies and public organizations to reduce their CO_2 emissions, and to offset unavoidable emissions by participating in financing projects for the reduction and sequestration of greenhouse gases.

A four program cluster

The Foundation's Climate program cluster is composed of four components that develop progressively.

- A carbon database consisting of 300 CO_2 emissions factors, half of which are calculated specifically for Morocco.
- A greenhouse gas footprint assessment tool that allows organizations to take inventory of their greenhouse gas emissions, estimate their contribution to global warming, and determine their actions to reduce or offset them.
- A CO_2 calculator that allows citizens or organizations to easily estimate the CO_2 emissions related to an activity and offset them online.
- Voluntary carbon offsetting that enables organizations to offset their unavoidable emissions through carbon sequestration activities or by limiting emissions.

Carbon database

The starting point is by estimating greenhouse gas emissions.

For a given activity, CO_2 emissions are difficult to measure directly. They are calculated by converting a known and measurable amount, such as the amount of fuel burned in liters, or the electricity consumption expressed in kilowatts, or in grams of CO_2 emitted.

Although emissions factors may be the same worldwide for certain emissions sources, such as the use of an automobile or air transportation, they can vary significantly from one country to another for other factors.

For example, CO_2 emissions per kWh of electricity vary from country to country depending on the energy sources used for electricity production. In France, due to its use of nuclear energy, the electricity emission factor is 0.123 g of CO_2 per kWh. In Morocco, ONEE estimates the electricity emission factor at 0.708 g per kWh and the Foundation estimates it at 0.766.

In this context, drawing on the approach of accounting for greenhouse gas emissions by developed AFEME (French Environment and Energy Management Agency), the Foundation conducted a study that enabled the development of a carbon database containing 300 emissions

factors adapted to the economic, social and environmental realities in Morocco.

Greenhouse gas (GHG) footprint assessment

Once the emission factors identified and estimated, the database allows greenhouse gas emissions assessments in Morocco to be conducted.

To achieve these footprint assessments of companies or organizations, the Foundation has developed a tool, the "Bilan GES" (GHG footprint assessment), in cooperation with ADEME (the French Environment and Energy Management Agency).

Three levels of emissions are included in the Bilan GES® GHG footprint assessment tool:

- Direct emissions (heating, manufacturing processes, etc.)
- Emissions directly attributed to an activity (transportation, commuting, electricity supply, etc.)
- Emissions indirectly attributed to an activity (use of finished products, depreciation, end of life)

It is available in Excel and structured per the ISO 14069 standards and Greenhouse Gas Protocol. Version 1.0 of this tool has been available since 2011.

This carbon tool is a true management tool for organizations. Despite their size, it allows organizations to determine their overall environmental footprint, limit the impact of their activities on the environment, assess their dependence on fossil fuels, identify the scope for reducing emissions, assess the economic risk of a higher cost of fossil fuels, save energy and raw materials, and anticipate emerging laws and regulatory pressure on the greenhouse gas emissions (carbon tax, etc.).

The tools of this type are the prerequisite for the establishment of a genuine climate risk management policy (Climate Plan, ISO 14001, etc.).

With the creation of these tools, and drawing on experiences from around the world, the Foundation encourages the establishment of a national governance framework to reduce greenhouse gas emissions.

Qualit'air agreement

By signing the Qualit'air agreement on February 11, 2016, the General Confederation of Moroccan Enterprises (CGEM) is committed to mitigating global warming by promoting greenhouse gas tool among its member companies. Seven companies have volunteered to sign the Qualit'air agreement: La Voie express, G.P.C, AMTRI-TTES, APC, CTM, Afriquia Gaz, and Oulmès. They will develop a pilot project based on the Foundation tools, with support from the Moroccan Cleaner Production Centre (CMPP). They have committed to:

- assessing their greenhouse gas emissions generated by their activity, using the GHG footprint assessment tool

- reducing their greenhouse gas emissions by adopting and implementing efficiency actions and optimizing the use of resources and cleaner production,
- offsetting their irreducible greenhouse gas emissions,
- communicating, sharing and disseminating good practices and experience feedback.

