Paving the way towards gender responsiveness:
An analysis of gender inclusion in ecosystem-based disaster risk reduction (Eco-DRR)

by
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Abstract
Gender issues are a sensitive topic in all cultures; however, gender is a highly significant factor to take into account to assess people’s vulnerability against disasters. Gender differences are pivotal in understanding unequal access to natural resources and the impacts of empowerment towards sustainable outcomes. This thesis elucidates the nexus of gender, ecosystem management and disaster risk reduction, providing recommendations for gender-responsive actions to support the implementation of ecosystem-based disaster risk reduction (Eco-DRR) interventions.
This study examines the current state of existing literature addressing the proposed nexus with a systematic literature review. The review is complemented by interviews with experts from the Eco-DRR field, evaluating the perception of gender issues in practice and discussed through a comparison of pilot projects by UNEP in Afghanistan and Haiti. Results from the first two methods revealed six main components that are defined to conduct gender-responsive actions in Eco-DRR. They determine people’s engagement for disaster risk strategies and serve as guiding tools for the application of activities to overcome gender biases. These components are exemplified with the suggested case studies to demonstrate the context-specific integration of gender considerations.
Through the analysis of scientific research, expert interviews as well as case studies this thesis brings science, policy and implementation perspectives together and provides a holistic understanding of the linkages in the nexus of gender, ecosystems and disaster risk reduction.
Statement of authorship

I hereby certify that this thesis has been composed by myself and describes my own work, unless otherwise acknowledged in the text. All references and verbatim extracts have been quoted, and all sources of information have been specifically acknowledged. It has not been submitted in any other application for a degree.

Signed: [Signature]

Dated: 20.01.2020

I agree that my thesis may remain at the disposal of each of the libraries, the one of the United Nations University Institute of Environment and Human Security and the library of the Department of Geography of the University of Bonn.

Signed: [Signature]

Dated: 20.01.2020
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<th>Full Form</th>
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<tbody>
<tr>
<td>CBD</td>
<td>Convention on Biological Diversity</td>
</tr>
<tr>
<td>CCA</td>
<td>Climate Change Adaptation</td>
</tr>
<tr>
<td>CBDRR</td>
<td>Community-based Disaster Risk Reduction</td>
</tr>
<tr>
<td>CEDAW</td>
<td>Convention on the Elimination of All Forms of Discrimination Against Women</td>
</tr>
<tr>
<td>CMB</td>
<td>Crisis Management Branch</td>
</tr>
<tr>
<td>DRR</td>
<td>Disaster Risk Reduction</td>
</tr>
<tr>
<td>EbA</td>
<td>Ecosystem-based Adaptation</td>
</tr>
<tr>
<td>Eco-DRR</td>
<td>Ecosystem-based Disaster Risk Reduction</td>
</tr>
<tr>
<td>ES</td>
<td>Ecosystem Services</td>
</tr>
<tr>
<td>FPE</td>
<td>Feminist Political Ecology</td>
</tr>
<tr>
<td>GAD</td>
<td>Gender and Development</td>
</tr>
<tr>
<td>HFA</td>
<td>Hyogo Framework of Action</td>
</tr>
<tr>
<td>IUCN</td>
<td>International Union for Conservation of Nature</td>
</tr>
<tr>
<td>MEA</td>
<td>Millennium Ecosystem Assessment</td>
</tr>
<tr>
<td>NGO</td>
<td>Non-governmental organization</td>
</tr>
<tr>
<td>PAR model</td>
<td>Pressure and Release model</td>
</tr>
<tr>
<td>PEDRR</td>
<td>Partnership for Environment and Disaster Risk Reduction</td>
</tr>
<tr>
<td>Ramsar Convention</td>
<td>Ramsar Convention on Wetlands</td>
</tr>
<tr>
<td>SDGs</td>
<td>Sustainable Development Goals</td>
</tr>
<tr>
<td>SFDRR</td>
<td>Sendai Framework for Disaster Risk Reduction</td>
</tr>
<tr>
<td>UNCCD</td>
<td>United Nations Convention to Combat Desertification</td>
</tr>
<tr>
<td>UNDP</td>
<td>United Nations Development Programme</td>
</tr>
<tr>
<td>UNDRR</td>
<td>United Nations Office for Disaster Risk Reduction</td>
</tr>
<tr>
<td>UNEP</td>
<td>United Nations Environment Programme</td>
</tr>
<tr>
<td>WAD</td>
<td>Women and Development</td>
</tr>
<tr>
<td>WED</td>
<td>Women, Environment and Development</td>
</tr>
<tr>
<td>WID</td>
<td>Women in Development</td>
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<td>WoS</td>
<td>Web of Science</td>
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1 The role of gender in ecosystem-based approaches

“You cannot protect the environment unless you empower people, you inform them, and you help them understand that these resources are their own, that they must protect them.”

(by Wangari Maathai; THE CLIMATE REALITY PROJECT 2011, September 26)

Wangari Maathai, the leader and initiator of the Green Belt Movement in the 1970s in Kenya, emphasized the essential connection between humans and their ecosystems by engaging locals, in particular women, to plant trees around their communities to counter the deforestation processes in the country and prevent deteriorating social conditions. Growing up in a rural area of Kenya, Wangari Maathai understood the consequences of changing land use and decreasing forest cover, which led to increased flooding, soil erosion and lack of wood for fuel and fire (MAATHAI 2010). A healthy ecosystem provides benefits for local communities, such as the mitigation of disaster impacts. This is why communities are responsible for maintaining their surrounding environment and reducing negative consequences such as environmental degradation (ORRADÓTTIR and AEGISDÓTTIR 2015, September 24). The gender component identifies roles within the community and supports the differentiation of vulnerabilities. It therefore plays a pivotal role for the strategy of disaster risk reduction (DRR). Studies show that marginalized groups face severe challenges during a disaster (SEAGER 2014; NEUMAYER and PLÜMPER 2007) such as during the Indian Ocean tsunami 2004, where women were four times more likely to be killed than men (MACDONALD 2005). This analysis initiated a stronger gender discussion and further research into social differences during hazardous events. It also raised the awareness to include a gender-sensitive perspective in the development of vulnerability analysis (WASTL-WALTER 2010).

Women’s vulnerability is repeatedly emphasized, however their capacity to build disaster resilience is rather neglected. This perspective has been insufficiently represented in disaster risk policies and decision-making procedures (FAO 2016). Through the empowerment of women, they can become active agents of the environment and respond to challenges posed by the increasing frequency and severity of disasters (UNEP and UN Habitat 2010).

Ecosystem-based approaches are increasingly recognized as important components of a successful disaster risk reduction strategy (CBD 2018). They are addressed under the term “ecosystem-based disaster risk reduction (Eco-DRR)” and described as “sustainable management, conservation and restoration of ecosystems to reduce disaster risk, with the aim to achieve sustainable and resilient development” (ESTRELLA and SAALISMAA 2013, p. 30). Ecosystem-based approaches for mitigation activities, such as reforestation or maintenance of wetlands, are put into place to reduce disaster risk by using the capacity of the ecosystem to cope with the impacts of sudden and slow
onset events. The approach encourages the involvement of indigenous and local communities to identify their exposure and vulnerabilities to hazards and improve their resilience, by maintaining their ecosystems and provide livelihood options (KLEIN et al. 2019).

The protection of ecosystems, as well as incorporation of gender perspectives is increasingly reflected in international policies of DRR and climate change. The 2030 Agenda for Sustainable Development addresses the necessity of gender-sensitive approaches in DRR for a sustainable development within the Sendai Framework for Disaster Risk Reduction. The Sustainable Development Goals (SDGs) underlines the achievement of gender equality and empowerment of all women and girls (SGD 5) and the prevention of further environmental degradation through restoration and sustainable use of ecosystems (SDG 15) (UNSD 2019).

To meet the obligations under the UN and its conventions, and in order to be more effective and efficient in its outcomes, Eco-DRR as a participatory risk reduction approach should work towards gender-responsive inclusion. Gender-responsive approaches determine gender norms and roles to advocate for gender equality (DAZÉ and DEKENS 2017).

Despite increasing awareness underlining the importance of emphasizing gender differences and empowering vulnerable groups in disaster research, the application of gender approaches is limited (Shreve 2016). Specifically in Eco-DRR, little work has examined how gender is reflected in this field and to which degree gender considerations are recognized or even applied. This thesis will showcase the value of gender-responsive approaches in ecosystem-based disaster risk reduction interventions, guided by the following research questions:

- How are gender considerations addressed and integrated within Eco-DRR?
  Which roles are assigned to men and women (agents of change vs. women/men-as-victims)?

- What are the factors that promote or hinder gender inclusiveness in Eco-DRR?
  What barriers/challenges have to be taken into account when considering gender within these interventions?

- What is the added value of an integrated gender approach in the implementation of Eco-DRR?
  Can gender be used as an entry point to better implement Eco-DRR?

Figure 1 provides an overview of the structure of this thesis. The first chapter introduces the concept of Eco-DRR in detail, followed by Chapter 2 that provides the theoretical baseline of the thesis. Therefore, the component of gender is examined in the field of DRR, enlarging upon social vulnerability. After that, the role of men and women in environmental management is evaluated, assessing gender-specific access to resources on the basis of the Feminist Political Ecology (FPE)
theory. After highlighting women’s active role in the environment, recent political agreements are summarized in chapter 3.4, which require actions to empower marginalized groups in DRR and the conservation sector. The theoretical part concludes with a distinction of gender approaches to understand their implications in Eco-DRR interventions.

Chapter 4 explains the methodological procedure of this thesis, starting with a detailed description of the applied systematic literature review, which pursues the question of how women and men are reflected within Eco-DRR literature. It follows the conduct of expert interviews from the Eco-DRR field that provides insight from a practical level to evaluate the causality of research and practice on a policy and field-based level. Moreover, findings from interviews should help to determine gaps in the implementation of gender considerations on projects and programmes. Two case studies from Afghanistan and Haiti from a pilot project by the United Nations Environment Programme (UNEP) undergo a comparison and exemplify the results from the first two methods. The aim is to identify valuable contributions of gender-responsive approaches to facilitate the implementation of Eco-DRR interventions.

The results are presented in three subchapters (5.1, 5.2, 5.3), outlined according to the corresponding method. Chapter 6 provides an extensive discussion of the results, pulling together acquired data and theory for the analysis of the proposed research questions.

Figure 1: Research structure of the thesis. Credit: The author.
2 The concept of Eco-DRR

Disasters disrupt societies with massive losses that exceed society’s capacity to use their own resources and withstand a disaster’s impacts. When a natural hazard takes place, it interacts with social vulnerabilities which influence the capacity of a society to respond to the disaster (GINIGE et al. 2009). In the last decades, disasters caused a significant increase in direct economic damage globally, accounted for US$ 2,908 billion, and also leading to 1.3 million fatalities (WALLEMACQ and HOUSE 2018). These numbers call for a comprehensive risk reduction strategy that differentiates the needs of different social groups such as rich, poor, women, indigenous, which must be examined and integrated into policies to achieve a successful and sustainable strategy.

2.1 A rising strategy in DRR

Since the 1970s, there has been a strong link between disaster risk management and nature conservation. This connection, which started as a top-down approach and developed to a participatory concept, supports local empowerment of resilience building – the concept of ecosystem-based disaster risk reduction (MURTI and MATHEZ-STIEFEL 2019).

A turning point occurred after the Indian Ocean tsunami in 2004, that describes a shift towards disaster prevention and risk reduction. This event triggered the development of the Hyogo Framework of Action (HFA) which highlighted for the first time which impacts disaster have on the environment and points out the role of ecosystems that might serve as natural defence during disaster events (RENAUD et al. 2013). The framework further referred to the need to integrate natural resource management and called for effective land-use planning in disaster risk reduction. SHAW and TRAN (2012) suggest a number of main entry points for integration strategies that comprise advocacy and policy dialogues amongst stakeholders to promote investments in ecosystem-based approaches among policy makers. At this point, environment-disaster linkages are apparent, however, the relevance of ecosystem-based approaches in DRR is not clearly stipulated in policies. The Convention on Biological Diversity (CBD) called for recognition of ecosystem-based strategies in 2014, as well as the Ramsar Convention on Wetlands (Ramsar Convention) that highlighted the importance of wetlands for hazard mitigation in cases of flood and drought events (MURTI and MATHEZ-STIEFEL 2019). Finally, the 2015 Sendai Framework for DRR (SFDRR) embedded the role of ecosystems in its agreement. The SFDRR replaced the HFA and was signed by 187 UN member states (UNISDR 2015b). It demonstrates the shift from disaster management to managing risk and building resilience through a variety of actions including the reinforcement of ecosystems and endorses the inclusion of all sectors of society. This scheme was followed by mainstreaming strategies of Eco-DRR in several sectors, like climate change.
adaptation, development and humanitarian aid. Additionally, nature-based tools and strategies were developed (FAIVRE et al. 2018). During the same year, the 21st UN-Climate Conference (COP 21) in Paris highlighted the linkages between ecosystems and humans as well as ecosystem’s capacity to protect humans from the impacts of disasters. It further pointed out the need for integrated community-based approaches for nature-based solutions.

Community engagement, especially with marginalized groups, is essential for Eco-DRR projects to build up capacities and improve outcome for livelihoods and environment and strengthen disaster risk reduction (KLEIN et al. 2019) which is emphasized in global frameworks like the SFDRR and the Paris Agreement. The study by KLEIN et al. (2019) recognizes the reciprocal influence of people and the environment, demonstrating the effect on the example of a community in Nepal that is planting broom grass for slope stabilization and protection from landslides. In addition to reducing disaster risk, these plantations provide fodder and fuel which can be used as an alternative income. The Eco-DRR projects collaborates with local women’s network and engages local groups resulting in resilience-building. Based on this example, a successful implementation requires the understanding of local contexts and recommends to dissociate from a one-size-fits-all approach (KLEIN et al. 2019).

2.2 Components and aim of ecosystem-based approaches

As the above-mentioned frameworks show, the relevance of ecosystem-based approaches in DRR is increasingly acknowledged (CBD 2018). An ecosystem is defined as a “dynamic complex of plants, animals and other living communities and the non-living environment interacting as a functional unit. Humans are an integral part of the ecosystem” (REID 2005, V). The definition refers to the complex interaction of nature and humans within a socio-ecological system, showing that both systems are linked through feedback mechanisms. The ability of ecosystems to provide services can be affected by impacts of climate change and natural hazards (FAIVRE et al. 2018), but also through anthropogenic actions such as unsustainable use of natural resources and overexploitation. Therefore, environmental degradation is recognized as a major factor for disaster risk (SUDMEIER-RIEUX et al. 2019; DOSWALD and ESTRELLA 2015). It is in the interest of the community to counter environmental degradation and maintain the ecosystem such as its services (LEACH et al. 2016). In order “to assess the consequences of ecosystem change for human well-being […] to enhance the conservation and sustainable use of those systems” (MEA 2005, ii), the Millennium Ecosystem Assessment (MEA) was initiated in 2001. Furthermore, ecosystem services (ES) are defined as a contribution of the ecosystem that is beneficial for people to improve human well-being and biodiversity. They are distinguished in provisioning services that are described as material outputs of the ecosystem such as food, timber and water; regulating services perpetuate a
healthy ecosystem through the sequestration of carbon, maintenance of air and water quality and prevention of soil erosion; cultural services encompass nonmaterial benefits such as aesthetic and spiritual gain, or providing recreational space and ecotourism; and supporting services that are not directly linked to human well-being, thus, are relevant for the production of other ES, such as habitat provision and biomass production for genetic diversity (MEA 2005). While the MEA has provided valuable findings about the critical condition of ecosystems and the provided services as well as emphasized sustainable conservation with appropriate measures, MURTI and MATHEZ-STIEFEL (2019) argue that the role of ES in decreasing people's vulnerability is still not sufficiently recognized. Therefore, adequate valuation options are missing to measure the benefits of ES.

Eco-DRR is defined as “sustainable management, conservation and restoration of ecosystems to reduce disaster risk, with the aim to achieve sustainable and resilient development” (ESTRELLA and SAALISMAA 2013, p. 30). Eco-DRR activities are implemented to reduce disaster risk due to an ecosystems ability to act as a natural defence and cope with the impacts of sudden and slow onset events. The approach encourages the engagement of indigenous local communities to identify their exposure to hazards and improve their resilience (DOSWALD and ESTRELLA 2015) which provides multiple livelihood benefit.

Ecosystem-based approaches address multiple interests and are characterized as no-regret solutions. The approach aims to both reduce disaster impacts and increase people’s livelihoods by providing material and energy products or regulates water and air quality in the area that has long-term impacts. As community-based approaches represent a crucial part in Eco-DRR, community engagement in Eco-DRR activities such as preservation of healthy ecosystems can present a unique opportunity to empower vulnerable groups (SUDMEIER-RIEUX et al. 2019).

For a comprehensive risk reduction strategy, their involvement is crucial to reduce their vulnerability and strengthen their capacity to cope with disaster events. Community-based disaster risk reduction (CBDRR) marks the shift from immediate response after a disaster event to risk reduction and recognizes the importance of community involvement. The focus lies on how to integrate communities in pre-disaster interventions (prevention, preparedness) (see chapter 2.4). The key elements of CBDRR include the active participation of community members; the integration of all sectors of the community, thus, prioritizing the most vulnerable groups; providing community-specific measures and taking into account their capacities and coping mechanisms (SHAW 2016). CBDRR addresses root causes of vulnerability that mostly include poverty, social inequalities and environmental degradation. The identification of these main factors helps to provide adequate measures to build communities’ resilience (SHAW 2016). A combined approach of ecosystem management and CBDRR can tackle some root causes, influencing peoples coping capacity.
The term community includes all societal sectors such as men, women, children, disabled, etc. (WARNER 2007). The distinction of these groups can provide valuable findings about different impacts, capacities to respond to shocks as well as valuation of ecosystems. A few papers examined the perception of ES by distinguishing between men and women (FORTNAM et al. 2019; YANG et al. 2018; ALLENDORF and ALLENDORF 2013). Different prioritization of ES between those groups were recognized, hence, the exclusion of disaggregated findings could lead to an exclusion of relevant ES in decision-making processes (BROWN and FORTNAM 2018). The protection of ES can be improved by engaging the right stakeholder with relevant knowledge and can help to minimize gender vulnerabilities by identifying needed interventions (FORTNAM et al. 2019). Additionally, it should help to avoid biases, such as the perspective of women as victims. Women can also exploit natural resources and contribute to environmental degradation. Therefore, their recognition as active agents of change is crucial towards successful adaptation and mitigation programmes (RESURRECCIÓN 2017; KELEMEN et al. 2016; GELL 2010). The differentiation of gender in these studies reflects the importance of this thesis to analyse further the role of men and women in the nexus of ecosystem management and DRR.

Ecosystem-based strategies can involve, among others, forest management, coastal zone management, watershed management and urban management (SHAW and TRAN 2012). These different strategies fit under the broader concept of nature-based solutions and can be categorized into the following approaches: 1) existing ecosystems can be *maintained and designated as protected areas* through conservation and management practices, 2) degraded natural environment undergoes *restoration processes* to regenerate a healthy ecosystem, 3) *creating new ecosystems* such as planting protection forests to mitigate disaster risk and 4) the *combined use* of artificial structures with ecosystems in case of limited protection of the ecosystem against a certain type and magnitude of a hazard (NATURE CONSERVATION BUREAU, MINISTRY OF THE ENVIRONMENT JAPAN 2016). The overarching aim of nature-based solutions is the protection of human well-being, taken into account cultural and social values, and enhance ecosystem’s capacity to provide services and “[…] address societal challenges (e.g. climate change, food and water security or natural disasters)” (COHEN-SHACHAM et al. 2016, XII).

Ecosystem-based approaches are increasingly recognized as a relevant measure to develop strategies for DRR (Eco-DRR) as well as for climate change adaptation (CCA). Climatic changes were progressively determined and monitored within the last decades with escalating effects on
disaster risk. The linkages between the DRR and CCA fields are close and several studies call for integrated processes (BIRKMANN and TEICHMAN 2010; THOMALLA et al. 2006). Both approaches address a slightly different focus to achieve sustainable development by using ecosystem management (see Fig. 2) (DOSWALD and ESTRELLA 2015). Therefore, ecosystem-based approaches with the main perspective on climate change adaptation are covered by the term ecosystem-based adaptation (EbA). EbA approaches aim to deal with long-term impacts of climatic change (RENAUD et al. 2013) and gained fast interest in the climate change policy agenda. The role of Eco-DRR noticed a slower development in DRR, even though the use of ecosystems to protect from hazards was known and applied in the past, e.g. plantation of forests for landslide protection in Japan (NATURE CONSERVATION BUREAU, MINISTRY OF THE ENVIRONMENT JAPAN 2016). The following table summarizes and elucidates the main differences between Eco-DRR and EbA:

Table 1: Characteristics of Eco-DRR and EbA approaches in comparison. Summarized from (DOSWALD and ESTRELLA 2015; NAIR and GUPTA 2012; THOMALLA et al. 2006).

