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DRIVERS OF WETLAND DEGRADATION IN WESTERN UGANDA AND ICELAND, AND HOW THEY ARE ADDRESSED IN CURRENT POLICIES AND LEGAL FRAMEWORKS

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ABSTRACT

Wetland degradation is a severe environmental problem in the world. In recent years, many studies have looked at the drivers of wetland degradation without considering how policies and legal framework address these issues. The goal of this study was to provide an assessment on the role of policies and legal frameworks in the management of wetland resources in western Uganda and Iceland. The study involved identifying the drivers of wetland degradation, exploring policies, and how they are prioritised in wetland restoration and management. A literature survey using scientific online databases was used to generate information for the study. This was supplemented with interviews with six wetland experts from Uganda and Iceland. The main drivers of wetland degradation identified were agricultural activities, overharvesting of wetland resources and infrastructure development. The drivers were related to socio-political dynamics and climatic changes. Wetland degradation results in biodiversity losses, increased greenhouse gas releases and spread of mosquito-borne diseases. Wetland management policies and legal frameworks in Uganda included the Constitution, a specific wetlands policy, and land and environmental laws and regulations; in Iceland, wetland management is regulated by the Nature Conservation law, the law on Environmental Impact Assessment, and the Act on Climate Change. The available literature indicated that both countries are taking wetland restoration issues seriously. The priorities for

restoration included biodiversity conservation, the need to reverse the effects of climate change and to curtail natural disasters. The study revealed that collaborative wetland resource management backed with public sensitisation and awareness are essential for policy and legal framework implementation. Both countries need to increase information on wetlands, update wetland inventories, and effectively monitor wetland degradation and restoration activities.

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1. INTRODUCTION

Wetland degradation has been a severe environmental problem since the 1970s despite the multiple values wetlands provide. Wetlands are a source of clean water, fodder, construction materials, and they sustain biodiversity (Turyahabwe et al. 2013). The natural resources obtained from wetlands enhance human health, livelihood and survival, and provide important economic, social and ecological benefits to present and future generations. However, the increasing demand for wetland services has led to overexploitation and degradation of these resources. Imeson (2012) defines degradation as “*any process in the loss of biological or economic productivity from the soil-vegetation-water systems*” (p. 61). Wetland degradation is becoming a major environmental problem in the world, moreover, with unsustainable utilisation of limited natural resources, population increase, desertification, soil erosion and decline in agricultural land productivity (Reed & Stringer 2016).

Wetlands are characterised by “*areas of marsh, fen, peatland or water whether natural or artificial, permanent or seasonal with water that is static or flowing, fresh, brackish or salty, including areas of marine water, the depth of which at low tide does not exceed six metres*” (Ramsar 1971, p. 7). In the 20th century, there was an estimated global decline in wetlands of 64-71%, both due to natural and human factors (Sidle et al. 2013). Degradation and loss of wetlands has deprived many human communities of important ecosystem services (Gardner et al. 2015). The continuation of this trend means that the world will face a very serious struggle to meet the global goals on water and sanitation, food security, climate change action, life on land and affordable and clean energy (FAO 2015).

Although wetland degradation is an environmental concern worldwide, the drivers and effects and how these are addressed by national policies and regulations may differ between different countries. In this study, I investigated and compared the drivers and effects of wetland degradation in two very different countries, tropical Uganda and sub-arctic Iceland. Despite the clear differences in terms of climate and biogeography, in both countries wetland degradation is a main environmental issue (Cesar et al. 2013, Arnalds et al. 2016).

In Uganda, wetlands have declined from an estimated 13% of the total land area in 1994 to 10.9% in 2008 (Nsubuga et al. 2014). Out of a population of 34.6 million, 80% of Ugandans are involved in agriculture and 69% rely on subsistence farming and are heavily dependent on wetlands (UBoS 2016). The benefits obtained from wetlands in Uganda range from water and food supply to materials for construction and handicrafts (Apunyo 2006). As a result of the increased use of wetland areas, there has been an increase in the frequency of vegetation clearance, draining and diversion of water flow, crop cultivation, overgrazing, sand mining and exposing the soil surface to erosion (MWE 2013). The trends observed in Western Uganda are similar: over recent decades there has been an increase in clearance and subsequent conversion of wetlands into other land uses. Coupled with the prolonged droughts, frequent flooding, erosion and siltation, wetland loss and degradation are causing biodiversity losses, reduced water storage and supply for the livelihoods of the people (MWE 2013).

In Iceland, soon after the Second World War, the country embarked on draining wetlands to increase hay fields for fodder production. Approximately 47% of wetlands were affected by draining (Arnalds et al. 2016). As a result, there has been an increase in the release of greenhouse gases and changes in vegetation characteristics. If the trend continues, wetland integrity will continue to be degraded, depriving people of the benefits derived from them for their livelihood and the environment. The disturbance will drive wetlands to adverse critical

thresholds, possibly resulting in water shortage, species extinction, climatic, health and sanitation problems.

The Ramsar Convention of 1971 was the first international treaty that promotes conservation and wise use of wetlands on a global scale (Farrier et al. 2000). The Convention focuses on developing and upholding international cooperation for sustainability of wetlands, especially as waterfowl habitats. Currently, there are 169 contracting parties to the Ramsar Convention with more than 2,000 designated sites around the globe.

This study identified wetland disturbances and the role of policy and legal frameworks in wetland management in western Uganda and Iceland. The focus too was on the main concerns for wetland restoration. The information generated by this study will be useful for guiding sustainable exploitation of wetland resources and restoration of degraded wetlands.

1.1. Study goal and objectives

The main goal of this study was to assess the effectiveness of wetland restoration policies in addressing the drivers and effects of wetland degradation, both in Uganda and Iceland.

The specific objectives were to:

- i. Identify the drivers and effects of wetland degradation in Western Uganda and Iceland,
- ii. Explore how existing wetland policies and laws address the drivers of wetland degradation, and
- iii. Find out how effectively the drivers are prioritized in wetland restoration in current policies and legal frameworks.

2. METHODS

2.1 Study areas

The research was conducted in two areas: Western Uganda in East Africa and Iceland in Western Europe. The areas have different climatic conditions, soil and vegetation types. The two were used to assess the effectiveness of wetland restoration policies and laws in addressing degradation and ensuring sustainable management. Maps and satellite images were also used to identify wetlands in Western Uganda and Iceland.

2.1.1 Western Uganda

Western Uganda covers a total land area of 55,282 km² which comprises 10.2% of Uganda. Western Uganda is subdivided into 26 districts (ENR 2009) and 10.2% of its surface is comprised of wetlands. Around nine million people, 26% of the population of Uganda, live in the Western region. Wetlands in Uganda are categorised as estuaries, lacustrine, riverine, and flooded plains, swamps, marshes and bogs.

In the Western region (Fig.1), the lakes and estuary wetland basins include Albert, George, Edward and Bunyonyi, while riverine deltas/plains include Kafu and the Nile system. These wetland basins are internationally recognized for biodiversity and abundance of bird species.

The main wetlands connected to the basins include Waisoke, Semliki, Waiga, Nkusi, Sonso, Wambabya, Muzizi, Waki, Nomuema, Reshebya, Kashmbya and Kafu.

Western Uganda covers four of the Ramsar sites in the country: the Rwenzori mountains, Murchison Falls-Albert Delta wetland system, Lake George and Lake Mburo-Nakivali wetland system. These harbour important bird and animal species, some of which are endemic.

