Lighting the way to social equality

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Abstract

Advances in technologies, planning and implementation of urban public lighting projects have addressed many significant issues related to street and outdoor public lighting such as improving driver and pedestrian safety while reducing energy consumption, associated greenhouse gas and other emissions affecting urban air quality, as well as light pollution. However, one area that the current street and public lighting illumination projects have not taken into account or been able to address is the situation of inequality with respect to gender and vulnerable individuals, especially in developing economies, including in the sub-Saharan Africa (SSA) region. The main focus of this study is the analysis of the interaction between gender and street lighting to define what gender responsive street lighting is, what are its long-term benefits and what are the methodologies to mainstream them in into the project cycle.

This paper summarizes the findings of a study commissioned by the French Development Agency (Agence française de développement, AFD) and financed by the European Union (EU) in the framework of the Covenant of Mayors in Sub-Saharan Africa (CoM SSA) initiative. It presents a state-of-the-art review of existing literature and analyses of recently completed and ongoing lighting projects regarding the correlation between gender inclusion and street and outdoor public lighting services. It is the first of a series of assessments that are being performed for AFD and the CoM SSA initiative on gender inclusion.

The paper first details the research methodology, next it discusses, the criteria, methodologies and long-term benefits that were derived for a gender responsive street lighting system (SLS) and references the experience of gender responsive SLS projects in four cities. This analysis enabled us to develop a definition of gender responsive street lighting, which encompasses resilient and sustainable systems that (1) use an intersectional gender approach to consider the gender-differentiated lighting needs of both motorized road users and pedestrians, (2) address women's and girls' urban safety needs by promoting natural surveillance and social integration, and (3) actively enable women's economic, social, and political empowerment. A series of methodologies was proposed to deliver this outcome at all stages of the development and implementation of energy-efficient street lighting programs (preparation, planning and design, procurement, construction, operation and maintenance, monitoring and evaluation).

One of the key findings on street lighting, gender and safety by this paper is the fact that street and public lighting have two main impacts on the perception of safety: natural surveillance (which encompasses someone's capacity to see around them and be seen by other people) and social integration (when positive impacts derive from community confidence that facilitate cooperation for mutual benefit, cohesion, and informal social control). While both are essential to increase women's feeling of safety in urban settings, "natural surveillance" fulfils mainly practical needs for gender equality (i.e., need for better visibility, decreased hiding places, and limited entrapment), whereas "social integration" fulfils strategic needs (i.e., addressing the root causes of gender-based violence and crime by strengthening community cohesion and informal social control). Thus, to effectively address women's and girls' safety issues in urban set-

tings, a gender responsive street lighting system must address both practical and strategic gender needs.

Introduction

Urban planning tends to reflect the dominant values of society, which are typically neither inclusive nor equitable. Cities have long reflected traditional gender roles and gendered division of labour, marginalising women and girls from public spaces. This is because historically, cities have been planned and designed by men with little knowledge or concern for how decisions affect women. Outdoor public lighting and street lighting services are an extension of this marginalisation, with outdoor public lighting and SLS being still planned and designed in many places without considering gender differentiated uses of urban spaces. These issues are exacerbated in many developing regions, including in sub-Saharan Africa (SSA) where cities are dimly lit due to, among other things, financial challenges, deficient operation and maintenance (O&M) and limited in-country technical capacity for planning and operations.

This paper summarizes the findings of a study commissioned by the French Development Agency (*Agence française de développement*, AFD) and financed by the European Union (EU) in the framework of the Covenant of Mayors in Sub-Saharan Africa (CoM SSA) initiative.[1] It is a state-of-the-art review of existing literature and of a selection of ongoing as well as recent street lighting projects to analyse the correlation between gender inclusion and street and outdoor public lighting services. This paper is the first of a series of assessments that are being performed for AFD and the CoM SSA initiative with the final aim to obtain operational recommendations and methodologies that municipalities and other project stakeholders will be able to use within the identification, design and implementation of public lighting projects in urban settings. Firstly, the research methodology is described. Next, the paper presents the findings of the research including key-elements of the relation between street lighting, gender and safety and shows criteria, methodologies and long-term benefits that were derived for a gender responsive SLS and references the experience of gender responsive SLS projects in four cities. The paper ends with a summary.