<table>
<thead>
<tr>
<th></th>
<th>Eco-DRR</th>
<th>EbA</th>
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<tbody>
<tr>
<td><strong>Aim</strong></td>
<td>Management of the environment through conservation, restoration, creation of ecosystems → Reduction of disaster risk and vulnerability, increase people’s resilience against hazards</td>
<td>Protect biodiversity and ES through restoration and conservation of ecosystems → Adaptation to climate change, reduce vulnerability and increase resilience to climate change</td>
</tr>
<tr>
<td><strong>Origins</strong></td>
<td>Emerged as a field of practice; increasing attention in DRR policy context</td>
<td>Emerged in context of international climate policy</td>
</tr>
<tr>
<td><strong>Implementation</strong></td>
<td>• Protection as primary aim, resilience building of people through maintenance of ES → focus on people and their surrounding environment • local scale • community-based • Activities performed mostly in all phases of disaster management (disaster preparedness, prevention, disaster response, recovery, reconstruction)</td>
<td>• Emphasis on biodiversity conservation → focus can be on the environment that people depend upon • global scale • Activities mostly focus on prevention, mitigation, preparedness and building adaptive capacities</td>
</tr>
</tbody>
</table>
The scope of the thesis does not allow a deepening in both approaches and specifies for this study on disaster risk reduction.

2.3 Linking ecosystems to DRR

To understand the linkages between environment and disasters it should be explained in the context of disaster risk. Disaster risk is defined by the frequency and magnitude of hazards events, people’s exposure to hazards and their vulnerability to damage. Figure 3 illustrates how each of these concepts can be considered further in order to understand society’s capacity to absorb and recover from disasters and enhance their well-being, which is mostly understood as resilience (UNISDR 2015a).

![Conceptual framework of disaster risk](image)

Figure 3: Conceptual framework of disaster risk by BOLLIN ET AL. (2003), adjusted by the author.

Sustainable ecosystem management has the ability to influence these components. It can help to mitigate the hazard, control exposure and reduce vulnerability (RENAUD et al. 2013). Ecosystems contribute to disaster risk reduction in several ways:

First, ecosystems can serve as a natural buffer to mitigate the impacts of a hazard such as floods, landslides and wildfires, and reduce physical exposure. For example, mangrove forest, seagrass or coral reefs serve as natural shoreline protection, stabilizing river banks and diminishing wave energy to prevent continues coastal erosion and the loss of land (BADOLA and HUSSAIN 2005).

Second, the provision of ES such as essential goods can strengthen human resilience and security against disasters and reduce socio-economic vulnerability. For example, the establishment of coastal nurseries provides seedlings for fruit, forest or mangrove trees. Planting these forests can provide food, increase aesthetical effects and provide shelter, which can support tourism activities (MEA 2005).
These two examples show that protecting ecosystems means maintaining natural protection barriers as well as preserving essential ES that provide multiple benefits to local communities. ES also contribute to important coping and recovery strategies (NAIR and GUPTA 2012). However, ecosystems also present a number of restrictions in physical protection. Specific factors influence the performance of ecosystems, such as ecosystem composition and health, as well as the intensity and type of the hazard. Natural buffers reveal further limitations regarding space availability, biological performance or incompatibility with land uses. For instance, small coastal vegetation strips have limited effects on the implications of severe cyclones and small wetlands reach their limits to serve as a retention pond during long lasting intense rainfall events. In these cases, hybrid solutions may be more appropriate, which describes a combination of natural and hard defences (RENAUD et al. 2013). For example, the structure of wetland can reduce the intensity of waves, thus, serves as buffer for artificial measures such as levees against storm surges and expanding their lifespan. In many cases, the maintenance of ecosystems is less costly compared to artificial measures. The latter, requires high-costs for maintenance and adaptation of new technologies (SUDMEIER-RIEUX et al. 2019; NAIR and GUPTA 2012). Consequently, nature-based solutions need to be considered in DRR strategies, supporting the effectiveness of disaster preparedness and mitigation (NAIR and GUPTA 2012).

2.4 Contribution of ecosystem management in DRR phases

The process of DRR can be divided into four phases that describe the disaster management cycle: relief, recovery, reconstruction and prevention (see Fig. 4). The first two phases are part of the post-disaster phase that aim to save lives immediately after the hazard event happens. Typically, disaster management focused on this part of the cycle and allocated a majority of the budget to relief and recovery (LLOYD-JONES et al. 2006). However, non-governmental organizations (NGOs) and development agencies have been challenging this dominant view, calling for a shift in disaster recovery towards disaster prevention. This can be achieved by focusing investments in risk reduction activities that work towards long-term outcomes, e.g. in risk-sensitive land-use planning or poverty reduction, instead of just managing risks (SUDMEIER-RIEUX et al. 2019).
SUDMEIER-RIEUX et al. (2019) emphasize that ecosystem management can be incorporated in every stage of the disaster management cycle and play a pivotal part in the reduction of risks. Within the **relief and recovery** phase, which takes place directly after an event, damage to ecosystems and their services should be minimized. For example, hazardous materials should not be dumped in environmentally-sensitive habitats. The relevance to protect healthy ecosystems will be particularly apparent in the long-term implications, e.g. in the provision of materials and energy such as timber, food, water that can be secured. Environmental assessments and contingency plans are often placed back in this phase, compared to the main objective of saving lives. Lifting the priority of ecosystems protection already in this phase might result in supporting outcomes in the next phases (SUDMEIER-RIEUX et al. 2019).

The **reconstruction phase** takes place for a few months after the disaster event and can continue for years. It implies the rebuilding of houses and infrastructure as well as the stabilization or even improvement of livelihoods. Established guidelines to ‘build back better’ support the reconstruction of areas that were severely impacted by a disaster (LINDELL 2013). At this point, environmentally sensitive reconstruction can be taken into account, involving restoration of ecosystems and creation of green infrastructure. Additionally, settlements could be relocated to locations that are less prone to hazards. To avoid further degradation, an awareness about the use of natural resources in a sustainable way should be transferred. For example, logging of forests from slopes to use the materials for reconstruction can generate new hazards such as landslides and generate a negative feedback loop. The approach should move towards “build back better and greener” (SUDMEIER-RIEUX et al. 2019, p. 105).

The stage of **prevention** is categorized within the pre-disaster phase; however, it should receive higher attention and be considered throughout the whole disaster management cycle (LLOYD-JONES et al. 2006). Preparedness (early warning systems, evacuation drills), risk and vulnerability...
assessments, and development of long-term risk reduction are described as key components of this stage. The latter addresses planning procedures that should emphasize land-use planning, and incorporate ecosystem restoration and protection into the process of zoning (SUDMEIER-RIEUX et al. 2019).

Since preparedness is mostly effective in reducing the number of fatalities during and after a disaster strikes, this phase has high priority in DRR. Well-planned evacuation strategies can increase people’s resilience temporarily, relying on effective early warning systems (LLOYD-JONES et al. 2006). Preparedness activities aid immediate emergency response, however, they often do not tackle root cause of risk to address long-term effects. SUDMEIER-RIEUX et al. (2019) explain this situation by applying the example of flood early-warning systems in coastal areas. The system can provide information shortly before a disaster event and enable prompt evacuation, in case of an intact working system. For an effective long-term risk reduction strategy, a relocation to areas less prone to flooding would be needed, which is often difficult to actually perform due to social and cultural links. Including local knowledge and ecosystems in preparedness programmes could contribute to a comprehensive risk reduction strategy and address underlying causes of risk (SUDMEIER-RIEUX et al. 2019).

2.5 Integrating ecosystems in risk assessments

Risk and vulnerability assessments are relevant measure for disaster prevention (see chapter 2.4). Risk assessments examine factors that cause potential harm, analyse the risk associated with the hazard and determine approaches to reduce future damage. The first step includes the identification of risks or potential losses to a population over time. The population should be distinguished in all sections, including men, women, young, elderly, disabled, etc. Through the recognition of differentiated risk, a comprehensive risk assessment can be ensured (UNDP 2010). As a second step, it is necessary to communicate the identified risks with decision-makers and communities and select suitable measures to reduce the risks. A common method to communicate the information are maps, which can be either hand drawn or dependent on data with GIS systems, or oral history transfer. Subsequently, the society
decides for the most cost-effective measure to reduce the risk. Therefore, it has to be taken into account that a zero-risk situation is mostly not possible to achieve. Several factors have to be considered by decision-makers such as economic costs which decide the accepted level of risk that can be taken into account regarding available resources (SUDMEIER-RIEUX et al. 2019). The process describes the ALARP principle “As Low As Reasonably Practicable” (see Fig. 5), which originates in safety management in the British health and safety system (Act 1974). The concept is applicable in all forms of risk management, and describes the point where risk can still be managed given the available resources. A cost-benefit analysis serves as a basis for decisions if and which risk reduction measures should be implemented. Risk reduction activities focus on the reduction of frequency of disaster implications and severity of consequences (BAI and JIN 2016).

The application of most risk assessment methods depends on the availability of data, the study scale, the method approach (expert-led or participatory), such as time and budget (VAN WESTEN et al. 2006). Based on the equation of risk in chapter 2.3, “Risk = Hazard * Exposure * Vulnerability”, the assessment of vulnerability and hazard presents integral parts of risk evaluation and will be shortly discussed.

Vulnerability analyses are difficult to assess due to differing perspectives on vulnerability by physical and social scientists. The first group addresses physical damage on infrastructure such as houses, whereas social scientists often combine vulnerability with capacity assessment, using socio-economic indicators such as income and education levels. Vulnerability shows linkages with ecosystem changes; thus, environmental degradation can cause further vulnerabilities. A limited availability of resources can lead to conflicts and inequitable distribution between people (SUDMEIER-RIEUX et al. 2019). Hence, vulnerability differs by access to resources, particularly women have restricted access and rights (WASTL-WALTER 2010) which limits their capacity to cope with and respond to disasters.

A hazard assessment includes two types of data. It assesses the likelihood of occurrence such as the intensity of an event, which can be determined with historical records and climate forecasts. If several hazards occur in a certain area, multiple-hazard maps can be developed, including high-quality GIS data or local knowledge (SUDMEIER-RIEUX et al. 2019). The latter can provide a comprehensive overview, due to different roles and responsibilities of the local community that expose individuals to different situations. These insights provide a distinguished picture and understanding about the current situation and environmental changes that might intensify hazard risk (UNISDR 2015c).

For a complete risk assessment, data of exposure is needed which can be collected from household surveys, populations statistics or satellite images. The development of a comprehensive risk map
requires a high level of data collection and expertise. It is a useful tool to identify areas at different levels of risk (high, medium, low) and estimate the expected return points of hazards. A common approach is the integration of communities which helps to receive a better understanding of local risks and resources, by using e.g. participatory mapping, livelihood analysis, capacity/resources maps (PARTNERS FOR RESILIENCE 2011). And additional benefit of this community-based method is the collection of qualitative information about ecosystem conditions. The status of ecosystems can be evaluated in every step of a risk assessment by adding layer of ecosystem data to the processes. Communities can provide data about their perception of ecosystems as a natural buffer against hazard impacts. The use and status of ES can provide relevant information on the health of habitats and degradation level which affect the protection function. This additional information on ecosystems provides a valuable contribution to vulnerability, hazard and risk assessments, improving the interlinkages between risk elements and ecosystem attributes (SUDMEIER-RIEUX et al. 2019).

One example of integrated ecosystem properties in a risk assessment presents the project RiVAMP (Risk and Vulnerability Assessment Methodology Development Project), an assessment tool developed by the UNEP in 2009. The project incorporates factors of ecosystem and climate change to analyse disaster risk and vulnerability. This tool assists decision-makers in national and local governments in evaluating development interventions by taking into account the role of ecosystems in risk reduction. Remote sensing can be here a useful tool to identify ecosystem functions and exposed areas to e.g. storms. Simultaneously stakeholder consultations determine main drivers of environmental degradation to raise awareness of linkages to disaster. The project targets in particular Small Island Development States (SIDS) that are highly prone to coastal hazards such as cyclones, storm surges and flooding. A main component of the project showcases the involvement of communities in consultations and mapping that supported the documentation of ecosystem changes and how these changes influenced people’s coping capacities to natural hazards. Consequently, awareness of local stakeholders could be raised referring to natural infrastructure as a crucial protection measure against disaster (UNEP and GRID-Europe 2010). RiVAMP represent only one of few interventions that incorporates ecosystem conditions or services in risk assessments, however, the application of the methodology might be challenging and requires access and availability of baseline information (DOSWALD and ESTRELLA 2015).
3 The Nexus of gender, ecosystem-management and disaster risk reduction

Women’s and men’s differing interest and engagement in environmental resource management is determined by their distinguished roles, responsibilities and knowledge. Gender, hence, is seen as a crucial variable that alters ecological changes and livelihoods, influencing sustainable development in the long term. The gendered perspective reflects distribution of power between women and men to access and control (RESURRECCION and ELMHIRST 2008) which demonstrates the importance to include the gender component in ecosystem management and DRR. It can help to understand the vulnerability of marginalized groups as well as to identify approaches to reducing inequalities. The following chapter firstly analyses the significance of the gender component in DRR and secondly elucidate its role in the field of ecosystem management. This breakdown highlights in a first step the main components of Eco-DRR individually in order to showcase the linkages in the nexus gender, ecosystem management and disaster risk reduction. The chapter initiates with the gender discourse by describing the development of feminist movements to build upon the FPE theory.

3.1 Women as victims vs. women as agents of change – A Feminist Political Ecology perspective

The movement to integrate women in development can be traced back to the 1970s and is closely linked to the institutionalization of women’s issues in the UN system. To work towards gender equity the emerging movement of Women in Development (WID) intended a better integration of women in development projects and to increase their work capacity. The intervention enhanced women’s visibility in the development process, however, it addressed women as a homogeneous group and described them from a Western point of view as ‘oppressed, poor and uneducated’, looking at women in isolation from other groups (RESURRECCIÓN 2017; WASTL-WALTER 2010). The first World Conference on Women in 1975 that called the International Women’s Year, was the movement’s first success and was followed by two further conferences. The network of women’s groups strengthened significantly during these years. Subsequently, the Women and Development (WAD) movement occurred in the mid-1970s (see Fig. 6). It shifted the focus to the integration of women in the economic and employment market, and centralized the concept of empowerment. Nonetheless, women were viewed as a class, neglecting the differences between women (WASTL-WALTER 2010).

Building upon this approach, the contemporary framework Gender and Development (GAD) emerged, bringing along changes in the use of terms. The focus shifted from ‘women’ to ‘gender’, as well as the conjunction ‘and’ reflects the importance to examine both gender and development.
The GAD movement pointed out on socially constructed differences between men and women such as gendered division of labour and power relations. With the ‘Convention on the Elimination of All Forms of Discrimination Against Women’ (CEDAW) 1979, an attempt was made to develop a set of policies for gender equality (WASTL-WALTER 2010). Gender equality is defined as “the equal enjoyment of rights, opportunities, resources, and rewards by women, girls, boys, and men. [It] does not mean that women and men are the same.” (CIAMPI et al. 2011, p. 23). The aspiration of gender equality anticipates empowerment of marginalized groups. During the Fourth World Women Conference in Peking 1995, an action platform was established that obliged all participating countries to integrate ‘empowerment’ into all programmes (WASTL-WALTER 2010).

Further research on women empowerment was inspired by rural demonstrations in the Global South, such as the Kenyan Green Belt Movement, to improve livelihoods and conserve the environment by planting trees (see also chapter 3.3.1), as well as the Chipko grassroots movement in India. The latter described the movement of local women protecting trees to prevent further logging thus, preserve the forests in southwest India. The movement resulted in a 15-years cutting-ban in that region by the government. This success story demonstrates the relationship of local communities with their environment as well as the active fight of women for their rights (JAIN 2017). The Women, Environment and Development (WED) approach was closely tied to these women movements, and was mostly eminent in the 1990s and 2000s. The discourse was rooted in the ideology of ecofeminism that referred to women as stewards of the environment due to their close connection to nature. WED emphasized that women should play a more active role in environmental interventions, but policies did not ensure women’s empowerment. The movement focused “on women as a group in the development process and as victims/care-takers of their environments” (RESURRECCIÓN 2017, p. 2) rather than having a broader perspective on gender.
In the mid-1990s, the Feminist Political Ecology (FPE) emerged, linking “insights of feminist cultural ecology, political ecology and feminist geography.” (ROCHELEAU 1995, p. 4). It combines a myriad of theoretical approaches with the focus on women as a rational category. The theory counters the homogenous picture of gender as a coherent group with common interests and coping capacities, especially in the context of environmental degradation and disaster. ROCHELEAU (1995) argues that various factors influence men and women in a different way, shaping different capacities even among women. Such differences evolve due to socio-economic and political circumstances, such as rapid growth of population and climate change, and their linkages to ecological issues and changes. It states a profound relation between women and the environment and addresses their linked experiences and responsibilities. This theory also explains that “although poor rural women are vulnerable due to unequal gender relation, they are not merely powerless” (NONOGUCHI and TANAKA 2016, p. 8).

FPE builds on the views of major feminist scholars which analyse the relationships between gender and environment (ROCHELEAU 1995). The theoretical approaches build upon each other and will be briefly outlined in the following section (see Fig. 7).

Ecofeminist scholars assume a close connection between women and nature which entitles women to benefit from the environment while valuing its services by preserving the biodiversity (BROWN and FORTNAM 2018). However, the ideological view on women’s relationship to nature was described through a Western feminist lens that victimized women from other parts of the world (RESURRECCIÓN 2017). Feminist environmentalism describes that the interest in natural resources and environmental processes is distinguished between men and women. This interest is determined by their societal chores and responsibilities (ROCHELEAU 1995). Socialist feminist analysed the oppression of women in the society comparing to the oppressive structure of capitalism. The goal of this concept was to integrate both gender into political economy and challenge economic equality. However, it does not recognize gender as a single variable for oppression (NAPIKOSKI 2019). Later, the poststructuralist feminist perspective referred to the influence of different identities, such as race, class and culture, that interlaces with each other. This perspective adds the concept of intersectionality which is adopted by the FPE approach (ROCHELEAU 1995). The term of intersectionality appeared in the beginning of the 1990s to respond to the critical binary gender analysis and challenge the ‘one-size-fits-all’ approach. To capture the vulnerability and resilience of gender, it is not sufficient to refer to gender as a single category. It stresses the need to identify root causes that generate vulnerability to climate change and natural hazards. Root causes of vulnerability are established over time and are shaped by social relationships, which are determined through the intersection with other social identities (gender, class, ethnicity, etc.). However,
intersectional approaches in gender analyses are still lacking, which is why the concept of intersectionality is placed behind gender in the disaster risk and conservation agenda (LOVELL and LE MASSON 2014). CHAPLIN et al. (2019) stress the relevance of intersectionality with regard to gender analysis and point out that the inclusion of an intersectional dimension would not require new approaches and systems and could be included in already existing methods.

The political ecologist perspective integrates social, economic and political context that influence environmental issues and practices. These factors lead to an unequal power distribution to control resources and emphasizes the intersection of gender with other social identities (HANNA et al. 2007). The feminist perspective brings local experiences into a broader global context, referring to race, class, culture and national identity as factors that shape these experiences in intersection with gender. Finally, environmentalists engaged with feminist perspectives including women in conservation and protection programmes as active players (ROCHELEAU 1995).

The FPE approach recognizes the multi-dimensional analysis of gender, which takes into account several factors that intersect with gender and shape vulnerability. It further emphasizes to investigate people’s experiences and influence on the environment from a bottom-up perspective. It helps to understand local contexts and embed this knowledge into policy-making to avoid exclusion of marginalized groups (RESURRECCIÓN 2017). This theory will be applied to understand the gender perspective in the fields of DRR and ecosystem management.

3.2 Gender as an aspect in disaster risk reduction

The differentiation of gender in disaster plays a pivotal role for the strategy of risk reduction. Studies show that the most marginalized groups are hit the hardest by disaster (SEAGER 2014; NEUMAYER and PLUMPER 2007). During the 2004 tsunami in the Indian Ocean, women were
almost four times more likely to be killed than men (MacDonald 2005). This number was presented a few months after the disaster occurred and initiated a stronger gender discussion and further research into social differences during a sudden, calamitous event. It raised the awareness to include a gender-sensitive perspective into the development of a comprehensive vulnerability analysis (Wastl-Walter 2010).

3.2.1 Clarifying the term of gender
Nelson and Huyer (2016) describe gender not as female or male, but refers to “masculine and feminine - that is, to qualities or characteristics that society ascribes to each sex. People are born female or male, but learn to be women and men” (p. 2) or any other fluid gender identity. These groups show differentiating experiences that are socially constructed (Enarson 2008) and “vary widely both within and between cultures, and change over time.” (Nelson and Huyer 2016, p. 2). For example, female smoking is not considered as appropriate in Vietnam, which is why more men than women smoke (Morrow et al. 2002). In some cultures, such as in Sub-Saharan African countries, women are assigned to specific tasks in agriculture or chores such as collecting firewood (Puri 2014); in other societies, women may not be encouraged to step outside home (Begum 1993). In regard to disaster risk reduction, some social and cultural norms might increase women’s disadvantages, e.g. in some cultures, the ability to swim and climb on trees is not taught to women. When the wave in the Indian Ocean hit the country in 2004, many women were incapable of saving themselves from the precarious situation due to the lack of these skills. After the severe event, it was examined that their role as caretaker and their responsibilities to domestic activities induced many women to stay at home and safe children and elderly first. These are just some of several reasons that might explain the high number of female fatalities after such extreme events (Seager 2014; Begum 1993). It further underlines the fact that disasters are not gender neutral (Ahmad 2018).