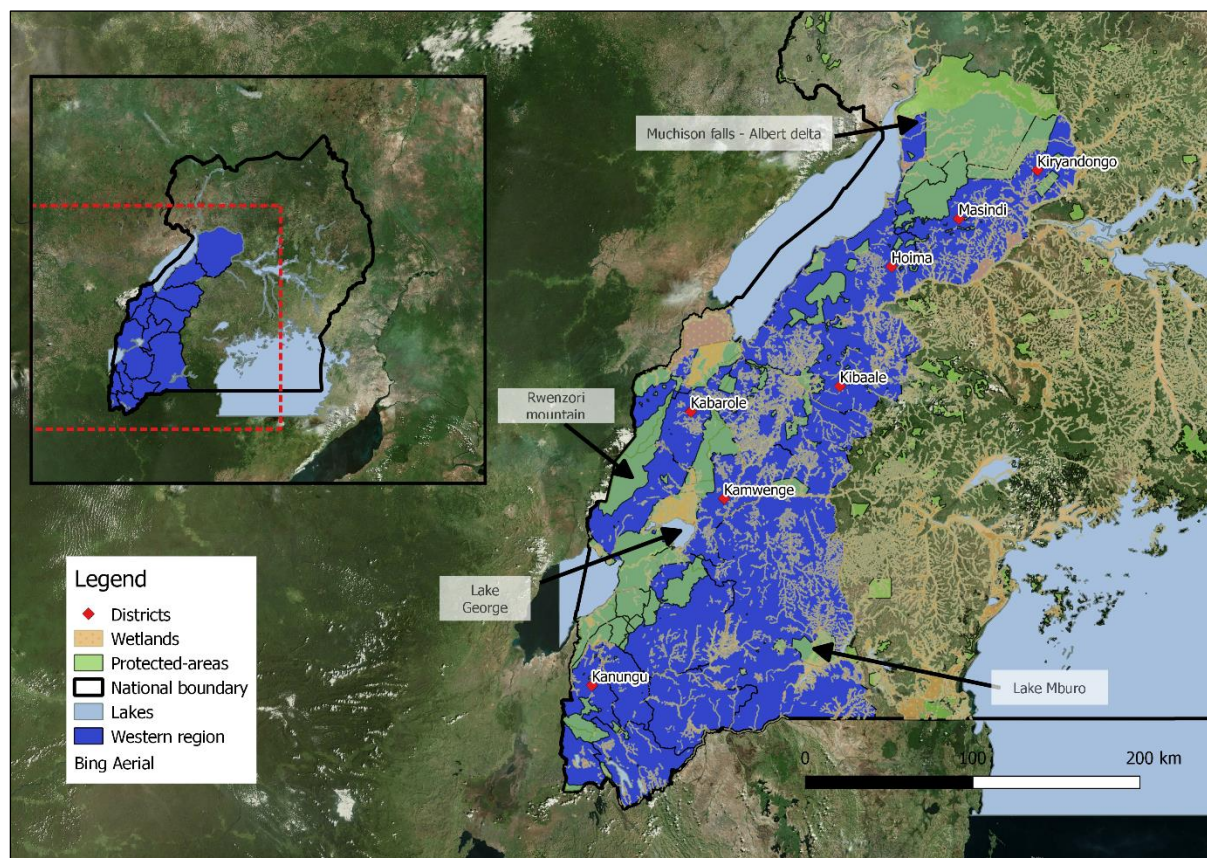


Figure 1. Map of Uganda showing the western region, lake basins (blue polygons), Ramsar sites (black arrows), wetlands (brown lines), protected areas (green polygons) and districts where rice cultivation is taking place (indicated by red dots).

The dominant wetland vegetation in western Ugandan wetlands includes papyrus (*Cyperus papyrus*), *Typha*, *Miscanthidium*, *Phragmites* and palm trees (*Phoenix* species).

Community benefits associated with wetlands include the cool temperature, water supply, cheap and affordable land for cultivation, small scale mining, hunting, fishing and craft material, harvesting medicine, and recreation (Isunju et al. 2016).

2.1.2 Iceland

Iceland is one of the Nordic countries located in the North Atlantic. It covers a total land area of 103,000 km² (Hagen et al. 2013). Icelandic wetlands are influenced by volcanic basaltic dust deposits, and range from inland to coastal wetlands. They include inland marshes, fen, peat bogs, estuaries ponds, salt marshes, rivers and lake shores and intertidal flats (Arnalds et al. 2016). Wetlands cover about 10% of the total surface of Iceland. Although the dominant soil type is Andosols, the surface horizon of most Icelandic wetlands has high organic content that

is partly attributed to rapid weathering of the basalt (Gunnarsson et al. 2015). The andic and organic characteristics make Iceland's wetland soils unique (Arnalds 2008). The soils support availability of nutrients and fertility. The wetlands are important habitats for a variety of bird species and plants.

According to research done by the Agricultural University of Iceland (2014) and Arnalds et al. (2016), wetlands are categorized into damp, saturated and disturbed wetlands. Common vegetation in Icelandic wetlands includes, for example, sedges (*Carex* spp.), *Eriophorum angustifolium*, common heather (*Calluna vulgaris*), and mosses of the genus *Racomitrium*.

Iceland has six Ramsar sites, as indicated in Figure 2.

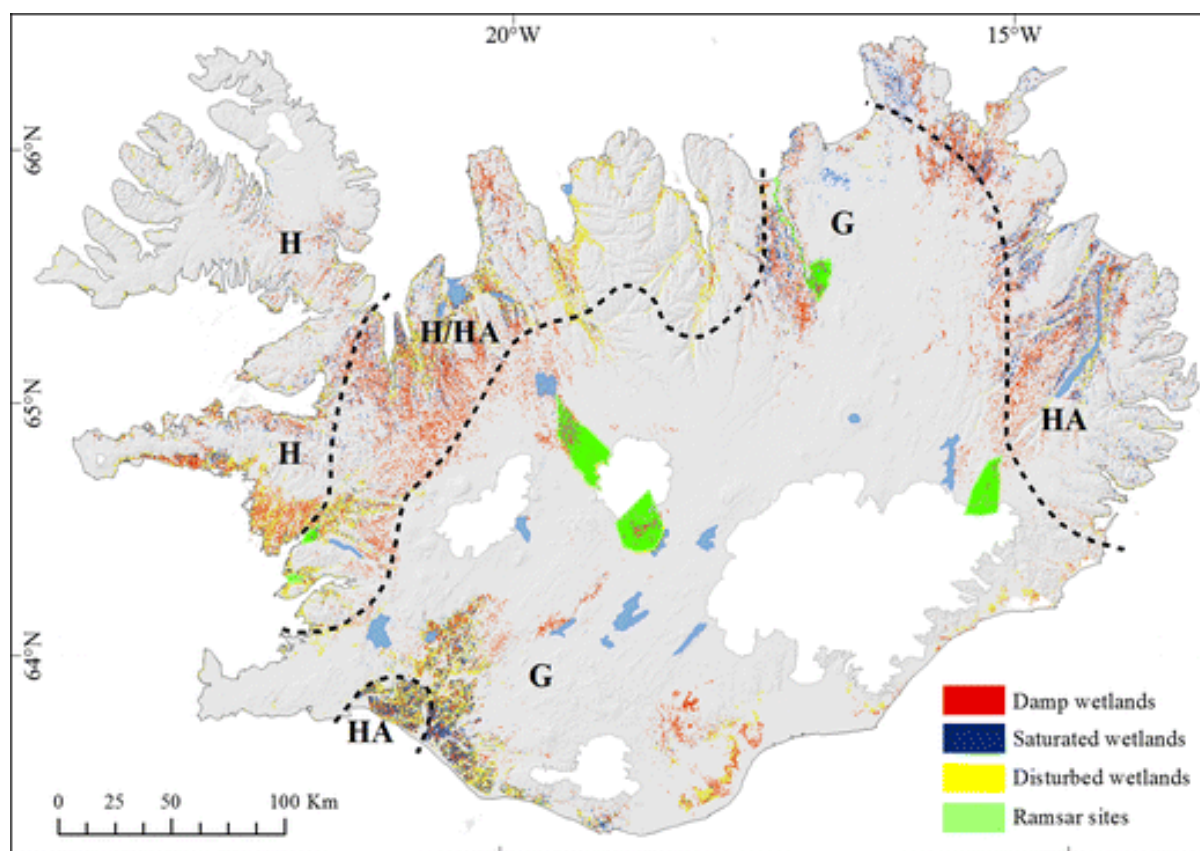


Figure 2. Ramsar sites in Iceland (green polygons), and the distribution and classification of wetlands in Iceland according to the Nytjalund database. The enclosed dotted black lines indicate major wetland soil types dominant in each region, H: Histosols, HA: Histic Andosols, and G: Gleyic Andosols. The yellow colour indicated mainly in the lowland areas marks wetlands impacted by draining (source: <https://link.springer.com/article/10.1007/s13157-016-0784-1>).

2.2 Data collection: literature search and expert interviews

Data collection methods included a literature survey using the scientific online databases Web of Knowledge and Scopus. The process encompassed identifying keywords that were used to search journals and articles. The documents resulting from this search, together with their abstracts, were exported to Microsoft Excel. Abstracts for all documents were read and a

selection of relevant documents was made based on the criteria that they were useful in relation to the topic and objectives of the study. Once identified, relevant documents were downloaded for reading in full. Information was gathered from the articles; the results reported in each study were extracted and compiled. Policy documents, books, reports and periodicals were also used to gather information.

For objective (i), to obtain information on drivers and effects of wetland degradation, I used the following search terms: "wetland importance" AND (Uganda OR Iceland); ("wetland services" AND (Uganda OR Iceland); "wetland degradation" AND drivers AND (Uganda OR Iceland); "wetland degradation" AND effects AND (Uganda OR Iceland OR "east Africa" OR Europe; "wetland encroachment" AND drivers AND (Uganda OR Iceland); and "wetland disturbance" AND drivers. With these searches, I obtained 96 document results.

For objectives (ii) and (iii), the search words used were ("wetland degradation" AND polic* AND (Uganda OR Iceland); "wetland restoration" AND polic* AND (Uganda OR Iceland); "wetland policy" AND (Uganda OR Iceland); "wetland restoration" AND "management polic*" AND (Uganda OR Iceland); and "wetland restoration" AND (Uganda OR Iceland). A total of 449 documents were obtained. In the end, I found 545 documents, but only 27 fit the criteria for this study.

