



Improving Sustainability Concept in Developing Countries

# Suitability of Renewable Energy Technologies in the Public Realm

## Analytical Framework

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### Abstract

Renewable Energy Technologies (RETs) are considered as one of the main solutions for energy efficiency in face of the climate change issue. Urban areas should contribute to the reduction in consumption of non-renewable energy sources by emphasizing on energy efficient solutions, which can play a vital role in the field of urban design and the nature of the public realm in cities, communities and neighbourhoods. This paper is concerned with the installation of RETs in the public realm. It aims to analyse the potentiality of installing RETs within the public spaces in addition to its effects and limitations. The paper sheds light on the physical aspects of the public realm, types of RETs and presents a framework identifying the RETs suitability to be used in the public spaces.

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### 1. Introduction

Climate change is certainly one of the greatest environmental threats the world is facing. Since the 1800s, scientists have realized the significant change in the earth temperature. The 1970s witnessed the beginning of the period of atmospheric warming known as “global warming” (1) [2]. 1992 witnesses the Earth Summit in Rio de Janeiro where Governments agree on the UN Framework Convention on Climate Change (UNFCCC), which commits them to preventing ‘dangerous climate change’. In 2010:

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international climate policy picks up a push at the well-organized 16th Conference of the Parties in Cancun, Mexico which set a number of policies and strategies to reduce CO<sub>2</sub> emissions [1].

The main problem in the case of climate change is an energy system based on fossil fuels that is no longer efficient and is mainly responsible for the rise in CO<sub>2</sub> emissions [3]. However, renewable energy provides one of the leading solutions to the climate change issue. By providing a low CO<sub>2</sub> emissions source of power, heat, cooling and transport fuels, renewable energy options such as wind, solar, biomass, hydro, wave and tidal energy offer a safe transition to a low emissions impact (Bank, 2011). Nowadays, many countries have considered a climate change program, including responsibility sharing of CO<sub>2</sub> emissions reductions and renewable energy targets. Such energy offers safe, reliable and increasingly cost effective alternatives for all the energy needs- mainly heating, cooling, electricity and motive power for transport [3].

Urban areas contribute to the consumption of energy due to industrialization and urbanization activities. Yet, by considering energy-efficient solutions, urban areas can play a vital role in reducing per capita consumption through changes in the physical configuration of space. These solutions should consider the urban forms and patterns that revolve around the public spaces, because it involves and affects the city and its citizens. Renewable Energy Technologies (RETs) are considered as one of these solutions for energy generation.

The objective of this paper is to install the RETs in the public realm to make the space more energy efficient. Therefore, the paper aims to analyze the potentiality of installing RETs within the public spaces as well as its effect and limitations.

To achieve this aim the following methodology is adopted; first a definition of the public realm physical aspects, identifying its main criteria forming the initial axis of the framework (part A). Secondly, a definition of RETs and their classification, identifying different types used across the literature forming the horizontal axis of the framework (Part B). Finally, through a discussion of the required inputs and outputs of RETs, a refined framework is reached that consists of the physical aspects and the suitable RETs in the public realm.

## **2. The Public Realm and Its Physical Aspects**

Public realm is defined as space that is shared communally by the public. As successful public spaces respond to societal changes, they encourage human growth and contribute to the survival of a culture. They are usually situated in a central location often near main circulation paths or the crossing of such routes and are well used by pedestrians [4]. Public spaces include parks, plazas, pedestrian pathways, streets, streetscape and building interfaces. The main three elements that influence the public realm are: the buildings that enclose and define the space, the space itself and the people that inhabit the public realm and the way they use the space [5]. Those elements indicate the integration between the physical and social aspects of the public realm [6].

Notwithstanding the social aspects of public realm, the research focuses on physical interventions to the public realm in so far as they pertain to the implementation of RETs. Hence, physical aspects can be defined through three main elements: the Enclosure (the space itself), Enclosing elements (defining the space), and elements within enclosure (enhancing the use of space).

### **2.1 Enclosure**

Enclosure measures the degree to which streets and other public spaces are visually defined by buildings, walls, trees, and other vertical elements. Spaces where the height of vertical elements is proportionally related to the width of the space between them have a proper quality [7]. A cross-sectional design ratio of approximately one height to two width, or less, creates a proper scaled image along the street

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