Moreno and Shaw (2018) criticizes the terminology of gender that mostly refers to women and men neglecting the complex relations in society. More and more scholars share this opinion and suggest to move towards a nonbinary understanding of gender (Hawkins et al. 2011), to avoid the exclusion of other vulnerable groups such as lesbian, gay, bisexual, and transgender (LGBT). In Southeast Asia and the Pacific for example, a number of minorities identify gender beyond the categorization of ‘male’ and ‘female’. Given heteronormative values and norms increased their vulnerability towards disaster. For example, to get access to emergency shelters in Nepal evacuees can only be registered either as women or men. This highlights a significant lack of awareness for their needs and concerns in DRR and shows that this two-gender framework is not sufficient to tackle the challenges in disaster management. A proper understanding of the capacities of gender
minorities can be achieved through the awareness of local settings and diversity to further support empowerment and redistribution of power among social groups (GAILLARD et al. 2017). Due to the scope of the thesis, this study will follow a binary approach which is why the notion of gender will refer only to women and men. For a comprehensive understanding and to recognize the complexity of the analysis the entire spectrum of gender should be addressed in future studies.

The next chapter enlarges upon the concept of vulnerability in disasters and explains how the aspect of gender becomes visible in DRR.

### 3.2.2 Identifying vulnerability in disaster events

As pointed out in chapter 2.3, vulnerability presents a key concept to understand disasters impacts (AKSHA et al. 2019). Disasters entail a set of vulnerabilities which influence the ability of an individual, a community or a society to deal with impacts of a calamity (GINIGE et al. 2009). Vulnerability is determined by several factors (social, environmental, economic, physical) and can be interpreted from different perspectives. From a physical disciplinary perspective, vulnerability describes the degree to which an individual is exposed to risk (AJIBADE et al. 2013) such as floods that impact the built environment, e.g. housing and infrastructure. In the 1970’s, the concept of vulnerability underwent a paradigm shift within the disaster discourse. A deeper focus was placed on vulnerability with the explanation that socio-economic conditions are causing natural disasters. (HEWITT 1983; O’KEEFE et al. 1976). These authors reframed the human-environmental interactions and described ‘marginalization’ as a key driver of vulnerability and risk. CHAMBERS (1989) discussed the internal and external side of vulnerability. Therefore, people are exposed to particular shocks and stressors, simultaneously they possess a range of capacities to cope with the impacts of these shocks. This conceptual interpretation highlights the multi-dimensionality of vulnerability.

These findings show that vulnerability is also based on a social sphere that refers in particular to susceptibility and resilience. The latter defines the capability of an individual to sufficiently cope with the impact of a disaster, whereas susceptibility represents the degree to which affected individuals suffer harm. In general, vulnerability evolves through the interaction of the biophysical environment with social aspects thus, it is socially constructed (AKSHA et al. 2019).

With this in mind, WISNER (2004) suggests that “humans are not equally exposed to hazards” (p.6) and points out to the complexity of this concept. The intersection of a variety of factors and contexts creates a unique vulnerability for each individual. That is based on the concept of BLAIKIE et al. (1994) that assesses the causalities of vulnerability by explaining the processes between root causes, dynamic pressures and unsafe conditions. These relations are presented in the Pressure-
and-Release model (PAR model), explaining the progressive development of vulnerability (see Fig. 8). The PAR model shows that vulnerability is rooted in historical, social, economic and cultural structures which evolve remotely from the initial disaster event and create a form of social vulnerability (CUTTER 1996).

Social vulnerability highlights the differences of human capacity to cope with shocks, which varies geographically and temporally, and among and between social groups (LOYOLA HUMMELL et al. 2016). These differences are shaped by underlying social conditions, among others age, race, ethnicity, poverty and gender, indicating the multidimensionality of the concept (CUTTER and FINCH 2008). The intersectional approach helps to recognize the diversified nature of vulnerability. It facilitates the understanding of dynamics and power relations that influence individuals and groups to experience power and oppression at the same time (CHAPLIN et al. 2019).

Socially vulnerable groups have mostly less access to critical resources before, during or after a disaster event which influences their capacity to respond adequately to its impacts and increase their risk (YOOIN 2012). Poor, women, children and elderly are determined as the most negatively impacted by shocks and are assigned to the group of marginalized individuals (WARNER 2007). Women and girls were mostly noticed as the most vulnerable within a community or household, particularly because of restricted access to resources (see chapter 3.3). First of all, circumstances and dynamics that generate these inequalities have to be understood. The lack of access to resources could be explained in some cases due to historically and culturally evolved patterns such as male created dominances in certain societies due to patriarchy systems. Applying this knowledge in the PAR model can help to identify the root causes for gender inequality (MORCHAIN et al. 2015). Paternalistic ideologies that create a male majority in political and economic positions, influence access to power and resources (KOESTER 2015). The PAR model facilitates practitioners to recognize the different roles of men and women facing disasters and receive a better understanding
of the impacts (MORCHAIN 2015). Gender shapes vulnerabilities and presents a crucial component for DRR which aims to reduce people’s vulnerability towards a hazardous event and build their resilience.

AJIBADE et al. (2013) point out the tendency of the social vulnerability approach to generalize women as one independent group and overemphasize their concerns and needs. Therefore, the feminist political ecology perspective considers the complex interaction of multiple identities with gender. It places gender relations in a specific context and seek to understand an individuals’ experiences in the context of environmental degradation, gender inequality and disaster risk.

The concept of vulnerability implies the socio-cultural context, discussing political circumstances which can either mitigate or exacerbate disaster impacts (WASTL-WALTER 2010).

### 3.3 Gender-specific access to resources

Across the globe, gender defines the power distribution of access to and control over resources between women and men. In almost all countries, women have less access and tenure rights, as well as less decision-making power (RESURRECCION and ELMHIRST 2008). Figure 9 shows the distribution of agricultural holders by women globally. It indicates that less than 20% of the land globally is in the possession of women. In particular, in the South Asian countries and in the Middle East region statutory rights for property are almost not existing. Not only political empowerment has to take place to ensure women’s tenure rights, patriarchal and ancient social structures, such as the Sharia Law, impede this development despite existing rights in several countries such as Bangladesh or Pakistan (VILLA 2017, January 11).

![Figure 9: Global proportion of women as owner of agricultural land in %. Source: FAO (2017).](image)
Therefore, the theory by Dianne Rocheleau (1996) is still applicable. The FPE concept assumes that access to and control over natural resources are strongly linked with gender, race, class and culture. It deals with the political requirements and consequences of gender-specific differences in relation to ecological issues and changes (RESURRECCIÓN 2017; WASTL-WALTER 2010). The following points have to be taken into account in particular.

The analytical framework in FPE implies three main components: 1) gendered knowledge, 2) gendered rights and responsibilities and 3) politics and grassroots activism. Every element points out that gendered power structures disregard capacities of women, limit the access and control over resources which places women in vulnerable conditions (NONOGUCHI and TANAKA 2016).

First, the triple role of women forces women to develop an ability to handle complex systems that are interacting on different levels such as household or community scale. It is led by the responsibility to provide and manage necessities of daily life and can generate conflicts through the separation of domains and knowledge. The three roles are divided in productive, reproductive and community managing skills (ROCHELEAU 1995). Women were primarily seen in their role as mother, which described their reproductive function, and wife who will indirectly benefit from the husband’s improved economic situation. Such gendered views led to a progressive exclusion of women in decision-making processes (DAZÉ and DEKENS 2017; GELL 2010).

Women’s activities in some rural areas, like catching water or collection of wood, contributes to their understanding about their environment. They are aware of environmental changes and are mostly directly affected by deteriorating conditions. Women have limited access to financial resources which impedes their ability to encounter those ecological consequences with expensive technologies or measures, compared to other social strata (WASTL-WALTER 2010).

Second, access to resources is an essential requirement to secure livelihoods and for economic development of each individual. It implies the power to change over and control processes in the environment. Access and control are often divided spatially in public and private spaces and are based on rights that are announced by statutory law or by practice and custom. Ownership of land regulated by law is mostly affiliated to men. Women’s rights are oftentimes embedded within rights that are controlled by men or allocated by men’s institutions. This reflects the gendered relation to power as a consequence of patriarchal structures and institutions (WASTL-WALTER 2010). Gender cannot be separately seen as an influencing factor to access natural resources (see chapter 3.1).

ROCHELEAU (1995) argues that gender intersects with race, class and culture. It explains different coping capacities of people within one group and showcases the complex dynamics and interdependencies of social organisation in different cultures that have to be taken into account, when adopting a gender perspective (WASTL-WALTER 2010).
Third, exclusion of women on a political level generates informal meetings and results in limited access to official resources, therefore a limited decision-making power. This gendered political participation encompasses the third theme of the FPE framework, based on the wave of women’s involvement in the 1980’s. Prime examples are the Green Belt Movement in Kenya or the Chipko movement in India that advocated for the stop of the massive deforestation in the Himalayan region (ROCHELEAU 1995). The Green Belt Movement is a grassroots movement that empowers particularly women to conserve their environment by planting trees and regaining valuable functions, for example provision of food and firewood, collection of rainwater and support the cohesion of soil. The movement responded to the ongoing deforestation in Kenya that impacted local communities and their livelihoods and targets to promote community empowerment and improvement of environmental management. Women were engaged and educated in forestation projects which resulted in a notable increase of forest cover, reduction of environmental degradation and equal participation of men and women (MAATHAI 2010).

These initiatives led to a shift on the national and international political level towards sustainable development. It engendered a redefinition of the identity of women through the manifestation of human agency, as well as resulted in a changing interpretation of environmental issues that integrate women’s knowledge, interests and experiences. New perceptions of women emerged as key actors of change, which resulted from their increased involvement and led to a development of agency and empowerment (ROCHELEAU 1995). The recognition of women as active agents of change is crucial towards successful adaptation and mitigation programmes (GELL 2010). PURI (2014) attributes women a good awareness of sustainable resources management and promotes gender-sensitive legislation to support a facilitative environment for women. This action would contribute to the work towards gender equality and could support empowerment of women which are strongly linked with environmental sustainability. Significant actions to endorse this concept are getting also apparent on a political level. Several environmental institutions and organizations with the focus on DRR adopted gender guidelines and policies in the last years, which will be explained in greater detail in the following chapter.

3.4 Political agreements and guidelines

The approach of gender mainstreaming is the latest process in the empowerment of vulnerable groups. It suggests the implementation of gender mainstreaming strategies to provide guidelines for programmes, policies and plans. Gender mainstreaming is defined as “a globally recognized strategy to integrate women’s and men’s concerns and experiences on design, implementation, monitoring and evaluation of policies and programmes in all political, economic, and societal spheres.” (LO 2016, p. 11). This strategy has been applied in several development projects and
environmental interventions where the participation of women became a requirement in the project agenda.

A first attempt towards gender mainstreaming was made with the HFA 2005-2015, which recognized the importance to include a gender perspective for resilience-building and substantial reduction of disaster losses and was adopted at the international level. The HFA’s successive document, the SFDRR 2015-2030, specifically emphasizes the critical influence of women’s participation for an effective management of disaster risk. The HFA had to face certain challenges which hampered a complete implementation: the comprehension of connections between gender and DRR was still poor on policy and practitioners level; financial resources were lacking for enhanced capacities and tools; gender was not determined as an integral component of DRR but rather as an ‘add-on’ aspect (UNISDR et al. 2009). The SFDRR furthermore calls for inclusiveness of all sections of the society which encompasses other social identities (e.g. age, disability, culture) that intersect with gender (WAHLSTROM 2012).

Building upon the adoption of a gender policy in 2011, the United Nations Office for Disaster Risk Reduction (UNDRR) facilitates actions to promote gender sensitivity in disaster risk reduction. UNDRR works closely with local and national governments and provides guidance to stakeholders to support the implementation of a gender-sensitive DRR agenda (WAHLSTROM 2012). During the same period, the United Nations Development Programme (UNDP) published gender guidelines for practitioners, mentioning the development of techniques and tools to support the mainstreaming of gender aspects in policies and programmes. This includes, among others, gender-sensitive training programmes, the collection of sex-disaggregated statistics, the use of gender indicators and indexes, such as the Gender Development Index (GDI). The latter is a benchmark that measures discrepancies between men and women in health, knowledge and living standards, to monitor progress towards gender equality. The use of these guidelines can create difficulties for governments and practitioners due to a lack of practical understanding and limited guidance. Gender mainstreaming should be taken into account as a fundamental component of programmes and policies and enable the integration of gendered needs within the strategy process or project development (UNDP 2011).

With the adoption of the SDGs in 2015, all United Nations Members signed to achieve sustainable development in various sectors by 2030. Seventeen goals call for action to, among others, tackle climate change (SDG 13), protect ecosystems (SDG 15), and reduce gender inequality (SDG 5) (UNSD 2019). In general, the Agenda 2030 aims to ‘leave no-one behind’ which requires the consideration of social differences and inclusion of all social groups into further actions (BROWN and FORTNAM 2018).
The United Nations Convention to Combat Desertification (UNCCD) adopted the first Gender Action Plan (GAP) in 2017, binding all Parties to “strengthen the participation and leadership of women at all levels in decision-making and local implementation of the UNCCD” (UNCCD 2018, p. 1). The Convention recognizes women’s active role as change-agents in the management of land resources. Their engagement and participation should be understood as a key element to achieve the SDGs (UNCCD 2018). Furthermore, in the sustainable use and conservation of wetlands, the Ramsar Convention on Wetlands stated within the Resolution XIII.18, women’s “vital role as agents of development” (Ramsar Convention on Wetlands 29/10/2018, p. 1). The resolution refers and considers to contracting Parties to empower women for the protection of wetlands and recognize gender differences. It further encourages to train delegates in gender issues in relation to wetlands, raise awareness and strengthen their capacities (Ramsar Convention on Wetlands 29/10/2018). The resolution was released after the 13th Meeting of the Conference of the Contracting Parties in 2018. At this point, it is not evident how the Parties applied these recommendations.

The overview of gender considerations in political agreements demonstrates the growing attention of intergovernmental institutions in gender issues within the last decade. The approach of FPE stresses that the acknowledgement of women’s work and knowledge does not entail the protection and restoration of ecosystems as a single responsibility of the women. The complexity of the linkages between gender and environment is still not fully understood. Gender studies still often focus on women and do not consider sufficiently social exchanges between men and women and the environment, which can result in insufficient specificity and reduced accuracy of models and may lead to inapplicable recommendations from policy makers (Yang et al. 2018).

A prevailing majority of institutions calls for gender-sensitive plans and programmes with an increasing awareness to develop gender-responsive tools for an effective progress towards gender equality. The differentiation between different stages of gender approaches will be described in the following chapter.

### 3.5 From gender sensitivity to gender responsiveness

The gender gap is a worldwide determined pattern that describes social differences, mostly indicating the disadvantaged position of women in access and control over resources in several sectors (compare chapter 3.3). Taking these inequalities into consideration can avoid a further reinforcement of already existing inequalities and support adaptation and sustainability of risk reduction approaches (Nelson and Huyer 2016). Shreve (2016) argues that most disaster research remains in the planning process mostly gender blind due to the assumption that the
population is a homogenous group. A gender-blind approach fails to recognize different needs and concerns of women and men due to e.g. the lack of disaggregated data. Challenges to adopt gender-sensitive or even gender-responsive approaches occur as a lack of staff on gender awareness, limited availability of gender experts or insufficient tracking and monitoring of progress and results (NELSON and HUYER 2016). A gender-responsive approach, coupled with the collection of disaggregated data of various factors (sex, age, ethnicity etc.), can determine how vulnerability is influenced. This can improve the development of DRR strategies and environmental management.

A gender-responsive approach implies the recognition of “particular needs, priorities and realities of men and women and addressed in the design and application […] so that both men and women can equally benefit” (NELSON and HUYER 2016, p. 2). In comparison to gender-sensitive approaches that focus mostly on the identification of gender issues, gender responsiveness seeks to overcome gender biases and work further than the “do no harm” approach (see Fig. 10). It includes gender-sensitive indicators, e.g. the count of men and women participating in projects, ensuring the active engagement of women in defining indicators and monitor impacts (NELSON and HUYER 2016). Examples for such indicators are the Gender Inequality Index (GII) by UNDP that measures differing achievement of men and women based on health, political and labour force participation, education and economic status (UNDP 2018). A further indicator is the Environment and Gender Index (EGI) which was developed by the International Union for Conservation of Nature (IUCN) to promote better transparency and monitor “the progress towards gender equality and women’s empowerment in the context of global environmental agreements” (IUCN Global Gender Office 2012, p. 2). Gender equality represents a stand-alone goal of the SDG’s and is cross-cutting with several other targets of the Sustainable Development Agenda 2030. This concept does not imply that women and men are the same, it rather aims to ensure equal rights and opportunities for people that do not rely on their sex or a binary definition of gender (DAZÉ and DEKENS 2018).

Figure 10: Trend of gender approaches towards transformation of gender dynamics. Source: NELSON and HUYER (2016).

A gender-transformative approach presents the most progressive stage in gender approaches and seeks to reconsider gender norms and relations and redress inequalities in a long-term. It targets to
changes power dynamics to reduce vulnerabilities such as uneven access to resources (MORCHAIN et al. 2015).

In overall, gender-sensitive approaches represent an essential step to address gendered differences in DRR and ecosystem management. The application should not stop here but include actions that ensure opportunities for both, women and men to actively participate in approaches of Eco-DRR.

Gender was reviewed within the discourse of vulnerability in DRR as well as in its contribution in environmental management. One on side, women’s vulnerability in disaster situations is identified and addressed within political agreements. On the other side, their active engagement in local ecosystems has been recognized both in contribution to environmental degradation as well as in awareness of sustainable resources management. It poses the question how the three pillars – gender, ecosystem management and DRR - are brought together in Eco-DRR. This thesis will analyse the issue with the proposed three research questions:

- How are gender considerations addressed and integrated within Eco-DRR?
- What are the factors that promote or hinder gender inclusiveness in Eco-DRR?
- What is the added value of an integrated gender approach in the implementation of Eco-DRR?

4 Mixed-method approach

For this research a systematic literature review was combined with expert interviews to explore the opportunities for Eco-DRR provided by gender considerations and their application in project planning, implementation and monitoring. Subsequently, these results will be applied on two case studies to suggest guiding questions for practitioners in the field of Eco-DRR or related disciplines. This section presents the selected methods and discusses its limitations.

4.1 Systematic literature review

The structure of the systematic literature review is oriented towards similar conducted literature reviews by DOSWALD et al. (2014), BRINK et al. (2016), MURTI and MATHEZ-STIEFEL (2019). These researchers addressed ecosystem-based measures with slightly differing foci: from the effectiveness of ecosystem-based approaches, ecosystem-based strategies in urban areas to the inclusion of social learning. All studies used a systematic literature review as a main tool to collect data for a thorough analysis. Therefore, a broader selection of terms was chosen which resulted in a higher amount of results within the databases.
4.1.1 Process of article selection

For the purpose of the systematic literature review, searches are conducted in the database of Scopus as well as ISI Web of Science (previously known as Web of Knowledge) to identify relevant scientific literature (see Fig. 11). After the identification of the research questions, CHAPLIN et al. (2019) suggest to select relevant research articles by applying a Boolean search in the databases. A Boolean logic allows to define the search in a wider or reduced frame of results. This search types includes the use of specific operators such as AND, OR, NOT. The databases Scopus and Web of Science are based on Boolean logic, thus, allows the use of combined terms to include or exclude articles to intended results (SCHULER et al. 2009).

A simple search string was applied to receive a first impression of the availability of literature for the specific nexus of gender and Eco-DRR applying “disaster AND risk AND reduction AND ecosystem AND gender”. Only one result appeared in both selected databases.

The author suggested to broaden the search using various combinations of four main terms and their acronyms: ecosystems, hazards, disaster risk reduction and gender (a detailed table with applied terms can be found in Annex I). First, ecosystem-related terms (A) were selected, based on MUNROE et al. (2012) and BRINK et al. (2016) including mainly notions of ecosystem management. Hazard terms (B) were based on the classification of EM-DAT (2016), which encompasses tectonic, meteorological, hydrological and climatological hazards. DRR terms (C) were matched with the terminology of UNDRR (2017). Gender-related terms (D) were based on UNICEF Gender Equality Glossary of Terms and Concepts (UNICEF 2017). This selection created the foundation to develop three suitable search strings (see Annex II) that were applied in Scopus and Web of Science:

1. A + B + D
2. A + C + D
3. A + B + C + D

A first abstract review helped to exclude irrelevant paper which could further undergo an in-depth analysis. For a closer review, literature was chosen meeting the following criteria:

1. Is a natural hazard addressed in the research?
2. Does the paper examine a kind of ecosystem management in relation to disaster protection/mitigation?
3. Is gender mentioned (in any descriptive way)?