The Ministry Delegate in charge of the Environment will be responsible for managing the carbon database, with support from a Management Committee consisting of the Foundation, CGEM, CMPP, Ministry of Commerce and Industry and the Digital Economy, and ADEREE.

Lastly, awareness and training efforts for companies and consulting firms in Morocco will be conducted to use the carbon tool. At the end of the process, the creation of a carbon label will reward the efforts of businesses and create a ripple effect.

VOLONTARY CARBON OFFSETTING

If the assessment tool is intended to encourage the reduction of carbon emissions from organizations, the Voluntary Carbon Offsetting is aimed at companies, governments and individuals that cannot reduce or avoid carbon emissions from their activities (travel by plane or car, heating or cooling space, office, etc.). The Voluntary Carbon Offsetting allows for proactive partial or total carbon offsetting. Thus they contribute financially to the realization of energy conservation, energy efficiency, and renewable energy or carbon sequestration projects.

Carbon offsetting is based on two principles: a general principle that the polluter pays for the environmental impact of its activities by participating in financing prevention, reduction or remediation of the pollution it has caused, and the principle of geographic neutrality where the polluter can offset the given amount of CO_2 emitted in one place by reducing or sequestering an equivalent amount of CO_2 in another.

The voluntary carbon offsetting follows a simple three-step process. The CO_2 emissions from an activity (e.g. air travel of a passenger, from departure airport to arrival airport, or the distance traveled by car annually, etc.) are estimated in grams of CO_2 emitted. These emissions are converted into a financial contribution by multiplying the weight of carbon emitted by a cost per ton of CO_2, provided either by the body that conducts the offsetting or by an international market. Lastly, the estimated amount is paid towards a carbon emission sequestration or reduction effort.

The voluntary carbon offsetting supports the implementation of solutions that do not emit carbon or reduce it, such as development projects in renewable energy, improving energy efficiency, reforestation, agroforestry, or methane capture (waste).

A Foundation program

The Foundation has developed its own voluntary carbon offset program that is aimed at businesses, the public sector and individuals who wish to partially or totally neutralize CO_2 emissions related to their activities.

The Foundation has signed agreements with partners who are committed to offsetting CO_2

emissions from air or car business travel for their staff. It achieves this through carbon sequestration or neutral emissions projects: either **electrification of rural schools** in solar energy (lighting, heating, water pumping, etc.) or planting palm trees under the Marrakech palm grove protection program.

Since the program launch in April 2009, and with the support of the Foundation's partners, the gains were consistent: 365 rural schools and 205 outbuildings (school administration, student cafeteria, and teacher housing) have been equipped with photovoltaic solar panels for lighting and operating electrical devices (PC, TV and refrigerator). The facility will enable about 6,000 tons of CO_2 emissions to be avoided during the project life.

10,000 palm trees have been planted, enabling the sequestration of about 12,000 tons of CO_2 during the project life. 10,000 in vitro palm date palms seedlings were produced and planted: 2,500 palm trees on public land of 15 hectares located along the road to Safi, 3,500 on the Marrakech Palm Grove walking tour, 2,000 in the area called Jnane Lakbir and 2,000 in Tamesna.

The plantation areas are irrigated by drip systems with water from solar pumping. Irrigation of the first 15 hectares of land, previously carried out by rotations of tanks consuming 120 liters of diesel per day, helped prevent 2,200 tons of CO_2 emissions. A second solar energy water pumping system using treated water from the city of Marrakech was established in 2013. It avoids 2200 tons of CO_2.

CONVEY

In 2002, the Foundation, in its **federating and mobilizing role**, launched a program to mitigate air pollution: Qualit'air.

With its partners, it has undertaken fundamental efforts that pave the way to cleaner air that is less harmful to the health of Moroccan citizens and mitigates global warming.

Emissions standards and the technical control system are now in place: the Ministry of Transportation ensures their compliance, and updates and continues to develop the system.