Research Methodology

The research methodology started by addressing the following research questions:

- What are the urban specificities that exclude women from public spaces?
- How can street lighting improve the safety of women in urban areas?
- How can we ensure that street lighting reassures people and encourages them to go out after dark?
- What technologies and standards make an urban space safer?

The responses enabled us to answer the following research questions:

- What is gender-responsive street lighting?
- What are the long-term impacts/benefits of gender-equal street lighting?
- How can we consider the voices of women who are often underrepresented in the design and decision-making processes of urban street lighting, and how is this related to the design of public spaces and/or pedestrian infrastructures?

The analysis framework developed by energy and gender specialists is presented in Table 1.

To answer the research questions and provide a clear overview of the topic, the following data collection and analysis methods were used:

- Undertaking a literature review of existing references on gender responsive urbanism and street lighting systems. Academic databases ResearchGate, Elsevier and Academia were used.
- Attending the Illuminating Engineering Society (IES) Street and Area Lighting Conference (October 26–28, 2020)[2], especially those sessions which focused on the lighting of public areas and design factors for pedestrian safety.
- Assessing the methods already used for promoting social inclusion and gender equality in selected cities at an international level (Vienna, Barcelona, New Delhi, Cape Town, etc.).
- Reaching out to Econoler's and AFD's network of street lighting project designers and managers to obtain their feedback on the research questions.

The geographical zone covered in the review of the existing literature included best practices worldwide but focused on SSA countries for the evaluation of the experience in recent projects. The criteria used to select literature were:

- Studies published in the last 10 years
- Studies which included qualitative analysis
- Studies which used an observational design including ethical concerns or logistical constraints and mostly based on cross-sectional analysis

We also conducted a series of interviews with project managers of four recent street lighting projects in the SSA region (in Dakar, Kisumu, Nouakchott and Accra) to obtain information on the methodologies, approaches and tools used across all phases of their projects. The interview questionnaire is presented in the Appendix. The findings served to define elements of gender responsive street lighting and helped identify methodologies to develop and implement gender responsive SLS and outdoor public lighting services.

1. The Covenant of Mayors Sub-Saharan Africa (CoM SSA) supports African cities to meet the interdependent challenges of climate change and access to sustainable energy. Started in 2015, CoM SSA is the African regional chapter of the Global Covenant of Mayors (GCoM) the largest network of cities that contribute to impulse urban action to fight against climate change. https://www.comssa.org

2. IES Street and Area Lighting Conference: https://www.ies.org/events/street-area-lighting-conference/.

Table 1. State of the art analysis framework.

Pillars of the analysis	Description	Sources
Conceptual	Main concepts in the following fields: social, social development and gender equity, urban design and public lighting.	Scientific articles, reports (UN Women, World Bank)
Social	Patterns of exclusion of women from public spaces in urban areas.	Reports (AFD), World Bank)
Methodological	Methods of surveys, public consultation, teleological approaches (end-means).	Case studies
Technological	Functions, standards and performance of lighting technologies and street/public lighting service: power, distance, color / temperature.	Scientific articles, case studies (Arup, Econoler)

Findings

STREET LIGHTING, GENDER AND SAFETY

Urban specificities that exclude women from public spaces

Cities Alliance (2015) states that over the past decades "urban planning has largely been inspired by neoclassical economic models to develop spatially segregated towns and cities, with distinct residential and employment zones, often linked only by extensive road systems, with little public transportation provision". These cities have not typically evolved, nor have they been designed with the safety of citizens in mind. Traditional urban design leads to three main exclusion patterns of women and girls, which are based on the following factors:

