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Gender equality in ocean science for sustainable development : analysis of ocean science institutions in Kenya

Renis Auma Ojwala

GENDER EQUALITY IN OCEAN SCIENCE FOR SUSTAINABLE DEVELOPMENT: ANALYSIS OF OCEAN SCIENCE INSTITUTIONS IN KENYA

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Renis Auma Ojwala
Kenya

A dissertation submitted to the World Maritime University in partial fulfilment of the requirements for the award of the degree of Doctor of Philosophy in Maritime Affairs

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Cover photo by © Renis Auma Ojwala. Photo taken by the Author from an exhibition on dangers at sea at Malmö Museum, Sweden which was part of WMU's contribution: – *In a place of equal opportunity women can do anything and everything, with less talk and more action* –

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Dedication

This thesis work is dedicated to the Almighty God for providing opportunity, protection and good health during my PhD studies (especially field work which I conducted during the COVID pandemic), and to my late parents (Peter Otieno Ojwala and Esther Adhiambo) for their love.

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This research area required access to various institutions dealing with ocean science in Kenya, and I had no contact with most of them. My special thanks go to Mrs Nancy Gitonga, who guided and supported me during fieldwork by sharing contact details of the respective persons and the selected institutions. Thank you for being the best mentor and for the several phone calls you made to the participants on my behalf that resulted in a fruitful fieldwork or data collection process.

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Figure 1: Supervision meeting with my three supervisors

Abstract

Gender inequality poses a serious problem for national and international developmental programmes such as the United Nations Decade of Ocean Science for Sustainable Development (the Ocean Decade) and appears in both developed and developing countries. The fundamental aim of the Ocean Decade is to improve ocean health worldwide through generating knowledge, supporting innovations, discovering creative ideas and developing solutions to achieve equitable and sustainable development under the changing environmental, social and climate conditions. The paucity of women in ocean management has been documented as a major hindrance to ocean sustainability and a top challenge to diversity in workplaces because of the exclusion of female knowledge, even though the greater proportion of primary resource users are women. The inclusion of women in management leads to different kinds of perspectives and leadership that facilitate and navigate various policy issues. Consequently, the Ocean Decade is committed to ensuring that the issue of gender inequality in the ocean science sector is urgently addressed and the contribution towards ocean-based activities by women is made visible in various disciplines, including education, fisheries, research, conservation and management. However, there is very little information on the link between gender and ocean science, especially in developing countries like Kenya. In order to increase the participation of women, we need to know where the gaps exist and how best to close them. The lack of information about women's substantial roles has led to unequal opportunities for women to participate in and contribute to ocean scientific research and governance. This lack of awareness about gender equality among ocean science communities has thwarted the progress and inclusion of women.

Gender equality is not only about having equal gender ratios in terms of students and staff within institutions, but also how this is related to seniority, position and influence. It is about understanding how gender intersects with factors such as ethnicity, education, class and age and how organisations must be inclusive, diverse and ensure everyone has an equal voice and opportunity – numbers are not all. This research explores gender equality gaps in ocean science institutions and the existing gender-related policies, providing baseline gender-disaggregated data and accounting for the underrepresentation of women in ocean science. The research employed a Feminist Political Ecology framework, utilising a balanced approach of quantitative and qualitative data collection and analysis methodologies. Using Kenya as a case study, this research has used the Gender Integration Continuum framework to evaluate the effectiveness of institutional gender policies against national standards. In addition, the study investigated gender gaps (using gender-disaggregated data) in the enrolment of students and recruitment of staff in ocean science universities and non-academic institutions. The career patterns, experiences

and barriers of both female and male students and ocean science professionals were also obtained through questionnaires and interviews. The questionnaires were administered to 102 undergraduate and postgraduate students while 30 interviews were conducted using two sets of guiding questions to target two groups of participants, i.e. ocean science staff in general and staff dealing specifically with gender issues –the gender focal points within the institutions, thus gaining insight into individual staff experiences as well as institutional work and progress on gender equality. The ocean science institutions studied were categorized into four groups: public universities, government agencies, non-governmental and intergovernmental organisations.

