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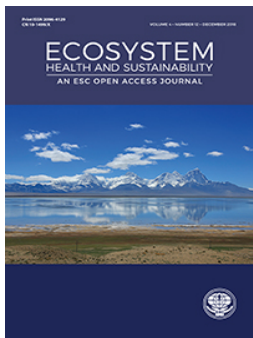
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A critical review of policies and legislation protecting Tanzanian wetlands

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ABSTRACT

Introduction: The benefit of wetlands for reducing poverty depends on the effectiveness of governance systems that influence peoples' behaviour in the wise use of wetlands.

Objectives: This article critically analyses the current poverty reduction strategies, agrarian policies and economic investments governing wetland usage, especially in Tanzania, with regard to their impact on sustainable Ramsar wetlands management.

Methodology: It analyses the management structure, domestic policies and legal framework relating to the protection of wetlands in Tanzania in accordance to the wise use concept of the Ramsar Convention.

Outcomes: Tanzanian legal provisions for wetland protection are uncoordinated and too limited in their coverage and scope to sufficiently address the destruction of wetland ecosystems. There is no comprehensive national legal framework to guide sustainable management of Ramsar wetlands in Tanzania as laid out by the Ramsar Convention, which the country ratified in the year 2000.

Conclusion: Without a sound legislative and policy-making framework, Tanzanian wetlands and their diverse ecosystem services will continue to degenerate with current strategies of increasing agribusiness and other developmental projects or economic investments. This paper provides critical baseline information to inform decision makers to develop appropriate policy and laws, which promote the wise use of wetlands in Tanzania.

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Introduction

Wetlands provide a wide range of direct benefits in Tanzania, such as water for livestock and domestic uses, support to dry season agriculture and animal grazing, cultural and ecotourism activities, provision of handicrafts, building materials and food resources and medicinal materials (Kema 2010; Mombo et al. 2011; Mwakaje 2009; Turpie 2000). Wetlands also provide indirect benefits such as flood control, microclimate moderation, purification of water, maintenance of the water table and habitats for specific flora and fauna (Rebelo, McCartney, and Finlayson 2010). Despite these benefits, the sustainability of the wetlands in Tanzania is threatened by over-cultivation, overgrazing and over-extraction of natural resources (Silva 2006; Kema 2010; Mwakaje 2009; Kashaigili and Majaliwa 2013). As estimated by the Ministry of Natural Resources and Tourism (MNRT (Ministry of Natural Resources and Tourism) 2003a), 10% of the Tanzanian land surface is covered by significant freshwater wetlands, subsequently thousands of people, especially local communities, depend on such wetlands for livelihood (Kangalawe and Liwenga 2004, 2005). For example, the Kilombero Valley wetlands contribute up to 80% of the annual cash income of the poorest households (Hella, Van Huylenbroeck, and Lazaro 2001; Wood,

Dixon; and McCartney 2013), through agriculture and fishing (Ochieng 2002). According to Tanzanian Population and Housing Census (PHC) of 2012, Kilombero and Ulanga Districts, where Kilombero Valley Ramsar site is located has a total population of 407,880 and 265,203 people respectively (PHC 2012), who depend on these wetlands. About 46,438 people of Mafia Islands (PHC 2012), depend on the Rufiji-Mafia-Kilwa Ramsar wetlands for fishing and mangrove harvesting, which are among the ten major income generating activities (Anderson and Ngazi 1995; Doody and Mesaki 2003). Inhabitants of Nyumba ya Mungu Dam and the Mara wetlands depend on fishing for income as well as direct harvest or agriculture (Doody and Mesaki (2003); Kilungu and Munishi (2009). Without appropriate management such wetland dependencies might not be sustainable, and will also lead to loss of biodiversity and ecological functions of such environments. Pressures to follow sustainable development precepts, and to maintain environmental, economic and social sustainability in land use decisions, might encourage compromises between individual and societal interests (Ramsar Convention Secretariat 2007).