- Spatial planning: cities encompassing distinct residential and employment zones often linked only by extensive road systems; This bias led to the perception of the modern city as inappropriate for women. According to a study conducted in five major cities by Plan International and XYX Labs (2018), 80 % of public space in cities is used by men. Meanwhile, women, especially young women and teenage girls, feel 10 times less secure and safe in public spaces.
- Economic: increased urbanization around the world, coupled with unprecedented levels of informal settlements and a significant increase in informal employment, means that cites foster a range of gendered, intersectional injustices. As noted by UN Women and ILO (2020) there is a direct link between urbanization and gendered poverty in many cities, especially for those that are not accessing the remunerated, daytime labour market.
- Social: gender violence in public spaces is one of the most neglected types of violence and is rarely addressed by policy and regulatory frameworks. A study conducted by Metropolis (2018) in 141 cities around the world found that only 36 % of these cities had policies that explicitly address women's safety in public urban spaces. ender-based violence being widespread in urban areas.

The marginalisation of women and girls from public spaces and urban areas is reinforced in cities that provide poor outdoor public lighting services (dim, poorly maintained, or not available) since a lack of adequate street lighting systems exacerbates their feelings of insecurity or limits their economic empowerment.

Street and outdoor public lighting improve the safety of women in urban areas

The World Bank (2020) found that SLS and by extension, outdoor public lighting services, are recognised as the most important environmental feature that influences subjective safety perceptions after dark. Kern (2019) found that SLS are however not generally designed with a pedestrian-centered approach, let alone a gender responsive one. In general attention in SLS designs is focused on road traffic facilitation, typically achieved by focusing on providing illumination at intersections and along major traffic arteries. Hence, SLS are designed mainly for the benefit of motorised vehicle owners, who are generally men, due to the gender asset and wealth gaps. The majority of design approaches demonstrate little consideration for low traffic or pedestrian-only locations (public markets, squares, residential areas, etc.) that comprise the majority of the locales where women gather and transit through. Plan International and XYX Labs (2018) found that this leaves the street lighting needs for non-motorised road users who are primarily women, children, youth, the elderly and vulnerable groups such as informal workers and disabled people unmet.

The relationship between low availability of street and public lighting, crime and gender-based violence is documented, global and widespread. For example, as reported by Plan International and XYX Labs (2018), in Kampala, Uganda, a city where, as of 2016, only eight percent of paved road and street networks is illuminated, 79 % percent of young women reported feeling unsafe when walking in their city's streets. The World Bank (2020) reported that in Cape Town, South Africa, a street improvement initiative changed a high-crime area into a multifunctional public space and led to a 30 % increase in pedestrian activity.

Street lighting designs help to reassure people and encourages them to go out after dark

The two main impacts of street and outdoor public lighting which reassure people and encourage them to go out after dark are visibility (natural surveillance) and message (social integration).

- Visibility is a key factor in natural surveillance, as defined by UN WOMEN (2017), and in combination with the presence of people, increases the perception of safety. Good lighting decreases hiding places for potential offenders and provides a better overview of someone's surroundings; it improves the visibility of escape routes for people and enables them to orient themselves and escape in case of danger. Dastgheib,

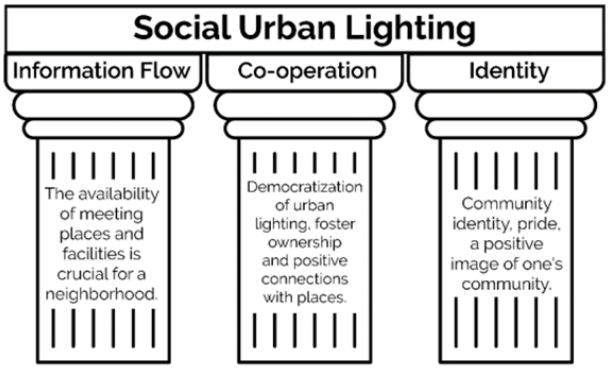


Figure 1. The Three Pillars of Social Urban Lighting.

(2018) found that vertical illumination, which enhances the ability to recognize details such as clothing color and facial features, also contributes to the feeling of security.

