



Deconstructing the dichotomies of solar photovoltaic (PV) dissemination trajectories in Ghana, Kenya and Zimbabwe from the 1960s to 2007[☆]

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HIGHLIGHTS

- ▶ I examined the disparate disseminations of PV in Kenya, Zimbabwe and Ghana.
- ▶ Kenya's PV market successes not down to private sector alone.
- ▶ Varied antecedents underpin the dissimilar disseminations of PV in these countries.
- ▶ Replication of Kenya and Zimbabwe success stories in Ghana demands certain factors.

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ABSTRACT

The profuse dissemination and utilisation of solar PV technology in the world is indispensable, especially in this era of climate change. However, in the African continent, between 1960 and 2007 Kenya and Zimbabwe were among countries with the highest PV dissemination, while Ghana was among countries with the least disseminations. Analysing empirical data through the lens of the Social Construction of Technology (SCOT) theory, the article aims to uncover the drivers underpinning the disparate dissemination trends of PV in the three countries within the stated period and to tease out lessons apropos replicating the successes within Kenya and Zimbabwe in Ghana. SCOT theory is chosen because it provides an excellent framework for analysing the social shaping of PV's development and diffusion processes in these countries. This theory posits that the shape and meanings of a technology do not reside in it, but are acquired through the heterogeneity of social interactions. Findings in the paper reveal that a gamut of socio-economic and political antecedents informed the varied dissemination outcomes of the technology in these countries. Premised on these findings, the paper recommends critical steps, which Ghana needs to undertake to enhance the replication of the Kenyan and Zimbabwean PV success stories.

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1. Introduction

Climate change and its attendant consequences have brought into perspective the dangers of developed and developing countries' continuing with conventional economic development paths, with the accompanying greenhouse gases. In recent years, a green economy development paradigm, has dominated international development dialogues and policy debates. The advocacy for a paradigm shift from the dinosaurian economic development models to a green economy is predicated on the latter paradigm's ability to improve

[☆]This paper is based on the author's doctoral thesis, which was accepted by the University of Hull, UK in 2008. Thus, the majority of PV data cover the 1960s through to 2007. However, the paper infuses current and relevant literature, whenever possible.

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intergenerational welfare and social equity, and concurrently reduce environmental risk and ecological scarcities (UNECA, 2011). A shift from the current path of large fossil fuel consumption to the uptake and utilisation of renewable energy technologies will enhance the global agenda on the green economy.

The choice of renewable energy technologies (RETs) includes solar photovoltaic (PV), wind, geothermal, biofuels, biogas, mini hydro-power, among others. According Greenpeace and EPIA, 2011 "Solar can and must be a part of the solution to combat climate change, helping us shift towards a green economy" (p. 6). An enhanced deployment and utilisation of these RETs could generate considerable benefits for the whole world. Their uptake will foster the protection of natural resources to serve as carbon sinks; reduction of health related risks associated with the use of non-modern sources of energy; increase access to modern energy; reduction of the oil dependency risks; economic development through creation of jobs, and so on (Laumanns et al., 2004; Radulovic, 2005).

The natural resources for most of these RETs are ubiquitous. Solar energy, for example, is the most abundant energy resource on earth, and the reliability of PV technology has gained grounds over the years (IEA, 2010). The global PV market has been on the rise, particularly in this 21st Century. With a worldwide PV cumulative installed capacity of about 1.5 GW in 2000, it rose rapidly to roughly 40 GW in 2010, producing some 5 TWh of electricity annually (EPIA, 2011). Although very encouraging, the distribution of this cumulative installed capacity has been, however, very lopsided between continents and between countries.

In Africa, for example, the dissemination of the technology has flourished in countries such as South Africa, Kenya and Zimbabwe, while many others including, Ghana, Uganda, Malawi among others, have lagged behind, and there is paucity of data giving understanding to such disparities. Examining empirical data and literature sources through the lens of the Social Construction of Technology (SCOT) theory, this article unlocks the varying antecedents that have underpinned the disparate dissemination trends of PV technology in Kenya, Zimbabwe and Ghana from 1960 to 2007. Kenya and Zimbabwe were chosen for this three-country analysis, because they are among the largest PV markets in Africa (Jacobson, 2004). In particular, the Kenyan PV market is viewed as an archetypal success story in the developing world (Duke et al., 2002; Otieno, 2004). In contrast, Ghana appears to be one of the least developed PV markets in Africa. Based on the findings, the article draws lessons apropos the feasibility of Ghana replicating the high dissemination trends of PV in Kenya and Zimbabwe. Bryne (2009) study for example, revealed that initial attempts to replicate the success of the Kenyan SHS niche in Tanzania, failed. The primary reason for this failure is that the two countries have disparate institutional and political structures, which emanated from their dissimilar political and economic development paths in the past.

