



Original Articles

Wood fuel consumption, institutional quality, and forest degradation in sub-Saharan Africa: Evidence from a dynamic panel framework



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ARTICLE INFO

Article history:

Received 13 July 2016

Received in revised form

30 November 2016

Accepted 30 November 2016

Available online 9 December 2016

Keywords:

Wood fuel consumption

Institutional quality

Forest degradation

Control of corruption

Government effectiveness

System GMM

ABSTRACT

The objective of this paper is to answer an empirical question regarding whether wood fuel consumption and institutional quality affect forest degradation in sub-Saharan Africa. To accomplish this, a sample of 45 sub-Saharan African countries covering 2005–2013 was employed. Also, the dynamic generalized method of moments (GMM) approach was used to estimate the specified model. The results indicated that wood fuel consumption significantly contributed to forest degradation in the region. On the other hand, control of corruption and government effectiveness were negatively related to forest degradation. This suggests that effective control of corruption and governance can contribute to lowering forest degradation in the region. Forest degradation aided by wood fuel consumption can be lessened by effective control of corruption and governance. Thus, policy makers should (1) provide adequate and affordable (or subsidized) modern fuels to the populace, especially rural dwellers, (2) intensify the fight against corruption, and (3) ensure effective governance.

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1. Introduction

The degradation of forests is occurring at an alarming rate in sub-Saharan. The Ivory Coast, for example, which previously had about 30 million hectares of tropical forests, saw its coverage reduced to 10 million hectares in 2005 (Butler, 2006). Sub-Saharan Africa, which is the area of the African continent located south of the Sahara desert, has 595 million hectares of forest land (FAO, 2015). That is about 88.3% of Africa's total forest covering of 674 million hectares. A map of sub-Saharan Africa is illustrated in Figs. 1 and 2, showing the countries in the region and the region's forested areas, respectively.

One of the most critical environmental problems involving all the sub-Saharan African countries is cutting down wood for fuel usage. Owing to this act, many countries in the region have had about three-quarters of their forests eaten up (Idiata et al., 2013), and if the trend is allowed to continue, there may be serious inadequacy in fuel wood by 2025.

Wood fuel is now considered the most significant energy source and top forest product in sub-Saharan Africa as it constitutes about 80% of the total wood consumption in the region (FAO, 2007). The

International Energy Agency (IEA, 2010) has reported that 9 out of 10 Africans do not have access to electricity and thus rely on wood biomass for energy generation. Consequently, the wood resources are pressured, over harvested, and thereby causing environmental problems. Due to the high demand for wood fuel in sub-Saharan Africa, the balance between supply and consumption is always characterized by a high deficit for the products. This eventually results in huge pressure on the forests to cater to the supply.

The situation is further worsened by the lack of effective governance, policies, programs, and strategies to tackle the growing challenges of unsustainable wood fuel consumption in the region. Policy makers and governments in the region have paid little attention to the manner in which wood fuels are produced and consumed. The World Bank maintained that weak institutions and poor administration constitute the characteristics of most sub-Saharan economies due to corruption. Two-thirds of African countries were reported to have rampant corruption in 2014, according to Transparency International. These countries scored less than 3 on the corruption perception index, which suggests widespread corruption (Abid, 2016).

Government effectiveness and the quality of regulations are considered key determinants of environmental quality (Esty and Porter, 2005; Djankov and Hoekman, 2002). Pushak et al. (2007) claimed that countries with less corruption and less effective governance are more effective in enforcing environmental rules and regulations. For the purpose of this study, two key institu-