Table 1. Institutions and positions held by respondents who participated in the study interview, and the type of interview (either by videoconference through Skype or written) and the date when the interview was conducted. To ensure anonymity, the interviewees are identified with numbers.

Affiliation of Interviewee	Position	Type of interview	Date	Number
University of Akureyri, Iceland	Professor	Skype	13/ 7/ 2017	(1)
Ministry of Natural Resources, Iceland	Environment specialist	Written	13/ 7/ 2017	(2)
Icelandic Road and Coastal Administration (IRCA), Iceland	Head of Environmental Management	Written	13/ 7/ 2017	(3)
Ministry of Water and Environment- Wetlands Management Department, Uganda	Regional Wetlands Coordinator –Western Uganda	Written	25/ 7/ 2017	(4)
Hoima District local government, Uganda	District Natural Resource Officer	Written	25/ 7/ 2017	(5)
Ministry of Water and Environment, Wetlands Management Department, Uganda	Senior Wetlands Inspector	Written	25/ 7/2017	(6)

The results obtained from the literature were then supplemented with six informal interviews with wetland experts (three from Uganda and three from Iceland). The interviewees from Iceland represented an academic institution, government institutions, and a public enterprise. The interviewees from Uganda were from the Ministry of Water and Environment and the local government. Interviewees were contacted earlier for arrangements. Due to their preference, one interview was conducted on Skype and others were written. Details are indicated in Table 1. An interview guide was used to gather information. To ensure consistency, the same interview guide was modified to reflect the study area and used for both western Uganda and Iceland (see Appendix I for the model for Uganda).

3. RESULTS AND DISCUSSION

3.1 Drivers and effects of wetland degradation in western Uganda and Iceland

3.1.1 Western Uganda

Wetland degradation is becoming a severe problem in western Uganda. Pressure on wetlands from both the poor and the rich sectors of society has increased, since wetland services are public goods. This affects the environment and the people's livelihoods. The main drivers of wetland degradation in Western Uganda include draining, overexploitation, burning and conversion to other uses like rice cultivation or urban sprawl (Namaalwa et al. 2013, Bosma et al. 2017). This results in open pits that contribute to the spread of mosquito-borne diseases, biodiversity loss and eutrophication (Opio 2008).

Drainage of wetlands in Western Uganda is attributed to population pressure and people's perceptions of wetlands as free land which should be utilised. Before the coming into force of the 1995 National Environment Act and the wetlands policy, farmers accessed big portions of land through obtaining lease titles for terms of up to 99 years in wetlands (Ntambirweki 1998). The wetlands were then fenced off and used for grazing or dairy farming, denying the surrounding local communities access and benefits from them. As a result, wetlands have been overgrazed and degraded (Bikangaga et al. 2007).

Wetland resources have been subjected to overexploitation and intensive resource use. All interview respondents from Uganda (respondents 4-6) observed that wetlands are concurrently used for two or more purposes. This involves overharvesting of plants for mulching, thatch and craft materials, water collection and livestock rearing (Namulema 2015). There is brick making, sand and clay mining for commercial purposes, all of which cause vegetation clearance and wetland degradation. Different stakeholders compete for resource harvesting, especially around municipalities. Illegal small-scale mining contributes to open pits that collect and stagnate water (Akwetaireho et al. 2010). These act as breeding grounds for mosquitoes that carry diseases like malaria (NEMA 2007, Opio 2008). Communities often dump waste in the open pits and industries channel waste water which pollutes the wetlands (Namaalwa et al. 2013). There is declining wetland water quality due to pollution, yet communities are dependent on it for domestic and agricultural use. The overexploitation threatens wetland ecological integrity, leading to deterioration and degradation (Kabumbuli et al. 2009).

Another key driver of wetland degradation in Western Uganda has been the introduction of rice cultivation. Rice was introduced in Uganda in the 1960s to ensure food security and eradicate poverty. It started in the Kibimba irrigation scheme in the eastern part of the country, but it has now spread to lowland districts of Western Uganda including Kiryandongo, Masindi, Hoima, Kibaale, Kanungu, Kabarole, Kamwenge, and Rukungiri (Fig. 1). It is important to note that lowland wetlands in the various districts have been impacted because of high moisture requirements for rice growth throughout the season. Farmers control wetland water regimes by flooding paddy fields in favour of rice growth. There is also poor water management by mostly small-scale rice farmers who account for 80% of rice farming. Thus, rice cultivation ends up draining the wetlands. The replacement of wetland vegetation with rice fields has led to biodiversity loss and decline in wetland functions (NEMA 2007, FAO 2014).

Wetland conversion into other land uses like settlements, infrastructure development and estates, also contributes to their degradation in western Uganda. Wetland areas end up split into

patches and plots. This reduces the potential to overcome natural hazards like floods. For example, the Kasese district was hit by floods in 2013 and 2015 which left 9,663 people displaced and a total of 25,445 people affected (International Federation of Red Cross 2014). According to respondent 5, the discovery of oil and gas in western Uganda contributed to displacement of the people, who were poorly compensated. They looked for cheap alternative areas and other people ended up converting wetlands into informal settlements.

Bush fires that are practiced annually in the dry season also contribute to the degradation of wetlands in western Uganda. Fire was mainly a traditional practice to clear land for grazing, cultivation and hunting (NEMA 2004). Fire exposes the land to erosion and siltation. There are changes in the biodiversity of wetlands since damage to non-target species is involved. This can be in the form of eliminating the species' essential foods from the wetlands which threatens their existence. This causes negative impacts to the wetland environment, which reduces the provision of services like water filtration, flood control and climate modification.

Wetland degradation has devastating effects on human livelihoods. The rural poor have limited livelihood options and greatly depend on wetland products. The prolonged droughts in western Uganda increase household susceptibility to food insecurity, resulting in increased pressure and overharvesting of wetland products to sustain livelihoods (Mwakubo et al. 2009 and Turyahabwa et al. 2013). This has contributed to the drying out of many wetlands that used to be sources of water. Consequently, there has been death of wildlife in protected areas like Lake Mburo National Park in 2016 and a hunger crisis for more than 10 million Ugandans (IPC 2017). Droughts have thus affected human health, education, tourism, and development.

According to the interview respondents (4, 5 and 6), wetland degradation in western Uganda may also be influenced by other factors including poverty, population increase, and institutional failure.

3.1.2 Iceland

Wetlands in Iceland exist mostly on public land and some on private land. Exploitation of wetlands has been regarded as something that people have benefitted from. Drivers of wetland degradation in Iceland can be traced back to the 1950s, when farmers got monetary support from the government to drain wetlands and rapidly develop agriculture. Many more inland wetlands than needed for grazing were drained in low-lying areas (Arnalds et al. 2016). It was estimated that 70-80% of lowland wetlands were affected since farmers considered draining to have more positive outcomes in improving their livelihoods. Examples of wetlands in Iceland can be found in Appendix 2.

Based on the responses from the interviews, the ecosystem services provided by wetlands were not as valued as the services from drained wetlands, because it was more difficult to tag a price on the environmental benefits obtained from healthy wetlands than the direct benefits from resource extraction from drained wetlands. For example, benefits for farmers were more immediate when wetlands were transformed to hay fields, from which farmers could sell the hay.

The extensive draining of wetlands expedited greenhouse gas emission release in Iceland. Arnalds (2015, while quoting the work of Oskarsson 2008, Gislason 2012 and Hallsdottir et al. 2013) suggests that the magnitude of greenhouse gas releases was comparable to the release by a heavy metal industry. Other effects of draining comprised dynamics of wetland ecosystem

survival conditions and losses, alteration of water and nutrient flow. Some wetlands had been shifting their flow course (Arnalds et al. 2016). According to respondent 1, local extinction of species like the water rail (*Rallus aquaticus*) in Iceland is also attributed to draining of wetlands.

Wetland degradation attracted a long discussion from stakeholders that included government, academia and wetland centres who suggested different opinions. According to the interviewee from the Ministry of Environment and Natural Resources, the state policy of draining wetlands for agricultural purposes was condemned and rejected. By the time of the research, the government promoted wetland restoration and sensitisation of land owners to ensure sufficient knowledge on the importance of wetlands.

Global warming and climate change contribute to the degradation of sub-arctic and arctic wetlands. Warming causes the melting of glaciers and the subsequent flooding of lowlands. Arnalds (2015) stresses that there have been considerable climate fluctuations leading to wetland vegetation changes. From the interview, it was noted by respondent 1 that there are vegetation types succeeding the native wetland vegetation. This is because vegetation cover changes with wetland change from dry marsh to submerged wetland and vice versa as succession takes place (Fay et al. 2016). Therefore, the current wetland condition is favourable to the new vegetation, unlike the native vegetation that is disappearing.

Hydropower and geothermal development are threatening some wetlands in Iceland. This is the case, for example, in the Ramsar sites at Thjórsárver and Kárahnjúkar, affected by hydropower development. The projects lead to destruction of habitat for invertebrates and plants. Based on the observations of respondent 2, infrastructure development, especially road construction, has affected many wetlands on the coastline.