Ramsar's wise use of wetlands in relation to sustainable use, sustainable development and ecosystem approaches

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calls for the maintenance of wetlands' ecological character, achieved through the implementation of ecosystem approaches, within the context of sustainable development (Ramsar Convention Bureau (RCB) 1993; Ramsar Convention Secretariat 2007). The wise use provisions of the Convention can apply to all wetland ecosystems. Therefore, societal choice is inherent in advancing human well-being and poverty alleviation, which depends on the maintenance of ecosystem benefits/services provided by wetlands. As part of its definition of the wise use of wetlands, 3rd Meeting of the Conference of the Contracting Parties (COP3) also defined "sustainable utilization" as: "human use of a wetland so that it may yield the greatest continuous benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations" (Ramsar Convention Secretariat 2007). Although wetland protection is officially a priority for the 169 nations (as of Ramsar 2018) that have ratified the Ramsar Convention, wetlands continue to be threatened by drainage and reclamation (Davidson 2014; Dixon et al. 2016). The Convention demands contracting parties to create their national wetland policies to suit their local environment (Ramsar 1971) and promotes the wise use and management of Ramsar wetlands through local community participation (RCB 1993). Since 2000, when Tanzania ratified the convention, four Ramsar sites have been designated, namely the Malagarasi Muyovozi, the Kilombero Valley Flood Plain, the Lake Natron Basin, and the Rufiji-Mafia-Kilwa Marine Site (Ramsar 2012a). These sites are crucial for ecotourism and provide economic income through fishing, farming, beekeeping and grazing for surrounding communities and require efficient management structures to ensure compliance with the Ramsar Convention. However, 18 years after ratification, there is no comprehensive wetland policy in place that would ensure that Tanzania abides by the ratified Ramsar Convention. This Convention demands contracting parties to conserve all its wetlands according to their local demands by developing and enforcing local wetland management regulation. Therefore, the primary focus of this paper is to review policies and legislation protecting Tanzanian wetlands, viewed in the context of the current agricultural and economic development policies, and with particular emphasis on the country's Ramsar sites. This paper critically analyses the current poverty reduction strategies, related agrarian policies and economic investments in Tanzania, with regard to their impact on sustainable Ramsar wetlands management as stated in the Ramsar "wise use" concept.

Theoretical framework and methods for analysis

Wetland management programs may seek to ensure "wise use" of wetlands, which means "the maintenance of ecological character, achieved through the

implementation of ecosystem approaches, within the context of sustainable development" (Ramsar 2012b). It should be noted that the wise use provisions of the Ramsar Convention do not exclusively apply to Ramsar sites; instead, these provisions are binding to all wetland ecosystems found in the specific member country. The basis for wetland-poverty interlinkages lies on an explicit recognition of wetlands' ecological character as a relatively value-based, economic, cultural and social construct. Wetland ecosystem services are directly linked to wetlands through the choices and tradeoffs people make and the governance systems that influence people's behavior in and around wetlands (Ramsar 2012b). Within this context, all relevant policies and other legal documents that are laid down to protect wetlands in Tanzania are reviewed in order to analyze their adequacy of the reflection and treatment of wetlands in their provisions in protecting these wetlands from ongoing destruction. However, the legislation and policy provisions discussed in this paper generally reflect only those with an element of wetland conservation or protection in relation to the wise use concept of the Ramsar because there are no unifying policies or laws that protect wetlands in Tanzania. Instead wetland management issues are segmented in various provisions of natural resource laws and policies. This analysis provides a more solid basis for assessing the extent to which Tanzanian legislative and policy-making framework addresses the management and wise use of wetlands and the abundant and diverse resources that these wetlands support. In addition, various ongoing governmental poverty reduction projects, short and long-term developmental strategies, agricultural policies, investments projects and other ministerial reports are also reviewed and analyzed in order to indicate how these short or long-term national investments programmes can impact the conservation and sustainability of sensitive ecosystems such as Ramsar wetlands.

Wetland management in Tanzania: structure, domestic policies and legal framework

a. Lack of overall wetland policy/legislation

According to the Ministry of Natural Resources and Tourism, MNRT (2004), the Wildlife Division is in charge of all wetlands issues in Tanzania. The whole management approach from community participation to the national level is operated by multi-sectoral organs (Mombo et al. 2011), which have diverse objectives, goals, administration and specialized legislation. In contrast, the wildlife division is limited in scope, i.e. it can only intercede with the issues of wetlands that fall under wildlife protected areas (WPA). It does not have enough power to protect the many other types of wetlands that do

not fall under WPA, from any type of mismanagement related to for example agriculture, water use, mining and energy issues, whose activities are supposed to be carried out by specific ministries through sectoral policies (MNRT 2004; Ministry of Agriculture (MoA) 2007). The four Tanzanian Ramsar sites, which should be conserved and managed by the responsible ministry, cover only about 5.5% of all Tanzania's wetlands (MNRT (Ministry of Natural Resources and Tourism) 2003b). Although 70% of the Kilombero Valley (Bamford, Daniel, and Wathan 2013) and 95% of the Malagarasi Muyovosi Ramsar Sites (Ramsar 2000) fall within protected areas i.e. game reserves, national parks and forest reserves, management of such sites remain a challenge. About 32% of the Rufiji-Mafia-Kilwa Ramsar site falls under Mangrove/Forest Reserve or under Marine Protected Areas (MPAs) (Francis and Machumu 2014). For Lake Natron Ramsar site, the Wildlife Management Area (WMA) was established on the Longido side of Lake Natron since year 2011 (Bird Life International 2013). Without adequate legal framework and comprehensive management plans of wetlands in Tanzania, most of the non-protected wetland areas in Tanzania, becomes increasingly degraded and thus their ecological functions are presumed to be lost in the future.

