Social-ecological Analysis of the Impact of Marine Resources on Food Security and Poverty Alleviation

Kola O. Odeku and Olufunmilayo F. Odeku

Abstract: One of the biggest challenges of the modern day governments, particularly in the developing countries of the world is how to eradicate poverty plaguing the poor and the indigents. Different socioeconomics interventions have been put in place, and are currently being used to address the problem, but remarkable success is yet to be achieved. A likely factor contributing to poverty alleviation in terms of food production is the exploration and exploitation of marine resources which are underutilised to produce socioeconomic goods and services. The marine economy is increasingly becoming important in ensuring that there are sustainable production of socioeconomic ecosystems goods and services and as such, third world countries should position themselves to include and focus on marine resources as part of their poverty alleviation strategies in order to ensure sustainable food production and promotion of good socioeconomic goods and amenities for the people. However, it is pertinent to point out that while marine resources presents a window of opportunities for increase in food production and employment opportunities; it also has some environmental challenges which can be very disastrous and impact negatively on the poverty alleviation strategy.

Keywords: Maritime economy, Poverty alleviation, Food security, Employment opportunity, Socioeconomic ecosystems

1 Kola O. Odeku and Olufunmilayo F. Odeku (Research Associate), Faculty of Management and Law, School of Law, University of Limpopo, South Africa, E-mail: kooacademics@gmail.com.
Introduction

Extensive body of literature has confirmed the benefits and usefulness of marine resources and wealth to the society and human beings (Summers et al. 2012). Marine resources are crucial poverty alleviation mechanisms, (Daw et al. 2011) because they are sources of safe and nutritious food to majority of the poor people who rely on them for their livelihoods and survival (Scherl, 2004). Literature has also confirmed that marine environment is very important to the people in the developing world and that about 950 million of them rely on the marine environment primary source of their protein (Crain et al., 2009).

Marine pollution from different sources, however, is a threat to sustainable marine lives and resources (Molnar, 2008) because it creates scarcity, food insecurity and abject poverty (Garnett et al. 2007). The developing and least developed countries are the highest hit, because they do not have, or possess requisite modern day technologies to mitigate and prevent marine pollution (Hassan, 2006). Most times, there is poor enforcement of anti-marine pollution laws.

It is generally acceptable that many people are faced with poverty world-wide (Grindle, 2004), however, there is continuous abject poverty in the developing and the least developed countries (Bardhan, 1996). Mass poverty is concentrated in the poor countries of sub-Saharan Africa and South Asia (Bardhan, 1996). Hence poverty alleviation and reduction are the major concerns of most governments in these countries (Newland and Patrick, 2004). The international community is also taking the issues surrounding poverty alleviation seriously (Mkandawire, 2005). There are a lot of specialised agencies that have been established by the United Nations to tackle poverty and ensure it is reduced and eradicated (Coady, 2003). In some countries, poverty is so prevalent and pervasive to the extent that most of the people rely on the international community and the specialised agencies for their daily survival (Sen, 1997) as they are unable to produce enough food due to factors such as environment and bizarre weather events and so on. Pursuant to this, it has therefore been observed that “although there is a general consensus that renewed growth is crucial for any sustained decrease in poverty, it is also widely accepted that social safety nets play a very important role in the poverty alleviation process. In fact, for many of the world’s poor, public safety-net programs are their only hope of a life free from chronic poverty, malnutrition and disease.”

Even though there have been many studies on marine economy, there is little information on how it can be used to address the challenges of food scarcity, caused majorly by marine pollution (Cribb, 2010). Nowadays, most of the government in the developing countries are looking more into how to intensify exploration of the maritime economies for economic growth and sustainable development (Stopford, 2009). For example, in South Africa, the government has challenged the people and captains of industry to start looking into marine economy from a more inclusive perspective in order to address socio-economic challenges facing the country. Against this backdrop, tapping into aquaculture is considered as one of the sustainable means of producing more food and income (Avadí and Fréon, 2015). Aquaculture also known as aqua fishing (Bartley et al., 2000), is the farming of aquatic organisms such as fish, crustaceans and aquatic plants. Aquaculture is an underdeveloped
sector because very little attention is given to it (Mustafa and Shapawi, 2015). Considering the value and huge benefits marine resources thus (there is no challenge of land degradation, requires minimal or no input, , they are good sources of protein, they are sustainable and so on) will contribute to the Gross Domestic Product (GDP) and socio-economic upliftments by creating more jobs, enhancing economic and social status of the people who will be engaged in the sector, there is need to intensify both human and capital investments in the sector. The method for the farming “involves cultivating freshwater and saltwater populations under controlled conditions and typically includes fish, molluscs, crustaceans and aquatic plants. Aquaculture is more productive and yields “higher rates of return than commercial fishing due to intervention in the rearing process. There is regular stocking, feeding and protection from predators; advantages that fish do not receive in the wild. Subsequently, aquaculture has emerged as a sustainable alternative to traditional fishing as stocks of fish around the world are becoming depleted” (Parker, 2011). The potential of this is that it will contribute to food security because marine foods will be sourced, processed and produced for domestic consumption and export (Kurien, 2005). This sector has shown a huge potential for economic growth and development in the developing countries.