In addition, relevant articles were selected via a snowball system, which entails the review of the bibliography and additional work of relevant authors from the before examined literature. An in-depth analysis of the selected data identified the opportunities in Eco-DRR that are provided by
gender considerations. Furthermore, it was determined to what extent gender issues are applied to understand how the role of gender is discussed and used in the context of Eco-DRR.

Literature was not included into the analysis if the study focuses on climate change adaptation approaches or addressed man-made and technological hazards. Only articles in English language were considered due to language limitations. These limitations simultaneously represent critique points of the method and demonstrate the deficiencies of this systematic literature review.

Following the steps of CHAPLIN et al. (2019), a reduced search of grey literature was undertaken. Grey literature refers to publications outside of academic publishing and includes a number of different publications, e.g. government reports, policy statements or issue papers. These types of publications are mostly made by government bodies, private companies, activists or academic research students. It serves as a valuable source of recent research and are often much more available online. Because grey literature is not going through a peer-review process such as academic publications, it is relevant to ensure its quality accordingly by evaluating the source, references, date of references and authors. Useful tools to find grey literature are the Advanced Google search or Open Grey. These databases are covering most subject areas (UNIVERSITY OF WOLLONGONG AUSTRALIA 2019). Some databases, such as Web of Science, are listing conference papers and proceedings, additionally to peer-reviewed articles. The author decided to use Google Scholar to assure a limited coverage of grey literature.

As suggested by HADDAWAY et al. (2015) “that searches of article titles focus on the first 200 to 300 results.” (p. 1), which is why the number of results was confined based on an iterative process. Certain limitations of Google Scholar should be taken into account. The search functions are limited with max. 256 characters so specific key words have to be used, and a Boolean search is not possible. Moreover, these databases do not show all emerging results from the conducted search, but reduces the total amount of results to the first 1000.
Limitations of method

It is necessary to address at this point the limitations of the approach which the author chose for this research. The specific terms and refined search strings were chosen with the aim to cover as many articles as possible according to the three main inclusion criteria. There is a probability that relevant paper did not appear as a result of the searches due to the use of different terms. The search did not include all ecosystem habitats due to the time scope of the thesis and excluded the term ‘men’ which lead to a great number of misleading articles. Moreover, the author decided to focus only on three databases (Scopus, Web of Science, Google Scholar). As mentioned, Google Scholar is an open source which is why articles that are not openly available could not be included in the analysis even though the inclusion criteria could be met.

4.1.2 Analysis procedure

As a last step of the systematic literature review CHAPLIN et al. (2019) describes the in-depth analysis of the final articles. For this procedure, key findings should be identified and suitable categories determined. A set of 20 review categories was developed, modified from BRINK et al. (2016), which was applied on each article. Category development and coding were considered as reasonable methods to highlight qualitative data attributes (MAYRING 2000). These categories were
adjusted during the processes and support the interpretation of gathered qualitative data based on the research propositions. The utilized table with the review categories can be found in Annex III.

4.2 Expert interviews

In addition to the results from the systematic literature review, actors with an expertise in the field of Eco-DRR were interviewed. The aim was to receive an encompassing perception of the use of gender considerations in this specific field by gaining insights from practice on a policy and field level. It should provide support in order to identify the gap between literature and practice. This chapter provides a short overview about the chosen interview method, the selected interview partner, followed by describing the method of coding which serves as a basis for an in-depth analysis.

4.2.1 Semi-structured expert interviews – method and selection

As a method, a semi-structured interview was selected which served as a guiding tool during the interviews via Skype, phone or in person. In comparison to a fully structured interview, this method offers flexibility and openness to add follow-up questions based on the development of the interview and can be adjusted according to the interview partner. It creates the opportunity for the participant to express their story and emotions and provides guidance for the interviewer (GILL et al. 2008). The interview type seems suitable due to the different backgrounds of the selected interview partner which allows the interviewer more flexibility.

KALLIO et al. (2016) identified five main phases on semi-structured interviews that support the development of this interview guide. First, to create a conceptual foundation for the interviews, the phenomenon of the study needs to be analysed on the basis of former knowledge. This interview type allows the participant to share their perception and does not require a high level of awareness of the issue (KALLIO et al. 2016). In the case of this study, it is not required from the interview partner to have an expertise in gender issues. It is anticipated that such a starting position will offer a better perception of the topic’s relevance.

Second, the interviewer’s target is to acquire a comprehensive understanding of the subject matter through previous knowledge to develop a predetermined scheme (KALLIO et al. 2016). This knowledge is built upon the theory as well as the findings from the systematic literature review that served as a conceptual basis to develop adequate interview questions.

The formulation of the questions attempts to achieve the most possible amount of data and generate unique, in-depth answers from the participants. Preferably, the questions should be well-formulated, participant-oriented and open-ended. It can be distinguished between two types of
questions: main questions and supplementary questions. The first type addresses key issues of the research subject and should give the opportunity to the participant to speak about experiences and perceptions freely. Follow-up questions support the understanding of the main questions and can help to “maintain the flow of the interview” (Kallio et al. 2016, p. 2960). They can be pre-designed or spontaneously included during the interview.

For this thesis, the question guide was developed based on the preliminary research propositions and findings from the first methodology. Question guides for interviews with experts from the policy level and from the field can be found in Annex V. The interview guide was modified during the interviews and ad-hoc questions were asked according to the process of the interview. Most interviews followed a similar structure. Main questions were adjusted, depending on the working background of the participant (field-based or policy level).

The selection of relevant interview partners was based on the research propositions and the focus of the study (see table 2). Therefore, organizations that actively advocate Eco-DRR or demonstrate case studies from this field were mostly considered for interview contacts. In particular, the Partnership for Environment and Disaster Risk Reduction (PEDRR)¹ was used a basis for relevant actors. It is a partnership of several international organizations, NGOs and institutes targeting to strengthen cooperation, mainstream and scale-up the implementation of ecosystem-based approaches to reduce disaster and climate change impacts (Lo 2016). The Secretariat is supported by UNEP/Crisis Management Branch (CMB). Former UNEP colleagues from this branch were contacted for interviews. One colleague has relevant experience in policy advocacy of DRR, particularly CBDRR, and ecosystem management. Another colleague is working as a Senior Advisor in DRR and has more than 10 years of experience in Eco-DRR. Both approached contacts are affiliated with the PEDRR Secretariat and supporting advocacy work of the partnership. Additionally, a consultant at the CMB with expertise primarily in research, monitoring and analysis of ecosystem-based approaches and increasingly in trainings on DRR was contacted.

IUCN represents another important actor for the advocacy of Eco-DRR, where a Programme Manager for DRR programs and ecosystem management and a Programme Officer with expertise on nature-based solutions could be gained as participants for this study. A further PEDRR partner is the Ramsar Convention, an international convention that contributes to the protection and conservation of wetlands. A Senior Advisor that represents the focal point for Eco-DRR and

¹The author was associated with the PEDRR Secretariat, by conducting an internship at the organisation. Due to the integration in several projects at the CMB, the topic for this thesis evolved through the participation in the initial stage of the project on gender and Eco-DRR during the internship.
gender was available to provide insights from the Secretariats. These representatives were chosen to gain practical insights particularly from a policy level.

In order to receive insights about challenges and outcomes from field experiences, representatives from local offices were contacted. This included Wetlands International representatives from local offices in Indonesia and India. Therefore, a Programme Coordinator for Wetlands Restoration and Conservation and Project Manager with expertise in risk management and ecosystem approaches were available for interviews. A former Wetlands International employee, now working as an independent consultant, shared experiences from Eco-DRR projects from different sites as well as knowledge about local capacity building which is linked with nature conservation.

Two case studies were selected (see chapter 4.3), to contextualize the concepts of Eco-DRR and gender, which demonstrated the implementation of Eco-DRR measures in Afghanistan and Haiti by UNEP. That is why participants with field experiences from these two project sites were approached. It proved to be difficult to gain a number of people from these specific areas, which explains the choice of experts with experiences from other projects.

For Haiti, a former staff member from the UNEP Porto Prince office in Haiti was contacted as well as current colleagues at the Haiti office. Only one colleague was available for an interview, who participated in the project from 2013 to 2015 and can share over a decade of experience in ecosystem protection.

During the project implementation in Afghanistan, a Professor from the University in Kabul who is working partially as a consultant for UNEP, was contributing to the project activities and contacted for an interview. A recent evaluation of the past project was conducted by a colleague from the CMB at UNEP. After the mission in Afghanistan, an informal interview with the colleague was conducted with project outcomes from phase one. A report from memory was made right after the interview and verified afterwards by the interviewee.

Table 2: List of interviewed experts.

<table>
<thead>
<tr>
<th>Interviewee indication</th>
<th>Interviewee position</th>
<th>Expertise</th>
</tr>
</thead>
<tbody>
<tr>
<td>I1</td>
<td>UNEP Advisor</td>
<td>DRR and ecosystem management; CBDRR</td>
</tr>
<tr>
<td>I2</td>
<td>UNEP Senior Advisor</td>
<td>DRR; Eco-DRR</td>
</tr>
<tr>
<td>I3</td>
<td>UNEP Consultant</td>
<td>Ecosystem-based approaches analysis and research</td>
</tr>
<tr>
<td>I4</td>
<td>IUCN Programme Manager</td>
<td>DRR programmes and ecosystem management; gender focal point</td>
</tr>
<tr>
<td>I5</td>
<td>IUCN Programme Officer</td>
<td>NBS; global ecosystem management</td>
</tr>
</tbody>
</table>
As all requested interview partners are located abroad, interviews were mostly conducted via Skype or phone, besides three personal interviews with UNEP personnel. The use of Skype allowed the gathering of qualitative data, overcoming the barrier of geographical limitations of time and place. It also provided the opportunity to conduct interviews with video or audio. The latter option was mostly preferred by the interviewees, which allowed some interview partners to communicate more openly. Skype interviews served as a viable data collection tool, compared to face-to-face interactions. For a more comprehensive overview of benefits and drawbacks with Skype, phone calls and personal interviews see LO IACONO et al. (2016).

4.2.2 Experiences from the interview process
It was possible to reach twelve experts in total, from which six experts provided their perception from the policy level, however, most of them also could provide an integrated view from field experiences. Six more experts shared experiences from different projects sites, amongst others from the case studies.

The gender ratio was balanced between six women and six men. Besides some technical interruptions during a few interviews, due to weak internet connection, no further problems are noted. All interview partners seemed open towards the critical topic of gender and even provided honest, personal concerns to raise the awareness of gender issues. Some strong opinions were introduced to the discussion during the interviews that demonstrated an emotional and personal
link to this topic. A few participants expressed their opinions to this topic carefully, explaining it due to limited expertise and background in gender issues. It shows that the sensitivity of this topic is acknowledged, with an existing personal initiative to discuss the nexus.

4.2.3 Coding and method of analysis

After the interviews were conducted, full transcripts for all interviews were written. The transcripts were written word by word, supported by the software amberScript that transcribes audio data in written form. All transcripts had to be checked by the interviewer to correct misspellings and unidentified parts due to accents of several interviewees. Minor grammatical errors, word repetitions and fillers were adjusted to enhance the reading flow. All transcribed interviews can be found in Annex VIII.

For an in-depth analysis of the interviews, the transcript material was coded using the coding software MaxQDA. According the stage-by-stage process by BURNARD (1991) for the analysis of qualitative interview data, notes were taken during and after the interview to generate general themes and major categories. Reading again through the interview transcripts, a first draft coding system was developed, listing seven coding categories that cover the major themes of the interviews. Each category is divided into subcategories (see Annex VI). Using MaxQDA, a programme for qualitative data analysis, relevant passages within the transcripts were assigned to one category. Coding examples are added in Annex VII. These codings are used as a central component for the discussion comparing findings from literature and practice. Furthermore, relevant insights should be provided for the analysis of the case studies.

Limitations of methodology

It proved to be difficult to approach experts that worked specifically on the selected case studies or are still engaged in the project site. Findings regarding the case studies will be limited to the experiences of available experts and the project reports from UNEP.

Semi-structured interviews provided openness to the interviewee, which is why a different development of the interviews were expected. Responses to certain questions can proceed differently, which might lead to different foci of the discussion and result in a deficiency of information.

4.3 Case study comparison

Two case studies were selected that demonstrate applied Eco-DRR interventions, thus, the concept of gender could be set in these specific contexts for a better understanding of the linkages between the three components of gender, environmental management and DRR.
For this purpose, two Eco-DRR projects conducted by UNEP have been chosen. UNEP implemented, from 2013 to 2016, pilot projects of ecosystem-based approaches in four countries that represent distinctive ecosystem zones and are located in highly vulnerable settings – Afghanistan, Sudan, Haiti and Democratic Republic of Congo (UNEP 2016a). In this thesis, the examples of Haiti and Afghanistan demonstrate the opportunities and barriers of gender considerations in specific Eco-DRR projects. The findings from the literature review and expert interviews entered the case study comparison and visualized the use of gender considerations in the past by integrating developed guiding questions.

A case study describes a thorough examination of e.g. an implementation process that has been undertaken over time. “Comparative case studies involve the analysis and synthesis of the similarities, differences and patterns across two or more cases that share a common focus or goal.” (GOODRICK 2014, p. 1). The main target of the selected cases studies is the implementation of Eco-DRR projects, such as the promotion of this intervention as a DRR strategy. Both case studies belong to the first phase of pilot projects to scale-up Eco-DRR. Haiti and Afghanistan present two different ecosystem zones with differing cultural backgrounds, which demonstrate different approaches for gender issues within these countries, underlining the context-specific character of gender. Four criteria were chosen to compare and evaluate specific conditions at the project sites and the procedure of the projects: determinants of vulnerability; implemented project components; integrated gender lens; project outcomes and impacts. Interviews with experts from the selected sites and a document analysis of the UNEP project reports served as data collection methods. Several researchers describe case study methods as difficult to prove scientific thoroughness; however, this approach helps to simplify the understanding of a case for further use (BAŠKARADA 2014). On the basis of the results, an advanced understanding of the influence of an integrated gender component in Eco-DRR approaches should be achieved.

5 Compilation of results

For this thesis, a mixed method approach was applied which generated a large data set. Relevant findings to evaluate the proposed research questions are first described and assigned to each methodology. Thus, results from the literature and practice can be adequately compared, as well as from the selected case studies. At the end of each method section the main results are summarized in a box. It is followed by a section on the interpretation of the results and examination of the hypothesis (see chapter 6).
5.1 The identification of a trend in Eco-DRR literature

The systematic literature review in Scopus, Web of Science and Google Scholar resulted in a total amount of 41 documents that met the inclusion criteria for an in-depth evaluation (see list of documents in Annex IV). Suitable data was found from the year 2009, with an exception in 1976, noting a rising curve until 2013. After a slight decline of publications between 2014 and 2016, the highest number of relevant documents was recorded in the year 2017 (see Fig. 12). The search in Google Scholar ensured to cover a limited part of grey literate which revealed next to additional research papers, six book monographs, three book chapters, four reports and one policy brief.

Figure 12: Number of relevant documents from the systematic literature review in years. Credit: The author.

Within the most documents, gender tends to be equated with women by mentioning almost always women when mentioning the word gender. Women are often presented as a vulnerable group which is generally clustered with children and elderly. Some of the excluded studies addressed vulnerable groups to disasters and environmental degradation with no further division into gendered vulnerability. Most of the relevant studies try to understand and explain gendered vulnerabilities because of roles and responsibilities in their communities, as well as lack of access to natural, financial or informational resources (Kamble et al. 2013; Allendorf and Yang 2013). In the course of the years, participation of women in environmental management was recognized as an essential part and promoted women as stewards of the environment (Lo 2016; Sudmeier-Rieux et al. 2013), as well as their contribution in disaster risk reduction due to differing skills and knowledge (Tigg 2015). The terminology developed from a women-focused approach towards gender-balanced, recognizing vulnerabilities of both, men and women (Jupiter et al. 2014) towards differing perceptions of ES and motivation to adapt (Yang et al. 2018; Allendorf et al. 2017; Rojas et al. 2017). Furthermore, in the latest studies, women or men are not represented as a homogenous group anymore, the studies are highlighting the intersection of gender with other
factors of social inequality, such as ethnicity, age, income, education, occupation or race (GAO et al. 2018; ALLENDORF and YANG 2017; VIVITHKEYOONVONG and JOURDAIN 2017). In the selected literature gender inclusion was not determined in relation to one specific ecosystem approach. Most paper described watershed and coastal zone management which include mostly mangrove, wetlands and forest restoration. Overexploitation of natural resources as well as land degradation were determined as most significant threats to ecosystems.

5.1.1 Victims vs. agents of change
In general, a trend can be identified within the selected literature (see Fig. 13). Articles from the first years applied women-focused approaches where women were mostly represented as a homogenous group. A development occurred that addressed the issue of women as victims vs. women as agents of change, with an increasing recognition of women’s skills and knowledge for ecosystem conservation and sustainability (CHAVEZ-TAFUR and ZAGT 2014). Followed by repeated calls for women’s participation in interventions (YANG et al. 2018; JUPITER et al. 2014; RENAUD et al. 2013), knowledge by men and women is seen as a key mechanism for environmental awareness and management already in the beginning of the 2010s (ALLENDORF and YANG 2013). The selected studies progressively work out differing perceptions, risks and vulnerabilities of women and men to understand their needs and priorities towards ES. Additionally, the approach of intersectionality gains importance, emphasizing that gender is intersecting with various factors particularly age, income, occupation and education.

Figure 13: Identification of a trend within the selected literature from the in-depth analysis. Credit: The author.

Regarding the limited amount of studies that mention the term gender or synonyms, most ecosystem-based DRR literature could be designated as gender-blind. However, this statement has to be interpreted with caution. There is a probability that not all relevant documents were identified with the selected methodology, so this assumption is based on the given findings.

This literature review determined 32 studies that address and identify gender roles and relations and can be defined therefore as gender-sensitive approaches (e.g. ROJAS et al. 2017; BOISSIÈRE et al. 2013; GUPTA and NAIR 2012). A tendency towards gender-responsiveness can be observed. It involves the response to the discovered roles and relations in an accommodating or transformative way. Nine studies can be classified into the category of responsiveness. An increasing call for more
inclusiveness is noticeable, however, first attempts to apply this approach are barely existing. Inclusion and empowerment were primarily mentioned in relation with community approaches.

5.1.2 Identification of main components for gender-responsive action

Based on the theoretical part of this thesis and the findings of the systematic literature review, six main components were identified that shape the experiences and interests, thus determines the engagement of people. They serve as guiding elements that support the application of gender-responsive approaches in Eco-DRR which will be exemplified in the case studies (chapter 5.3). It is important to emphasize that these elements should not be seen separately from each other and the boundaries are not strict (see Fig. 14).

A main determinant that largely influences gendered vulnerability is summarized under roles and responsibilities. It is mostly generated by social structures, traditions and cultures that determine obligations of men and women. As presented in DRR, the defined structures can cause tremendous harm to certain groups that are more vulnerable to hazards. The example of the Indian ocean tsunami shows this issue, where the mortality number of women was four times higher than that of men due to their roles as caretaker which kept most women inside the houses when the wave hit the coast (SEAGER 2014).

Lack of access to and rights over resources limits the opportunities to manage and maintain land properly, to invest in preparation measures or to receive relevant information for preparedness. The latter describes the restricted transfer of knowledge to certain groups due to limited access to education facilities. People are educated differently about impacts of disaster and adaptation options, which can result in different capacities to respond to hazardous situations as well as different attitudes and values of the environment (ALLENDORF and ALLENDORF 2013). The component knowledge refers also to different experiences of men and women in their local environment due to socially determined roles. Studies often described women’s responsibilities linked to tasks in natural resources management, and recognized their strong awareness about changes in the environment (PURI 2014). Moreover, differing roles determine needs and priorities of groups. YANG et al. (2018) highlighted that women prioritize provisioning ES such as freshwater and timber, which could be linked to their chores to fetch water and collect fire wood.

Overall, these differing aspects create unequal vulnerabilities among men and women and result in different exposure to risks. Therefore, it is important to highlight the element of vulnerabilities and risk, which should be considered and approached in gender-responsive actions.

An increased call for participation of women and the equal engagement of both genders was identified in order to empower vulnerable groups and enhance their opportunities to reduce their risks. Past movements led by female activists resulted in enhanced awareness of environmental
changes and improved ecosystem restoration (see chapter 3.3). Equal participation options for men and women in projects ensure the considerations of different environmental knowledge, perception and needs. Gender disaggregated data were stated as necessary to develop comprehensive strategies and understand how men and women benefit from ecosystems (FORTNAM et al. 2019).