2. Global dissemination perspectives of PV

The development of PV has been rapid since its first application in small quantities in the 1950s. It emerged in the last decade as a potentially major technology for power generation in the world (EPIA, 2010; Greenpeace and EPIA, 2011). The average annual growth rate over the last decade was about 40%. With a global cumulative installed capacity of 0.1 GW in 1992, installed PV power capacity grew to 14 GW in 2008, 22 GW in 2009 and over 37 GW by

the end of 2010 (IEA, 2010; Greenpeace and EPIA, 2011) (see Fig. 1). This rapid change in the installed capacity of PV has not only taken place at the global level, but also at the country level. The evolution of installed capacities in countries around the world hitherto, shows that different countries have been at the forefront at different times.

Fig. 2 depicts the changing trends of the relative cumulative installed capacity of PV in different countries from 2000 to 2010. In the year 2000, Japan was the leading PV installer in the world, followed by the Rest of the world, United States of America and Germany. In 2004, Japan continued to lead in the global share. However, Germany leapfrogged to second place (35%), followed by the Rest of the world (14%) and the United States of America with (13%). Since 2006, however, Germany became the frontrunner of the world's PV installation and dissemination. Germany had a share of 57%, Japan (20%), rest of the world (10%), United States (7%) and rest of Europe (6%) of the total global PV installed capacity in 2006. In 2008, Germany had 36% share in world-wide PV installation, followed by Spain (23%), Japan (15%), rest of the world (11%), United States (8%), and Italy, Korea, France, China. In 2009, Germany controlled about 53% of the global PV market and an installed PV capacity of about 10 GW. Italy was second, followed by Japan, USA, Czech Republic, Belgium, France, rest of the world, China, Korea, Australia, Canada and Spain. Germany continues to lead in 2010, followed by Spain, Italy, Japan, USA, the rest of the world, Czech Republic, France, Belgium, China, Korea and other EU.

As a sub-set of the rest of the world, Africa's share of the global installed capacity of PV is less than 1%. On a country level, however, as of 2007 Kenya and South Africa were leading all the African countries with approximately 150,000 installed PV systems each, followed by Zimbabwe (see Fig. 3). There is a clear gulf between the disseminated PV systems in South Africa, Kenya and Zimbabwe and the rest of the African countries.

In respect of the disparate market shares and installation figures in different countries, most authors draw links between the countries' dissemination rates and their prevailing conditions. For instance, it has been argued that solar power booms in countries where the so called boundary conditions are right (Greenpeace and EPIA, 2011). It has been argued that the dominance of Germany in PV installations and market shares stems from the existence of good conditions, including the introduction of the feed-in-tariffs (FiT), good financing opportunities, a large availability of skilled PV companies, and a good public awareness of the technology (EPIA, 2010). It has also been argued that the sharp rise in Italy's installations in 2009 was attributed to the implementation of the

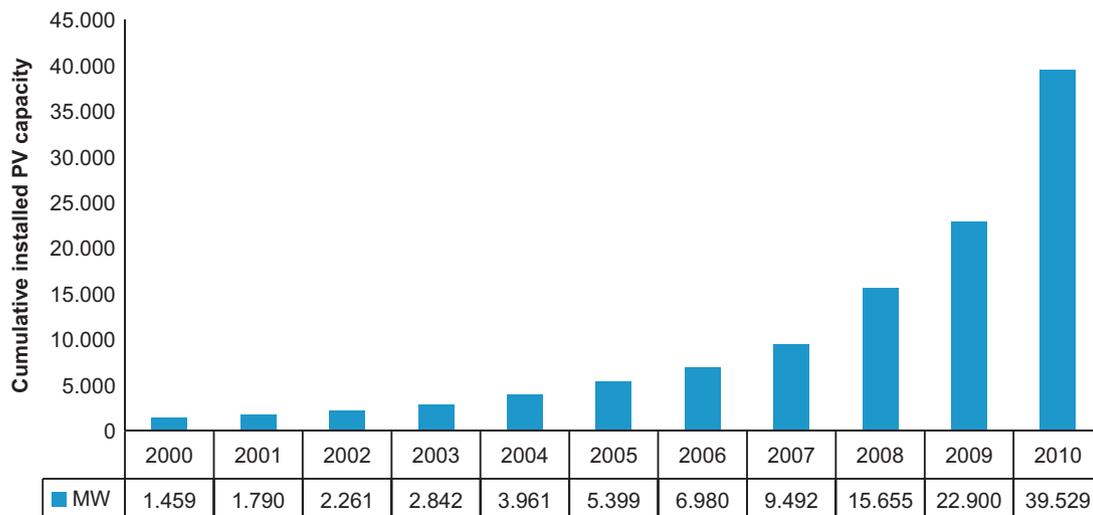


Fig. 1. Evolution of global cumulative installed PV capacity: 2000–2010. Source: Adapted from EPIA, 2011.

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