The findings revealed that even though most public universities have gender policies in place, these do not necessarily translate into gender balance of students and staff. Fewer female than male students were found to be enrolled in ocean science-related courses at public universities. All the ocean science institutions had lower representation of female staff at all career stages, including management and decision-making positions. Institutional management was found to be strongly male-centred (androcentric), especially in government affiliated agencies. Interestingly, this was not the case for non-governmental and intergovernmental organizations, where the number of female managers and directors was greater than in academia. Ethnic and gender biases were found to be prominent in the enrolment of students and hiring of staff in ocean science programmes. Cultural barriers, gender discrimination and stereotypes were highlighted by student respondents as the major impediments to full participation of female students in ocean science education. Results also showed that career patterns were diverse between female and male staff, with both genders acknowledging discriminatory promotion guidelines, work-family conflicts, incidents of sexual harassment and lack of support and recognition as barriers to career progression and gender equality in ocean science. Most participants mentioned institutional gender centres and formalised gender policies as good practices in forwarding gender equality.

Based on these findings, this study generated the following recommendations that will significantly contribute to, promote and improve the status of gender equality in ocean science institutions in Kenya: (i) the establishment of gender-transformative policies with clear and measurable targets and indicators, (ii) the effective implementation of such policies through regular evaluation and monitoring, (iii) constant and mandatory gender analysis through collection of gender-disaggregated data of students and staff to keep track on the progress, (iv) having equitable recruitment and hiring committees or panels to eliminate discrimination, (v) including women in leadership, management and decision-making positions in the institutions, (vi) mandatory training of students and staff, and (vii) developing and strengthening mentorship programmes to encourage and attract more female prospects to increase their participation in ocean science fields.

Keywords: Gender equality, ocean science, public universities and institutions, ocean decade, empowering women, gender policy, sexual harassment policy, gender-disaggregated data, career progression, barriers, good practices.

Abbreviations

CEDAW	Convention on the Elimination of All Forms of Discrimination Against Women
CISP	Comitato Internazionale per lo Sviluppo dei Popoli (International Committee for the Development of Peoples)
CUE	Commission of University Education
DEI	Diversity, Equity and Inclusion
ECOPs	Early Career Ocean Professionals
ECOSOC	Economic and Social Council (of the United Nations)
FAO	Food and Agriculture Organisation of the United Nations
FGM	Female Genital Mutilation
FPE	Feminist Political Ecology
GEF	Global Environment Facility
GIC	Gender Integration Continuum
GWA	Gender and Water Alliance
HELB	Higher Education Loans Board
IGOs	Intergovernmental organisations
IGWG	Interagency Gender Working Group
IOC-UNESCO	Intergovernmental Oceanographic Commission of the UNESCO
IUCN	International Union for Conservation of Nature
MDGs	Millennium Development Goals
NACOSTI	National Commission for Science, Technology and Innovation
NGOs	Non-governmental organizations
SDGs	The UN Sustainable Development Goals
SEI	Stockholm Environment Institute
SIDA	Swedish International Development Cooperation Agency
STEM	Science, Technology, Engineering and Mathematics
UN	United Nations

UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNGA	United Nations General Assembly
UNFCCC	UN Framework Convention on Climate Change
UNHCR	United Nations High Commission for Refugees
UNICEF	United Nations Children's (Emergency) Fund
USAID	United States Agency for International Development