3.2 Wetland management policies and laws

Wetland degradation is an environmental problem in Uganda and Iceland. During the 20th century, wetland degradation activities, for example draining, intensified in both countries as a result of agricultural enhancement schemes. The governments of both countries have actively encouraged draining of wetlands. Even after the development of wetland management policies and legal frameworks, wetland degradation has continued due to lack of sufficient coordination and monitoring of illegal activities in the wetlands by the communities and farmers in both countries. Some of the illegal activities include small scale mining, dumping, clearance, constructions and draining (Opio 2008, NEMA 2011).

3.2.1 How policies and laws address the current condition of wetlands in Uganda

Wetland management in Uganda has undergone a significant transition following the political regimes and power struggle. Historically, wetlands were jointly owned and governed by local community bylaws until the 19th century when Uganda became a British protectorate. During the colonial era, the British introduced new land tenure systems that included Freehold, Leasehold and Mailo (Rugadya 1999). These favoured the wealthy people who acquired large portions of land in the wetlands and leased them with terms of up to 99 years. They reclaimed the land for large farms and grazing fields and degraded many wetlands, especially in southwestern Uganda. This trend, however, denied access to wetlands to the poor and vulnerable peasants. At that time, there was no government institution mandated to handle wetland related issues (Nakiyemba et al. 2012).

In October 1962 Uganda attained independence. The “Land Reform Decree” of 1975 declared all land in Uganda public land (Rugadya 1999). It then mandated the Uganda Land Commission to manage all public land, including wetlands. Nonetheless, the country underwent persistent political instabilities and did not realize effective management of wetland degradation.

In 1986 when the National Resistance Movement (NRM) assumed power, the government banned large-scale wetland drainage until a comprehensive management plan was developed. The Ministry of Lands and Environmental Protection was formed to handle issues related to wetlands and the environment. This was followed by Uganda’s ratification of the Ramsar Convention on wetlands of international importance in 1988 and was obliged to promote the wise use of wetlands and their resources. The Republic hosted the 9th Conference of Parties to the Ramsar Convention in November 2005 (Apunyo 2006). By the time of this research, Uganda had the highest number of Ramsar sites in the River Nile basin. In 1989, the national wetlands programme was launched to conduct wetland research and generate scientific information that would guide the formulation of a sound policy on wetlands.

In 1995, the National Policy for Conservation and Management of Wetlands Resources was enacted (Nakiyemba et al. 2012) with the goals of:

- 1) Establishing principles by which the wise wetland utilization could be based for sustainability;
- 2) Ceasing unsustainable practices that reduce wetland output for the benefit of all;
- 3) Maintaining the biological diversity of wetlands in their natural state.
- 4) Maintaining wetland socio-ecological functions and values for all citizens;
- 5) Integrating wetland concerns in development planning processes by all sectors.

The policy was then codified into legislation. Various aspects of the policy were incorporated in many laws and regulations of Uganda. The following are some of the laws:

- The Constitution under Article 137 stipulates for the public trust doctrine and obliges the state to shield vital natural resources, including forests, land, lakes, water, wetlands, rivers, minerals, oil, and national parks on behalf of all citizens of Uganda. Specifically, Objective XXVII(i) specifies that Uganda should promote public knowledge, awareness and sustainable development, the need to manage land, air and water resources in an equitable way for the present and future generations; Objective XXIX(g) makes it the duty of every citizen to familiarize themselves with the provisions of the Constitution, uphold, defend the Constitution and the law that includes wetlands.
- The Land Act provides for the access, occupancy, and possession besides management of land. Section 43 obliges landlords and occupants to manage land in harmony with the provisions of all other laws of Uganda that include the National Environment Act and wetland regulations. Subsection (4) of section 44 provides that the government or local government shall not lease or even separate land holding any natural resource indicated as environmentally sensitive and referred to as wetlands, forest reserves, natural lakes, rivers, ground water, national parks or land earmarked for ecological or touristic intentions. This means that issuance of land titles in regulated areas by the government is prohibited and illegal. However, in Subsection (5) of section 44, it is indicated that the government or the local governments can issue a license or permit relative to any resource in this section in accordance with other laws.

- The National Environment Act Cap. 153 is the framework law for environmental management in Uganda. The Act protects the right of all citizens to a clean and healthy environment. It establishes the National Environmental Management Authority (NEMA) as the principal agency for environmental management in Uganda and the district environment offices. Section 36(1) of Cap. 153 provides restrictions for wetland utilization as follows:
 - No draining or reclaiming wetlands;
 - No construction, development, or placement of any structure on the wetland;
 - No wetland disturbance by drilling or tunneling in a way likely to adversely affect a wetland;
 - No depositing in, on or under any wetland any substance in a manner that is likely to pollute the wetland, and
 - No introduction of alien plants and animals in to a wetland without approval from NEMA.

Nonetheless, traditional uses of wetlands like water collection, harvesting of craft materials for home consumption, medicine, fishing using traps, among others, are exempted.

The National Environment Act was only an enabling framework which could not respond to all essential needs of wetland management. Therefore, various provisions were advanced into regulations. These have included the National Environment Impact Assessment regulations, and the National Environment, Wetlands, Riverbanks and Lakeshore Management regulations. These have paved ways for the application of the law on the ground.

- Environmental Impact Assessment (EIA) regulations were developed and adopted by NEMA in 1997. All proposed developments in wetlands are subjected to EIA processing to identify their likely consequences, mitigation measures and alternatives. The shortcoming is that they mainly target large-scale activities; small-scale activities only undergo screening and not a detailed impact study. These can have cumulative negative impacts over time. Projects are then approved on condition that they conduct an annual environmental audit and determine whether they are on track. Those who do not comply with the regulations are issued environmental restoration orders for sections they degraded on wetlands (Apunyo 2006).
- The National Environment (wetlands, riverbanks and lakeshore management) Regulation 3/2000 was developed to ensure an integrated approach to conservation, wise use and management of these ecologically related ecosystems in Uganda. Both local and central governments are prohibited from leasing out or even alienating any wetlands by the regulations. Some of the principles for wetland management by the regulations comprise:
 - Sustainable utilization of wetland resources in a way compatible with incessant survival of wetlands, their hydrological functions and other services.
 - Mandatory Environmental Impact Assessment for all activities in wetlands, riverbanks and lake shores.
 - Provision of special measures vital for protection of wetlands of local, national and international importance as wildlife habitats.
 - Integrating the wise use concern of wetland management into national and local plans for resource management through sensitization and information dissemination.

- It is the duty of land owners contiguous or adjacent to wetland to prevent their continuous degradation and ensure the maintenance of wetland functions. Regulation 17(2) states that “a person who fails, neglects or refuses to protect a wetland adjacent to or contiguous with the land commits an offence which is liable for prosecution”. Therefore, illegal developments on wetlands without reporting by land owners is an offence liable for prosecution.

The regulation in the second schedule provides a list of regulated activities that include draining, brick making, cultivation, burning, construction, etc. The regulation lists all major rivers in Uganda and provides for a protection zone of 100 m measured from the highest water mark, and 30 m for wetlands. The highest water mark is the highest point at the time of water discharge where the land-water interface historically occurred. This is illustrated in Figure 3.

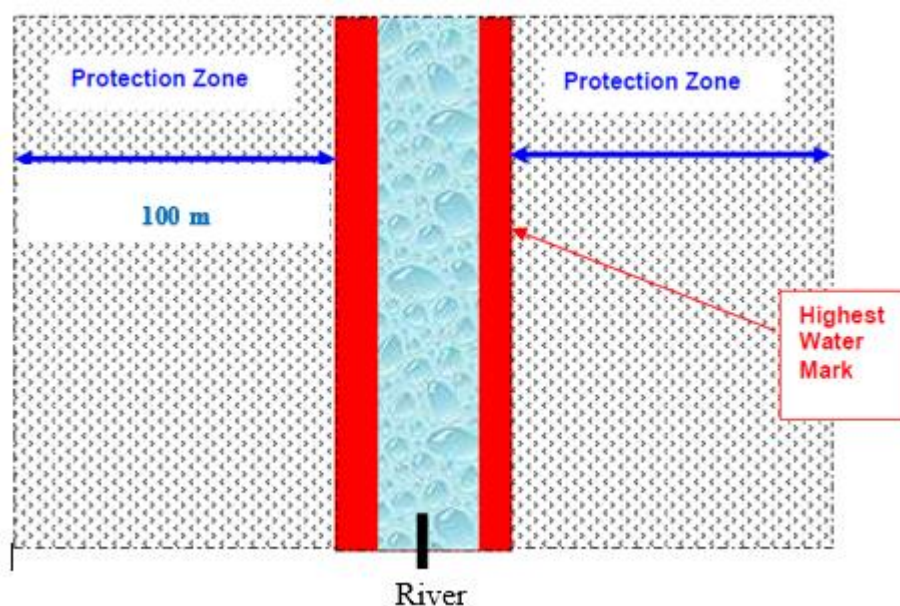


Figure 3. Illustration of riverbank protection zone from the highest water mark according to the National Environment (wetlands, riverbanks and lake shore management) Regulation 3/2000 (source NEMA 2011).