Figure 14: Correlations between main elements for gender-responsive action. Credit: The author.

- 41studies identified in time range 2009-2019 that addresses notion of gender in nexus of DRR and environmental management
- Trend from victimization of women to including women as agents of change, to inclusion of gender
- Intersectional approach increasingly applied in vulnerability analysis
- Most paper are gender-blind, a few selected studies can be determined as gender-sensitive, particular examples show gender-responsive action
- Identification of six main elements that shape coping capacity of people

Box 1: Main findings from systematic literature review.

5.2 Expert perspectives on the ground and at policy level

Interviews with experts from the policy level as well as from the field, enabled a comprehensive picture from an application-oriented view on how gender issues are perceived and incorporated within ecosystem-based approaches. The first section illustrates the relevance of both perspectives – policy and research - based on statements from experts so that an encompassing conception can be enabled.
The gathered qualitative data was categorized in several groups aligned with the research questions. Firstly, results are summarized according to those that provide a picture about the perception of gender and noticeable changes over the years. This is followed by the application of examples of gender integration, highlighting emerging limitations during interventions and major barriers that impede the integration of gender considerations. Finally, results about lessons learned from past experiences are revealed in the last block of this section and provide recommendations from practitioners on how to better implement gender issues in ecosystem-based approaches. The acronyms that were used to cite the interview statements are listed in table 2.

### 5.2.1 The causality of research and policy

Practitioners from policy and grassroots level were asked about the importance of research in policy to promote gender issues in ecosystem-based interventions. It became evident that these two perspectives are strongly connected. Practitioners from policy level rely on evidence to promote gender aspects and develop guidelines.

“You do need the topic to enter into the policy arena and enter the political agenda for you to create the enabling environments from a policy and programmatic point of view. […] which is why the research is so important, because the documentation, the evidence base and the research helps shape those policy discussions. Then it will start to promote more and more these types of practices.” (I1, line 100-105)

The quote emphasizes the interconnection of research and documents to provide a basis for policy makers. Originating from a policy level, this perspective might be suitable. From an NGO side, it is important to conduct projects and focus on practice, taking gender issues into account. Expert interviews indicated that the application on the ground does not reflect the amount of documentation and research in the field of Eco-DRR. Therefore, the chosen methodology of literature analysis and interviews with practitioners was necessary to receive a comprehensive picture of application.

Figure 15: Recurring sequence of practice and research. Credit: The author.

Figure 15 reflects the statements about returning gender discussions over the years. Interviewee I9 mentioned that a gender lens was applied several times over the past decades. Currently, a strong focus on gender is recognized in the field of DRR and climate change (I3, I12).
5.2.2 Perception of gender in Eco-DRR

All interview partners defined women as one of the most vulnerable groups in regard to disaster and environmental degradation. Therefore, women’s inclusion in Eco-DRR interventions was recognized as crucial in order to identify the needs of marginalized groups. The majority of the interviewed experts understood women’s capacity to manage the environment in that, “[women] are a key part of the puzzle.” (I2, line 121). This comment attaches a great importance to the role of women, which was generally confirmed by experts from both the policy level and from the field. While some participants focused on the position of women and the increasing integration of women groups, three experts alluded not to talk only about women and even expanded the notion: “If we talk about gender, for us it is obvious but not for everybody. It is not only about women and men; it is about all type of gender.” (I5, line 11-12). This comment demonstrates the tendency to focus on women in many interventions, giving a reminder to not forget about concerns for men and other gender identities. “[…] [T]he two perceptions [by men and by women] are actually very complementary.” (I12, line 160), which shows that it is inevitable to neglect either one or the other perspective for a comprehensive gender analysis and vulnerability assessment.

In general, a unanimous comprehension among the interviewees existed that gender should be an integrated part in community-based approaches to avoid a homogenization of communities. In this case, contextualization is important to show that gender issues differ geographically and need to be approached site Specifically, as emphasized by interviewee I12. This is why it is not possible to apply a ‘one-solution-fits-all’ approach (I6, line 53), especially because of interrelating factors with gender that differs significantly in every area. Three interviewees mentioned that gender should not be seen in isolation and intersect with other factors such as age, culture, ethnicity, etc. (I4, I2, I5).

“Because in many developing countries, there are cast systems, different social structure of the society, where maybe a rich woman might have more decision-making power than poor and similarly a higher cost than men.” (I4, line 116-119)

The intersectionality of diverse social inequalities demonstrates the complexity of gender mainstreaming, which was described as a difficult process by interviewee I9. Gender mainstreaming was identified as a returning phenomenon in the field of DRR. Practitioners experienced a coming and going of gender discussions over the last decades, resulting in insufficient applications that had to be renewed. Interviewee I12 refers to the recent time as “[...] a big momentum on gender. More now than before. Gender markers and gender mainstreaming is more and more important in our work […]” (I12, line 79). It can be inferred from this quote that gender has received again a relevant position in the political agenda. Interviewee I1 promotes this time as suitable to integrate gender considerations adequately in Eco-DRR referring to the availability of
policies such as the SDGs and the SFDRR. Their political agendas require approaches to maintain the environment and promote gender equality, providing a substantial foundation to build on.

“Now no one’s questioning [why we are looking at gender] anymore. The next question is how to do it.” (I1, line 352).

This quote refers to an improved understanding of the gender component by different stakeholders and outlines a solid basis for concrete actions to build on. However, the second part of the quote indicates the need of means and techniques to explain an appropriate integration of gender considerations in various interventions.

5.2.3 Application of gender considerations in ecosystem-based approaches

Experts from the field shared past experiences of successfully integrated gender considerations within their approaches. One noticeable example was mentioned by participants that were representing Wetlands International. The organization developed in the 1990s the ‘bio-rights-approach’, “which is the mechanism through microcredit that will link together restoration and livelihood approach.” (I7, line 89). Community members, in particular women groups, receive a loan to establish their own livelihood activities. In return, they are required to engage in ecosystem restoration activities, such as mangrove plantation. After a few years, the organization visits the sites and evaluates the sustainability of the project. A successful continuation of the activities ensures the loan without reimbursement. Representatives from the organization (I7, I8, I9) stated positive outcomes with this approach and exemplified these projects as a good concept to integrate gender considerations in ecosystem-based interventions. These loans are increasingly given to women groups to ensure their empowerment in the community and a stronger participation in DRR activities. Also, representatives from IUCN shared similar experiences from projects that empowered women to engage in alternative livelihood activities and noticed a successful continuation of the programme even after the end of the project. The reason to provide specifically women groups with loans in these projects is because women were identified as the most vulnerable group in these communities. Specifically in the mountain areas, women were assessed as very vulnerable to the given conditions, thus, addressed as a group that needed to be particularly integrated in the environmental intervention (I5).

On a policy level, most organizations adopted a gender policy or action plan that requires all staff members to attend trainings and workshops that address gender issues. With these actions, the organizations try to apply internally a gender lens to staff members and raise the awareness of gender-based violence (I6, I9, I4). Conventions, such as the Ramsar Convention on Wetlands, released a resolution (XIII.18) on wetlands and gender, encouraging all contracting parties to e.g. consider the role of women, facilitate balanced participation and provide sex-disaggregated data.
within their national reports. At this point it is not apparent which information will be provided by the parties and how successful the implementation is going to be (I6).

Given examples also show that most of the practitioners have a positive perception with women in leadership positions and with increased power in natural resources management. Women’s leading role was explained by experts due to the strong relation of women’s activities in their study areas with the local ecosystems. Daily chores develop organisational skills (I9) and a sense of keenness (I7) that were determined as helpful in the maintenance of ecosystems and implementation of Eco-DRR activities. Women were specifically addressed in some interventions due to their vulnerable position in society or their acquired skills that were assessed as useful for the project. These projects were defined as gender-responsive.

The identification of gender issues within communities was stated as necessary in the beginning of an intervention. The interview findings demonstrate that the consideration of both genders is intended, mostly defined under the concept of community-approaches. Gender seems to appear as a crucial component within these approaches, which is why strong statements about the non-negotiable character of gender issues in the work with communities and livelihoods were made (I4, I5, I9).

On the basis of these findings, it will be examined in the discussion (chapter 6.2) which opportunities emerge by considering gender.

5.2.4 Limitations in the integration of the gender component

An increasing importance of gender considerations could be noted from the interviews; however, a number of barriers were mentioned that impede the process of gender mainstreaming in Eco-DRR, which are distinguished between bottom-up and top-down.

During several projects, practitioners recognized that time constraints from local community members, in particular women, prevented their participation in project activities such as consultations and workshops. It was observed that women focused on their daily tasks and showed a limited willingness to participate in Eco-DRR activities. Practitioners interpreted this reaction with the fear to be overloaded with work. Male outmigration was pointed out as a common phenomenon in rural areas that creates additional burden for women by taking over tasks from absent male community members (I2, I4). Therefore, it was stated as necessary to find roles within the conservation projects demonstrating benefits for local communities and combine these assignments with their everyday life. Illiteracy was mentioned as another barrier that emerged in several projects in India, Indonesia or Afghanistan. Particularly, the illiteracy rate among women is noticeably high which makes the involvement in planning processes difficult (I5, I11). Cultural and social structures were mentioned by more than half of the interviewees as a significant barrier.
These structures determine the role of men and women in the society, and the opportunity to raise their opinion and act openly.

From the stakeholders and practitioners’ side, several interviewees explained the use of gender considerations as a requirement to receive funding for the projects, which mostly result in applying only quantitative measures to achieve gender balance within the participants. Practitioners elucidated this consequence from a lack of understanding about the appropriate implementation of gender considerations, whereby gender remains as a ‘tick-mark-exercise’. Interviewee I4 explains that as long as gender issues are not a part of everyone’s belief system, gender will not be sufficiently implemented. The notion of behaviour plays a crucial part in attributing values to each component. “[…] it remains like a sprinkling of gender into progress report and planning and all that needs to go beyond.” (I4, line 213). More participants shared this opinion emphasizing the low prioritization of gender issues within existing programmes and projects calling for more awareness. Critique was raised towards the working structures of organizations, outlining the so-called silo-approach: “[…] there is a lot of Eco-DRR activities or there’s gender activities but they’re not being connected.” (I1, line 232). The quote describes the necessity to support an exchange between the different fields, communicating in a common language to increase the understanding how the separate components can benefit from each other. Realising this action could counteract the lack of adequate tools to approach gender in Eco-DRR, which was raised as another fundamental issue (I12). The author gained the impression that an exchange about knowledge, experiences and needs between the already the interviewed experts would provide effective solutions to several listed barriers.

### 5.2.5 Lessons learned and recommendations

The list of barriers provides an important base to develop improvements and solutions. In particular, experts from the field shared a number of recommendations from past interventions which will be summarized at the end of this subchapter.

“The lesson we learnt is that if we involve the community, all members, that's very beneficial for the future of the work in the community. Because the community will feel that this project belongs to all the community members, not the specific people. They will support that.” (I11, line 121-124)

Interviewee I11 experienced that only if all members of the community are equally addressed and feel an equal integration to the project, the communities’ support can be ensured. A common understanding of the projects objectives and processes has to be given. In this manner, transparency is provided and trust can be built. Furthermore, the development of a sufficient communication strategy was raised as a crucial point, which can differ between study areas due to culture, customs and religion. Therefore, a certain degree of sensitivity is required as highlighted
by Interviewee I8 and I9 in handling the issue of gender to avoid major obstacles for the project proceeding.

All interviewees raised the importance to insert gender as a crucial component in ecosystem-based interventions. It was suggested to incorporate women and men in every stage of the project cycle, which assumes a more effective identification of issues and opportunities.

At each stage, from the stakeholder analysis, from the design of the project to see what would be the benefits. (I12, line 186-187)

[…] there should be consultations with women and men about gender aspects before we even start a program. Before we start writing it. The question is 'how you actually do that'. (I2, line 96)

It is evident that all practitioners would appreciate a stronger advocacy for gender, which is not provided in a sufficient degree at this point. Therefore, a number of recommendations were shared and open questions were raised, which stimulated open discussions about how gender considerations could be better implemented in Eco-DRR. Some interviewees evaluated their past interventions reflecting an insufficient integration of women and the gender component in their interventions (I1, I9, I11). These thoughts induced further questions and advice for future interventions, which are summarized here:

In institutional structures:

- Invest and train people/staff at personal level, providing sensitization for gender issues
- Contextualize trainings; need of trainers with on-the-ground experiences
- Provide regular and consistently updated trainings
- Support exchange about experiences and activities between organisations, institutions, NGOs from the field in environmental management, disaster risk reduction and gender
- Identify existing tools and gender analyses, to avoid extra work on the development of new tools and guidelines

On the ground:

- Include the gender component in every stage of the project cycle
- Provide transparent approach for all community members
- Develop communication strategy that addresses different categories of people (women, men, youth, indigenous, etc.) equally
- Identify daily chores/responsibilities of community members to adjust consultations, workshops and trainings and enable participation
- Understand cultural and social structures to avoid exclusion of particular community members
Comparison of two projects

To visualize the concept of gender-responsive approaches in Eco-DRR, the projects in Haiti and Afghanistan will serve as a case study to point out the context-specific application of gender issues. Four criteria have been chosen for a comparison of the projects (see chapter 4.3) and these findings are outlined in the following chapter. Brief country descriptions in regard to the project as well as a comparison table are summarized in Annex VII.

Based on the results from the systematic literature review, six main components for gender-responsive action were identified (see chapter 5.1.2). Derived from these components the author generated guiding questions which support the application of a gender lens in the planning, implementation and monitoring process of projects. Exemplified by the case studies of Haiti and Afghanistan, these guiding questions are applied in box 3 to showcase the value of gender considerations in Eco-DRR intervention.

Root causes and determinants of vulnerability

The determination of root causes represents the risks that the communities are facing in the selected areas. It is a first analysis to identify the challenges the project is confronting. Both countries, Haiti and Afghanistan, show a high level of poverty that is influencing the stability of the local state which is reflected in fragile institutions and decades of conflicts. These are determined to be root causes that are shaping people’s vulnerability to disaster risk. Both countries show rapid and unplanned urbanization and unregulated exploitation of land resources, which results in severe environmental degradation. Due to the countries’ mountainous topography, the

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Box 2: Main findings from interviews.

- Research and policy depend on outcomes from both sides and have to go hand in hand
- Women-focused approaches to support empowerment
- Current momentum on gender promotes gender issues in DRR and environmental management
- Integration of women groups in projects results in accomplished ecosystem restoration and livelihood improvement
- Lack of understanding about notion of gender and its application neglects gender component leading to tick-mark-exercises
- Limited access to resources and education limits power in decision-making processes, resulting in unequal contribution of men and women
- Inclusion of gender considerations in every part of the project cycle proposed as
local population is exposed to natural hazards such as avalanches, landslides and flash floods. Haiti is located on an island in the Caribbean Sea and experiences regularly severe impacts of tropical storms; Afghanistan’s history shows a number of extreme drought events.

**Implemented project components to reduce disaster risk**

A closer look at the project components illustrates the measures taken to address the above-mentioned risks. In both project sites practical field interventions were undertaken, including community tree nurseries and replanting activities to stabilize stream banks and degraded slopes. Due to Haiti’s topography, a ridge-to-reef approach was applied which implies activities in mountainous areas along the river as well as at the coast. Therefore, coastal vegetation (mangroves, vetiver grass) was planted to create a natural buffer against storm surges and coastal flooding. A main livelihood option was identified and used for further interventions. It refers to the plantation of vetiver grass, that can be used for the stabilization of soil due to its deep roots. The unsustainable farming and harvest of vetiver to this point induced environmental degradation in these areas.

“If you harvest that crop, you make the soil very vulnerable to soil erosion, because you have to take the roots. So, you increase soil erosion, flash flooding and at the end of the day, sedimentation to the sea. That was one of the reasons why we focused on that.” (I12, line 65-68)

Additionally, sustainable fisheries were targeted to build local resilience to disasters by collaborating with the fisher’s cooperative.

Tree nurseries in Afghanistan provided alternative livelihood sources for the community and strengthened economic development through the sale of tree by-products.

“[…] community mostly bring bushes from the mountain for cooking and heating up. If we plant the trees then there is not too much need for them to go to the high mountain, the long way.” (I11, line 70-1).

This statement indicates the reduction of risk with local tree planting that also prevents further encroachment, which is an intensified process through community activities.

The development and improvement of local and national capacities for the implementation of Eco-DRR reveal another main component of both projects. Communities were encouraged to identify land use changes as well as in natural resources practices by comparing existing conditions with past circumstances. This perspective should help to determine disaster risks and driving factors of change. At national level, the aim was to bring actors from national and provincial governments together, strengthen collaborations and promote the concept of Eco-DRR so that after the end of the project, governments can provide trainings to the communities.
Project outcomes and impacts

This section outlines the environmental and social impacts of the project to identify its progress and accomplishment. Field intervention such as the re-vegetation of vetiver and replantation of trees on river banks and slopes resulted in the stabilization of soil, thus reducing probability of landslides at both sites. Moreover, a diversification of livelihood options developed through the establishment of nursery activities, which contributed to increased community resilience. The establishment of a market for vendors in the Haiti project enhanced their economic situations by providing an adequate place to sell their products and increased their competitive position (I12). Through the integrated marine protected area management and strengthening of the fishers’ cooperative, sustainable fishing practices were developed, which has a further influence on fish vendors and thus affects the whole livelihood chain of the community. Local awareness was raised about sustainable and integrated planning and helped municipal governments to develop further awareness and conduct community campaigns.

In Afghanistan, it was noticed that the concept of Eco-DRR was applied in the political agenda, which led to further implementation of Eco-DRR projects in other areas in the country (I11). Cooperation with humanitarians, CC and DRR actors as well as collaborations between governmental institutions and NGOs has been strengthened. One reason for this development was highlighted by interviewee I11: “The success of the project is that the communication strategy was very important at the first time in the beginning, and secondly during the conducting of the project with the local government and also community” […]. (I11, line 25-28). This quote emphasizes the need of appropriate communication strategies to engage with various stakeholders and ensure transparent working processes.

Integrated gender lens

In regard to the focus of this study, this section highlights project actions that took gender into account and shows how far gender considerations were addressed in the past interventions and what influence these considerations had on the implementation of the project. Practitioners that were involved in the Haiti project agreed that the main objective was the promotion of Eco-DRR activities for disaster risk reduction. The strong dependency on natural resources due to limited livelihood activities shows the necessity to maintain a healthy ecosystem. Gender was not a major component in this first phase. The awareness of gender issues was apparent but not intentionally implemented (I1, I12). Women’s and men’s activities are assigned by the community. Therefore, women are mostly responsible for subsistence farming and are attributed to the role of vendors.
The main income source for men is fishing. Both activities are linked, thus project meetings were mostly documented as gender balanced (I12).

The head of the vetiver cooperative was a woman; however, the cooperative was mainly led by members with access to land, which are mostly men. Therefore, women have limited power to engage in such cooperatives. In this project it was not intended to transform land ownership:

“For the scope of the project it was ok. Women were integrated, they were in managing roles, focal point roles, in charge of nurseries and so on.” (I12, line 152-153)

In Afghanistan, most land is private and tenure rights are strict. Within the project, arrangement with land owners were established so that their land could be used for tree nurseries. In return, a certain amount of the income had to be shared with the land owner. This example shows an action to enable marginalized groups to access land and resources.

The main goal of the project in Afghanistan was to promote Eco-DRR approaches in this area as a community-based concept. The gender component was not directly approached as presented in the following statements:

“In the document there was not a bullet. Gender should be involved. But in the whole program, it was a big component of that. Because when we write local community, in the local community gender was involved.” (I11, line 179-181)

The roles of men and women are determined by social structures, such as patriarchal systems that are existing in Haiti and Afghanistan. Women are mostly caretakers and responsible for domestic chores and assigned to nursery activities. Men’s role is mostly related to physical work and decision-making. Even though a gender balance in consultation meetings was aimed, it was mostly men who attended these meetings. High female illiteracy in the country was presented as an additional challenge.

Both projects demonstrate first attempts to address gender issues in the communities. However, gender was not seen as a main component in this first phase of Eco-DRR projects. It became apparent that community-based approaches require a differentiation of gender. Some gender issues were approached, so that a certain degree of gender awareness can be determined; however, it was not a specifically addressed concern. Several experts emphasized the importance of gender elements within the projects and called for a stronger focus.