- Social integration is defined as positive impacts derived from community confidence, networks and social trust that facilitate coordination and cooperation for mutual benefit, cohesion and informal social control. Yang, et al. (2019) found that by reinforcing informal social control (i.e. the ability of local neighbourhoods to supervise the behaviour of their residents and the capacity of neighbourhoods to socialise their residents conventionally), social integration directly contributes to safer communities. Malagoni (2019) found that communities displaying high social integration therefore directly contribute to decreasing crime rates, gender-based violence and anti-social behaviours such as vandalism and resource degradation. As illustrated in Figure 1, social urban lighting is a system that can (1) enable information flow (by providing opportunities for people to meet and develop social interactions) (2) promote cooperation (by involving residents in the design process, the decision-making process, and/or by informing them), and (3) foster community identity (by generating pride and reputation linked with the built and natural environment).

When applying theories of gender needs to the two impacts presented above, we see that "natural surveillance" fulfils mainly practical needs (i.e., need for better visibility, decreased hiding places, and limited entrapment), whereas "social integration" fulfils strategic needs (i.e., addressing the root causes of gender-based violence and crime by strengthening community cohesion and informal social control). To effectively address women's and girls' safety issues in urban settings, a gender responsive street lighting system must address both practical and strategic gender needs as shown in Figure 1, designed by Malagoni (2019).

Technologies, standards, and practices for a safer urban space

Econoler (2017) analysed the widespread adoption of light-emitting diodes (LEDs) in SLS and showed that they provide clear economic and environmental performance advantages over traditional high-intensity discharge (HID) (e.g. mercury vapour, low and high-pressure sodium and metal halide lamps) options and incandescent lights. City administrations however tend to overuse LEDs and over-illuminate areas.[3] Over-illumination is the inappropriate or excessive use of artificial light. It can take many forms including glare (or excessive brightness), sky glow and light trespass (when light falls where it is not needed or reflected upwards). Yang et al. (2019) found that over-illumination is not a solution to producing safer urban spaces and may even have undesirable impacts on crime rates and women's and girls' feeling of safety. Consequently, only carefully designed SLS increase urban safety while limiting other detrimental impacts (such as light pollution, increased carbon emissions, etc.).

As described above, street lighting can impact safety and its perception in two ways: "visibility" and "message", which may both be challenged by poorly designed street lighting. First, excessive glare from bright, unshielded, and poorly aimed light limits visibility by creating deep shadows, restricting the eyes' ability to adapt to low-light conditions, and creating contrasts between light and dark areas. Second, Malagoni, (2019) found that social integration might be detrimentally affected by over-illumination since people can be drawn away from too bright and bare areas, just as they are frightened by a dark alley. Furthermore, the positive effects of social integration happen only if the street lighting is seen as being installed for community development purposes, not for control purposes. The World Bank (2020) determined that the important point with visibility is to strike a balance, by ensuring: (1) regular spacing of street lighting infrastructure in streets and public spaces, (2) adequate lighting of primary and secondary roads and open spaces with clear, well-lit access to exits in public spaces, and (3) lighting levels that allow for the recognition of an approaching person's face from 10–15 metres away.

Other social and sustainability consequences arise from poorly designed SLS. Drake (2019) found that negative health impacts may develop, such as damaged eyesight from over-illumination and sleep deprivation from the wavelengths of blue light emitted by white LEDs. She also reported that light pollution and bright white light impact wildlife by deviating animals from their migration trajectories, killing thousands of birds and other animals every year. Over-illumination also causes additional carbon emissions from unnecessary lights. To be socially inclusive and gender responsive, an SLS must consider all the potential detrimental impacts of its design and technologies, including impacts on safety, health, and the environment. Furthermore, a SLS must be cost-efficient and limit carbon emissions. All these factors will ensure that the SLS is resilient and can have sustainable effects. Benjamin and Aly Mbaye (2012) found that good design of such systems is crucial in sub-Saharan Africa where cities and SLS are bound to sprawl due to growing populations, greater access to electricity, and increased urban development. Based on these findings the project identified key factors which contribute to good SLS, as listed in Table 2[4].