However, wetlands and riverbanks have been abused. When proponents construct structures in wetlands, politicians connive with the local communities and degrade wetlands.

In western Uganda, many districts formulated environment and wetland policies that are in line with the national policies to handle issues at that level. An example is the Masindi district in mid-western Uganda. The district Wetlands Conservation and Management Policy statement is “to provide adequate tools for wetland conservation in line with the national policies and legislation on wetland conservation” (MDLG 2009, p. 11). This policy document has numerous objectives and strategies for sustainable wetland management. The policy is then supported by the Masindi District Environment and Production ordinance.

Wetland services and benefits and activities in one way or the other are included in the legal framework for wetland management in Uganda. The Ministerial Framework Paper also provides for the implementation of those activities which might not directly be within the policies.

The policies define the wetland boundaries (define what is a wetland), and provide for the need for the management and conservation of wetlands as an independent ecosystem. The policies ensure that the national sustainable development goals are met, and articulate clear goals for government and other stakeholders' involvements.

In 2001, the government started the process of physical restoration of critical wetlands in the country. An Environment Protection Police Unit (EPPU) was established at central and regional level to monitor the activities of wetland restoration and management. However, the above policies have not been effectively enforced to deter degradation of wetland resources in the Western region.

Institutional set-up for wetland management in Uganda

Uganda adopted and has provided structure for a decentralized wetland management since 1980 on the assumption that local actors will respond to conservation and management issues better if they participate in planning and implementation (Nakiyemba et al. 2013). Over the years, numerous changes have occurred that saw government institutions including ministries and departments split. The following institutions are responsible for wetland management in Uganda today:

- The Ministry of Water and Environment is a cabinet level ministry responsible for overseeing the management, protection and conservation of wetlands of Uganda.
- The National Environment Management Authority (NEMA) is a semi-autonomous institution and a principal agency in Uganda charged with the responsibility of environmental management. NEMA coordinates, supervises and monitors all environmental activities including wetlands. The agency is under the Ministry of Water and Environment.
- Wetlands Management Department (WMD), under the auspices of the Ministry of Water and Environment, is obliged to ensure sustainable management of wetlands through setting wetland standards, investigations, policy formulation, and technical backstopping. The department established a regional technical support unit. Wetland Officers are attached to all regions including western Uganda.
- District Local Governments, municipalities and sub-counties are mandated to manage wetlands within their jurisdiction. They create awareness on wetlands, formulate inventories, identify critical wetlands, enforce wetland legislation, conserve and manage wetlands.
- Local Environment Committees are required to plan, and manage wetlands. The local communities formulate these local environment and wetland committees.

However, the institutions are constrained by understaffing, limited financing, and at times lack of political will. Some actors assume ownership of wetlands, which is dangerous if we want to protect these resources. This leaves the challenge of low performance and wetlands continue to degrade. There is also inadequacy in coordinating wetland management and restoration issues. The departments involved in the implementation are far more than the mentioned institutions yet they tend not to take full responsibility. This is because institutions sometimes overlap roles and responsibilities. That only creates gaps which may lead to abuse. The Mines

Department, for instance, can issue a licence to a company before the Environmental Agency approves the EIA. For example, the Ministry of Energy and Mineral Development issues exploration licences in wetland areas to companies before the environmental impact assessment for the area is conducted. Companies use such gaps to conduct environmentally illegal activities in wetlands. Many such scenarios backed by political support undermine the work of these institutions in western Uganda.

According to the policy and legal framework in Uganda, wetland ownership is by the local community but held in trust for the people by the government. Nonetheless, district land boards in western Uganda and the Uganda Land Commission continue erroneously to issue land titles to individuals in wetlands.

3.2.2 *How policies and laws address the current condition of wetlands in Iceland*

Wetland protection is perceived as one of the policy measures to address Iceland's commitment to the Paris agreement of 2015 (IUCN WCPA 2016), where conservation, restoration and sustainable wetland ecosystem management was looked at as "*a nature based solution to climate change*". This is because wetlands have the capacity to store approximately three times the amount of carbon found in the atmosphere while at the same time provide environmental and livelihood benefits (Mitsch et al. 2012).

In 1977, Iceland signed the Ramsar Convention and ratified it in 1978. At the time of this research, there were six Ramsar sites in Iceland (Fig. 2), namely: Andakíll Protected Habitat Area, Grunnafjörður, Guðlaugstungur Nature Reserve, Mývatn-Laxá region, Snæfell and Eyjabakkur Area and Þjórsárver/ Thjórsárver wetland (Ramsar 2017). The sites host numerous waterbird species and hydrophytes, store carbon and stabilize the shoreline. Wetland issues had been incorporated in the national biodiversity and action plans, national strategies for sustainable development, and the national forest programmes. Therefore, implementation provisions of the Ramsar Convention address wetland degradation and relate or contribute to other environmental agreements like the Convention on Migratory species, Convention on Biological Diversity (CBD), United Nations Convention on Climate Change (UNCCC) and the United Nations Convention to Combat Desertification (UNCCD).

There is relatively limited policy on wetlands in Iceland. Applicable legislation mainly includes the provisions on restoration in the Nature Conservation Act, the Environment Impact Assessment Act, and the Planning and Settlement Act (Opio 2008).

- Nature Conservation Act. Article 37 prohibits man-made disturbances on the landscapes that include areas of bogs, fens, marshes and mudflats. Wetlands over 3 ha in size shall not be drained unless for well justified reasons. Through applying soil conservation and the objectives of the nature conservation law, the Soil Conservation Service and the environment protection lobby groups - Landvernd - are applying the policy to run restoration programmes that protect wetlands.
- Environment Impact Assessment Act 106, 2000. The Act restricts activities and projects which substantially affect the environment, including draining wetlands. Activities likely to drain wetlands must seek permission from environmental authority. Other activities that disturb wetlands like construction especially for roads are restricted to ensure preservation of the wetlands.

- Planning and Building Act. The Act encourages efficient utilization of the environment and natural resources like land and wetlands, while preventing damage and overexploitation. Provisions of the Act link to the overall goal of sustainability.
- The Climate Act (Law 70/2012). This provides for restoration of wetlands as a way to mitigate carbon emissions and reduce the effect of climate change. The act creates a basis for carbon allowance and demands development companies to keep records of all wetland restoration activities.

Policy addresses wetland issues through actual demarcation and restoration of wetlands such as Framengjar. According to interview respondent 2 from the Ministry for the Environment and Natural Resources, wetland reclamation activities and restoration programmes have only been running for a few years. The activities started slowly but are gaining increasing stakeholder support. The need for wetland protection has been recognized especially by the roads institution and other land users.

However, the policy on conservation of wetlands seems only partly effective. This is because land owners do not seem to apply for permits when draining wetlands though municipalities are responsible for enforcement. This may leave the country without sufficient overview of current state and trends in draining wetlands.

From the interview, respondent 1 affirmed that there is a lack of a comprehensive land use policy and legal framework. Land use agencies and government departments find it hard to formulate specific policies to control development in an environmentally sound manner without supporting legal framework.

Institutional setup for wetland management in Iceland

The institutional setup in Iceland is not specific to wetlands. Wetland management is part of the general land use management by farmers.

The Ministry for the Environment and Natural Resources oversees sustainable development affairs and supervises issues related to nature. The general concern of nature and environmental protection gives the Ministry responsibility for wetlands as a natural habitat.

There is an Environment Agency operating under the direction of the Ministry that is responsible for the implementation of Nature Conservation Laws. Among others, the responsibilities of the Environment Agency include, for example, monitoring of wetlands being drained or developed upon, and reviewing municipal and development plans which affect wetlands.

The Ministry of Agriculture oversees issues relating to agricultural land use, forestry and soil conservation. In 1996, the Ministry appointed a committee which is sometimes referred to as the Wetlands Committee. The committee on drained wetlands recovery looks at areas of collaborative wetland recovery and progress management with farmers and landlords.

The Agricultural University has conducted extensive research on wetlands, as reported in their data bases (Arnalds et al. 2016). This has led to major institutional changes from the policy of draining wetlands for agriculture to wetland restoration.

The Soil Conservation Service which is coordinated by the Ministry of Agriculture aims at combatting land degradation. It started an extensive programme, the “Farmers Heal the Land” project, to rehabilitate degraded land for agricultural sustainability and other uses that include wetlands. Wetlands have been restored by farmers under this arrangement.

Municipal local governments are mandated to conduct physical planning of their areas. Planning involves preparation of structural and detailed plans indicating various land uses. They also issue development licences/permits which may impact wetlands. This is done in consultation with the Environment Agency.