31 air-monitoring stations were acquired to establish an air quality-monitoring network that is now run by the National Directorate of Meteorology, which transmits weekly measurement results to the competent authorities.

An eco-epidemiological study conducted in Casablanca enabled the establishment of a model that the Ministry of Health will replicate in other cities. It has especially helped to set up a monitoring and control system that the Directorate General of Local Authorities is now beginning to deploy in large Moroccan cities.

The Foundation has worked to put in place the base of an expansive air quality management framework that belongs to entities whose function is to bring it to maturity. The Foundation supports the training of its participants and contributes to air quality by raising awareness and educating citizens about the need to breathe clean air, and the role that each person plays in

achieving the objective of public health and well being.

Tomorrow the **local territories will be at the heart of the air quality system**. A system with seven players (Department of Health, DGCL, Ministry Delegate in charge of Environment, Ministry Delegate in charge of Water, Ministry of Interior, Directorate of National Meteorology, and the Foundation) who engaged in an agreement signed under the auspices of the Mohammed VI Foundation for Environmental Protection.

Upstream, **the Ministry of Health provides eco-epidemiological monitoring**. It mobilizes its local network, connected to the direction of Epidemiology and Disease Mitigation. They collect health data on air pollution and populate a database that is analyzed by its experts. They will forward their comments and any alerts to the local territories.

On the other hand, the local territories receive **air quality monitoring network newsletters**, and the **National Directorate of Meteorology** made the stations available to the Communes. The National Directorate of Meteorology experts analyze and interpret the collected data and issue warnings when necessary.

Finally, the Directorate General of Local Authorities, the Wilayas, and the Foundation support the Communes, for this surveillance as well as in establishing veritable Climate Plans. These include, beyond the monitoring of air quality, a carbon assessment to measure the territories' greenhouse gas emissions and take steps to reduce them. The Foundation and the Directorate General of Local Authorities mobilize the necessary training to bring the communal staff the necessary skills for this new mission.

This new system will be tested in the Marrakech-Safi region over the next three years (2016-2108). The Directorate General of Local Authorities will provide the necessary funding for the development of the regional air quality-monitoring network, and it will also monitor and evaluate the program. The program will also be developed by the Ministry Delegate in charge of Environment to later expand it to all territories.

After this pilot in Marrakech-Safi, which will be extended to two other regions (Rabat-Kenitra and Souss-Massa-Draa) before being expanded nationally, local authorities (regions and communes) will have the tools to continuously monitor the changes in the air quality and lead the way.

They will be responsible for ensuring citizen health, communicating the information on the pollution and greenhouse gas emissions levels and taking the necessary steps to locally reduce this pollution (traffic, efforts by polluters) and greenhouse gas emissions. They will also be responsible for educating citizens and stakeholders about the issues concerning pollution and global warming.

The Mohammed VI Foundation for Environmental Protection will continue to conduct awareness campaigns among different targets groups for the same goals: to encourage citizens to adopt environmentally friendly behavior; for companies and the administration to reduce their pollutant and greenhouse gas emissions; for decision makers to enable the mechanisms that are available to them to mitigate greenhouse gas emissions, and to preserve the health of the planet and citizens.

RAISING AWARENESS,

The Foundation's work primarily concerns advocacy and education. It is conducted among citizens, especially the youth.

For example, global warming is explained to young people on a platform designed by the Foundation to raise awareness among children about air pollution and global warming. With a playful approach, it transmits fundamental knowledge that enables them to understand the global warming challenge they will face tomorrow.

The Foundation also educates specific target groups, such as motorists during the installation of a system designed to reduce car pollution. It educates businesses about global warming. It signed an agreement with the General Confederation of Enterprises of Morocco (CGEM) to identify and support pilot businesses in conducting their carbon footprint assessment with the GHG tool it has developed. Lastly, the Foundation, in partnership with the Directorate General of Local Authorities, raise awareness among local territories, and support three pilot regions in conducting greenhouse gas emission and deploying climate plans.