3. Generally, this is due to the perception that it is necessary to match or increase the lumen output of individual luminaire instead of ensuring the average light levels are appropriate for the application. Econoler, (2017).

4. Overall (or delivered) light levels/keeping lights low to the ground and use properly designed lighting fixtures: A rating that takes taking Backlight, Uplight, and Glare into account.

Table 2. Key Factors that Contribute to Good Street Lighting Performance.

Factors	Usual Technical Description	Added Safety, Social, and Environmental Considerations
Overall (or delivered) light levels	The amount of light reaching the intended horizontal area to be illuminated. It is usually reported as the average light level.	• Keep lights low to the ground and use properly designed lighting fixtures (appropriate BUG rating) to avoid lighting wastage and light pollution. • In public spaces, ensure clear, well-lit access to exits. • Provide lighting levels that allow for the recognition of an approaching person's face from 10–15 metres away.
Light distribution	How evenly the delivered light is distributed over the intended area. It is usually reported as the uniformity ratio.	• Multiple light sources and surfaces with different reflective values make women feel most safe.
Lighting of vertical surfaces	Describes the amount of light landing on a vertical surface, such as a wall or a person (also known as vertical illuminance).	• Adequate vertical illumination allows for better visual perception of non-road characteristics, such as facial features or clothing on a person, the color of clothing, or signage on posts.
Light quality	How well the light renders the colour of objects in the intended area when compared to natural daylight. It is usually reported as the colour rendering index of the light.	• Women prefer a high-quality LED light that enables them to distinguish shapes and colour, helping to create a sense of safety.
Light colour appearance	How the light appears to the observer—they can range from yellowish to blueish white.	• Spaces with warmer colour temperatures are perceived as safer places. • While in urban lighting, LEDs mostly have a colour temperature of around 5,000 K and above. The World Bank (2020) has demonstrated that 4,000 K is optimal for drivers' and pedestrians' visibility while entailing minimal exposure to blue light, which is detrimental to human health.
Cut-off or glare	How much light is directed downward, and at what angle.	• Excessive glare limits visibility by creating deep shadows, restricting the eyes' ability to adapt to low-light conditions and creating contrasts between light and dark areas.
Trespass	This factor describes how the boundary area between light and dark at the edge of the lighted area is controlled.	• Light trespassing may illuminate houses and negatively impact the health of its inhabitants by affecting their sleep cycle.

CRITERIA FOR GENDER RESPONSIVE STREET LIGHTING AND LONG-TERM BENEFITS

What transpired from the information presented in previous sections is that the perception of cities as gender-neutral entities is inaccurate. It shows that women and girls have been marginalized from public spaces due to spatial planning and economic and social factors. Hazelton (2017) found that gender-based violence, which encompasses street harassment and sexual violence is pervasive, causing women to fear for their safety and thus adapting their behaviour and modifying their urban commute. Public spaces have a role in shaping a favourable urban environment but, more importantly, they are also a democratic right for all citizens. Consequently, city administrations and planners must apply a gender responsive approach when designing public spaces. Since street lighting is generally recognized as the most important environmental feature that influences subjective perception of safety after dark, designing and deploying socially inclusive and gender responsive street lighting systems is increasingly urgent. Based on the analysis presented in the previous section, we have developed six foundational criteria of a gender responsive SLS as follows:

- SLS that not only considers the **different lighting needs of men and women**, but take into account **intersectionality** – i.e., how individuals' different social and political identities (e.g. sexuality, disability, race, income, age, religion, etc.) impact their perceptions of safety and their use of public space.
- SLS **designed for both motorized and non-motorized road users** that targets all relevant urban spaces (including public places, parks, markets, residential areas, public transportation infrastructure, toilet facilities, etc.) and not only major traffic arteries.
- Well-designed and well-maintained SLS that are energy and **cost efficient, emit low carbon emissions, and limit detrimental impacts on safety, health, and the environment.**
- SLS that addresses both **women's and girls' practical** (i.e., better visibility, decrease in hiding places, and limited entrapment) **and strategic** (i.e., address the root causes of gender-based violence and crime by strengthening community cohesion and informal social control) **gender needs regarding urban safety.**
- SLS that **actively promote women's economic, social, and political involvement and empowerment** by increasing women's income-generating opportunities, involving women and girls as active stakeholders in the planning and design of the system, and involving women as municipal decision makers involved in SLS development and implementation.
- SLS planning, implementation, and evaluation that are undertaken **along with other initiatives to address gender-based violence in cities and mainstream gender in municipal affairs.**

Box 1. Definition of Gender Responsive Street Lighting.

