german cooperation
DEUTSCHE ZUSAMMENARBEIT

Implemented by

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

In cooperation with

ENGAGEMENT GLOBAL Service für Entwicklungsinitiativen

With its

SERVICE AGENCY COMMUNITIES IN ONE WORLD

Inventory and diagnosis of the public lighting network in the city of Benslimane

Energy efficiency in public lighting

Energy production and consumption are at the heart of global concerns. As a result of economic development, increasing industrialisation and technological progress, the demand for energy is constantly increasing. Morocco also faces these challenges. As a country that does not produce its own energy resources, Morocco is heavily dependent on imports for its energy supplies. However, this persistently high energy dependency - 96% until 2008 - has been declining since 2009, reaching 89% in 2019. Over the last two decades, gross national consumption of primary energy has risen by an average of almost 5%. It rose from 15.1 million tonnes of oil equivalent (MTOE) in 2009 to 23.37 MTOE in 2019. The country's final energy consumption increased by 33.8%, reaching 17 MTOE compared to 12.7 MTOE in 2009. Investments and appropriate energy strategies have been put in place to fully exploit the country's energy potential and meet the challenges associated with access to energy and energy efficiency. Public lighting is the largest single item of energy expenditure in local authorities. It accounts for between 30% and 40% of municipal energy consumption. In order to reduce this very high and costly consumption, it is essential to undertake measures to improve the public lighting service and make it more efficient.

The regional project "City-to-City Cooperation Maghreb-Germany (KWT II)", commissioned by the Federal Ministry for Economic Cooperation and Development (BMZ), was implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH in cooperation with the Service Agency Communities in One World (SKEW) of Engagement Global gGmbH, from March 2020 to February 2024. Among other activities, the regional project supported project partnerships between German and Maghreb cities, particularly in the field of public lighting. The good practice described in this factsheet was developed by the partner cities of Benslimane and Bamberg. These practices will be scaled up as a part of the follow-up regional project "Urban Adaptation to Climate Change in the Maghreb", running from March 2024 to February 2027.

Inventory and diagnosis of the public lighting network in the city of Benslimane

In Morocco, the regional project KWT II was implemented in collaboration with the Directorate-General of Territorial Communities (DGCT) of the Ministry of the Interior. One of the project's partner cities was the urban municipality of Beni Mellal, located in the west of the country.

The municipality of Benslimane, also known as the "Green City", is characterised by its unspoilt natural environment and its strategic location close to the economic (Casablanca) and political (Rabat) capitals of the Kingdom. It has a relatively low population density and urban growth (58,194 inhabitants according to the 2014 General Population and Housing Census), with a surface area of 7,086 ha, close to a cork oak forest of almost 62,000 ha. Given these assets, the municipality has undertaken a number of environmental management initiatives, including the development of a Sustainable Energy Action Plan.

The management of the public lighting (PL) service is of great importance to the municipality of Benslimane. Since 2014, it has been managed directly by the municipal services, despite the lack of sufficient and relevant knowledge of the assets transferred.

To gain a better understanding of its public lighting assets, modernise them and improve their management, the municipality of Benslimane undertook an inventory and diagnosis of its public lighting network. The aim was to define an action plan, rationalise energy consumption and make the right decisions for the management of public lighting. This has been taking shape since 2016 as part of a project partnership with the German city of Bamberg, with support from the regional project KWT I and II.

Left: Overview of the mapping of the public lighting network in the municipality of Benslimane.

Right: Consultation meeting with partners from the municipality of Benslimane.

Photos: © GIZ/Mustapha Saber

Approaches and actions

The inventory and diagnosis of the public lighting network (PLN) in Benslimane covered the entire municipality using a box-based[1] approach, including the following points:

Organisational analysis of the public lighting service and documentary analysis:	Inventory of the components of the PLN as well as technical and energetic diagnostics of the boxes and light points:	Photometric measurements to assess compliance with ISO 13201:	Drawing up a multi-year investment master plan:	Organisation of training for the updating of PLN data and the control of energy consumption in public lighting:
Analysis of the operation of the public lighting service (material, human and financial resources, organisation charts, management methods, expenditure, contracts, maintenance, etc.).	This step involved carrying out a detailed inventory of the existing system (light points, cabinets, monitoring systems, significant consumption, etc.) in order to create a new, up to date, geolocated database.	Since the aim is to provide precise, efficient and economical lighting, it is always essential to take photometric measurements to identify the lighting requirements for each lane according to its use.	Elaboration of a priority plan for upgrading and an energy efficiency plan to correct irregularities and ensure optimal availability. This is followed by a relamping operation to replace old luminaires with energy-saving LEDs to ensure adequate lighting and energy savings.	As the diagnosis is a task that needs to be carried out regularly over time, it was essential to update it, given the daily changes in the PLN in general. It was therefore necessary to build up the capacity of the teams responsible for managing this service.