Narrating the intrinsic benefits to the shift in focus to marine economy Morrissey et al., (2007) assert “the realisation that the world’s oceans play an important role in climate regulation and many territory activities, notably food production, coupled with economic changes and the rapid advancement in ocean technology have seen a shift in the perception of the importance of marine resources.” Marine goods and services will contribute tremendously to sustainable livelihoods by solving one of the greatest problems facing society and humanity (Daily et al., 1997) which is food insecurity and its deadly consequences (Beddington, 2010). Therefore, there is a pressing concern for every nation and each individual to fight poverty from different angles and dimensions in order to eradicate it (Laderchi et al., 2003).

**Research problem**

Developing countries of the world are facing chronic poverty because of their inability to utilise their naturally endowed natural resources reasonably and sustainably (Collier, 2008). Marine resources are considered as sustainable socio-economic tools to address poverty, hunger and unemployment (Abila 2003), yet, the investment and focus in the sector is minimal. Substantial investments are being made toward fossil fuel resources for economic sustenance and growth but scientific studies have confirmed that these are unsustainable (Aguirre, 2009). It is therefore imperative to focus and invest heavily in sustainable ocean and seas resources for sustainable economic development and growth (Hutton and Leader-Williams 2003). Although, there are many pollution challenges inherent in the exploration and exploitation of marine lives (Agardy, 2010), these are mainly caused by human activities and they can be addressed and solved provided there is general will and firm commitment to stop doing things on the basis of business as usual (Berger, 2009). Since these problems are caused as a result of human activities, it will require human beings to reverse the unsustainable attitudes and behaviours
(Wackernagel and Rees, 1998). To this end, marine economy will serve the purpose of providing necessary goods and services for sustaining socio-economic needs of the people (Kumar, 2010).

**Research methodology**

The methodology used is non-empirical literature reviewed. Literature on marine economics and life was extensively consulted, analysed and applied to find solutions to how to explore and use marine goods and services for poverty eradication and attaining food security. Scholarly discussions of literature were also used to explain and interpret the concept of marine economic, poverty and their linkage to poverty eradication and sustainable economic growth and development. The socioeconomic impacts of marine economic are very important because marine resources help create jobs and provide food and nutrition (Sanchirico and Emerson, 2002). Literature supporting this assertion was heavily reviewed and huge contribution was made by filling the gaps in the existing literature which eventually produced new knowledge in the field.

**Literature reviews**

Oceans and seas are spread all over the world covering over 70 per cent of the earth’s surface (Molnar et al., 2008.). They contain natural resources, biodiversity, marine lives and goods. They are intricately linked to human existence hence without them; there would be no life on our planet (Cicin-Sain et al. 2004). Marine environment is very important to the people in the developing world and about 950 million people rely on the marine environment as primary source of their livelihoods and survival (Crain et al., 2009).

Marine social ecological environment is a combination of marine and coastal natural resources, social and economic realms that operate and change around these resources” (Ferrol-Schulte et al., 2013). More importantly, the responsibility to protect the marine environment from pollution generally lies on everyone (Gubbay, 1995) because the “natural ecosystems perform fundamental life-support services upon which human civilization depends. However, many people believe that nature provides these services for free and therefore, they are of little or no value. While we do not pay for them, we pay significantly for their loss in terms of wastewater treatment facilities, moratoriums on greenhouse gases, increased illnesses, reduced soil fertility and losses in those images of nature that contribute to our basic happiness” (Summers et al., 2012).