b. Consequences of multiple pieces of sectoral legislations

Wetland management issues in Tanzania are regulated by several laws and policies that deal with different sectors such as agriculture, livestock, transportation, wildlife, fishery, water, land, forestry, investment, settlement, and mining as summarized in Table 1. According to Turner and Jones (1992), when interrelated sectors are governed by different specific policies and/or are overseen by different government departments, complex policies overlap and inconsistencies arise, which is the case for the seven different sectors responsible for wetland management in Tanzania.

Tanzania does not have comprehensive or unifying policy or legislation on the management, conservation and wise use of its wetlands. However, there are numerous uncoordinated provisions in natural resources management legislation and policies (Table 1) that address important matters related to the conservation and management of wetlands. In Tanzania, different sector specific policies such as natural resources management, land and water use, address wetland management issues in implementing sectoral development. However, since such provisions and Sections are segmented, uncoordinated and fragmented, they may be only useful in providing a very general skeletal guide on the general management of Tanzanian wetlands. To ensure consistency with

applicable national policies and related laws in wetland management, it would be useful to harmonize nationally such legislation in any review process in order to reconcile possible conflicts of interest that may arise in specific sectors. Main legislation such as those covering agriculture, forests, water and land issues, for example, are segmented, and might not precisely and directly address wetland protection in their provisions. Table 1 reiterates the reflection and treatment of wetlands by the existing policies and legislative provisions of Tanzania. For instance, while the agricultural policy promotes intensive and large-scale mechanized farming systems to increase food and cash crop production (URT 1997a), the fishery policy encourages improved commercial fishing with little concern for the environmental consequences (URT 1997d), and the investment policy emphasizes further investment in various sectors to promote economic growth without taking into account environmental measures such as Environmental Impact Assessments (EIA) (URT 1997f). The whole issue of wetland management in Tanzania is therefore regulated by fragmented policies and plans whose implementation largely depends on political, sectoral, regional or district interests.

If wetland management issues are coordinated in an integrated wetland policy, it might maximize the economic and social welfare activities, without affecting the sustainability of vital wetland ecosystem services and the environment as a whole. In order to overcome sector-based policy fragmentation and inefficient governance structures, socio-economic development and ecological management of wetlands in Tanzania can be achieved by developing an integrative or unifying wetland management policy, which is strengthened by a supplementary laws to address all concerns of wetlands. In order to reduce fragmentation and failures of co-ordination, it is essential to identify synergies across ecological-sectoral policies in the domains of economic development such as land use, spatial planning, tourism (wildlife biodiversity, natural resources), mining investments and energy during decision making processes for sustainable wetland management.

c. Weak enforcement

The conversion of sectoral policies (Table 1), which are non-binding and not enforceable in court, may take long time before sound decisions are made. Since wetlands are a multi-sectoral resource, there is a need to create and establish an appropriate institutional arrangement and enact a unified law for regulating the management of wetlands. A majority of wetlands can easily be protected if the local authorities are guided and encouraged to make by-laws for the proper management of wetland resources. The

Table 1. Summary of the reflection and treatment of wetlands by the existing Tanzanian policies and legislative provisions.