3.3 Priorities for wetland restoration

Wetland restoration in Uganda and Iceland was a low priority in the 20th century compared to the threats and pressures to these natural ecosystems (Hagen et al. 2013). The realization of the role of wetlands in carbon storage, water filtration and as biodiversity habitats ignited the need for their conservation. Restoration of degraded wetlands is slowly gaining momentum as countries begin to recognize that protection of existing wetlands is not enough to curtail the problems to natural systems (Bloomberg 2012). Policies and legal frameworks in Uganda and Iceland have been used as mechanisms to prioritize wetland restoration (Hagen et al. 2013).

3.3.1 Western Uganda

The coverage of wetlands in Uganda has drastically declined at a rate of 713.4 km sq. per year (Nsubuga et al. 2014), despite recognizing the importance of wetlands and having relevant policies, laws and regulations in Uganda. Radical measures need to be taken to prevent such losses. Western Uganda looks at wetland enhancement, creation and restoration as the most appropriate measures to reverse wetland loss. The interviews conducted during this study provided the following sources of priorities and activities addressed by policies and legal framework for restoration of wetlands in western Uganda:

- In 1997, Uganda initiated “wetlands for disaster risk reduction”. Eighty percent of the population in western Uganda are dependent on wetlands for their livelihood. Western Uganda substantially implements restoration programmes for promotion of good health and to improve community livelihood. Respondents 4, 5, and 6 argued that healthy wetlands cope with extreme natural events like, especially, the weather. Therefore, restoration of wetlands is a crucial step in disaster risk reduction.
- There is a need to fight environmental degradation. Degraded wetlands in districts like Masindi, Rakai, Isingiro, Bushenyi, Mbarara, Hoima, Kisoro, Rukungiri and Kasese have been demarcated by the Ministry of Water and Environment using pillars. The wetlands prioritized for restoration are sources of municipal water or urban waste water and sewage sinks. Interview respondent 5 asserted that district local governments also started marking wetland boundaries by planting native trees and live fences using *Euphorbia* species.
- There are conflicts linked with wetland access, and therefore make use of the priority for resolution and management. Management framework and restoration plans are a priority for transboundary wetlands which belong to more than one district. They help stakeholders to rationalize resource use while promoting shared responsibility. District

wetland action plans are prepared and mainstreamed in the district and five-year development plans and budgets for implementation.

- There is promotion of eco-tourism, especially around Nakivale in the Isingiro district where communities were supported to restore degraded sites and to conserve the wetland. Wetlands coding and gazettement in the national gazette is ongoing. The Ministry is promoting the categorization of wetlands and coding them for quick monitoring and management. This will provide wetland information necessary for Western Uganda to produce a regional wetland inventory. All districts are encouraged to generate their own wetland inventories that provide details on soils, biodiversity, water levels, human activities taking place in the wetland, history and management practices.
- The identification of native wetland vegetation to be planted is also prioritized; research is ongoing to generate information on native wetland vegetation and help identify the most appropriate vegetation types to use for wetland restoration, the nature of wetland and the appropriate methods to be used for purposes of restoration.
- There is monitoring of the planning process, wetland spatial and temporal extent to separate them from other land cover, evaluation of recovery and restoration. The programme was prioritized.
- Sensitization on wetlands and laws is a priority. Restoration of wetlands is a new phenomenon that needs to be undertaken at all levels of community and government organizations. A massive sensitization campaign through community meetings and media is going on. This is attached to the need to protect restored wetlands. It involves advising the stakeholders to monitor and protect wetlands in their areas and report any cases of misuse or damage.

3.3.2 Iceland

The environmental policies in Iceland prioritize habitat restoration. Wetlands are valued as habitats for birdlife and more dynamic fauna and flora (Gunnarsson et al. 2006). There is a discussion on how to value wetland services due to the unique roles they play, especially when it comes to carbon sequestration and global climate change action. According to interview respondent 2, the monitoring programmes for wetlands prioritize water level, plant composition, birdlife and gas fluxes (carbon dioxide).

Land ownership is a key priority issue for successful project implementation. Land use in Iceland is dominated by farmers. Wetland restoration opportunities depend on the dedication and willingness to accept by local farmers. Currently, there are few supporters for wetland restoration and therefore low prioritization by farmers.

The government looks at the cost-effectiveness of the project. Restoration of wetlands can help counteract greenhouse gas emission or create a carbon sink (Arnalds 2015). This can be a cheap way of reducing and controlling such gases. Key stakeholders involved in wetland restoration include; institutions in research and soil conservation, land owners (both private, municipalities and state), aluminium smelter companies, NGO's (like Birdlife), farmers and road authorities (Aradottir et al. 2013, Hagen et al. 2013). However, restoration efforts by stakeholder groups are still limited when compared with draining. Restoration priorities in Iceland are influenced

by government policies and integrated in the available systems (Petursdottir et al. 2013). The Soil Conservation Service of Iceland spearheads restoration activities. It encourages and prioritizes stakeholder engagement in wetland restoration, especially farmers. This is implemented through its main project, “Farmers heal the land”.

Erosion control was one of the major priorities of restoration in Iceland. Currently, nature conservation and recreation are also prioritized (Aradóttir 2003). These goals entail wetland restoration. According to one of the interviewees, wetland restoration targets long-term ecological benefits other than productivity. However, information on wetlands and areas that need intervention is still limited. Little has been done in wetland restoration compared to other areas of restoration in Iceland.

Restoration of natural processes of wetlands is a key priority in Iceland (Hagen et al. 2013). The few wetlands restored entail covering of ditches to raise the water table so that natural wetland processes of water and nutrient regulation take course (Appendix 2).

Tourism, one of the main economic activities in Iceland, is another motivation for wetland restoration. Respondents 1 and 3 in the interview clarified that restored wetlands significantly attract tourists. The likely increased potential for tourism draws the attention of stakeholders to policy priorities for wetland restoration.

Nonetheless, another school of thought concerning the likely changes in land use from agriculture to restored wetlands and tourism would cause reduction of rangelands and fodder production (Arnalds 2015). It is also clear that there are some wetlands that were drained and are currently not used for agriculture. In this case, a cost-benefit analysis is required to optimize sustainable land use.

Management of invasive species by the Soil Conservation Service is a key priority for restoration. Efforts to protect both lowland and highland wetlands from invasive species like Nootka lupine (*Lupinus nootkatensis*) are being executed to protect wetland biodiversity and ecological integrity.

4. RECOMMENDATIONS

4.1 Recommendations for Uganda

The existence of various institutional structures for wetland policy and legal framework implementation requires collaboration and coordination. Wetland activities should be synchronized to avoid competing interests.

There is a need to consider stakeholder participation on policy evolution. This is because they are the people who mostly interact with wetlands and will be affected by the policy. Therefore, their input is paramount. Western Ugandans are very sceptical about top-down laws and policies and this negatively affects policy implementation.

The National Environment Act which came into force in 1995, does not cater to restoration activities. It is therefore recommended that the current policy under review by parliament should take care of restoration issues like; who should be involved, sources of funding, the

roles of all the relevant stakeholders, and which categories of wetland to be vanquished or restored.

There should be committees established for each restoration site. They should develop restoration monitoring plans with detailed checklists of the site being restored.

The EPPU and the local council defence secretary should be involved and the courts should act to deter the offenders who might destroy the restoration materials.

4.2 Recommendations for Iceland

The Icelandic landscape plan is only advisory and limited in policy making. There is need for a functional strategic and comprehensive national land use plan that is legally binding to the different players/ stakeholders. This demands a national plan, regional plan, municipal plans and area plans which will guide the competing land uses of agriculture, forestry, wetlands, settlements and protected lands at all levels.

The use of wetlands as agricultural subsidies left many wetlands drained. There is an urgent need to halt all new draining of wetlands by law. For wetlands that were drained, other wetlands need to be restored at least in proportion 2:1 restoration to draining.

The use of wetland restoration as a formal activity to mitigate climate change deserves increased funding. Sensitization of society to the value of biodiversity and climate impact needs to be recognized. This may only be done through education and knowledge transfer at various levels.

All wetlands of Iceland have high values, although for different services. But wetlands with high biological value and high in organic matter should rank high. Better understanding of the variability of climate impact on drained wetlands in different circumstances requires considerable efforts in research and monitoring. Monitoring protocols at different levels of wetland management and governance should be established. This will simplify and strengthen the process which prevents new draining and clarify responsibility for draining, and accountability for restoration. Some areas that were drained and are not used should be considered to ensure their recovery.

Wetlands information in Iceland is still limited. The country should support an up-to-date national wetland information system identifying existing wetland issues. That can help managers with actionable information on wetlands that should be prioritized for restoration and other management activities at all levels.

5. CONCLUSIONS

Wetlands in Uganda and Iceland are affected by many of the same drivers of degradation and the resultant effects as wetlands in other parts of the world. The drivers include: agriculture, infrastructure development, overharvesting of wetland resources, overgrazing, bush fires and urban sprawl. These have resulted in biodiversity losses, the creation of ditches and water stress. It is therefore imperative for farmers and all stakeholders to realize the dangers associated with wetland degradation and curtail them for sustainability of wetlands.