A proposal on how gender considerations can be integrated into future projects is presented in the following box on the case studies Haiti and Afghanistan. For this purpose, the elements for gender-responsive action from chapter 5.1.2 were used to create guiding questions to simplify an integration of the gender component.
<table>
<thead>
<tr>
<th>Element</th>
<th>Guiding question</th>
<th>Suggested actions</th>
<th>Case study (Haiti / Afghanistan)</th>
</tr>
</thead>
</table>
| Roles & Responsibilities | What are the **roles** of men and women in the community?  
What are the cultural and social structures? | - Send facilitator to community to assess distribution of roles between community members & social, cultural structures (customs, caste system, etc.)  
- Consult with local councils/representatives of community  
- Identify gendered division of labour | Haiti:  
Roles are tied to traditional structures; strong patriarchal structure;  
Women are mostly vendors and subsistence farmers, men are fishers;  
Leader of vetiver cooperative was a woman  
Afghanistan:  
Strong patriarchal structure;  
Women are caretaker and primarily responsible for householding activities;  
Women have essential role in farming activities such as planting, weeding and livestock keeping, men are in charge of demanding physical activities e.g. tree planting;  
Power position mostly held by men - local councils comprise one woman which is elected by the community |
| Vulnerabilities & Risks          | What are the **risks** they are facing?                                          | - Identify most vulnerable groups and root causes  
- Gather disaggregated data in gender, age, income, etc.  
- Create exposure map, engaging locals and remote sensing data/satellite data, assessing level of degradation | Haiti:  
Coastal erosion, decrease in fish stock, decreasing income for fishers – respectively for vendors;  
Unsustainable farming practices (e.g. vetiver grass) intensify environmental degradation, thus frequency of landslides  
Afghanistan:  
Women are tied to specific locations and depend on local resources;  
Daily chores (e.g. fetching water in mountain sites) makes women vulnerable to hazards;  
High female illiteracy rate (ca. 70%) results from limited access for formal education;  
Building behaviour of houses in higher levels of the slope increasing people’s exposure to landslides and avalanches |
| Knowledge & Skills | What **knowledge and skills** are helpful and can be provided from community members? | - Receive understanding about people’s awareness to sustainability and environment  
- Awareness-raising among community members about the important role of women in natural resource management and DRR | Haiti:  
Fishermen can provide information on the status of coastal degradation and marine life;  
Women are taught about sustainable plantation and harvest practices;  
Afghanistan:  
Women have good awareness of local environment due to daily chores (firewood collection, fetching water); helpful to determine hazards |
<table>
<thead>
<tr>
<th>Needs &amp; Prioritize</th>
<th>What activities are needed?</th>
<th>Haiti: Women have burden of several tasks from caretaking to selling of farming and fishing products; Vetiver cooperative was established to strengthen the economic resilience and ensure equal participation in the market; Tree nurseries were almost only managed by men</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>How can men and women <strong>contribute</strong> to ecosystems?</td>
<td><strong>Afghanistan:</strong> Women were engaged in nurseries and awareness raising activities; priorities in household chores led to time constraints</td>
</tr>
<tr>
<td>Participation &amp; Grassroots</td>
<td>Which <strong>communication</strong> strategy should be applied to promote <strong>equal participation</strong>?</td>
<td><strong>Haiti:</strong> Consultations were conducted with both men and women in separate focus groups <strong>Afghanistan:</strong> During project: strong communication between governments, NGOs &amp; communities, collaboration was strengthened &amp; trusting environment created; Communication with local council which are representative for the local community; Communication with donors &amp; stakeholder after project not sufficient to document about project progress and impacts</td>
</tr>
<tr>
<td>Access &amp; Rights</td>
<td>How can activities be implemented so that community members will be <strong>empowered</strong>? What accesses and rights are needed?</td>
<td><strong>Haiti:</strong> To attend the vetiver cooperative, the member has to provide access to land; People without access to farming land are limited in power and decision-making processes – tenure rights are mostly assigned to men <strong>Afghanistan:</strong> Most land is private property - established arrangements with land owner to use the land for tree nurseries by dividing the profit of the nurseries with owner and nursery user</td>
</tr>
</tbody>
</table>

Box 3: Application of gender-responsive elements on case studies. Credit: The author.
6 Scrutinizing gender and Eco-DRR in theory and practice

This chapter discusses the outlined results from the systematic literature review as well as from the interviews and case studies, bringing it in line with the theoretical foundations from chapter one to three, especially the FPE theory. The discussion chapter is structured in the three proposed research questions, which provided guidance throughout the research study.

6.1 Addressing gender considerations in Eco-DRR - victims vs. agents of change

The results from the literature analysis and expert interviews made clear that gender is still often associated with women. YANG et al. (2018) criticized this point, saying that gender research concentrates strongly on women as opposed to include also men, which was identified in literature around 2010 as well as during some discussions with experts. Subsequent literature and the majority of expert interviews mentioned several facets of women in relation to DRR and environment. On the one hand, the perspective of women as victims was predominantly validated, which shows a common understanding that disasters are not gender neutral. The identification of the marginalized group resulted in focused attention on interventions and establishment of specific activities to increase their resilience. On the other hand, women are attributed to having a good awareness of sustainable resources management (PURI 2014) which again was confirmed by numerous experts with a positive influence on the implementation and progress of Eco-DRR approaches. Women were stated as being active agents of change, which can also imply an active mismanagement of local resources and intensify environmental degradation (KELEMEN et al. 2016). This effect was analysed in the case studies in Haiti and Afghanistan where women contributed to slope degradation due to unsustainable harvest of vetiver grass and bushes. It should be taken into account that active agents can contribute positively but also negatively to environmental management. The theory of FPE underlines women’s role as active agents by addressing women’s experiences and responsibilities with their close connection to the environment, which is particularly stated by ecofeminism (see chapter 3.1).

A misinterpretation of feminist theories by practitioners might be a reason why the focus is still very reduced to women. The idea of the FPE theory was to criticize the homogenous picture of gender, emphasizing women’s capacity to respond to disasters and actively engage in environmental management. Nevertheless, it should be taken into account that the perspective of men seems to be neglected in most identified studies. But only a sufficient understanding of both sides results in a complementary approach. In regards to this point, it should be noted that this thesis mostly addressed gender as a binary approach. The two-gender framework in disaster management was criticized by GAILLARD et al. (2017) and points out the missing understanding of challenges of
other gender identities, such as transgender or non-binary persons, in disaster situations. It leads to the tendency to almost exclusively distinguish individuals between women or men and neglect the whole spectrum of society, which opens a new discussion for future research. This argument was supported by three expert statements that identified a slow progress to break the binary perspective and the comprehension of specific knowledge of local settings and diversity.

Expert interviews also indicated that the use of the term gender is still not consistent and clear. Due to the deficiency of a comprehensive understanding of the gender component, particularly in its inclusion in interventions, gender considerations are not yet incorporated consistently in ecosystem-based activities as presented in the small number of identified studies. These few describe a gender-sensitive perspective, which mostly determine factors that generate gender issues. Transformative actions were barely mentioned, which also showed in the Haiti case study that primarily social structures were determined but the project did not intend to change gender dynamics to for example change tenure rights. Again, it can be explained that an insufficient understanding of gender issues, due to its sensitive and dynamic character, leads to insecurities and cautious way of acting. This obstacle should be overcome and promote gender-responsive actions to ensure opportunities for both men and women in participatory approaches.

Discrepancies were recognized in literature and statements from experts. Whereas documented research of the systematic literature review presented intersections of gender with other factors (GAO et al. 2018; ALLENDORF and YANG 2017), the concept of intersectionality was not indicated by most interviewees by describing women rather as a homogenous group. It underlines the complexity of a vulnerability analysis and suspects a lack of intersectional approaches in practice. LOVELL and LE MASSON (2014) describes the concept of intersectionality as not sufficiently integrated and low prioritized which might explain the modest reflection of other intersecting factors during the interviews. The gender component contributes to an improved vulnerability analysis, nonetheless the integration of further factors is essential. Gender is intersecting with various elements that distinguish vulnerability also among the group of women or men. The concept of intersectionality is an integral part in a comprehensive vulnerability assessment, its importance needs to raise at the same time as gender approaches.

A few applications that were shared during the interviews showed that empowerment of women can lead to enhanced ecosystem restoration and improvement of livelihoods. These results support the FPE theory which describes that access to land and resources is essential to secure livelihoods and economic development. The active engagement of women in Eco-DRR activities proved to be an asset for the success of the project which is increasingly implied in ecosystem-based interventions. Several interviewees’ statements highlighted characteristics of women that supported
the implementation of environmental management practices. Women’s organized and nuanced approach could be explained through the triple role of women (reproductive, productive, and community managing). The FPE describes this function as a development of women’s ability to deal with complex systems.

Overall, the data contributes to a clearer understanding of the integration of gender consideration in Eco-DRR interventions. It became apparent that gender is mostly associated with women, which explains the focus on women groups in ecosystem-based projects. The understanding about their vulnerable position is increasing and is being taken into consideration in analyses. WASTL-WALTER (2010) recognized the increasing understanding to include gender-sensitive perspectives into vulnerability analysis, which can be verified with the growing number of applications in literature and practice. A trend toward gender-responsive approaches could develop due to increasing comprehension and acceptance of women’s role as agents of change.

While gender-sensitive perspectives are increasingly being included in vulnerability assessments, this investigation showed that the gender component is still secondary and not comprehensively integrated in many Eco-DRR studies and projects. A reason for this could be that the concept of Eco-DRR itself is still in the early stage. The focus within the last decade was on the promotion and conviction of the effectiveness of Eco-DRR itself, as it was described in the pilot projects of UNEP. It was only in 2015 that the SFDRR embedded the role of ecosystems in its agreements, reinforcing ecosystems which endorses the inclusion of all sectors of the society (FAIvre et al. 2018). Considering the development of the gender discourse which was, and still is, fighting its corners within the last decades, it can be assumed that a similar process can be expected in the recently adopted field of Eco-DRR. Experts, in turn, referred to the returning discussion of gender issues in DRR, which is partly reflected in the progressive discourse development of gender described by WASTL-WALTER (2010). It could be expected that single feminist movements that triggered the establishment of political agreements, enabled new windows of opportunities to integrate gender discussion into diverse fields which was perceived by practitioners as a repetitive process. The current Agenda on Sustainable Development provides an enabling environment and creates a current momentum for gender. Simultaneously, the agenda highlights the maintenance of healthy ecosystems with goal 5 to enhance human well-being. Both components are considered to be highly relevant and could bring a positive notion into discussion. Thus, Eco-DRR approaches can address several SDGs and promote its effectiveness.

Therefore, this thesis supports the development of gender-responsive approaches in Eco-DRR by demonstrating the linkages of gender empowerment with environmental activities and enhanced elaboration of disaster risk reduction strategies. The component of gender is not a new movement;
however, its comprehension seems to impede an adequate and immediate integration in Eco-DRR strategies.

6.2 Factors that promote or hinder gender inclusiveness in Eco-DRR

Expert interviews and the case study analysis showed that adequate integration of gender considerations pose a challenge to practitioners, which result in cautious actions. Practitioners mentioned particularly lack of time, funding and tools to integrate a comprehensive gender approach in Eco-DRR programmes and projects. It became clear that the disconnection of the three pillars - gender, ecosystem management and DRR - impedes the linkages of different expertise to develop sufficient tools and approaches for this nexus. Even though the theory pointed out the recognition of the gender component in the separate fields of DRR and ecosystem management, intersections between the three fields are so far barely apparent. An exchange and combining of different expertise between different fields is unavoidable in Eco-DRR. The comprehension of physical and social aspects is necessary to guide successful ecosystem conservation and livelihood improvements (COHEN-SHACHAM et al. 2016). All components are closely interconnected and provide mutual opportunities. In particular, interviewees criticized the so called ‘silo approach’, which describes the work in separate pillars. An exchange could further raise awareness about crucial linkages of the nexus, resulting in higher prioritization of gender within programmes and providing higher budget for tools and actions. A better understanding of existing connections also reduces the use of gender approaches as a tick-mark-exercise and increasing the value of gender considerations in Eco-DRR.

The theory of this study showcased that in local communities of developing countries, daily tasks are mostly linked to activities in the local environmental (PURI 2014). Farming practices, collecting of firewood or fetching of water require a good understanding of the ecosystem and identification of environmental changes. This knowledge is crucial for ecosystem-based interventions. Due to socially constructed roles in the community, individual members experience different risks and acquire different skills, which describes the heterogeneity of a group. The gender component is one factor that highlights this feature, however, other factors such as age, income, cast also shape people’s vulnerability and capacity to respond to changes (LOVELL and LE MASSON 2014). It leads the discussion back to the concept of intersectionality. Not every woman, nor every man is affected or is able to respond the same way to disasters and environmental changes. It can be argued that Eco-DRR requires an intersectional approach to adequately reduce disaster risk and improve human well-being, which includes gender.
Furthermore, a better integration of gender considerations would be supported through the development of universal standards in Eco-DRR. The lack of uniform standards impedes the overarching application of gender considerations in nature-based interventions. The theory shows that political movements on gender mainstreaming are developed (see chapter 3.4); however, gender guidelines and action plans in most organisations only recently evolved so that actions are not evident and documented. As recognized by experts from the policy level, an essential foundation of political agreements is given to establish such standards and support a progression of gender considerations in Eco-DRR.

Political conventions and agreements are necessary to achieve empowerment and progressively adjust social structures to support gender equality. They provide an enabling environment that facilitates equal opportunities for both men and women and to overcome the main challenges that were summarized in chapter 5.2.4.

ROCHELEAU (1995) states with the third main component of her analytical framework that political empowerment of women has to take place in order to break patriarchal structures which impede sustainable development. Therefore, transformative actions at political level and in practice are needed which present the most progressive stage in gender approaches. A few presented approaches by experts from IUCN and Wetlands International applied activities to empower women, providing alternative livelihood sources. Further observations are needed to determine where these actions are sufficient to initiate changes in power dynamics long-term. A comprehensive review of these applications and their impacts are necessary to understand the single steps of the intervention and evaluate societal implications.

A gender-responsive inclusion in Eco-DRR requires changes in gender dynamics, which are often impeded through the disadvantaged position of women due to cultural and social structures. As showcased in the Haiti case study (see chapter 5.3), patriarchal structures determine the access to resources. Therefore, most land owners are male, which restricts women in power and decision-making. The FPE describes this influence on access due to certain social structures. As long as these patterns exist, gender issues will remain unchanged. In addition, gender is dynamic and needs to be contextualized in order to understand gender dynamics in specific sites and identify specific challenges (NELSON and HUYER 2016). Several interviewees highlighted this point and indicated this difficulty to apply gender-responsive approaches. For example, different challenges have to be tackled in Afghanistan to provide equal opportunities for men and women. A high female illiteracy rate was mentioned as a pivotal barrier for the development of gender equality in the country (see chapter 5.2.4). Women have mostly restricted access to education facilities. A decreasing illiteracy rate would enhance the understanding in consultations about local DRR strategies and sustainable
use of natural resources. It could further provide new opportunities for women to achieve leadership positions for improved engagement in higher policy levels. Gender balanced representation is necessary to ensure equal contribution of different perspectives in decision-making processes and take the concerns of marginalized groups into account. Such an approach could counter the lack of awareness and limited development to only quantitative indicators, resulting in gender-sensitive methods.

Also, men should increasingly be educated about the roles and responsibilities of women. An increasing understanding about their capacities might trigger a change in behaviour and generate a change of patterns within the community. This process is needed to achieve a sustainable empowerment of all community members.

The process of male outmigration is a progressive phenomenon in rural areas (MOLDEN et al. 2017), which shows alterations in community structures. The absence of men increases the burden of additional work on women in these areas. However, their increased responsibility puts women in a new role, which could be used as an opportunity for empowerment. The focus lies on their needs and priorities, but should be approached carefully to not overload women with work and trigger negative outcomes (e.g. deteriorating environmental degradation). Gender dynamics are not necessarily changed in these cases, but these newly created situations have to be taken into account to adjust Eco-DRR strategies.

6.3 The added value of an integrated gender approach in the implementation of Eco-DRR

The adoption of a gender lens in DRR interventions provides a more nuanced identification of vulnerabilities, which enhances the development of comprehensive strategies to reduce disaster risk. Experts from the field emphasized that gender should be a part of every vulnerability assessment and determine specific risks of individuals in a community. As stated in chapter 3.2.2, every person is differently affected by risks and shows different coping capacities, which should not be generalized by groups. The gender component differentiates these risks in communities next to various other factors such as age and income. Primarily elderly, children and women are identified as the most vulnerable groups in disaster and the integration of all segments of the community is crucial for a comprehensive risk reduction strategy (FAIVRE et al. 2018). Although the function of the gender component is recognized by practitioners, consistent application was not identified in practice. The introduction of gender guidelines and actions plans shows that an implementation of gender considerations is increasingly presupposed.
Community involvement is a major component of Eco-DRR approaches (see chapter 2.2), which is why gender plays a pivotal role in the development of these strategies. Daily responsibilities are closely linked to the environment in certain communities. Understanding the key roles in a society can help to determine differentiating knowledge about the ecosystem. For example, the role of fishers in Haiti is assigned to men, whereas women are vendors. This differentiation is essential to identify different experiences and perceptions of risk to develop reliable risk reduction maps.

Furthermore, to apply adequate conservation measures for a sustainable use of ecosystems, a good understanding of the environment and potential hazards is required. Communities’ knowledge about their environment is necessary for these interventions. The FPE points out that communities are not a homogenous group of people and specifically, that women’s experiences with the environment should be taken into account (WASTL-WALTER 2010), as representatives from IUCN and Wetlands International reported about successful project outcomes when women were specifically involved. Women’s organisational skills and motivations were highlighted as a result of women’s triple role, which refers to their ability to deal with complex systems and provide for their family. The FPE refers to that fact, and underlines that the consideration of women’s capacities benefits to ecosystem-based activities.

Gender appears to be, indirectly, a crucial component in Eco-DRR, especially in relation to community-approaches. Eco-DRR approaches aim to achieve increased community resilience, so that people deal better with disaster implications and adjust their livelihoods to climatic changes. To adequately reduce disaster risk and improve human well-being, a comprehensive vulnerability assessment is required which implies differentiation of community members by various factors, among others gender. Gender is not inherent in the definition of nature-based solutions but it is one of its basics. Chapter 5.2 sets out the challenges that still hinder the inclusion of gender considerations in Eco-DRR.

The movement of gender is more than about improved DRR strategies. Inclusiveness of gender considerations can lead to empowerment of women, providing equal opportunities and increased responsibilities. Women in a leadership role might influence decision-making processes and create cooperatives, such in the case of Haiti, where the leader of the vetiver cooperative was a woman. Their comprehension for women’s roles and position can result in saving groups that empower women on local level to raise their opinion and share their concerns. This movement could induce a reconsideration of DRR strategies and develop new approaches.
7 A strategy for risk reduction and empowerment

This discussion outlined relevant points why gender should be an integrated and a non-negotiable part in Eco-DRR interventions. First, the gender component enables a more specific vulnerability assessment and second, it ensures the identification of different environmental knowledge and skills that are relevant for a sustainable use and conservation of ecosystems. Both perspectives are essential to develop a comprehensive DRR strategy.

Additionally, Eco-DRR could be used as an empowerment tool for marginalized groups. A gender analysis identifies vulnerabilities of men and women, and their roles and responsibilities in the community. It further assesses the different needs and ensures an integration of all community members, by providing suitable livelihood options that restore and maintain the environment. This can result in economic development and an enhanced understanding about the multiple benefits of a healthy ecosystem, which protects the community from disaster implications and improves their livelihoods in a long-term.

The identification of elements for gender-responsive action (see chapter 5.1.2) can be used as a supporting tool for practitioners in Eco-DRR interventions to apply gender-responsive or even gender-transformative activities that change gender dynamics and empower vulnerable groups. The next steps would imply the evaluation of applied gender guidelines in this sector and document best practices. That would further promote the necessity of gender approaches, which should also pay greater attention to other gender identities, not only focusing on women and men.

Since Eco-DRR is still fighting its corner, more documented evidence is needed to convince donors to increase their investments in this strategy. Additionally, promoting Eco-DRR as a strategy that addresses multiple SDG goals (protection of ecosystems, reduction of disaster risk, adaptation to climate change and gender equality) with one intervention would be a supporting argument for donors and stakeholders. Moreover, it should make use of this momentum of gender to support exchanges of expertise of intersecting fields, and assess existing tools so that sufficient measures can be developed in the near future. Because climate change is continuously progressing and disaster’s intensity, as well as frequency, is increasing, actions are needed now to increase everyone’s resilience.
Bibliography


NONOGUCHI, A. and Y. TANAKA (2016): How can promoting women’s participation (and agency) and responding to their needs improve disaster risk reduction? Case from post-disaster reconstruction (operations and measures) in the Philippines and Sri Lanka. Japan Development Service Co. Ltd (JDS); Japan International Cooperation Agency (JICA).


Annex

1 Systematic literature review

Annex I - Table of search terms
Selection of main terms and synonyms for the search string the in databases SCOPUS and Web of Science.