| Implementing sector | Legal framework (Policy or Act) | A bearing to a concern for the wise use, conservation and management of wetlands | Outcome |
|------------------------------|---|---|---|
| Wildlife conservation sector | Wildlife Policy of 2007 | -Adopts the definition of wetlands from the Ramsar Convention (URT 2007a) | -Only wetland areas reserved for wildlife within a national park or game reserve are protected under this jurisdiction |
| Agricultural sector | Wildlife Conservation Act of 2009 | -Prohibits livestock keeping, crop cultivation or any agricultural activities in any wetland reserve areas (URT, 2009b: Sections. 18(2), 8(4) and 20(1)(c)). | -Promotes issues of food security and poverty alleviation -Allows exploitation of water resources for the development of crop irrigation systems -Does not set a monitoring criteria for agrochemicals use in sensitive ecosystems -No regulations or restriction for discharging of agricultural/livestock wastes or industrial effluents to the environment. |
| | Agriculture and Livestock Policy of 1997 | -Recognizes that environmental issues cut across different sectors and calls for a coordinated approach to the conservation of environmental resources -Recognizes that agriculture depend on natural resources such as land, water, forests and air, and thus irrational use of these resources would negatively affect agriculture and livestock sectors (Sections 2.4.2 and 3.3.2) -Emphasizes rehabilitation of traditional irrigation systems in order to achieve less negative impact on wetlands (URT 1997a) | |
| | Pesticides Regulations of 1984 (made under section 41 of the Pesticide Act 1979) | -Requires registration of all pesticides intended to be used in the country (URT 1984a) -Sets criteria for the protection of public health and the environment from pesticide contaminations | |
| Land sector | The National Land Use Planning Commission Act, 1984 | -Sets powers and functions on the conservation and wise use of wetlands (URT 1984b: Section 4(a), (c) and (h)). | -Protects land and enhances land quality by encouraging good land use plans. -Ensures that government takes adequate account of conserving its land through effective policies (Section 4). -Wetlands have no economic value but should be properly studied for effective land use plans (Section 7.6.1). -Promotes land tenure systems that facilitate social and economic development without disturbing the ecological balance of the environments. -The Act does not recognize wetlands as reserve/protected lands. -The Act recognizes other sectoral legislations that conserve and manage wetlands (Section 6). |
| | Tanzanian Land Policy of 1997 | -Sensitive areas, such as forests, river basins, areas of biodiversity and national parks cannot be developed. -Categorizes a "wetland" as unproductive and hazardous/waste land, which should not be developed. -Prevents coastal lines and coastal wetlands from erosion. -Conserves land and aquatic environmental resources (URT 1997b) -Categorizes wetlands as "hazardous land" where development is likely to pose a danger to human life or leads to environmental degradation (URT 1999b, 2004a). | |
| Forestry sector | Land Act No. 4 of 1999 (as amended in 2004) as well as the Village Land Act of 1999 | -Protects mangroves and swamp forests, which have important functions in water catchment areas | -Only the central government should authorize and legalize the protection of watersheds or wild plants by the surrounding local communities (URT, 1998a: Section. 22(4) (b)) -Does not protect wetlands and other river catchment areas that do not fall within the areas of forest reserves. |
| | National Forest Policy of 1998 | -Protects water sources and promotes watershed management (URT 1998a: Section. 4(3) (2)) -Safeguards ecosystem stability through conservation of water catchments -Requires all developmental projects in watersheds to adhere to Environmental Impact Assessment (EIA) mitigation measures (URT 2002b: Section. 18(1)) | |
| Mining sector | Mineral Policy of 1997 | -Integrates environmental and social aspects into mineral development projects (URT 1997c: Section. 3 [3] [12] [1]). | -Government should set appropriate guidelines for mining in restricted areas (water sources, wetlands). -No specific guidelines on protection of watershed/wetlands and river basins. |
| | The Mining Act of 1998 | -Protects the environment and water from adverse effects of mining operations (URT 1998b: Section 100 [2] [d] and [j]) | |
| Fishery sector | National Fisheries Policy and Strategy Statement of 1997 | -Protects biological diversity of fragile coastal and aquatic ecosystems (URT 1997d: Section 3(3)(6)) -Promotes the conservation, development and sustainable management of fisheries resources. | -Manages the coastal than the in-land wetlands -Protects the coastal and aquatic ecosystems only. |
| | Fisheries Act No 22 of 2003 and Fishery regulations Pursuant to section 44 of the Act | -Prohibits fishing by using any poisonous chemical or toxic substance (URT 2003: Section 57 [2](k)) -Prohibits release of any solid, liquid or gaseous poisonous material into the waterbodies (URT 2003) | |

(Continued)

Table 1. (Continued).