Poverty and in particular chronic poverty is affecting majority of the people on the earth particularly in the developing countries (Hulme, 2003). Poverty is producing hunger because indigents and the poor do not have the where withal or means to buy basic food necessary for human survival and livelihoods (Baloyi, 2013). Most of them are unemployed and those who supposedly claimed to be employed are not because they do not have the skills to earn living wages. Farmers are unable to grow and harvest agricultural products due mainly to the impacts and effects of the trends of global climate change (Cline, 2007) which have distorted predictions in farming seasons and calendars (Hammer et al., 2001). One of the means of alleviating poverty is to ensure accessibility to safe and nutritious food by
producing enough at reasonable costs and prices to the farmers and consumers (Weinberger and Lumpkin 2007). Diversification into exploration and exploitation of marine resources (Pauly, 2002) and the goods and services they possess is considered a potent way of solving hunger, malnutrition and ensuring food production and security (Williams, 1996). The overarching result of this will be apparent manifestation of reduction in poverty and if intensified (Belshaw and Coyle, 2001), will contribute to poverty eradication and sustainable food production and livelihoods (Krantz 2001).

The impact of pollution on marine environment is one of the impediments to sustainable marine socioeconomic activities. Discharges of harmful substances such as land filling, dumpsites, land spreads, water disposal, and incineration into the oceans and seas are have serious environmental implications because of their potential to pollute and contaminate underground and surface water bodies in the marine environment. There is need for prevention of marine pollution for the protection of marine vulnerable marine resources and goods for purposes of providing sustainable production and delivery of socioeconomic goods and services (Adeyemo, 2003).

**Marine pollution and food security challenges**

One method of ensuring food security is to explore and exploit marine goods and services for poverty alleviation from oceans and seas. Polluted oceans and seas will definitely exacerbate the already complex situation because no socio economic goods and services derived from them will be useful due to negative impacts of pollution. Rather, there will be intense food scarcity, starvation and chronic poverty.

It is pertinent to point out that the higher food commodity prices commencing from 2007 came as a shock to the human race (Kamgnia, 2011) to the extent that the international community; through their various specialised agencies intervened in different ways, one of which was to create awareness in agriculture, food production, and food security. The problem was global in nature hence hikes in commodity prices were passed to the consumers in developed and developing countries alike. The aftermath result of this is that the problem escalated into civil unrest, protests and strikes in some countries because “the number of undernourished people in the world increased by 75 million in 2007, mainly attributed to high food prices. This brought the proportion of people in the world without access to sufficient food back to the levels of a decade ago” (Beddington, 2010). At the same time, poverty and starvation surged tremendously thereby creating tension in the society (Pellissery and Mathew, 2013). Worse still, the impacts of environmental pollution, particularly marine pollution exacerbated the already complex and complicated problem by disrupting marine resources and lives (Islam and Tanaka 2004). Globally, climate changes continue to impact the environment, seas, oceans and waters and the resources they harbour (Gibson et al., 2011). Production of marine food became distorted and disrupted to the extent that marine farmers were unable to harvest and sell marine products thereby throwing them into the already saturated unemployment market (Mooney et al., 2009). Most of the people became chronically poor and this resonated by impacting negatively on their
dependants as most of their children dropped out of schools, sick ones died because of lack of money to access medical care.

Considering the consequences and impacts of the challenges and problems of food commodity price hikes, food insecurity and marine pollution, entrepreneurs and government saw this as a window of opportunities and decided to fill the gaps through sustainable solutions to the threat of malnutrition, starvation, food insecurity, poor food yields, pollution and unemployment. Intensification and modernisation of agricultural activities were some of the notable approaches identified as practical solutions to solve the problems (Merrington et al. 2002). For an example, in South Africa, government had reiterated the growing socio-economic importance of the seas and oceans in alleviating poverty and creates jobs. To this end, relevant institutions both from government and private sectors are brainstorming on how to dig deeper and tap more into marine economies of all kinds for purposes of fighting poverty, starvation, malnutrition and unemployment.

Human activities and marine pollution

There is growing evidence that high level of human activities is having huge impacts on marine resources, ecosystems and lives. This is impeding the realisation of the socio-economic importance of seas and oceans (Surís-Regueiro, 2013). There is a consensus among scholars and scientists that time is ripe to intervene and address the threats and impacts of marine pollution. This is against the backdrop that harmful human activities are weakening the strength and capacity of the oceans, seas and ecosystems. Scientific literature has revealed that “marine species have suffered major declines, in some cases 90 percent losses, due to human activities and may be heading for extinction, as happened to many species on land.” It has also been indicated through the Ecosystem Assessment Report “that humans have changed ecosystems more rapidly and extensively in the past 50 years than at any other comparable period of time in human history and as a result there has been “a substantial and largely irreversible loss in the diversity of life on Earth” (Surís-Regueiro, 2013).