Definition of terms

Career advancement	The progression of an individual's career. It entails career growth and promotions (Kanyata, 2022).
Career development	Activities undertaken by the employees themselves and the organisation so as to achieve career objectives and job requirements (Kakui & Gachunga, 2016).
Development	A term that has been used to refer to both economic and human developments. It has been defined as the constant improvement of the well-being of the entire population and of all individuals on the basis of their free, meaningful participation in development and in the fair distribution of benefits (UN Declaration on the Right to Development, 1956).
Empowerment	The process of generating and building capacities to exercise control over life by expanding choice. This entails gaining access to resources and developing people's capacity in order to actively participate in shaping one's own life and community in social, economic and political terms (Muyoyeta, 2007). Female empowerment is achieved when women and girls acquire power, inherent confidence, knowledge, skills, and voice to act freely, and exercise their rights and full potential as full and equal members of society (Hickel, 2014).
Feminism	A complex concept with various meanings as defined by many scholars, but the underlying premise is seeking justice and equality in all spheres of life by creating opportunities for women to have the same access to resources as men (Raina, 2017).
Gender	Refers to the socially constructed roles, responsibilities, attributes, phenomena and behaviours associated with being female and male, and the relationship between women and men, girls and boys, that emerges in families, societies and culture and is considered the appropriate life status for women and men at a given time, giving women unequal life chances and unequal opportunities. Gender is not the same as sex and cannot be determined biologically (UN Women, 2011; Kabeer, 2003; UNESCO, 2003; FAO, 2018).

Gender blind	Ignores gender issues, roles and gaps between women and men and may contain measures that discriminate against women and men and/ or reinforce gender inequalities (FAO, 2016; IGWG, 2017; FAO, 2018).
Gender discrimination	Any restriction to, or exclusion from, opportunities and entitlements based on gender relations and roles that prevent a person from enjoying full human rights (FAO, 2013; FAO, 2018).
Gender division of labour	The result of how a society divides work among women and men according to what is considered appropriate or suitable for each gender (UNESCO, 2003).
Gender equality	The equal participation of women and men in all spheres and at all levels, including decision-making positions; equal rights to access development-related benefits, including equal access and control over natural resources; equal employment opportunities; and absence of discrimination based on sex. Gender equality is not specific to one gender and does not imply that genders will or should merge into one (FAO, 2013, GEF, 2017; FAO, 2018).
Gender equity	The process of showing fair and just treatment to women and men as well as to gender minorities in the distribution of responsibilities and benefits, while taking into account their different interests, needs, vulnerabilities, social and cultural barriers. In other words, it's a means or tool to achieve gender equality. It involves measures that compensate for women's, girls' and gender minorities' historical and social disadvantages that prevent them from operating on a level playing field (UNESCO, 2003; African Union, 2009; IFAD, 2015).
Gender focal point	Gender focal point is a staff member who is responsible for facilitating the promotion of women's empowerment and gender equality issues in the activities of his or her working unit [1]. He/she is a change agent who has been designated within an institution or organisation to monitor and stimulate greater consideration of and awareness on gender parity and equality issues in daily operations (UN Women, 2020). The main role is to provide information to staff on policies

[1] European Union Resource Package (n.d). Gender mainstreaming in development cooperation. https://eugender.itcilo.org/toolkit/online/story_content/external_files/BB7.pdf

	relevant to advancing gender equality in the workplace and on creation of enabling working environment such as family friendly policies and flexible working arrangements (UN Women, 2020, p. 4).
Gender identity	Refers to the individual's feeling about their own gender, i.e. one's own psychological perception of being female, male or other. This may or may not be the sex received at birth. Every person has a gender identity which they present to the outer world in a unique and personal way (Arendell, 2000; Rokach & Patel, 2021).
Gender inequality	Unequal treatment of individuals, manifested as hierarchical gender relations, mostly originating from those differences in cultural and social responsibilities, roles, perceptions and discriminatory gender norms that are created and maintained to define women and men in society (Buckingham, 2020).
Gender imbalances	Inequalities that exist between women and men which are not related to their biological roles (Muyoyeta, 2007).
Gender integration	Identifying and then addressing gender inequalities during project design, implementation and monitoring and evaluation. This is important because the power relations and roles between women and men influence or affect how an activity is implemented (USAID, 2012).
Gender mainstreaming	Assessing the implications for women and men of any planned action, including legislation, policies and programmes, in all areas and at all levels. It is a strategy for making women's as well as men's concerns and experiences an integral dimension of the design, implementation, monitoring and evaluation of policies and programmes in all political, economic, and social spheres so that women and men benefit equally and inequality is not perpetuated (ECOSOC, 1997, p.27).
Gender neutral	Recognises gender inequalities but does not include specific measures to address gender inequality and discrimination (FAO, 2018).
Gender norms	Refers to the informal, widely held and deeply entrenched rules and socially shared or societal expectations about how each gender should behave or that define socially acceptable responsibilities and roles of women and men and the power relations between them. Gender norms are disproportionately