| Implementing sector | Legal framework (Policy or Act) | A bearing to a concern for the wise use, conservation and management of wetlands | Outcome |
|----------------------|--|--|---|
| Water sector | The Water Utilization (Control and Regulation) Act, 1974 | -Regulates water for forestry, industrial purposes and for power generation (URT 1974: Section 17) -Stipulates conditions for water use by any person (Section 14) -Requires any abstracted water to be returned from the same source from which it was extracted. | -Considers wetlands to be vulnerable to changes in their water supply. -Makes cross-reference to forests Ordinance in granting water rights for forestry purposes (Section 13). -Prevents people from polluting water courses, wetlands or any surface waterbodies. |
| | The National Water Policy of 2007 | -Includes wetlands in its definition of water resources -Seeks to improve the management and conservation of wetlands (URT, 2007b) -Protects water resources and aquatic biodiversity -Calls for establishment of protected zones of any catchment, swamp, reservoir, wetland, spring or any other sources of water. (URT 2009c: Section 37 [1]) | -Gives a highest priority to water for human consumption as a basic need -Neither penalties nor sanctions are laid down for polluting water sources/ wetlands, or destruction aquatic biodiversity |
| | Water Resource Management Act No.11 of 2009 | -Aims at improving environmental management and conservation of biodiversity and wetlands (URT 1997e: Section 16) -Elaborates clearly how economic investment projects and agricultural intensification can lead to the encroachment of public land, wetlands and woodlands -Controls agrochemicals run-off to minimize pollution of both surface and ground water (URT 1997e: Section 46) | -Formulated to unify natural resource policies in order to lessen existing contradictions, minimize sectoral conflicts, and reduce the overlap of activities in respect to natural resources management |
| Environmental sector | National Environment Policy of 1997 | -Aims at improving environmental management and conservation of biodiversity and wetlands (URT 1997e: Section 16) -Elaborates clearly how economic investment projects and agricultural intensification can lead to the encroachment of public land, wetlands and woodlands -Controls agrochemicals run-off to minimize pollution of both surface and ground water (URT 1997e: Section 46) | -Formulated to unify natural resource policies in order to lessen existing contradictions, minimize sectoral conflicts, and reduce the overlap of activities in respect to natural resources management |
| | Environment Management Act No. 20 of 2004 | -Recognizes wetlands as fragile ecosystems that play an important role in water systems (URT 2004b) -Mandates the National Environmental Management Council (NEMC), established in 1983, to oversee the management of all natural resources including wetlands. | -NEMC coordinates, raises awareness and provides advice on all matters pertaining law enforcement on environmental conservation, management and sustainable use of the natural resources in Tanzania |

Local Government (District Authorities) Act of 1982 provides for the duties, functions and special guidelines to Local District Authorities (LDAs) to enable them effectively perform their administrative tasks and the powers to make by-laws in executing their duties (URT 1982, s.111). Some of the by-laws that may be promulgated under this legislation by LDAs have a general bearing on the management of wetland resources. Furthermore, Section 118 of this Act, which stipulates the general functions and duties vested in these authorities, provides for some of the powers that may be exercised in managing wetlands. This protection can include necessary measures to prevent soil erosion and protect crops, forests and forest products. Accordingly, the local authorities may declare any area of land to be reserved for purposes of natural regeneration, prevention of pollution of water and any river, stream or water way or other water supply and regulate or control the use of swamps or marshlands (s. 5, s.91 and s.95).

The effectiveness of the above legislation in protecting wetland ecosystems is weak because of poor or non-existing enforcement and minimal or non-existing sanctions to address actual threats. For instance, there are no any sanctions stated by key Tanzanian legislative instruments such as the Environmental Act of 2004, Land Act of 1999, and Forestry Act of 2002 in relation to wetland destruction. The lack of sanctions for misusing wetlands is because the key legislative instruments have specific roles in what to protect. Although wetlands are considered as waste or hazardous lands by Tanzanian Land Act No 4, of 1999 (URT, 1999a), the wildlife sector is considered the strongest sector which contains stringent rules and sanctions in protecting wetlands only when they fall under wildlife management areas.

Among other objectives of the Wildlife Conservation Act of 2009 is to protect and conserve areas with great biological diversity, including wetlands which are representative of the major wildlife habitats (URT 2009b, s. 5[1a]). Section 18 (2) of this Act, prohibits any person from cultivating and grazing of any livestock in a game reserve, wildlife protected areas, including wetlands reserve areas for wildlife (URT 2009b). In Section 18 (4) of this Act, it is stated that for any person who contravenes this, commits an offence and shall be liable to a fine of not less than three hundred thousand Tanzanian shillings and a fine not exceeding five million Tanzanian shillings or imprisonment for a term of not less than two years but not exceeding five years or to both. Where the offence under this section involves foreign livestock, the owner or caretaker, shall be liable to a fine of not less than the value of the livestock involved or imprisonment for a term not less than three years but not exceeding five years or to both (URT 2009b, Section 18 [5]). However, the Wildlife Act of 2009

does not explicitly elaborate the management of any other wetlands which are located outside of the wild-life protected areas.

Therefore, the major challenges in wetland management in Tanzania, which might be the case for other Sub-Saharan African countries as well, are uncoordinated governance and fragmented policies, which lead to poor management and inefficient use of wetland ecosystem services. To some extent some of the natural resources policies and legislation in Tanzania, provide for a framework that could supplement initiatives and strategies aimed at conserving and managing wetlands.