Since we have identified human activities as the major sources of marine pollution, the most potent and effective intervention that will reverse and stop the threats of outright destruction of marine resources and lives is to use human intervention to implement and enforce all the anti-pollution laws and policies. This is because, there is no other means of getting the problem solved except through the use of human beings. This requires sensitisation, education and creating awareness of the devastating impacts, effects and consequences of marine pollution. With this, changes in attitudes and mind-sets may start happening and business as usual will be jettisoned while sustainable paths will be explored and towed.

Solutions

Innovative technologies as impetus for sustainable marine resources and lives

Marine natural resources can play vital role in the economic growth and development of the world (Daily, 1997) through the deployment and use of “cutting-edge technology for exploration and exploitation of the ocean resources” (Colazingari, 2013). There is a linkage between the “challenge we
face to ensure food security through the twenty-first century and other global issues, most notably climate change, population growth and the need to sustainably manage the world’s rapidly growing demand for energy and water” (Beddington 2010). To this end, human race is challenged to find solutions to poverty reduction and eradication through existing and new innovative technologies (Ommen, 2006) and science in order to achieve the lofty ideals of the Sustainable Development Goals which enjoins human race to aggressively reduce and eradicate poverty and accelerate the delivery of socioeconomics goods and services to the poor living in the developing and least developing countries of the world. The concern is that the world population is growing at an alarming rate. Billions of people need to be taken care of and fed properly in order for human race to continue to exist sustainably. Increase in global population causes increase in demand for food, which will continue to rise unless something is done to slow the pace of population growth (Boserup, 2005). The increase in food demand will put pressure on agriculture which will lead to intensification of agricultural activities such as extensive planting and harvesting. Undoubtedly, this will in turn place increasing demands on the natural environment resources.

As part of strategies to achieve sustainable food production and security that will eradicate poverty, the deployment and use of contemporary modern technology will play a major role in increase of food production. (Pimbert et al., 2001) This will lead to food prices reduction, accessibility and affordability particularly by the poor. (Parr, 2012). Pursuant to this, these interventions need to be prioritized and government needs to increase investments and activities on sustainable marine economy and resources for sustainable economic growth, marine foods security and poverty eradication. Techniques from many disciplines scientific or otherwise to newer fields in marine exploration, exploitation and production are all needed to be deployed and used in order to facilitate tackling marine pollution, facilitating increase in marine foods production and eradication of poverty.

**Effective conservation of marine resources**

The effective conservation of marine resources requires sustainable, efficient and equitable identification and verification for impacts and likely consequences of various social, economic and environmental aspects of development within marine and ecosystem environments (Fisher et al. 2008).

Conserving and increasing existing marine resources need to be intensified and made more effective and efficient (Danielsen et al., 2007) because marine pollution threats are very real (Burke, 2011). There is overwhelming evidence of discharge of industrial waste into the world’s oceans (Hinrichsen, 1999). In addition, the concern is that “invasive non-indigenous species is destroying the ecosystems and the effects of climate change on marine habitats and species are potentially enormous” (Molnar et al., 2008). In order to ensure sustainable preservation and conservation of these precious marine resources, there is an urgent need to confront the problems through a coherent and integrated approach (de La Fayette, 2009).
Participatory environmental monitoring has proven effective and efficient as demonstrated in the study of Danielsen et al. (2007) where they found that in Philippines parks, “investment in participatory biodiversity monitoring makes economic sense for obtaining data for management decisions... from a government perspective, investment in monitoring that combines scientific with participatory methods is strikingly more effective than a similar level of investment in conventional scientific methods alone in generating conservation management interventions.”

They also emphasized the vital role played in ensuring successful monitoring and asserted that “the local populace seemed to benefit from more secure de facto user rights over land and other resources. Participatory biodiversity monitoring not only represents a cost-effective alternative when conventional monitoring is impossible, but it is also an unexpectedly powerful complementary approach, capable of generating a much higher level of conservation management intervention, where conventional monitoring already takes place” (Danielsen et al., 2007).

Modern day technologies are also very useful and effective in marine conservation activities (Day, 2008). Scientists have developed different models to match different challenges in different environment (Carpenter et al., 2009). Developing countries would have done better than their current position if they have channelled revenues toward buying and acquiring modern conservation technologies and equipment (Tietenberg, 1990). Though these modern equipment are expensive, governments in developing countries do not have any excuse not to use the state’s resources to invest in conservation which will be a breeding ground for more food production for poverty alleviation. Rather, most of the resources are channelled to non-productive corruptive ventures.