	disadvantageous to women and skewed in favour of men (e.g., women should do domestic work). These norms are distinct, not universal and can vary from every society both within and between cultures, and can change over time (Petesch et al., 2018; FAO, 2018).
Gender representation	Having equal or same numbers of women and men receiving education and/or in workplaces at any level and in any field or institution (Francesca et al., 2013).
Gender responsive approach	Identifies, recognises, and adequately addresses the different or particular needs, priorities, power structures, status and relationships between girls, boys, women and men to promote equal outcomes in the design, implementation and monitoring of activities (GEF, 2017).
Gender roles/relations	Gender roles refer to the activities and responsibilities given or ascribed to women and men in a society based on their sex. These roles are influenced by the cultural, economic, political, social and religious situation (FAO, 2018). Gender relations, on the other hand, refer to the ways a society defines identities, responsibilities, rights and roles of women and men in their interaction with one another, and these relations are informed by socio-cultural norms that determine how power is distributed between sexes (FAO, 2018).
Gender sensitive	Shows awareness of gender differences and inequalities, but does not necessarily address them (IGWG, 2017).
Gender stereotype	A generalized view or perception that is widely held, a fixed image or idea about the attributes or characteristics that define women and men. This can limit the capability of either gender to develop their personal abilities, make choices about their lives and pursue their professional careers (Baltic gender report, 2020).
Gender transformative	Recognises specific needs and priorities of women and men, and proactively and purposefully tackles gender inequalities by questioning and challenging the structures, norms, and institutions on which these inequalities are based, reinforced, sustained, and reproduced over time (FAO, 2018).
Gender/sex-disaggregated data	Data that allows for the measurement of differences between women and men and which is presented separately (UNESCO, 2003).

Intersectionality	The understanding that a person's identity is made up of multiple, intersecting factors such as age, class, race, ethnicity, marital status, education, disability, gender identity and/or sexual orientation among others, all of which combine to both benefit and disadvantage women and men alike and which cannot be separated (Rocheleau et al., 1996).
Mentoring	The process of developing formal relationships between junior and senior members of an organisation. It creates an opportunity for less experienced staff to learn from more experienced staff (Aneeq, 2012).
Ocean science	The study of the global marine environment, including the physics, chemistry, and biology of marine systems (McConnochie, 2023).
Productive role	Tasks that produce services or goods with a monetary value attached, including trading, farming, and formal employment (Muyoyeta, 2007).
Reproductive role	Tasks related to child bearing, rearing and general well-being of the family (Muyoyeta, 2007).
Scorecard	A tool used to evaluate gender equality in workplace (EQUILEAP, 2019). A scorecard establishes and puts goals, strategies, and vision at the centre, and assumes that people should adopt them to promote gender equality in their respective institutions.
Sexual harassment	Unwelcome sexual advances, requests for favours and other verbal, behavioural or physical conduct of a sexual nature – things that explicitly or implicitly affect an individual's employment (Weinberg & Nielsen, 2017).
Sustainable development	Development that meets the present needs, without compromising the ability of future generations to meet their own needs (United Nations, 1987).