Conflicting interests in terms of the Ramsar sites in Tanzania

The four Ramsar sites in Tanzania (Figure 1) are facing various threats depending on location, natural resources and their appeal for economic investors who seem to have the full support of the government to fulfill its long-term economic developmental vision 2025, which acknowledges the importance of linking economic development and environmental sustainability (URT 2000).

In this review, the overview of the conflicting interests and ecological threats on the Kilombero Valley, Lake Natron Basin, the Rufiji-Mafia-Kilwa Marine Site and Malagarasi Muyovozi Ramsar sites are discussed.

Kilombero valley ramsar site

The Kilombero valley wetlands are found on the largest seasonal freshwater lowland floodplain in East Africa and are located between the Kilombero and Ulanga Districts of Tanzania (Ramsar 2012a) (Figure 1). The destruction of biodiversity hotspots and habitats for endemic species of flora and fauna is a major threat to the Kilombero Valley (MNRT (2004). The current management condition is poor due to poor law enforcement and inadequate implementation of planned management intervention (Munishi et al. 2014). Fourth presidential initiatives, have earmarked the country's southern highlands, where this Ramsar site is located, for the Southern Agricultural Growth Corridor of Tanzania (SAGCOT) project of large scale agricultural investments for long-term land lease to

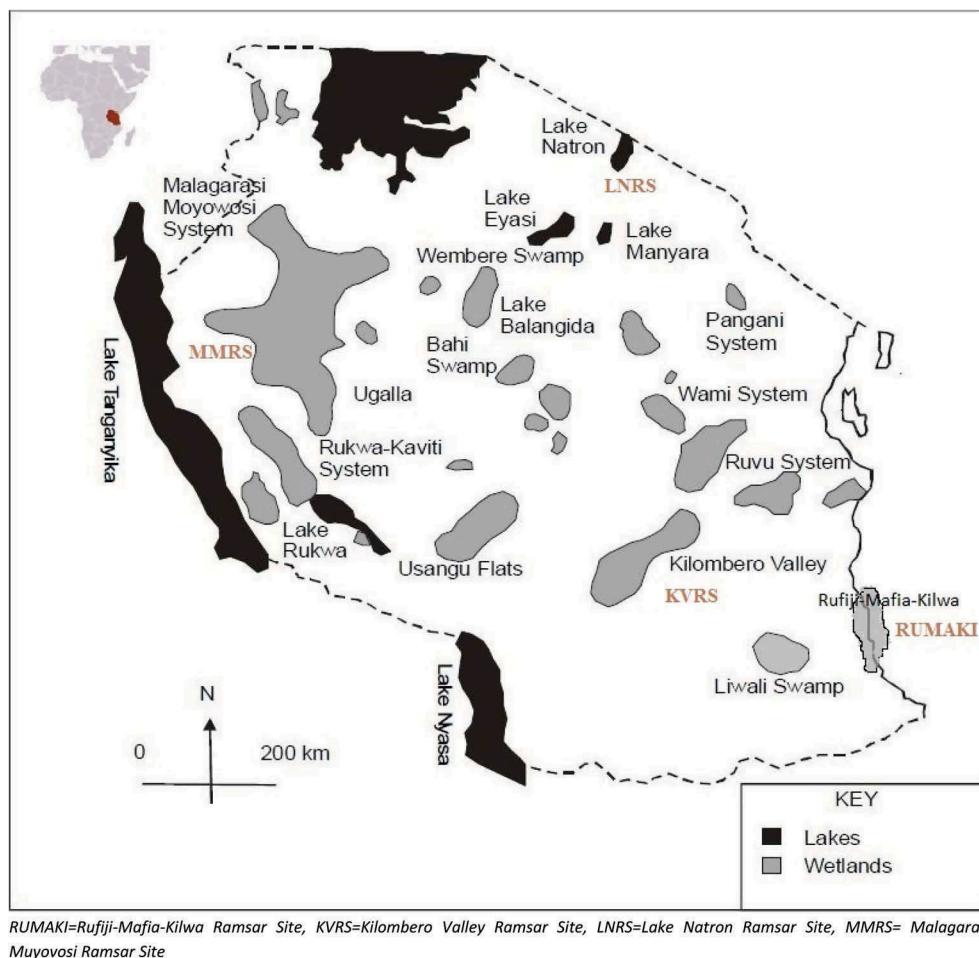


Figure 1. Map showing location of Ramsar sites and distribution of other inland wetlands in Tanzania (modified from FAO 1998, Kamukala and Crafter 1993).