Gender responsive street lighting encompasses resilient and sustainable systems that: (1) use an intersectional gender approach to consider the gender-differentiated lighting needs of both motorised road users and pedestrians; (2) address women's and girls' urban safety needs by promoting natural surveillance and social integration; and (3) actively enable women's economic, social and political empowerment.

These six criteria lead to the definition of gender responsive SLS (in Box 1).

From the criteria and definition, we see that gender responsive street lighting leads to several long-term benefits, as presented in Figure 2.

METHODOLOGIES TO DEVELOP AND IMPLEMENT GENDER RESPONSIVE STREET LIGHTING SYSTEMS

The steps to develop an energy efficient (EE) street lighting project are presented in the Table 3. Since gender responsive SLS must be energy and cost efficient, we only refer to EE SLS herein. The table also highlights the methodologies and approaches that must be integrated in each relevant step of the process to ensure the implementation of gender responsive SLS.

Experience in recent projects

A series of interviews has been conducted with project managers and representatives of four recent street lighting projects in the SSA region to obtain information on the methodologies, approaches and tools used across all phases of their projects (planning, design, implementation, evaluation). The projects are listed below.

- Senegal, Dakar – Street Lighting Program for the City of Dakar;
- Kenya, Kisumu – Improving Life Conditions in Kisumu;
- Mauritania, Nouakchott – Support to the Nouakchott Region for Resilient and Equitable Sustainable Development (AREDDUN – French acronym for Appui à la Résilience environnementale et développement durable de la ville de Nouakchott);
- Ghana, Accra – Street Lighting Program Under the Framework of the Millennium Challenge Corporation (MCC) Ghana.

This feedback provides an interesting overview of the technical and social specifications of ongoing and recent street lighting projects in SSA. The interviews revealed that the projects followed a wide range of methodologies, technology selections and integration of gender and social aspects. When analysing the characteristics of the projects, we nonetheless see that none comply with all the criteria of gender responsive street lighting. In addition, the analyses show that many of the projects do not have a robust baseline, or omit baseline analysis altogether. This is problematic, as this has resulted cities identifying solar-based LED street lighting systems as the preferred solutions, even if these have higher initial and O&M costs, and could be a rentable and valuable option only in areas not deserved by SL network.

Summary

Street lighting has been recognized as the most important environmental feature that influences subjective perception of safety after dark. Light has in fact two main impacts on the perception of safety: natural surveillance (which encompasses someone's capacity to see around them and be seen by other people) and social integration (when positive impacts derive from community confidence that facilitate cooperation for mutual benefit, cohesion, and informal social control). While both are essential to increase women's feeling of safety in urban settings, "natural surveillance" fulfils mainly practical needs for gender equality (i.e., need for better visibility, decreased hiding places, and limited entrapment), whereas "social integration" fulfils strategic needs (i.e., addressing the root causes of gender-based violence and crime by strengthening community cohesion and informal social control).

To effectively address women's and girls' safety issues in urban settings, a gender responsive street lighting system must address both practical and strategic gender needs. Some technologies, such as LEDs, are known to make a place feel safer but city administrations tend to overuse them and over-illuminate areas. Over-illumination is not a solution to producing safer urban spaces and may even have undesirable impacts on crime rates and on women's and girls' feeling of safety. Indeed, over-illumination can take many forms including glare (or excessive brightness), sky glow and light trespass (when light falls where it is not needed). Consequently, only carefully designed SLS will improve urban safety while limiting other detrimental impacts (such as light pollution, increased carbon emissions, etc.).