Diagram 01: *Methodological approach. © GIZ*

Achievements

The diagnosis project was completed in March 2018, providing the municipality of Benslimane with a decision-making tool for the management of public lighting. The inventory and diagnosis of the PLN provided the main figures on the size and condition of all the components of the municipality's PLN, namely: control and protection boxes, supports, luminaires, light sources and supply cables. The results were as follows:

Sharing experience and training on public lighting:

A series of exchanges, visits and training have taken place as part of the partnership with the city of Bamberg since 2016.

PLN database and mapping:

A geo-referenced database that enables data to be saved and updated, as well as network mapping to be displayed.

Detailed diagnosis by box:

An inventory of PLN components including brackets, lamps and light sources - status 2018:

Number of boxes	113 including 11 on hold
Number of light points (LP)	4.676
Number of luminaires	5,083 of which 584 on hold
Type of cables	44 overhead and 56% underground
Total length of cables	157 Km
Average power installed per LP	179 W
Average cost per LP: consumption + maintenance	1,243 MAD of which 100 MAD maintenance costs
Cost per KWh	1,35 MAD TTC
Annual rate of change in the PLN	5 %

Cartographic illustration of lighting data for the municipality:

Lighting maps have been produced using a geographic information system (GIS) to assess the performance of public lighting equipment.

Action plan to upgrade and improve energy efficiency over 3 years, with a breakdown of the corresponding investment required:

The upgrading and energy efficiency measures can be implemented over 3 years and require a total investment of around 26,125,000 MAD.

Diagram 02: *Results achieved. © GIZ*

[1] *There is a light point based diagnostic approach and a box-based approach. An electrical box is a special enclosure designed to protect electrical equipment from environmental factors and human interference. It operates several light points.*

Challenges

A number of challenges were encountered, requiring specific solutions. These are detailed in diagram 03:

1

UPDATING THE DIAGNOSIS SEVERAL TIMES:
This presented a major challenge, as it had to be re-evaluated every time data was changed or added, slowing down the process. As soon as the data collected becomes older due to the rapid development and change that the street lighting network generally undergoes, the diagnosis becomes obsolete.

2

HUMAN RESOURCES:
There was a shortage of staff in the areas of public lighting and the design of digital maps and light maps. The first solution was to strengthen the capacity of the existing teams.

3

DIGITISATION DIFFICULTIES:
The lack of digitisation of the service was a major obstacle. It was therefore necessary to strengthen the teams and integrate the necessary IT equipment, in particular tablets and computers equipped with software to digitise data collection.

4

EMERGENCY MANAGEMENT:
This involved dealing with anomalies as they arose, without any prior planning or anticipation.

5

FINANCIAL CONSTRAINT :
Diagnosis and digital mapping require the acquisition of a range of appropriate devices and equipment, such as vehicles, measuring equipment and network analysis, which represents a significant financial investment.

Diagram 03: *Challenges encountered. © GIZ*

Innovative aspects and strengths

The Benslimane project stood out for its strengths, reflecting a commitment to sustainable and efficient energy management (diagram 04):

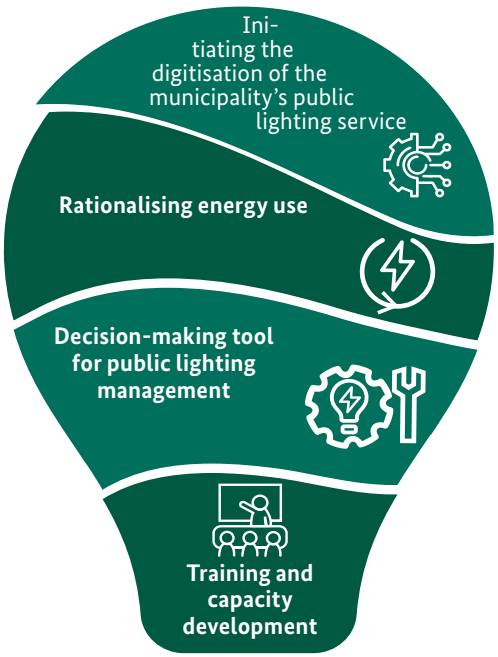

Diagram 04: *Innovative aspects and strengths. © GIZ*

Photos: Examples of sections of light points in the municipality of Benslimane (2018): on the left, light points served by an underground network, representing 56% of the energy supply, and on the right, those served by an overhead network, representing 44% of the energy supply.