RUMAKI = Rufiji-Mafia-Kilwa Ramsar Site, KVRs = Kilombero Valley Ramsar Site, LNRS = Lake Natron Ramsar Site, MMRS = Malagarasi Muyovozi Ramsar Site

private investors. This initiative is a long term threat to this Ramsar wetland. Currently, more than 50% of the flood plain has already been converted into agricultural land (TAWIRI 2008, 2009) by both large scale and small scale farming. This agricultural initiative contradicts the “wise use” concept of the Ramsar Convention. The Kilombero Valley Ramsar Site serves as a wildlife corridor and is famous for its traditional harvesting of natural vegetation and traditional agriculture, which is basically mixed farming and fishing. If large portions of these wetlands are completely converted to large-scale exploitation, such as cash crop farming and food production which favors a monoculture activity, the locally adapted way of agriculture is at risk of being lost completely. Legal frameworks for sustainable wetland management are necessary to be in place before the central government issues a long term land lease and permits for intensified wetland agriculture or economic investors. The issue of permitting single authorities to manage the entire wetlands on behalf of the surrounding community might not be sustainable and might stimulate conflicts over resources use with the local communities, because any decision to use wetlands must also consider the requirement and traditional benefits of the local community. Therefore, local councils need to be empowered and provided with legal capacity in protecting natural wetlands. The increased agro-pastoral activities and mechanized agriculture, which involve intensive use of pesticides, have caused contamination of Kilombero Valley wetlands (Materu 2015) and destroyed fish spawning grounds, threatening the integrity of this sensitive and diverse ecosystem (MNRT 2004).

Lake Natron Basin Ramsar site

This site is a rift valley soda lake in East Africa that covers an area of 224,781 ha basin in northern Tanzania (Figure 1). The site is known to be the only regular breeding area for 2–4 million Lesser Flamingos (*Phoeniconaias minor*) (Ramsar 2012a). This Ramsar site has infertile soils and experiences inadequate rainfall to support agricultural activities (URT 2009a), thereby making food insecurity a major socio-economic challenge (Norconsult 2007). However, the major risk for sustainable management of this site is the newly proposed soda ash facility, which is estimated to mine about one million tonnes of soda ash per year with 50 years lease (Bird Life International 2013). According to the Ramsar Advisory Mission Report of 2008, Lake Natron in the rift valley zone is estimated to have reserves of at least 4.7 billion cubic meters of soda ash (sodium carbonate), a key raw material for glass, chemicals, soap and detergents. This investment project had been suspended since 2008 due to the opposition from environmental conservationists and the

Ramsar Advisory Mission (RAM 2008), but it has been approved by the Tanzanian government in January 2013 as a means to improve infrastructure and boost the economy in these remote areas (Bird Life International 2013; Ihucha 2013; MAC 2007). The motivation for the project implementation downplays the fears that the soda ash plant might wipe out the Lesser Flamingo population by interfering with feeding sites and breeding colonies. Nevertheless, continuous generation, storage and dissemination of scientific information about the ecological importance of Lake Natron Ramsar wetland, might help to ensure proper planning in the future and ecological maintenance of this wetland of both local and international importance.

Rufiji-Mafia-Kilwa Ramsar site

The Rufiji-Mafia-Kilwa Ramsar site is located within Rufiji, Mafia and Kilwa Districts of the Coastal and Lind regions of southeastern Tanzania. The Rufiji Basin covers nearly one fifth of the country, and its river tributaries originate in the southern highlands, Tanzania’s highest and wettest parts (URT 2011) where the SAGGOT project is planned. This is the only coastal marine Ramsar site in Tanzania (Figure 1) with both coral reefs (Ramsar 2008) and mangrove forests (Matiza and Chabwela 1992; URT 2009a). The archipelago has four islands and 15 types of coral reefs, comprising an important and unique ecological landscape (Ramsar 2008). In all coastal districts in Tanzania, poverty is rampant (Hogan et al. 2000), with about 150,000 people depending on unsustainable agricultural and fishing practices for their living (UNDP 2012; WWF 2009).