<table>
<thead>
<tr>
<th>Ecosystem (A)</th>
<th>Hazard (B)</th>
<th>Disaster Risk Reduction (C)</th>
<th>Gender (D)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;ecosystem service*&quot; OR</td>
<td>earthquake* OR ground-shak* OR &quot;mass movement*&quot; OR landslide* OR landslip* OR debris flow* OR mudslide* OR slopeslide* OR avalanche* OR rockfall* OR tsunami* OR &quot;tidal wave*&quot; OR volcano* OR lahar* OR &quot;pyroclastic flow*&quot; OR &quot;ash fall*&quot; OR &quot;lava flow*&quot; OR drought* OR wildfire* OR &quot;forest fire*&quot; OR flood* OR storm* OR &quot;tropical storm*&quot; OR &quot;wind storm*&quot; OR &quot;hail storm*&quot; OR &quot;sand storm*&quot; OR tornado* OR hurricane* OR &quot;tropical cyclone*&quot; OR &quot;storm surge*&quot; OR &quot;heat wave*&quot; OR &quot;cold snap*&quot;</td>
<td>disaster risk reduction* OR mitigation OR resilience OR</td>
<td>gender* OR girl OR boy OR women OR empowerment OR &quot;gender analysis&quot; OR &quot;gender awareness&quot; OR &quot;gender-blind*&quot; OR &quot;gender-sensiti*&quot; OR &quot;gender mainstreaming&quot; OR &quot;gender equality&quot; OR &quot;gender equity&quot;</td>
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<tr>
<td>&quot;green infrastructure*&quot; OR</td>
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<tr>
<td>&quot;ecological infrastructure*&quot; OR</td>
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<td>&quot;soft infrastructure*&quot; OR</td>
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<tr>
<td>&quot;soft engineering&quot; OR</td>
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<tr>
<td>&quot;natural infrastructure*&quot; OR</td>
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<tr>
<td>&quot;ecosystem approach*&quot; OR</td>
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<tr>
<td>&quot;nature based&quot; OR</td>
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<tr>
<td>ecosystem-based OR</td>
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<tr>
<td>&quot;ecosystem management*&quot; OR</td>
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<tr>
<td>&quot;ecosystem restoration&quot; OR</td>
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<td></td>
</tr>
<tr>
<td>&quot;ecosystem conservation*&quot; OR</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>&quot;natural hazard regulation&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Annex II - Table of search strings
Created search strings from search terms (Annex I) for databases of Web of Science and Scopus.

A = ecosystem management
B = hazard terms
C = DRR terms
D = gender terms
<table>
<thead>
<tr>
<th>Simplified search string</th>
<th>Search string for Scopus</th>
<th>Hits for Scopus &amp; WoS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Search 1</td>
<td><strong>TITLE-ABS-KEY</strong> (&quot;ecosystem service&quot; OR &quot;green infrastructure&quot; OR &quot;ecological infrastructure&quot; OR &quot;soft infrastructure&quot; OR &quot;soft engineering&quot; OR &quot;natural infrastructure&quot; OR &quot;ecosystem approach&quot; OR &quot;nature based&quot; OR ecosystem-based OR &quot;ecosystem management&quot; OR &quot;ecosystem restoration&quot; OR &quot;ecosystem conservation&quot; OR &quot;natural hazard regulation&quot;) AND (earthquake* OR ground-shak* OR &quot;mass movement&quot; OR landslide* OR landslip* OR &quot;debris flow&quot; OR mudslide* OR slope slide* OR avalanche* OR rockfall* OR tsunami* OR &quot;tidal wave&quot; OR volcano* OR lahar* OR &quot;pyroclastic flow&quot; OR &quot;ash fall&quot; OR &quot;lava flow&quot; OR drought* OR wildfire* OR &quot;forest fire&quot; OR flood* OR storm* OR &quot;tropical storm&quot; OR &quot;wind storm&quot; OR &quot;hail storm&quot; OR &quot;sand storm&quot; OR tornado* OR hurricane* OR &quot;tropical cyclone&quot; OR &quot;storm surge&quot; OR &quot;heat wave&quot; OR &quot;cold snap&quot; ) AND (gender* OR girl OR boy OR women OR empowerment OR &quot;gender analysis&quot; OR &quot;gender awareness&quot; OR &quot;gender-blind&quot; OR &quot;gender-sensit*&quot; OR &quot;gender mainstreaming&quot; OR &quot;gender equality&quot; OR &quot;gender equity&quot;)</td>
<td>Scopus – 19 hits WoS – 12 hits</td>
</tr>
<tr>
<td>Search 2</td>
<td><strong>TITLE-ABS-KEY</strong> (&quot;ecosystem service&quot; OR &quot;green infrastructure&quot; OR &quot;ecological infrastructure&quot; OR &quot;soft infrastructure&quot; OR &quot;soft engineering&quot; OR &quot;natural infrastructure&quot; OR &quot;ecosystem approach&quot; OR &quot;nature based&quot; OR ecosystem-based OR &quot;ecosystem management&quot; OR &quot;ecosystem restoration&quot; OR &quot;ecosystem conservation&quot; OR &quot;natural hazard regulation&quot;) AND (disaster risk reduction OR mitigation OR resilience) AND (gender* OR girl OR boy OR women OR empowerment OR &quot;gender analysis&quot; OR &quot;gender awareness&quot; OR &quot;gender-blind&quot; OR &quot;gender-sensit*&quot; OR &quot;gender mainstreaming&quot; OR &quot;gender equality&quot; OR &quot;gender equity&quot;) AND (EXCLUDE( SUBJAREA, &quot;MEDI&quot; ))</td>
<td>Scopus – 42 hits WoS – 44 hits</td>
</tr>
<tr>
<td>Search 3</td>
<td><strong>TITLE-ABS-KEY</strong> (&quot;ecosystem service&quot; OR &quot;green infrastructure&quot; OR &quot;ecological infrastructure&quot; OR &quot;soft infrastructure&quot; OR &quot;soft engineering&quot; OR &quot;natural infrastructure&quot; OR &quot;ecosystem approach&quot; OR &quot;nature based&quot; OR ecosystem-based OR &quot;ecosystem management&quot; OR &quot;ecosystem restoration&quot; OR &quot;ecosystem conservation&quot; OR &quot;natural hazard regulation&quot;) AND (earthquake* OR ground-shak* OR &quot;mass movement&quot; OR landslide* OR landslip* OR &quot;debris flow&quot; OR mudslide* OR slope slide* OR avalanche* OR rockfall* OR tsunami* OR &quot;tidal wave&quot; OR volcano* OR lahar* OR &quot;pyroclastic flow&quot; OR &quot;ash fall&quot; OR &quot;lava flow&quot; OR drought* OR wildfire* OR &quot;forest fire&quot; OR flood* OR storm* OR &quot;tropical storm&quot; OR &quot;wind storm&quot; OR &quot;hail storm&quot; OR &quot;sand storm&quot; OR tornado* OR hurricane* OR &quot;tropical cyclone&quot; OR &quot;storm surge&quot; OR &quot;heat wave&quot; OR &quot;cold snap&quot;) AND (disaster risk reduction OR mitigation OR resilience OR exposure OR vulnerab* OR risk*) AND (gender* OR girl OR boy OR women OR empowerment OR &quot;gender analysis&quot; OR &quot;gender awareness&quot; OR &quot;gender-blind&quot; OR &quot;gender-sensit*&quot; OR &quot;gender mainstreaming&quot; OR &quot;gender equality&quot; OR &quot;gender equity&quot;) )</td>
<td>Scopus – 8 hits WoS – 6 hits</td>
</tr>
</tbody>
</table>

Abstract analysis and removal of duplications

In total – 16 results
Annex III - Review categories
Review categories for support of in-depth analysis of selected articles from systematic literature review.

<table>
<thead>
<tr>
<th>#</th>
<th>REVIEW CATEGORY</th>
<th>DESCRIPTION</th>
<th>TYPE OF INPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bibliographic information</td>
<td>Review categories 2-6 contained standard bibliographical information, namely Author(s), Year of publication, Title, Abstract and Article type.</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Country of affiliation of author</td>
<td>Name of the country in which the first author’s affiliation is located.</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Country of case study</td>
<td>Name of the country in which the case city is located.</td>
<td>Person, household, group, community, government, multiple scales, undefined</td>
</tr>
<tr>
<td>4</td>
<td>Geographical scale</td>
<td>The geographical scale on which the study was conducted.</td>
<td>Person, household, group, community, government, multiple scales, undefined</td>
</tr>
<tr>
<td>5</td>
<td>Hazard</td>
<td>The type of climate-related hazard at which the article’s adaptation or risk reduction is aimed.</td>
<td>(pluvial, ...) flooding, drought, landslide, storm surges, fire, etc.</td>
</tr>
<tr>
<td>6</td>
<td>Type of ecological structure / ecosystem</td>
<td>The type of ecosystem or ecological structure providing the ecosystem service for adaptation/risk reduction.</td>
<td>Mangrove, wetland, forest, etc.</td>
</tr>
<tr>
<td>7</td>
<td>Existing or new structures</td>
<td>Whether the article focused on the conservation or management of existing ecological structures or the creation of new ones.</td>
<td>Restoration of e.g. mangroves or reforestation, Replantation of e.g. mangrove forests</td>
</tr>
<tr>
<td>8</td>
<td>Role of ecological structure in DRR, adaptation strategies</td>
<td>Whether the article focused on the ecological structure’s direct (biogeophysical) contribution to hazard reduction, its indirect contribution to people’s adaptive capacity, or the modification of ecological structures through institutional mechanisms, thereby contributing to adaptation.</td>
<td>Flood control, slope stability, alternative income option, etc.</td>
</tr>
<tr>
<td>9</td>
<td>Management practices studied</td>
<td>The management practices for Eco-DRR that were mentioned in the context of the case city and studied or evaluated in the article.</td>
<td>Text: e.g. the passing of laws and policies to protect biodiversity in the city</td>
</tr>
<tr>
<td>10</td>
<td>Enablers</td>
<td>Outside conditions/factors that facilitated the implementation process of Eco-DRR</td>
<td>Text: e.g. citizens’ active engagement to prevent further destruction of natural environment</td>
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</tr>
<tr>
<td>11</td>
<td>Barriers</td>
<td>Outside conditions/factors that hindered the implementation process of Eco-DRR</td>
<td>Text: e.g. different objectives and interests of donors and environmental planners</td>
</tr>
<tr>
<td>12</td>
<td>Evaluation criteria used</td>
<td>The (biogeophysical or socioeconomic) criteria mentioned or used by the article to evaluate the success of Eco-DRR</td>
<td>Text: e.g. temperature, willingness to pay*</td>
</tr>
<tr>
<td>13</td>
<td>Results of evaluation</td>
<td>Potential result of evaluation/evidence for Eco-DRR provided by the article.</td>
<td>Text: e.g. the study shows that trees with greater plant area intercepted a greater amount of rainfall</td>
</tr>
</tbody>
</table>
| 14 | Gender awareness | Influence of gender inclusion in success of Eco-DRR intervention  
1) gender-aware,  
2) gender-sensitive,  
3) gender-mainstreamed,  
4) gender-transformative | Text: e.g. the study conducted a survey asking women and men separately |
| 15 | Intersectionality | Gender intersects with other identities of inequality | Text: e.g. age, disability, ethnicity, class, etc. |
| 16 | Drivers of change | Gender intersect with external drivers | Text: e.g. urbanization, infrastructure development, technological interventions, and produce differential types and degrees of vulnerability |
| 17 | Discussion of negative consequences/ trade-offs of Eco-DRR | Whether or not the article mentions the possibility of negative consequences or trade-offs related to Eco-DRR | No; Yes |
| 18 | Discussion of alternatives of Eco-DRR | Whether or not the article discusses other alternatives to adaptation than Eco-DRR (e.g. “hard” or “soft” approaches). | No; Yes |
| 19 | Case study time focus | Was the case study conducted on a (specific) past hazard event/disaster (= "lessons learned"), or is the focus rather on future hazards? | Text |
| 20 | Barrier- or solution-oriented article | Whether the article in general focused on barriers or solutions for adaptation. | Text |
## Annex IV - Selected articles from systematic literature review in chronological order

<table>
<thead>
<tr>
<th>#</th>
<th>Author, Year</th>
<th>Title</th>
<th>Hazard</th>
<th>Ecosystem</th>
<th>Gender component</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bashir (1976)</td>
<td>Sustainable management of drought and desertification in Nigeria</td>
<td>Desertification</td>
<td>Forests</td>
<td>Implementation of policies to minimize drought impacts to vulnerable groups, especially women, children aged</td>
</tr>
<tr>
<td>2</td>
<td>Sudmeier-Rieux &amp; Ash (2009)</td>
<td>Environmental guidance note for disaster risk reduction: healthy ecosystems for human security</td>
<td>Multiple</td>
<td>Multiple</td>
<td>Including communities, especially women, minorities to enable dialogues, develop collaboration between environment, DRM and planning authorities; Women’s vulnerability during disaster identified</td>
</tr>
<tr>
<td>3</td>
<td>Estrella et al. (2010)</td>
<td>Risk and Vulnerability Assessment Methodology Development Project (RVAMP): Linking Ecosystems to Risk and Vulnerability Reduction; The Case of Jamaica, Results of the Pilot Assessment</td>
<td>Coastal hazards</td>
<td>Coral reefs</td>
<td>Workshop participation adjusted to different roles of men and women</td>
</tr>
<tr>
<td>4</td>
<td>Gero et al. (2010)</td>
<td>Disaster risk reduction and climate change adaptation in the Pacific: The challenge of integration</td>
<td>Coastal hazards</td>
<td>Coastal ecosystems, e.g. mangroves</td>
<td>Project conducted meetings and workshops with single gender focus groups to determine differing concerns</td>
</tr>
<tr>
<td>5</td>
<td>Takeuchi and Shaw (2010)</td>
<td>Climate change adaptation and disaster risk reduction experiences in Japan</td>
<td>Typhoon</td>
<td>Forest management</td>
<td>Gendered differences in mortality rate recognized</td>
</tr>
<tr>
<td>6</td>
<td>Maskrey (2011)</td>
<td>Revisiting community-based disaster risk management</td>
<td>Multiple</td>
<td>Ecosystem management in general</td>
<td>Gender mentioned in relation to community-based management</td>
</tr>
<tr>
<td>7</td>
<td>Urban et al. (2011)</td>
<td>Issues at the interface of disaster risk management and low-carbon development</td>
<td>Multiple</td>
<td>Ecosystem-based approaches</td>
<td>Project teaches women traditional knowledge to educate them as steward of the environment</td>
</tr>
<tr>
<td>8</td>
<td>Bunch et al. (2011)</td>
<td>Promoting Health and Well-Being by Managing for Social–Ecological Resilience the Potential of Integrating Ecohealth and Water Resources Management Approaches</td>
<td>Storm surges, Floods</td>
<td>Watershed-based water resources management</td>
<td>Solution ideas to improve women’s life standards and reduce time spend to daily chores, e.g. improved-drinking water sources</td>
</tr>
<tr>
<td>9</td>
<td>Warren-Rhodes et al. (2011)</td>
<td>Mangrove ecosystem services and the potential for carbon revenue programmes in Solomon Islands</td>
<td>Coastal storms</td>
<td>Mangrove forests</td>
<td>Intersection of gender and occupation; Recognition of gender as an important variable in analysis that influences ecosystem use and awareness</td>
</tr>
<tr>
<td>10</td>
<td>Wisner et al. (2012)</td>
<td>Handbook of Hazards and Disaster Risk Reduction and Management</td>
<td>Multiple</td>
<td>Ecosystem management mentioned in relation to community-based approaches</td>
<td>Gender as a factor for limited access to resources determined</td>
</tr>
<tr>
<td>11</td>
<td>Rombledo et al. (2012)</td>
<td>The role of forest ecosystems in community-based coping strategies to climate hazards: Three examples from rural areas in Africa</td>
<td>Droughts, Floods</td>
<td>Forests</td>
<td>Questionnaires are disaggregated in several factors (age, gender, major income); Equal distribution of rights among community members</td>
</tr>
<tr>
<td>12</td>
<td>Gupta &amp; Nair (2012)</td>
<td>Ecosystem Approach to Disaster Risk Reduction</td>
<td>Multiple</td>
<td>Ecosystem-based approaches</td>
<td>Distinguishes knowledge between men and women and refers to differing traditional knowledge to cope with environmental changes and disaster impacts</td>
</tr>
<tr>
<td>13</td>
<td>Nandy &amp; Ahammad (2012)</td>
<td>Navigating mangrove resilience through the ecosystem-based adaptation approach: lessons from Bangladesh</td>
<td>Tropical cyclones, Storm surges</td>
<td>Mangroves</td>
<td>Involvement of women groups in particular project activities</td>
</tr>
<tr>
<td>14</td>
<td>Uy &amp; Shaw (2012)</td>
<td>Watershed Approach to Ecosystem Management</td>
<td>Watershed management</td>
<td>Project ensured the participation of all sections of the community amongst others women, occupational castes, minority groups</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Sudmeier, Ash, Murti (2013)</td>
<td>Environmental guidance note for disaster risk reduction: healthy ecosystems for human security and climate change education</td>
<td>Multiple</td>
<td>Multiple</td>
<td>Determination that women are severely impacted by extreme events and recognition of women’s special role as stewards of natural resources and agents of change</td>
</tr>
<tr>
<td>16</td>
<td>Kamble et al. (2013)</td>
<td>Ecosystem Approach to Flood Disaster Risk Reduction</td>
<td>Floods</td>
<td>Coastal ecosystems (wetlands, forests, peatland)</td>
<td>Children and women are particularly vulnerable; Promote distribution of information to women and their involvement</td>
</tr>
<tr>
<td>17</td>
<td>Renaud et al. (2013)</td>
<td>The Role of Ecosystems in Disaster Risk Reduction</td>
<td>Tropical, island hazards</td>
<td>Call for inclusion strategy to ensure active participation of women in activities</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Boissiere et al. (2013)</td>
<td>Local Perceptions of Climate Variability and Change in Tropical Forests of Papua, Indonesia</td>
<td>Floods, Droughts</td>
<td>Forests</td>
<td>Questionnaires were used with four groups of villagers defined by gender and age</td>
</tr>
<tr>
<td>19</td>
<td>Allendorf and Yang (2013)</td>
<td>The role of ecosystem services in park–people relationships: The case of Gaoligongshan Nature Reserve in southwest China</td>
<td>Droughts</td>
<td>Protected areas; riparian region, sub-tropical evergreen forest</td>
<td>Recognition of women’s disadvantage in perceiving benefits due to limited access to information due to social structures - information usually passed through male head of household</td>
</tr>
<tr>
<td>20</td>
<td>Barau (2014)</td>
<td>Perceptions and contributions of households towards sustainable urban green infrastructure in Malaysia</td>
<td>Floods</td>
<td>Urban greenery (open spaces, parks, private gardens, scrublands, etc.)</td>
<td>Gender as variable to define respondents; Attitude and perception of green infrastructure analysed by gender</td>
</tr>
<tr>
<td>21</td>
<td>Jupiter et al. (2014)</td>
<td>Principles for integrated island management in the tropical Pacific</td>
<td>Higher global temperatures, Changed patterns of rainfall, Sea level rise, Extreme events</td>
<td>Ecosystem Management</td>
<td>Vulnerability of men and women recognized; Ensuring full participation by women due to preparation of gender analyses and conduct of divided consultations</td>
</tr>
<tr>
<td></td>
<td>Author(s) (Year)</td>
<td>Title</td>
<td>Event(s)</td>
<td>Ecosystem(s)</td>
<td>Gender and DRR</td>
</tr>
<tr>
<td>---</td>
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</tr>
<tr>
<td>22</td>
<td>Chavez-Tafur &amp; Roderick (eds.). (2014)</td>
<td>Towards productive landscape</td>
<td>Droughts, Irregular raining events</td>
<td>Forests, Trees, Agroforestry</td>
<td>Vulnerability of women due to gendered roles (e.g., collection of firewood)</td>
</tr>
<tr>
<td>23</td>
<td>Twigg (2015)</td>
<td>Disaster risk reduction</td>
<td>Multiple</td>
<td>Green engineering and ecosystems (case study 'room for the river')</td>
<td>Vuln. of women, young monitored; recognizes women's knowledge and skills that could contribute to DRR; gender awareness training seen as necessary in organizations</td>
</tr>
<tr>
<td>24</td>
<td>Yang et al. (2015)</td>
<td>Changing Perceptions of Forest Value and Attitudes toward Management of a Recently Established Nature Reserve: A Case Study in Southwest China</td>
<td>Floods</td>
<td>Forest</td>
<td>Questionnaire records social variables (education, gender, age, living distance); Social dynamics influence willingness of women to respond</td>
</tr>
<tr>
<td>25</td>
<td>Lo (2016)</td>
<td>Synthesis report on experiences with ecosystem-based approaches to climate change adaptation and disaster risk reduction</td>
<td>Multiple</td>
<td>Multiple</td>
<td>Gendered knowledge as effective adaptation tool recognized; Case studies (Timor-Leste, Uganda) demonstrate successful plantation of trees for risk reduction and adaption to CC by women groups</td>
</tr>
<tr>
<td>26</td>
<td>Imamura et al. (2016)</td>
<td>Attitudes toward disaster-prevention risk in Japanese coastal areas: analysis of civil preference</td>
<td>Storm surges, Tsunami</td>
<td>Coastal ecosystems</td>
<td>Gender was further multiplied in analysis with species, services, seawalls, subsidies, donations</td>
</tr>
<tr>
<td>27</td>
<td>Kumar et al. (2017)</td>
<td>Wetlands for disaster risk reduction: Effective choices for resilient communities</td>
<td>Floods, Droughts and Storm surges</td>
<td>Wetlands</td>
<td>Call for integration of gender component and mainstreaming as a significant aspect of wetlands intervention in DRR</td>
</tr>
<tr>
<td>28</td>
<td>Molden et al. (2017)</td>
<td>Advancing Regional and Transboundary Cooperation in the Conflict-Prone Hindu Kush–Himalaya</td>
<td>Floods, Droughts, Landslides</td>
<td>Transboundary landscape approach</td>
<td>Change of social roles for men and women observed, in consequence of male outmigration that forces more responsibility to women</td>
</tr>
<tr>
<td>29</td>
<td>Zanzanaini et al. (2017)</td>
<td>Integrated landscape initiatives for agriculture, livelihoods and ecosystem conservation: An assessment of experiences from South and Southeast Asia</td>
<td>Extreme weather events</td>
<td>Integrated landscape approaches (mangroves, coastal wetlands)</td>
<td>Lack of female participation in consultation does not result in lack of invitations, Existing power dynamics and inequities and access to resources</td>
</tr>
<tr>
<td>30</td>
<td>Allendorf et al. (2017)</td>
<td>Pathways to improve park–people relationships: Gendered attitude changes in Chatthin Wildlife Sanctuary, Myanmar</td>
<td>Floods</td>
<td>Protected area (forest)</td>
<td>Changes in perception and attitude differ over time; correlation with time Gender is monitored</td>
</tr>
<tr>
<td>31</td>
<td>Allendorf &amp; Yang (2017)</td>
<td>The role of gender in local residents’ relationships with Gaoligongshan Nature Reserve, Yunnan, China</td>
<td>Floods, Mudslides</td>
<td>Protected area (forest)</td>
<td>Gender correlates with education; Vuln. of women due to limited access to education</td>
</tr>
<tr>
<td>32</td>
<td>Rojas et al. (2017)</td>
<td>Social Perception of Ecosystem Services in a Coastal Wetland Post-Earthquake: A Case Study in Chile</td>
<td>Earthquakes, Tsunamis, Storms</td>
<td>Coastal wetlands</td>
<td>Perception was influenced by the categorical variables of gender, age, and ethnicity; Women gave higher valuation to hazard regulation</td>
</tr>
<tr>
<td></td>
<td>Authors (Year)</td>
<td>Title</td>
<td>Threats</td>
<td>Ecosystems</td>
<td>Gender Differentiation Activities</td>
</tr>
<tr>
<td>---</td>
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</tr>
<tr>
<td>33</td>
<td>Mul et al. (2017)</td>
<td>Dependence of riparian communities on ecosystem services in Northern Ghana</td>
<td>Dry season, Floods</td>
<td>Wetlands, seasonal floodplains</td>
<td>Ensuring gender-differentiated participation opportunities, allowing females and males within the same household or community to carry out the surveys separately; exercises carried out in gender-segregated groups</td>
</tr>
<tr>
<td>34</td>
<td>Vivinthkeyoonvong &amp; Jourdain (2017)</td>
<td>Willingness to pay for ecosystem services provided by irrigated agriculture in Northeast Thailand</td>
<td>Flooding, Droughts</td>
<td>Paddy fields, wetland river fields</td>
<td>Correlation of gender with other factors (rural, urban, age) recognized and examined; Respondents were gender balanced</td>
</tr>
<tr>
<td>35</td>
<td>Tsai et al. (2017)</td>
<td>Perceptions of tourism impacts and community resilience to natural disasters</td>
<td>Typhoons, Flooding</td>
<td>Multiple</td>
<td>Questionnaire defined by factors such as gender, female and male participation noticed</td>
</tr>
<tr>
<td>36</td>
<td>Gao et al. (2018)</td>
<td>Local perceptions of ecosystem services and protection of culturally protected forests in southeast China</td>
<td>General</td>
<td>Culturally protected forests</td>
<td>Statistical analysis of different factors including gender, age, etc.</td>
</tr>
<tr>
<td>37</td>
<td>Hinzpeter &amp; Sandholz (2018)</td>
<td>Squaring the circle? Integrating environment, infrastructure and risk reduction in Post Disaster Needs Assessments</td>
<td>Multiple</td>
<td>Eco-DRR</td>
<td>Gender aspects are usually considered in any sector; Crucial to prevent girl’s absence of work or school due to chores such as collection of firewood for cooking</td>
</tr>
<tr>
<td>38</td>
<td>Yang et al. (2018)</td>
<td>Gendered perspectives of ecosystem services: A systematic review</td>
<td>Extreme events</td>
<td>Ecosystem services to multiple ecosystems</td>
<td>Recognition of women’s vulnerability due to restricted access to information; Call for more case studies and comparative studies to identify relationships between gender and ES perceptions</td>
</tr>
<tr>
<td>39</td>
<td>Jayanti et al. (2018)</td>
<td>The vulnerability of fishermen’s community and livelihood opportunity through drought and seasonal changes in border area of Indonesia-Timor Leste</td>
<td>Dry season, Drought</td>
<td>Coastal ecosystems</td>
<td>Involvement of women’s group in interviews; however, no further results mentioned</td>
</tr>
<tr>
<td>40</td>
<td>Klein et al. (2019)</td>
<td>An integrated community and ecosystem-based approach to DRR in mountain systems</td>
<td>Multiple</td>
<td>Mountainous ecosystems</td>
<td>Recognized vulnerability of women and children; Engagement with women groups; Promoting integration of marginalized groups in DRR planning</td>
</tr>
<tr>
<td>41</td>
<td>Brink &amp; Wamsler (2019)</td>
<td>Citizen engagement in climate adaptation surveyed: The role of values, worldviews, gender and place</td>
<td>Floods, Storms, Heat waves</td>
<td>Coastal &amp; urban ecosystems</td>
<td>People’s gendered engagement determined; Analysis by gender conducted based on people’s adaptation motivation</td>
</tr>
</tbody>
</table>
2 Interviews