Policies and legal frameworks for wetland management and conservation have been developed. The basic policies and legal frameworks for wetland management in both Western Uganda and Iceland may seem different but the principles of wetland restoration are the same. This study found out that Uganda has good policies and a good legal framework for wetland management. However, there is no guarantee that there will be no further degradation once the policies are in place. Therefore, there are weaknesses in the implementation and enforcement of the wetland policies and legal framework. Some of the weaknesses include lack of political will, overlapping mandates by agencies, lack of coordination among implementing agencies and inadequate institutional capacity (Nakiyemba et al. 2013). Uganda also lacks guidelines for sustainable harvesting and utilization of wetland resources (Opio 2008). On the other hand, Icelandic policies and legal framework are neither specific and nor comprehensive as to wetland management. However, some provisions of the Ramsar conventions and the Nature Conservation Act are used for wetland conservation and management. Iceland has also undertaken a century of restoration of degraded land under their main programme “Farmers heal the land”. Some wetlands were also targeted by this programme. Both countries are applying similar wetland restoration principles. These include use of native species, restoration of ecosystem natural structure and functioning. It is therefore important for Iceland to establish a conclusive policy on wetland management. Uganda may need to borrow a leaf from Iceland on proper implementation of existing policies and wetland restoration. There is a need for Uganda to guide sustainable harvesting of wetland resources.

Traditional management of wetlands was more considerate of the local area settings. Policy and law seem to be more influenced by international principles. There are unclear definitions of wetland boundaries. This is because standard policy definitions are based on vegetation or land cover, soils and water characteristics. This makes monitoring over time difficult, especially when there is land conversion. There is need to revisit policies to develop more comprehensive legislation that promotes sustainable wetland management by integrating the traditional values and ways of wetland management.

Wetland restoration is a new phenomenon that is more influenced by international standards. There are many stakeholders involved in restoration and policy implantation. The stakeholders have varying potential to achieve wetland restoration and management. Politicians influence decisions and central government coordinates, and local governments influence implantation, while farmers and the community implement decisions. The value of wetland restoration needs to be well recognised by all stakeholders through consistency and information flow. Therefore, there is need for cooperation between managers, policy makers, farmers and the wider community. All stakeholders need to be committed to wetland restoration and management on a long-term basis exclusive of prioritising quick gains from wetlands. This is essential for successful policy implementation and monitoring for both Uganda and Iceland to safeguard their wetlands.

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LITERATURE CITED

Akwetaireho S, Getzner M (2010) Livelihood dependence on ecosystem services of residents: A case study from Mabamba Bay wetlands. *International Journal of Biodiversity Science, Ecosystem Services and Management* 6: 75-87.

Apunyo R (2006) *Managing Wetlands with Changing Times-Uganda's Experience*. Makerere Institute of Social Research, Inc., Kampala
<http://archive.riversymposium.com/2004/index.php?element=06APUNYORobert> (accessed 22/7/2017).

Aradóttir AL (2003) Restoration challenges and strategies in Iceland. Pp. 61-65. In: Bois FC, Doreen L, Imeson A (eds.) *SCAPE. IBED 2003*: Briefing paper of the 1st SCPAE workshop, Alicante, 14-16 June 2003. University of Amsterdam
<https://www.researchgate.net/publication/238733982> (accessed 27/8/2017).

Aradóttir ÁL, Petursdóttir T, Halldorsson G, Svavarsdóttir K, Arnalds O (2013) Drivers of ecological restoration: lessons from a century of restoration in Iceland. *Ecology and Society* 18(4): 33.

Arnalds O (2008) Soils of Iceland. *Jökull - The Icelandic J Earth Science* 58:409–421
<http://jardvegsstofa.lbhi.is/lisalib/getfile.aspx?itemid=1878> (accessed 14/8/2017).

Arnalds O (2015) *The Soils of Iceland*. Springer Dordrecht Heidelberg Inc., New York London.

Arnalds O, Gudmundsson J, Oskarsson H, Brink SH and Gísladóttir FO (2016) Icelandic inland wetlands: characteristics and extent of draining. *Wetlands* 36:759-769.

Bikangaga S, Picchi MP, Focardi S and Rossi C (2007) Perceived benefits of littoral wetlands in Uganda: a focus on the Nabugabo wetlands. *Wetlands Ecol Manage* 15:529–535.

Bloomberg MR (2012) *New York City Wetlands Strategy*.
http://www.nyc.gov/html/planyc2030/downloads/pdf/nyc_wetlands_strategy.pdf (accessed 14/8/2017).

Bosma C, Glenk K and Novo P (2017) How do individuals and groups perceive wetland functioning? Fuzzy cognitive mapping of wetland perceptions in Uganda. *Land Use Policy* 60: 181–196.

Cesar E and Wolf H (2013) *Environment and Climate Change Policy Brief Uganda*.
<http://sidaenvironmenthelpdesk.se/wordpress3/wp-content/uploads/2014/02/Uganda-Environmental-and-Climate-Change-policy-brief-draft-2013-09-04.pdf> (accessed on 27/8/2017).

ENR (Environment and Natural Resources) (2009) *Enhancing Wetlands' Contribution to Growth, Employment and Prosperity*. UNDP/NEMA/UNEP Poverty Environment Initiative, Kampala Uganda https://www.unpei.org/sites/default/files/e_library_documents/uganda-enhancing-wetlands-contribution-prosperity-final.pdf (accessed 20/8/2017).

FAO (Food and Agricultural Organisation) (2014) *Environment and Health: Uganda* http://www.fao.org/nr/water/aquastat/countries_regions/uga/index.stm (accessed 30/7/2017).

FAO (Food and Agricultural Organisation) (2015) *FAO and the 17 Sustainable Development Goals*. Viale delle Terme di Caracalla, Rome, Italy <http://www.fao.org/3/a-i4997e.pdf> (accessed 30/7/2017).

Farrier D and Tucker L (2000) Wise use of wetlands under the Ramsar convention: A challenge for meaningful implementation of international law. *Journal of Environmental Law* 12:21-42 <https://doi.org/10.1093/jel/12.1.21> (accessed 25/8/2017).

Fay PA, Guntespergen GR, Olker JH, and Carter WJ (2016) Climate change impacts on freshwater wetland hydrology and vegetation cover cycling along a regional aridity gradient. *Ecosphere* 7: <http://onlinelibrary.wiley.com/doi/10.1002/ecs2.1504/full> (accessed 30/7/2017).

Gardner RC (Chair), Barchiesi S, Beltrame C, Finlayson CM, Galewski T, Paganini M, Perennou C, Pritchard DE, Rosenqvist A and Walpole M (2015) *State of the World's Wetlands and their Services to People: A Compilation of Recent Analyses*. 12th Meeting of the Conference of the Parties to the Convention on Wetlands (Ramsar, Iran, 1971), Punta del Este, Uruguay http://www.ramsar.org/sites/default/files/documents/library/cop12_doc23_bn7_sowws_e_0.pdf (accessed 5/6/2017).

Gisladottir FO, Brink SH, Arnalds O (2014) *Nytjaland (The Icelandic Farmland Database)*. Agricultural University of Iceland Report No. 49. Reykjavik, Iceland http://www.lbhi.is/sites/default/files/gogn/vidhengi/rit_lbhi_nr_54.pdf (accessed 20/8/2017).

Gunnarsson TG, Arnalds O, Appleton G, Mendez V and Gill JA (2015) Ecosystem recharge by volcanic dust drives broad-scale variation in bird abundance. *Ecology and Evolution* 5: 2386-2396 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4475371/> (accessed 4/9/2017).

Gunnarsson TG, Gill JA, Appleton GF, Gíslason H, Gardarsson A, Watkinson AR and Sutherland WJ (2006) Large-scale habitat associations of birds in lowland Iceland: Implications for conservation. *Biological Conservation* 128: 265-275.

Hagen D, Svavarsdottir K, Nilsson C, Tolvanen AK, Raulund-Rasmussen K, Aradóttir AL, Fosaa A, and Halldorsson G (2013) Ecological and social dimensions of ecosystem restoration in the Nordic countries. *Ecology and Society* 18(4): 34.

Imeson A (2012) *Desertification, Land Degradation and Sustainability*. John Wiley and Sons, Inc., West Sussex, (UK).

International Federation of Red Cross and Red Crescent Societies (2014) *DREF Preliminary Final Report Uganda: Kasese Floods*
<http://reliefweb.int/sites/reliefweb.int/files/resources/MDRUG033PDFR.pdf> (accessed 4/9/2017).

IPC (Integrated Food Security Phase Classification) (2017) *Uganda - Current Acute Food Insecurity Situation*.
http://www.ipcinfo.org/fileadmin/user_upload/ipcinfo/docs/IPC_Uganda_AcuteFI_Jan-March2017.pdf (accessed 20/7/2017).

Isunju JB, Orach CG and Kemp J (2016) Community-level adaptation to minimize vulnerability and exploit opportunities in Kampala's wetlands. *Environment and Urbanisation* 28: 475-494.