The major threat to this freshwater and marine site is coral mining (Darwall, Guard, and Andrews 2000), coastal erosion, unregulated fishing/fisheries production and degradation of marine habitats (WWF (World Wildlife Fund for Nature) 2009, 2010). The sustainability of this diverse coastal-marine ecosystem is also threatened by current multinational oil and gas exploration activities/investments since the discovery of gas and oil in Tanzania’s coastal areas (IRG 2008). For instance, the Songo Songo natural gas exploration project was commercialized in 2004, which has triggered further exploration by the multinational petroleum companies, both on- and off-shore (URT 2013). Although, oil and gas development has the potential to benefit livelihoods through employment, national and local community support for developmental programs, there might be negative potential impacts of the wastes associated with this offshore oil and gas production, which include long-term impacts on marine populations as a consequence of low-level but chronic exposure to petroleum hydrocarbons, drilling fluids, metals and other chemicals associated

with industrial activity. Gas from the Songo Songo gas field, located in the Songo Songo Island, a limestone fossil coral island, which is less than 5 m above sea level in Kilwa District, is processed on the island at the processing facility (within the Ramsar site) to remove water and other hydrocarbon condensates (PMO-RALG 2011). The Songo Songo archipelago forms part of the Rufiji-Mafia-Kilwa Marine Ramsar site. There are a variety of wastes produced by or associated with offshore oil and gas production. These wastes might include oily water, which is discharged from a platform after separation from the oil and the water which was injected into the reservoir to maintain pressure and oil production, drilling fluid chemicals, oil-based drilling muds and cuttings, water-based drilling muds and cuttings, oils including both crude oil from extraction processes and fuel/diesel oil from ships and equipment used in the production of oil and gas (Neff, Rabalais, Boesch 1987; Holdway 2002). These wastes contain a number of organic pollutants such as hydrocarbons, esters, polymers, and inorganic pollutants basically metals such as barium, chromium, lead, zinc, copper, arsenic and mercury, which have been reported to cause both chronic and acute toxicity to marine organisms (Holdway 2002.) Also during operation, there might be accidental oil spills/leakages in the pipelines, increasing the risk of pollution loading into marine ecosystem. The Tanzania Petroleum Act of 2015 provides for protection of environment in mid and downstream activities. In case of accidental petroleum spills, this Act mandates the holder or the owner of the product to report, within 24 hours, to Energy and Water Utilities Regulatory Authority of Tanzania (EWURA), and the company or the owner of the spilled product is required to clean the contaminated area (URT 2015, s.218). However, for the purpose of this provision “major petroleum or petroleum product spill” means a petroleum or petroleum product spill of more than two hundred liters per spill. The rule does not regulate spills less than 200 liters, which can happen during extraction and processing activities. With the oil and gas discoveries in both off-shore and on-shores of Tanzania, the government focusses more on revenues transparency and accountability than the risk of environmental destruction (Katunzi and Siebert 2015). Further research is recommended to substantiate and forecast long term impact of offshore gas and oil extraction to the ecological character of this marine Ramsar site.

Malagarasi-muyovozi ramsar site

This Ramsar site covers an area of about 3.25 million hectares (Ramsar 2000) (Figure 1), and its sensitive zones are very remote and difficult to access (DANIDA 1999); site management, conservation

and the implementation of developmental programs are therefore a particular challenge. 95% of the Ramsar site is within protected areas (game reserves and forest reserves) while the rest is in district or village lands of the Malagarasi river catchment (Ramsar 2000). The major threat to this site is the conversion of wetland areas into agricultural land and accompanying land degradation related to the cultivation of tobacco by surrounding communities (DANIDA (Danish International Development Agency) 1999). From year 1984 to 2002, there was 18.4% increase in settlement and cultivated area, from 42.91 km² to 51.01 km² while woodland area declined by 1.6%, from 405.48 km² to 398.91 km², and wetland area declined by 45%, from 36.35 km² to 19.91 km² (Kashaigili and Majaliwa 2013). The decrease in woodland areas in the catchment was associated with the increased expansion of agriculture (shifting cultivation), timber logging, grazing activities and deforestation due to large influx of refugees in the upper catchment of the Malagarasi river (Kashaigili and Majaliwa 2013).

Conclusion

Although Tanzania is signatory to the Ramsar Convention, it does not mean that its Ramsar wetlands are fully protected according to the wise use concept of the Convention. Tanzania does not meet its commitment under the Convention and it is not delivering the maintenance of the ecological character of its wetlands, including the Ramsar wetlands. The analysis made in this paper shows that wetland management issues have been given some coverage in the national natural resources management legislation and policies. Most provisions of the legislation, however, do not provide for a comprehensive coverage on management and conservation of wetland because they are limited in their coverage and scope as they usually reflect sectoral policy objectives and strategies, in such that the legislative coverage of some wetland resources within the same ecosystem receives relatively more comprehensive treatment than others. It is hoped that this review article will in turn ignite more studies on wetland aquatic ecosystems to gather comprehensive secondary data on the deterioration of wetlands in Tanzania. This will help to guide decision makers to make an informed decision on wetland management and conservation.

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