This study analysed the interaction of gender and street lighting and answered a series of questions to then define what gender responsive street lighting is, what are its long-term benefits and what are the methodologies to mainstream them in into the project cycle.

The answers provided to the research questions enabled us to develop a definition of gender responsive street lighting, which encompasses resilient and sustainable systems that (1) use an intersectional gender approach to consider the gender-differentiated lighting needs of both motorized road users and pedestrians, (2) address women's and girls' urban safety needs by promoting natural surveillance and social integration, and (3) actively enable women's economic, social, and political empowerment. A series of methodologies was proposed to deliver this at all stages of the development and implementation of energy-efficient street lighting programme (planning and design, procurement, construction, operation and maintenance, monitoring and evaluation).

Finally, the interviews provided an interesting overview of the technical and social specifications of four ongoing or recent street lighting projects in SSA. They showed that the projects followed a wide range of different methodologies, technology selection and integration of gender and social aspects. When the characteristics of the projects are analysed, we see that none comply with all the criteria of gender responsive street lighting developed in this project.

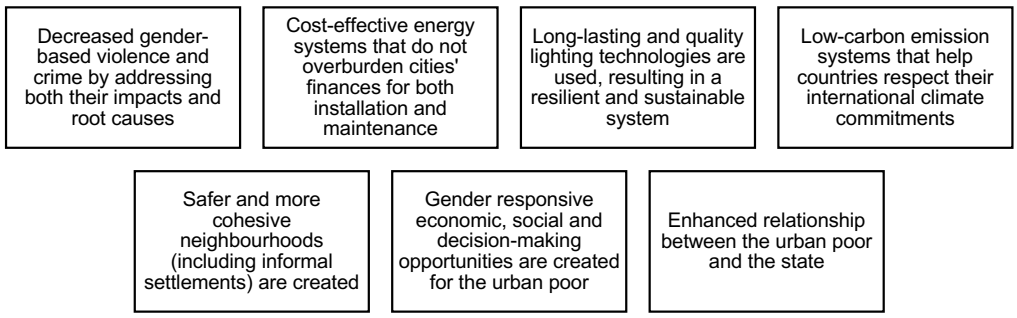


Figure 2. Long-Term Benefits of Gender Responsive Street Lighting.

Table 3. Gender Responsive Approaches Applied to the Street Lighting Project Cycle.

Project Steps and Activities	Gender Responsive Approach
Project Preparation	
Team set-up and training Establishment of project financial requirements	Ensure that women are included in the project team and in decision-making power positions. Ideally recruit a local gender expert as part of the team. Train team members on basic concepts in gender, gender responsive street lighting and how to use gender mainstreaming tools and guidelines. Integrate gender in the project budget either as a specific component or in existing budget items.
Planning and Design	
Public consultations Selection of technologies Economic analysis Design of Monitoring & Evaluation plan	Establish an inclusive and gender-balanced stakeholder consultation process (using interviews, mental mapping, exploratory walks, surveys, focus group discussions, collaboration with civil society, etc.) and use main outcomes to plan and design SLS. Ensure a wider planning scope, thereby covering more urban areas with more emphasis on lighting designs for different urban areas (implementation zones) rather than simply focusing on urban roads. Ensure that SLS are energy and cost efficient, emit low carbon emissions and limit detrimental impacts on safety, health and the environment. Include a walkthrough survey to establish the baseline of existing SLS to identify EE measures to be implemented Design a gender responsive monitoring and evaluation (M&E) plan.
Procurement Procedures	
Definition of the legal framework Definition of the financial resources and services Tender procedures	Establish gender responsive procurement protocols to ensure that women-owned businesses are considered in all aspects of the procurement chain and that local suppliers who are women-owned or have strong representation of women in senior leadership roles are favourably considered.
Construction	
Purchase of equipment Pilot installations Installation of the complete system	Use pilot installations not only to ensure that technologies and infrastructure are suitable and ready to be scaled up to the full scope of the project, but also to allow for gender equality and social inclusion considerations to be examined and monitored.
Operation and Maintenance (O&M)	
Monitoring and verification (M&V) Preventive and corrective maintenance	Use M&V to confirm the performance of the installed SLS i.e. require the verification and monitoring of energy/emission savings as well as lighting performance. Foster social integration through ongoing collaboration with beneficiaries by keeping them informed of the investments being made in their neighbourhood and the anticipated impacts on gender equality, safety and well-being. Build local technical capacity for ongoing maintenance.
Monitoring and Evaluation (M&E)	
Post-installation follow-up Evaluation against M&E indicators	Use M&E to not only support the design of future gender responsive SLS initiatives but also inform relevant stakeholders such as decision makers, police forces and community leaders, in order to help them develop policies and procedures to address urban gender-based violence.