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List of papers included in this dissertation

The list of papers (Appendix 7) in this thesis are presented in chronological order in line with the research questions, starting with those evaluating gender policy implications and empirical data on gender representation in ocean science institutions in Kenya and followed by those focusing on the theoretical or thematic analysis of students' and staff experiences. This thesis is based on the work contained in the following papers:

Paper 1: Ojwala, R. A., Kitada, M., Neat F., & Buckingham, S. (2022). Effectiveness of gender policies in achieving gender equality in ocean science programmes in public universities in Kenya. Marine Policy, 144: Article 105237, pp. 1-12. DOI: https://doi.org/10.1016/j.marpol.2022.105237.

Paper 2: Ojwala, R. A. (2023). Status of gender equality in ocean research, conservation and management institutions and organizations in Kenya. African Journal of Marine Science, 45 (2), 1-11. DOI: https://doi.org/10.2989/1814232X.2023.2213724.

Paper 3: Ojwala, R. A. (2023). Unravelling gender and ethnic bias in higher education: Students experiences in access to ocean science education and career opportunities in Kenya. Higher Education (Under review).

Paper 4: Ojwala, R. A., Buckingham, S., Neat, F. & Kitada, M. (2023). Gender and the ocean: Understanding women's roles, experiences and barriers to participation in ocean science education in Kenya. Ecology & Society (Under Review).

1. Introduction

The absence of gender equality and women's empowerment in ocean science is a concern for the conservation, protection and sustainable use of the ocean (Orcutt & Cetinić, 2014; Huyer, 2015; Gissi et al., 2018; Legg et al., 2023). The need to address gender inequality remains a key focus within the management of marine resources to ensure sustainable oceans for future generations and is established within the framework of the UN Sustainable Development Goals (SDGs) (United Nations, 2015a; Virto, 2018; Giakoumi et al., 2021). Women play a crucial role in ocean resource management around the world, especially in small-scale fisheries, marine conservation and managing aquatic resources at the community level (UN Women, 2015; Tilley et al., 2021). According to the UN Women (2015), women's substantial contribution has been observed across the entire fisheries supply chain, largely associated with the post-harvest activities such as processing, seaweed and shellfish collection, marketing, and net repairs (Gissi et al., 2018; Shah & Bukhari, 2019).

Women also actively engage in local development plans or projects led by the local, national, and regional conservation organisations through participating in mangrove planting or regeneration to restore marine biodiversity and help re-establish the shoreline buffering and stabilization (IUCN, 2017). Women are the primary users of the ocean resources in the Global South because of their subsistence or domestic roles. Besides, women in local coastal and indigenous communities have extensive traditional knowledge that is necessary and needed to achieve sustainable use and conservation of ocean ecosystems (UN Women, 2015). Despite these substantial contributions, women are often overlooked and do not translate to decision-making power for women. In ocean science, gender balanced teams and organisations are, not only fair, but result in better outcomes because ocean sustainability issues are complex and require diverse and innovative perspectives.

The IOC-UNESCO, as the agency dealing with ocean science globally, initiated the UN Decade of Ocean Science for Sustainable Development (hereafter Ocean Decade) –a ten-year implementation plan of the SDG 14 (Life Below Water) to reverse the declining health of the oceans through involving all stakeholders (Ryabinin et al., 2019), both women and men alike. Less than ten years now remain to achieve the SDGs underpinning the 2030 UN Agenda for Sustainable Development. Gender equality which is a cross-cutting and crucial element of the

Agenda 2030, with its own specific SDG (No. 5) is a far-reaching goal. Despite this, gender equality has not been fully addressed in most parts of the world and ocean science is no exception. Based on the existing literature and reports, including the annual global ocean science and gender gap reports by IOC-UNESCO and World Economic Forum, respectively (Kabeer, 2005; Orcutt & Cetinić, 2014; Gissi et al., 2018; WEF, 2020; IOC-UNESCO, 2020; Isensee, 2020), there is clear evidence that gender inequality is problematic in ocean research and governance globally.