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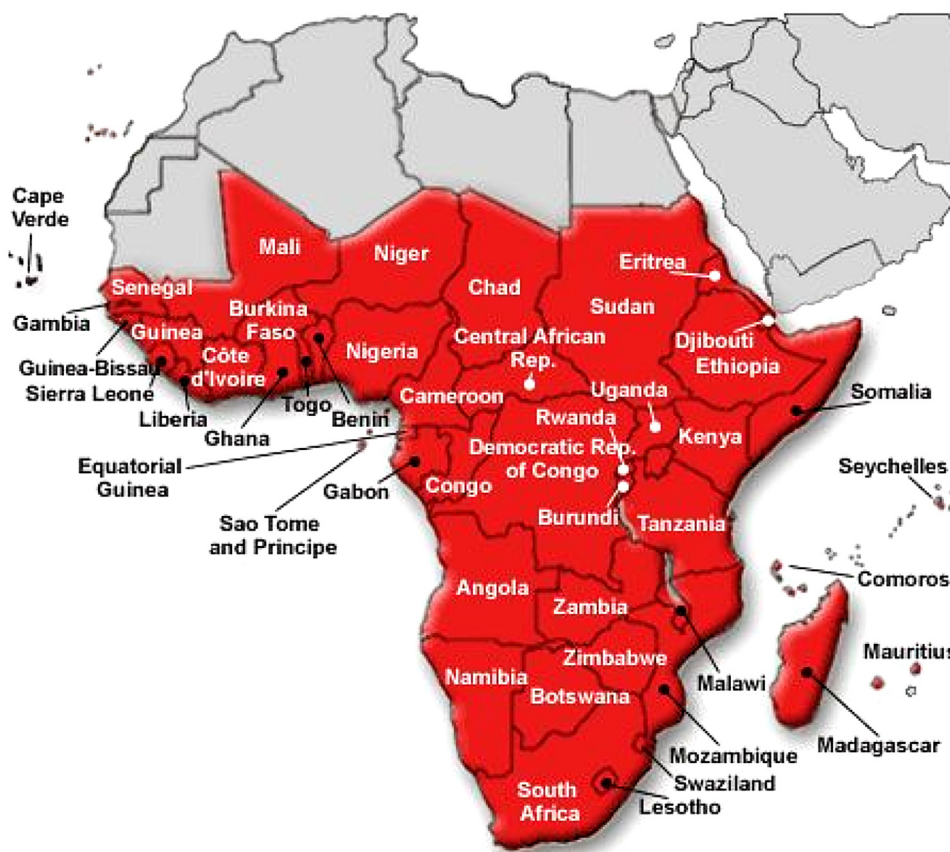


Fig. 1. Map of sub-Saharan Africa.

Source: <https://www.pinterest.com/pin/326159197983207674/>.

tional quality indicators will be used (i.e., control of corruption and government effectiveness) to ascertain their impact on forest degradation in sub-Saharan Africa. The objective of this study is to determine the impact of wood fuel consumption and institutional quality on forest degradation in sub-Saharan Africa.

2. Literature review

Generally, in sub-Saharan Africa, the production and consumption of wood fuels coupled with poor institutional quality are sources of concern for sustainable management of the region's dry forest areas, as well as its wooded lands. However, only a few researchers have focused on the forest degradation caused by wood energy harvests and they have not considered the role of institutions. Even the few studies that have been conducted have focused mostly on one component of wood fuel, charcoal, and only in selected forest areas. Some of these studies concentrated on charcoal production from humid and dry forest areas (see [Mwampamba, 2007](#); [Chidumayo and Gumbo, 2013](#)).

[Hofstad et al. \(2009\)](#) maintained that even though wood fuel such as charcoal may not be the main driver of deforestation, it can cause the destruction of forests. Contradicting this argument, [Girard \(2002\)](#) reasoned that charcoal is made from tree trunks, which necessitates cutting down trees. Hence, charcoal making leads to land clearing and thereby causes deforestation. Similarly, [Bailis et al. \(2015\)](#) pointed out that most of the regions depending on wood fuel experience a high rate of deforestation. In that light, [Sander and Zeller \(2007\)](#) claimed that wood energy is the major cause of deforestation and forest degradation in sub-Saharan Africa.

Equally, the price of wood fuel is also identified as an important factor determining the deforestation rate, as [Samuelson \(1981\)](#)

claimed that an increase in the price of fuel wood sends a signal to the producers that more fuel wood is needed and, hence, more cutting down of trees, which consequently leads to deforestation and environmental degradation. All these studies established that wood fuel extraction or consumption could have an adverse effect on either deforestation/forest degradation or the environment in general.

[Allen and Barnes \(1985\)](#) indicated that deforestation is caused by a number of factors, including intensive wood harvesting for fuel, population growth, and subsistence agriculture. [Chase \(1993\)](#) argued that poverty is also a primary driver of tropical deforestation since the poor need to cut down trees to supply their needs for heating and cooking.

[Mortimore and Fabiyi \(2003\)](#) argued that deforestation and environmental degradation are mostly the result of authorities poorly defining property rights, which might otherwise militate against the problem if properly defined and enforced. [Bhattarai and Hammig \(2001\)](#), in a panel study of 66 countries, found that institutions have a significant positive impact on deforestation and argued that better institutional quality in a country can assist on reducing deforestation; agricultural policies can have significant impact on the deforestation rate. [Sutton and Aghrout \(1992\)](#) described Algerian agricultural policy in the 1980s as a key factor in controlling desertification and forest loss. In contrast, [Ali \(2009\)](#) found that policies have been ineffective in combating environmental degradation and, thus, the study recommended a policy shift to developmental projects.

Having reviewed the above literature, one can see that the link between wood fuel consumption and forest degradation has long been established. However, this study differs in that it will focus not only on the impact of wood fuel consumption, but also on the

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