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Appendix: Interview Questionnaire

Objective: Collect data on project methodologies, results and lessons learned from four ongoing and recently completed street lighting projects in sub-Saharan Africa (SSA) in the following cities: Kisumu (Kenya), Dakar (Senegal), Nouakchott (Mauritania) and Accra (Ghana)

Interview targets: Project managers

Interview duration: 1 hour

Project Description: On behalf of the European Union, the Agence Française de Développement (AFD) supports the Covenant of Mayors in Sub-Saharan Africa (CoM SSA) to meet the interconnected challenges of climate change and sustainable energy. The support is aimed at attracting regional level climate finance for planning and implementing concrete projects in municipalities. The AFD is concerned with the situation of inequality with respect to gender and vulnerable individuals in planning and implementing urban public lighting projects in sub-Saharan Africa. Therefore, under the auspices of the third CoM SSA initiative, the AFD has contracted the services of Econoler to develop gender-sensitive tools and methodologies that are useful to municipalities and other actors involved in identifying, preparing, implementing, monitoring and evaluating urban public lighting projects. The aim of the study is to formulate recommendations that public lighting actors can directly apply to help design projects and implement infrastructure that factor in the specific needs of women, men and vulnerable individuals.

INTERVIEW INSTRUCTIONS

You have been selected by the AFD to participate in a research study to collect data on project methodologies, results and lessons learned from four ongoing and recently completed street lighting projects in sub-Saharan Africa (SSA) in the following cities: Kisumu (Kenya), Dakar (Senegal), Nouakchott (Mauritania) and Accra (Ghana). The results of this study will be included in the project's first deliverable, a situational analysis of existing knowledge on gender and street lighting.

Do you grant us permission to use your name, title and/or quote you in the publication?

Do you grant us permission to record this interview?

PROJECT OBJECTIVES AND SCOPE

1. Please describe the project's scope and objectives.

PROJECT PLANNING

1. Does the project address only existing infrastructure, or does it include new roads, highways and/or other public areas that previously have not received lighting service?
2. If existing infrastructure only:
    a. Was a new infrastructure survey conducted? Or was existing system data (inventory, pole locations, road classifications, etc.) used?
    b. Did the project have access to other data sets such as accidents, pedestrian traffic, crime and other social/commercial statistics?
    c. Was there a mechanism in place for users to report lighting issues to the current system?
3. If expansion to new service areas:
    a. Are any details available on these new service areas?
    b. How were these areas identified and selected?
4. Did the project planning process include public areas or only roads and highways?
5. Did the planning process take into account lighting designs for specific urban zones where there are higher pedestrian traffic and activities?
6. Did the planning and lighting design process identify travel routes that are critical for the community?
7. Were the different travel and commuting patterns of women taken into account from the outset?
8. Did the planning process incorporate areas of self or community-established lighting?
9. Did the lighting retrofit implementation plan consider impacts on:
    a. Women and girls?
        i. If yes, how?
    b. Vulnerable groups such as informal workers, the elderly and persons with a disability?
        i. If yes, how?
    c. Were any of these groups involved in the evaluation process of the street light network?
10. Were gender considerations taken into account at any/all stages of the planning or lighting design process?