Annex V - Interview guides

1 Questionnaire – Policy level

Warming Up

- Introduction of myself, research topic, aim of the thesis
- Information: interview will be anonymous, thesis not planned to be published, recording desired
- Short introduction of the interviewee (organization, position/tasks, expertise)

Present state of gender mainstreaming in Eco-DRR / DRR

- To what extent is a gender perspective seen as relevant in Eco-DRR / DRR nowadays? Was a development apparent during the years that recognizes differences between men and women in disaster risk and environmental management?
- How is the topic of gender developing/ evolving in the field of DRR and environmental management?
- How is ‘gender’ perceived in the scientific community? How is it perceived in the political community?
- How can a gender perspective be a curial component for Eco-DRR interventions?
- What comes first? Research or practice? Is there a need for the practitioner side to take this up or does it come from the literature first?

Application of gender perspective into interventions (political level, projects)

- How are/were gender differences represented in current & past Eco-DRR interventions?
  - Was a gender balanced participation/ inclusion targeted?
  - What were the reasons that an integral gender perspective was not directly applied within the first Eco-DRR projects of UNEP?
  - Where specific indicators applied to measure progress?
- What actions/ activities were undertaken to integrate gender issues?
  - What efforts were made to receive sufficient information from both, women and men?
- Where should gender approaches be included? At what stage of project management cycle?
- How could the gender component be a part of community-management approaches?
- How is your organisation support gender-sensitive approaches?

Barriers/ challenges

- To what extent can political restrictions influence the integration of gender approaches in Eco-DRR interventions?
What major barriers might impede the integration of gender considerations on a political level?
What level of effort was made to overcome these challenges?

- Lessons learned from past interventions? How would gender be considered within future interventions?
  - Did negative outcomes appeared after project ended? Long-term effects?
- What lessons can be drawn to further promote gender mainstreaming in the projects?

**Opportunities for Eco-DRR**

- What needs to be done to integrate gender considerations in Eco-DRR?
- How could gender considerations help to support Eco-DRR processes?
- Gender equality is a single-target of the SDG’s → How could Eco-DRR integrate this goal?

**Closing**

- Any further insights or further information to add from your side?
- Do you have any questions regarding my research or my thesis?

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**2 Questionnaire – Practitioner, field level**

**Warming Up**

- Introduction of myself, research topic, aim of the thesis
- Information: interview will be anonymous, thesis not planned to be published, recording desired
- Short introduction of the interviewee (organization, position/tasks, expertise)

**Present state of gender perceptions in projects**

- How were gender differences represented in projects/ on the ground?
- Are project stakeholders more cognizant of gender equality and the value of women’s participation and leadership?
- How is the issue of gender evolving in the field of DRR/ conservation?

**Application of gender perspective in projects**

- How were gender differences represented in past interventions (in particular in the case of Afghanistan & Haiti)?
  - What are the circumstances in your country (implementation country of project) that led to higher male or female participation?
  - What is the role of men and women in this country?
• What were the reasons that an integral gender perspective was not integrated?
• What actions/ activities were undertaken to integrate gender issues?
• Where should gender approaches be included? At what stage of the project management cycle?
• How is your organization supporting gender-sensitive approaches (e.g. trainings, workshops)?
• Did the project have gender specific indicators or gender disaggregated indicators to measure progress?
• To what degree were the benefits/results distributed equitably between women and men?

**Barriers and challenges**

• What major barriers impede the integration of gender actions/ considerations in projects?
  ▪ What level of effort was made to overcome these challenges?
• Lessons learned from past interventions?
  ▪ What lessons can be drawn to further promote gender mainstreaming in the projects?
• What were there constraints (e.g. political, practical, and bureaucratic) to addressing gender equality efficiently during project implementation?

**Opportunities for Eco-DRR**

• What needs to be done to better integrate gender considerations in projects?
• How could gender be used as an entry point for effective ecosystem-based DRR?

**Closing**

• Any further insights or further information to add from your side?
• Do you have any questions regarding my research or my thesis?
### Annex VI - List of codes

List of codes for analysis of interviews

<table>
<thead>
<tr>
<th>Coding system</th>
<th>Number of Codings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Category one: Perception of gender</strong></td>
<td></td>
</tr>
<tr>
<td>Roles of men and women / gender</td>
<td>38</td>
</tr>
<tr>
<td>Historic development of gender discussion</td>
<td>16</td>
</tr>
<tr>
<td>Victims vs. agents of change</td>
<td>21</td>
</tr>
<tr>
<td>Community-based approaches</td>
<td>8</td>
</tr>
<tr>
<td>Other gender identities</td>
<td>3</td>
</tr>
<tr>
<td>Intersectionality</td>
<td>2</td>
</tr>
<tr>
<td><strong>Category two: Application of gender approaches</strong></td>
<td></td>
</tr>
<tr>
<td>Examples of gender approaches</td>
<td>48</td>
</tr>
<tr>
<td>Lessons learned</td>
<td>28</td>
</tr>
<tr>
<td>Application limitation</td>
<td>25</td>
</tr>
<tr>
<td><strong>Category three: Barriers and challenges</strong></td>
<td></td>
</tr>
<tr>
<td>External factors as barriers</td>
<td>55</td>
</tr>
<tr>
<td><strong>Category four: Opportunities</strong></td>
<td></td>
</tr>
<tr>
<td>Gender as an entry point</td>
<td>27</td>
</tr>
<tr>
<td><strong>Category five: Recommendations</strong></td>
<td></td>
</tr>
<tr>
<td>Recommendations</td>
<td>33</td>
</tr>
<tr>
<td>Open questions</td>
<td>6</td>
</tr>
<tr>
<td><strong>Category six: Case studies</strong></td>
<td></td>
</tr>
<tr>
<td>Haiti</td>
<td>8</td>
</tr>
<tr>
<td>Afghanistan</td>
<td>14</td>
</tr>
<tr>
<td><strong>Category five: Chicken &amp; egg discussion</strong></td>
<td></td>
</tr>
<tr>
<td>Influence of research &amp; practice</td>
<td>21</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>353</td>
</tr>
</tbody>
</table>
Annex VII - Coding examples from interview transcripts

Example 1 – IUCN Programme Manager

IUCN Programme Manager: I can give you two good examples on how we work on and include gender issues. If we talk about gender, for us it is obvious but not for everybody. It is not only about women and men; it is about all type of gender. The first case is a more women-focused project. It is a global project in mountain ecosystems. We work with a group of mothers. Why do we work with women in this case, because they were the most vulnerable group of the communities. It was not the children or elderly; it was the women. Why, because mountain ecosystems suffer the most of male migration. There is still the patriarchal way of thinking. The men go to the urban areas to find a job, while the family stay in the mountain area. So that project worked with the women. We created home-stay activities where the tourists can stay there with the communities. Those activities where managed by women. They also worked on alternatives practices, usually their income was based what was coming from the agricultural practices. Now they have new practices such as the bee-keeping, so they have their own honey. And this honey can be sold to tourists or other areas... they are even selling the honey to shops in urban areas. There are also new agricultural practices and livestock practices that are even more efficient in a climate change scenario.

Another example is in Mozambique. We have a project on coastal resilience. We are developing community-action plans. These are developed by the communities. We just give them some ideas, but they are the one that are deciding what has to be done in their territory. This is a challenging project because of the high level of illiteracy, so about 85%.

(Connection interrupted) Because of their religion, they are Muslim. Women are staying behind. In this case, we have two workers separately, sometimes. So, then we were sure that also that women have their say.

Example 2 – Wetlands International Programme Coordinator

Programme Coordinator, Wetlands Int.: Based on our experience, there are two options, whether we will arrange how a woman and men in a role and then tried to make sure that they have the same proportion, they have the same or so many people say something, if the condition is fine. Because of the cultural limitation and also other circumstances, we have to do a different arrangement. Intentionally, if opportunity for a woman to establish a women group, to do the small business microfinance and things. There are difficulties for the women to be together with the man. It depends on the characteristic of the communities that they are facing. I think the idea thing, how to make sure that in one group and then that it will be in proportion of men and women and that they have the same opportunity to say something. But if these conditions cannot be reached and then the intervention that we often took, is supporting woman to establish a women group. They can relate their own plan and try to implement the program. In several cases that we had, if it's still with, for example with microfinance program and also the livelihood, saving money and also doing business, the result of women groups is more promising compare to men because they are very keen to maintain and to do the business. In our culture here the women are more patience. If they have money, they would like to use the money in a wiser way compare to men.
3 Case studies

Annex VIII – Brief country profiles and comparison table

Haiti

The country is located in the Caribbean Sea, comprising the western part of the island Hispaniola. Haiti’s topography varies implying mountainous terrain and a coastal line of 1,771 km (CENTRAL INTELLIGENCE AGENCY (CIA)). Therefore, the pilot project by UNEP applied a ridge-to-reef approach, addressing vulnerable areas in hilly zones which are connected through fluvial systems with the coast. The land is predominantly used for farming activities, whereby a majority of the population is engaged in subsistence farming, in particular women. Next to cash crops such as beans, corn and onions, most notably the perennial grass vetiver is cultivated. Vetiver grass is very drought resistant and grows well even under poor soil conditions. Its deep roots can stabilize the soil, thus, be used as an erosion control measure. Vetiver grass serves as one of the main livelihood options. Two further options comprise fishermen and female fish vendors, which are determined as socio-economic vulnerable groups in this country. The lack of alternative livelihood sources, access to credits and investments intensifies their vulnerability. The country is stated as the poorest country on the Western hemisphere, facing weak infrastructure, rapid unplanned urbanization and fragile institutions (UNEP 2016a).

Almost 96% of the population is exposed to natural hazards predominantly hurricanes, floods and earthquakes. Environmental impacts of disasters are coastal/soil erosion and sedimentation deposition which lower the ecosystem’s capacity to act as a natural buffer against disaster impacts. Intense deforestation, unsustainable harvest of vetiver and fishing activities contribute to progressive environmental degradation. Therefore, one of the main components of the pilot project implied the re-vegetation of vetiver and mangroves to stabilize coastal areas and riverbanks and create protection measures against storm surges. Reforestation and sustainable vetiver plantation activities in the hill sites are supposed to prevent further soil erosion. As a third component, the project aimed to implement sustainable fishing practices by establishing marine protected areas (UNEP 2016a).
Afghanistan

Afghanistan is one of the poorest countries in the world, marked by decades of conflicts. It is located in South Central Asia in mostly mountainous terrain, considered as semi-arid steppe (MANI et al. 2018). The country experienced severe droughts, which intensified the loss of vegetation cover and erosion. Increasing occurrence of landslides and flash floods are consequences of this environmental degradation. Therefore, the pilot project in the mountain areas of Koh-e Baba established tree nurseries and replanting activities as a prevention measure against disaster risk (UNEP 2016b).

Main threats to the environment include disputes over natural resources and unsustainable land use. Limited land use policies, in particular grazing, cause environmental degradation. About half of the agricultural land is rangeland and used for extensive livestock grazing. Spreading farming and grazing activities cause intensive deforestation and desertification. Only 1.3% of the land in Afghanistan is considered to be forest (BROWN and BLANKENSHIP 2013). The latter effect is linked to climate change resulting in frequent crop failures and abandoned, uncultivated land (SAVAGE et al. 2009).
Summarized comparison of the case studies in four main categories. Source: UNEP (2016a); UNEP (2016b).

<table>
<thead>
<tr>
<th>Main disaster risks</th>
<th>Haiti</th>
<th>Afghanistan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Root causes</td>
<td>Coastal floods, Tropical storms, Landslides</td>
<td>Floods, Earthquakes, Droughts</td>
</tr>
<tr>
<td>Determinants of vulnerability to disaster risk</td>
<td>• Environmental degradation • Poverty • Fragile institutions</td>
<td>• Poverty • Environmental degradation • Conflicts</td>
</tr>
<tr>
<td>Ecosystem for DRR</td>
<td>• Weak infrastructure • Unregulated exploitation of land and marine resources • Rapid and unplanned urbanization</td>
<td>• Population increase and shift • Unplanned urban growth • Conflict</td>
</tr>
<tr>
<td>Main components of Eco-DRR intervention</td>
<td>Vetiver grass, Trees/ Riparian trees, Coral reefs, seagrass beds, Mangroves</td>
<td>Rangelands, (Apple) trees</td>
</tr>
<tr>
<td>1. Undertake field interventions to reduce disaster risk covering the entire landscape from the hills to the sea (ridge-to-reef), including:</td>
<td>1. Mainstream Eco-DRR in local development planning</td>
<td></td>
</tr>
<tr>
<td>- Re-vegetation and sustainable vetiver farming to reduce the risk of upland erosion and inland flooding;</td>
<td>2. Undertake practical field interventions, including community tree nurseries and stabilizing streambanks and degraded slopes through re-planting activities</td>
<td></td>
</tr>
<tr>
<td>- Coastal re-vegetation as natural buffers against coastal hazards, such as storm surges and coastal flooding;</td>
<td>3. Develop local and national skills and capacity for implementing Eco-DRR and Green and Resilient Development Planning</td>
<td></td>
</tr>
<tr>
<td>- Sustainable and resilient fisheries to increase local resilience to disasters</td>
<td>4. Support advocacy on Eco-DRR for enhancing national disaster and climate resilience</td>
<td></td>
</tr>
<tr>
<td>2. Develop local and national capacities for implementing Eco-DRR for improved coastal zone management; and</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Support national advocacy on Eco-DRR through marine protected area management.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cultural aspects/ background</th>
<th>Haiti</th>
<th>Afghanistan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primarily Christian country</td>
<td>Assigned gender roles (women indoor activities, caretaker; men outdoor activities provider of livelihood)</td>
<td></td>
</tr>
<tr>
<td>Traditionally male dominated</td>
<td>Women have extremely limited decision-making capacity</td>
<td></td>
</tr>
<tr>
<td>In rural areas, women have mostly care taking role, in household &amp; vendors</td>
<td>High level of female illiteracy</td>
<td></td>
</tr>
<tr>
<td>Focus on gender integration</td>
<td>Outcome &amp; impacts</td>
<td></td>
</tr>
<tr>
<td>----------------------------</td>
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<td></td>
</tr>
</tbody>
</table>
| • Men mostly responsible for farming  
• society retains a strong patriarchal structure | • Reduction of soil erosion, stabilization of stream and river banks  
• Diversity of local livelihoods, improved community resilience  
• Concept of Eco-DRR applied in political agenda  
• Replication of concept in other areas  
• Strengthen cooperation with humanitarian, CC and DRR actors  
• Strengthen collaboration with national government and NGOs  
• Plantation continued partially |
| • Creation of marine protected area to secure marine ecosystem, promoting sustainable & resilient fisheries  
• Cooperation with fishermen and fisher’s cooperative improved coastal early warning system  
• Establish vetiver cooperative & market to strengthen economic resilience  
• Reduction of soil/beach erosion & sedimentation run-off, stabilization of hillsides  
• Reduction of exposure to coastal hazards  
• first national training on Eco-DRR with a focus on integrated coastal zone management, raising national awareness |
Annex IX - Interview transcripts

All transcripts from the conducted expert interviews are provided on the attached CD.

Annex X – Turnitin report

The full Turnitin report can be found on the CD provided with this hardcopy.