Contact person

Anita Sebio Kouhè
Project Manager
anita.sebio-kouhe@giz.de
T +49 6196 79 - 1068
Dag Hammarskjöld
Weg 1-5
65760 Eschborn
Germany

Best practices, lessons learnt and advice

Several lessons have been learnt, best practices and advice identified from the experience in Benslimane, which should be considered when implementing similar projects (diagram 05):

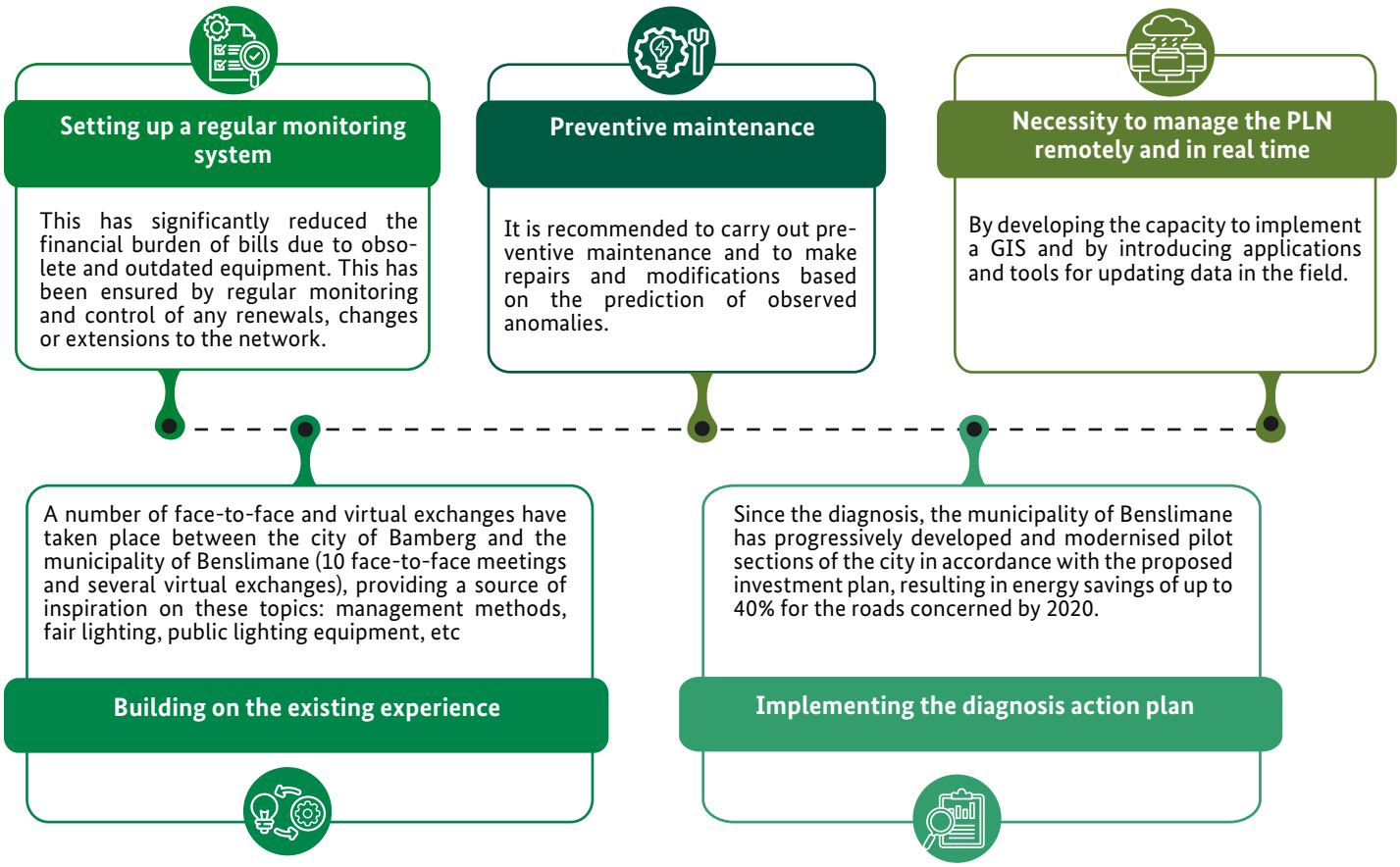

Diagram 05: *Good practices, lessons learnt and advice. © GIZ*

Published by
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Registered offices Bonn and Eschborn, Germany

Regional project City-to-City Cooperation Maghreb-Germany (KWT II)
Dag-Hammarskjöld-Weg 1-5
65760 Eschborn, Germany
Tel +49 (0)6196 79 1068
info@giz.de
www.giz.de

As at
October 2024

Text
Samah Flissi, Meriem Andam, Carole Fappani, Essodom Loufaï

Design
Narimane Boucena, Essodom Loufaï

On behalf of
Federal Ministry for Economic Cooperation and Development (BMZ)

In cooperation with
Directorate-General of Territorial Communities (DGCT) within the Ministry of the Interior in Morocco