IUCN (International Union for Conservation of Nature) WCPA (2016) PARKS. *The International Journal of Protected Areas and Conservation*. 22.1, Gland, Switzerland
https://www.iucn.org/sites/dev/files/parks_22.1_-_2016.pdf (accessed 26/8/2017).

Kabumbuli R, Kiwazi FW (2009) Participatory planning, management and alternative livelihoods for poor wetland-dependent communities in Kampala. *Africa Journal of Ecology* 47:154-160.

MDLG (Masindi District Local Government) (2009) *District Environment Policy*.
http://nemaug.org/district_policies/Masindi_District_Env_Policy.pdf (accessed 25/8/2017).

Ministry of Natural Resources (1995) *National Policy for the Conservation and Management of Wetland Resources*. Uganda Printing and Publishing Corporation, Kampala.

Mitsch WJ, Bernal B, Nahlik AM, Mander U, Zhang L, Anderson CJ and Jørgensen SE (2012) Wetlands, carbon, and climate change. *Landscape Ecology* 28:583-597
<file:///C:/Users/lrtzb17/Downloads/Wetlands,%20carbon,%20and%20climate%20change.pdf> (accessed 24/8/2017).

Mwakubo SM and Obare GA (2009) Vulnerability, livelihood assets and institutional dynamics in the management of wetlands in Lake Victoria watershed basin. *Wetlands Ecology and Management* 17:613–626.

MWE (Ministry of Water and Environment) (2013) *The National Forest Plan 2011/12 – 2021/22* Directorate of Environmental Affairs, Kampala, Uganda.

Nakiyemba AW, Isabirye M, Poesem J, Maertens M, Deckers J and Mathijs E (2012) Decentralised governance of wetland resources in the Lake Victoria Basin of Uganda. *Natural Resources* 4: 55-64.

Namaalwa s, Vandam AA, Funk A and Kagwa RC (2013) A characterisation of drivers, pressures, ecosystem functions and services of Namatala wetland. *Environmental Science and Policy* 34: 44-57.

Namulema MJ (2015) *Relevance of Wetland Economic Valuation in Uganda: Case Study of the Kiyanja–Kaku Wetland in Lwengo, Central Uganda*. United Nations University Land Restoration Training Programme [final project] <http://www.unulrt.is/static/fellows/document/namulema2015.pdf> (accessed 13/8/2017).

Nansubuga FN, Namutebi EN and Ssenfuma MN (2014) *Water resources of Uganda: An Assessment and Review*. Ministry of Foreign Affairs. Kampala, Uganda http://file.scirp.org/pdf/JWARP_2014102716093775.pdf (accessed 4/6/2017).

NEMA (National Environment Management Authority) (2004) *National State of Environment Report*. Kampala, Uganda.

NEMA (National Environment Management Authority) (2007) *National State of the Environment Report*. Kampala, Uganda.

NEMA (National Environmental Management Authority) (2011) *Wetlands and Forests*. Kampala, Uganda.

Ntambirweki J (1998) *The Evolution of Policy and Legislation on Wetlands in Uganda: Technical consultation on designing methodologies to review laws and institution relevant to wetlands*. Gland, Switzerland.

Opio M (2008) *An Institutional Analysis of the Management of Wetland Resources: A Comparative Study of Flóahreppur Municipality in South Iceland and Oyam District in Uganda*. United Nations University Land Restoration Training Programme [final project] <http://www.unulrt.is/static/fellows/document/moses.pdf> (accessed 2/6/2017).

Petursdottir T, Arnalds O, Baker S, Montanarella L, and Aradóttir A (2013) A social–ecological system approach to analyze stakeholders’ interactions within a large-scale rangeland restoration program. *Ecology and Society* 18: 02-29 <https://www.ecologyandsociety.org/vol18/iss2/art29/> (accessed on 24/8/2017).

Raburu PO, Wa’munga PO, and Okeyo-owuor JB (2012) Experiences from Community Participation in Managing Nyando Wetland. Pp. 81-99. In Raburu PO, Okeyo-owor J.B, Kwena F(eds.) *Community Based Approach to the Management of Nyando Wetland, Vake victoria Basin, Kenya*

<http://www.oceandocs.org/bitstream/handle/1834/7776/ktf0429.pdf?sequence=1> (accessed 5/6/2017).

Ramsar convention secretariat (2013) *The Ramsar Convention Manual: A Guide to the Convention on Wetlands* (Ramsar, Iran, 1971), 6th ed. Ramsar Convention Secretariat, Gland, Switzerland. <http://www.ramsar.org/sites/default/files/documents/library/manual6-2013-e.pdf> (accessed 5/6/2017).

Ramsar list (2017) *The List of Wetlands of International Importance*. Gland, Switzerland <http://www.ramsar.org/sites/default/files/documents/library/sitelist.pdf> (accessed 4/8/2017).

Reed MS, Stringer LC (2016) *Land Degradation, Desertification and Climate Change*. Routledge, New York.

Rugadya M (1999) *Land reform: The Ugandan Experience*. Land use and villagisation workshop conducted at Hotel De Mille Collines. Kigali, Rwanda <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.433.9383&rep=rep1&type=pdf> (accessed 23/8/1017).

Sidle RC, Bensonb WH, Carrigerb JF and Kamaik T (2013) Broader perspective on ecosystem sustainability: Consequences for decision making. *Proc Natl Acad Sci USA* 110: 9201–9208 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3677449/> (accessed 3/6/2017).

Turyahabwa N, Kakuru W, Tweheyo M and Tumusiime DM (2013) Contribution of wetland resources to household food security in Uganda. *Agriculture and Food Security* 2: 2-12 <https://agricultureandfoodsecurity.biomedcentral.com/articles/10.1186/2048-7010-2-5> (accessed 5/6/2017).

UBoS (Uganda Bureau of Statistics) (2016) *Statistical Abstract*. Kampala, Uganda http://www.ubos.org/onlinefiles/uploads/ubos/statistical_abstracts/2016%20Statistical%20Abstract.pdf (accessed 3/4/2017).

APPENDICES

APPENDIX 1. Interview guide for Uganda

This interview guide is to answer questions on the effectiveness of wetland management policies in addressing the drivers and effects of wetland degradation in Uganda. It is important to note that the policies are operationalised by Laws/Ordinances and regulations at the national and district level.

Wetlands perform ecosystem services, some of which are well recognised, others less so, and are internationally recognised as one of the most important ecosystems for the conservation of biodiversity.

The research on wetlands is carried out in partial fulfilment of the requirements of the course in sustainable land management and restoration at the Agricultural University of Iceland. In recognition of your role within the institution or sector of wetland resource management, you have been selected to participate in this study and your participation is very important to this research.

Your answer reflects your opinion or insight on the situation and available data that you have in the institution data bank regarding wetland condition and policies.

General Questions

- I. In what Organisation/Ministry / Department do you work/serve?
- II. What is your position in the Organisation/ Ministry/ Department
- III. What is the role of the Organisation/Ministry/ Department in wetland management?
- IV. Who owns wetlands in Uganda?

Objective 1: Drivers and effects of wetland degradation

1. What is the status of wetland environments in Uganda? In what condition are they? What are the reasons/drivers behind their current condition?
2. What are the effects of the current condition? How does the current condition influence natural and social systems or livelihoods? What are the services that the wetland provides?

Objective 2: How policies address drivers of wetland degradation

3. What is the institutional set-up for wetland management in Uganda?
4. What wetland management policies are present in the country?
5. How do those policies address the current condition of wetlands?
6. Are all the services of wetlands mentioned above (objective 1 and 2) included within the policy?
7. What are the outcomes of wetland policies throughout the country?
8. Are the policies effective in addressing the current wetland status and the wetland services? Is there any monitoring programme to follow the effectiveness of restoration?

Objective 3: How are the priorities for restoration

9. If there are wetland restoration activities, which areas/wetland types do you prioritize for restoration? What are the wetland services that are accounted for while restoring?

- 10.** Are the current services accounted for enough, or restoration should account for more services?
- 11.** What are the priority activities to look for and implement while restoring wetlands?
- 12.** Who are the stakeholders that participate in restoration activities? How is gender participation observed?

Objective 4: Recommendations for Uganda.

- 13.** Which recommendations could you give towards wetland management and restoration according to the following issues:
 - a.** Policy
 - b.** Services wetland render but are not recognized
 - c.** Restoration priorities for both high and low land wetlands
 - d.** Monitoring of both wetland degradation and restored areas.

APPENDIX 2. Examples of wetlands in Iceland



Figure 4: Wetland area that has not been drained in north-east Iceland (source: <http://www.springer.com/us/book/9789401796200>)



Figure 5: Example of drainage ditch in a wetland of South Iceland (source: <http://www.springer.com/us/book/9789401796200>)



Figure 6: Wetland restoration in Iceland involves in many cases filling the ditches with soil and planting with grass. The image shows an example of a wetland in west Iceland restored by the Agricultural University of Iceland where ditches were covered with soil to enhance the natural processes of the wetland (source: <http://www.springer.com/us/book/9789401796200>)