Implementation of marine pollution interventions

While technology and scientific interventions are of paramount importance in preventing the pollution of oceans and seas (Colazingari, 2013), a holistic implementation and enforcement approach is also vital to ensure clean oceans and the resources therein. Therefore, anti-marine pollution and anti-poverty interventions are powerful tools that can bring about sustainable marine economies that will eventually reduce and eradicate poverty, hunger, starvation, environmental degradation and other environmental challenges and problems linked to marine pollution. One intervention that supports anti-marine pollution is the specialised agency established by the UN namely; The International Maritime Organization of 1958 (IMO). In Article 1(a) the purpose for which the organisation was established is stated thus “to provide machinery for cooperation among governments in the field of governmental regulation and practices relating to technical matters of all kinds affecting shipping engaged in international trade; to encourage and facilitate the general adoption of the highest practicable standards in matters concerning maritime safety, efficiency of navigation and prevention and control of marine pollution from ships.” It emphasizes the importance of prevention and control knowing very well that the impact and consequences of marine pollution wherever it happens are devastating with catastrophic impacts (AbdAlziz, 2013). For example, there are many marine pollution prevention instruments that have been introduced in South Africa such as the Marine Pollution

However, while compliance enforcement seems to be slow and poor, the renewed interest in marine economy by the government is stepping up effective implementation and enforcement for sustainable marine resources and lives.

The 1996 Constitution of South Africa laid a solid foundation for anti-marine pollution as encapsulated in section 24(a) of the Bill of Rights in the Constitution and categorically state that "everyone has the right to an environment that is not harmful to their health or well-being." Clean oceans and seas and the resources therein are amply protected by the constitution because the oceans and seas are part of the environment and human beings derive their livelihoods from them (Daw, et al., 2011). Any harmful substance discharged into the marine will impact human well-being, health and the marine resources (Assessment, 2005). It is against the backdrop of this that it is incumbent on everyone to desist from causing any harm to the seas and oceans. To this end, section 24(b) assert and obligate the state to “(i) prevent pollution and ecological degradation; (ii) promote conservation; (iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.” This provision reaffirmed and confirmed marine pollution prevention and control. Consequences for pollution are well spelt out in the instruments and can result to both criminal and civil sanctions. For an example, The Marine Pollution (Prevention of Pollution from Ships) Act 2 of 1986 empowers South Africa to impose a fine of R500 000 or a prison sentence of five years for any criminal act emanating for any South African ship, wherever it may be, and to any ship found within the Republic or its territorial waters or exclusive economic zone.

Undoubtedly, impacts and consequences of marine pollution are catastrophic and devastating causing massive death of marine lives and destroying the resources which are sources of livelihoods to many people (Adger et al., 2005). The outcome of this will be scarcity of marine products that are being used for socio economics needs, goods and services. Scarcity will create tension and result in the production of abject poverty because those who rely on marine resources for livelihood will be unable to generate income thereby throwing them into the already saturated employment market. This is why prevention and control of marine pollution should be made more effective. To this end, The South African Maritime Safety Authority ("SAMSA") was established in terms of SAMSA Act, 1998 ("the Act") as a juristic person with the key objectives of ensuring (a) safety of life and property at sea; (b) prevent and combat pollution of the marine environment by ships; and (c) promote the Republic’s maritime interests.

**Conclusion**
Marine resources are important because they are beneficial to both human beings and the environment. Pollution caused by the discharges of harmful substances is threatening the survival of marine resources. In most cases, these discharges are as a result of human activities. The impact and consequences of marine pollution can lead to food scarcity, starvation, unemployment and poverty. It is against the backdrop of this that human beings need to intervene to stop marine pollution in order to sustain marine resources and lives. Intervention is considered as a mechanism that can prevent pollution and protect environment. It requires the enlistment of support of everybody. In order for intervention to produce the desired result of ensuring clean marine that is devoid of harmful substances, there must be political, administrative and judicial wills to administer, implement and enforce legislative interventions on marine pollution. Undoubtedly, clean and benign seas and oceans could serve as harbour for sustainable useful oceans food and products that could be used to produce goods and services for human consumptions. Therefore, prudent management dictates that conservation should be paramount in the scheme of solutions to the problem of marine pollution. The deployment and use of contemporary marine technologies are very important in order to engage in sustainable farming, conservation and extraction of oceans and seas goods and services.

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