Recently, discussion on gender equality has gained traction in ocean science due to the growing seriousness of deteriorating ocean health, driven largely by human-induced (and gender related) environmental and climate change impacts (Giakoumi et al., 2021). Understanding the gender inequalities in ocean science is critical in ensuring sustainable ocean management in terms of its approaches and policies (Boesch, 1999; Håkon et al., 2005; Brodie et al., 2020). Most countries have ratified the international and national frameworks on gender equality to increase women's participation in development and sustainable environmental management (Hicks, 2011; Popp et al., 2019; Bennett et al., 2019). However, the underrepresentation of women is still evident mostly in developing countries. In light of this, this study is focused on gender equality in ocean science institutions in Kenya in order to provide the missing data and information on status and trends in this sector. The aim is to evaluate existing national and institutional gender policies, examine the gender-disaggregated data of students and staff, and explore the experiences of female and male ocean scientists (both students and staff) in higher education, research, conservation, and governance.

This study adopted Feminist Political Ecology (FPE) as a theoretical framework to provide insights on the existing relationships between gender, environment, and the politics of place in order to understand how the differences in gendered power relations influence the institutional policies and practices in the ocean science sector as well as the achievement of a sustainable ocean. Being a deductive research design, FPE was employed in framing the research objectives and questions. The following sub-sections discuss in detail the research aim, objectives, and questions of this study.

1.1. Research aim

This research aimed to examine gender equality and the empowerment of women in ocean science in Kenya. Using ocean science institutions in Kenya as a case study, the effectiveness of existing institutional gender policies was evaluated using national policies and standards and gender-disaggregated data. This study explored what makes a successful and effective gender equality policy. The gender gaps identified were then interpreted with respect to the intersectionality between

ethnicity, age, family support, education, and class, using the information provided by the participants of questionnaires and in-depth interviews. Ultimately, the study sought to generate recommendations on how to close the gender gaps identified and mitigate the factors that impede the achievement of gender equality in ocean science institutions.

1.2. Research objectives

The overall objective of this research was to conduct a comprehensive baseline study of gender equality within ocean science institutions in Kenya. This encompassed understanding the current state of gender policies and representation among students and staff. The insights derived from this study aim to inform and bolster strategies to promote gender equality within these institutions. Utilising these insights, the study sought to facilitate the advancement of gender policies, creating a more inclusive environment for all genders. This broad objective was achieved by five specific objectives:

First, *to evaluate gender-related policies against national standards and their impacts in ocean science institutions in Kenya*. The focus was on the existing national and institutional gender policies and their impacts in the institutions on women's participation in ocean science.

Second, *to investigate the representation of women and men in ocean science at all levels across educational, research and management institutions in Kenya.* The focus was on students and staff gender ratios in ocean science programmes.

Third, based on the outcomes of the gender representation of the students and staff, *to examine the students and staff views, and barriers to gender equality in ocean science in Kenya.* The focus was on students' and staff experiences in ocean science fields and barriers to access and equal participation in higher education.

Fourth, *to apply Feminist Political Ecology to explore the forms of gender inequalities, and the intersections between gender and age, family support, education, ethnicity and class, across ocean science institutions in Kenya*. The focus was on how intersectionality contributes to explaining variability in ocean science above and beyond the gender equality policy to the gender inequalities that currently dominate in ocean science institutions among students and staff.

Fifth, *to identify the good practices and interventions in the institutions to promote gender equality in ocean science in Kenya and generate recommendations*. The

focus was on all the interventions or initiatives in the institutions that are viewed as good practices by staff, including gender policies.

1.3. Research questions

To achieve these objectives, the following five research questions were formulated to guide this research:

1. What is the relationship between gender-related policies and women's representation in ocean science institutions in Kenya?
2. How does gender representation vary across ocean science career levels and institutions in Kenya?
3. What are the barriers to gender equality among students and staff participating in ocean science disciplines in Kenya?
4. How does age, family support, education, ethnicity and class intersect with gender to influence the achievement of gender equality in Kenya?
5. What are the good practices in place to promote gender equality in ocean science institutions in Kenya?

2. Literature review

¨Throughout Africa, women are the primary caretakers, holding significant responsibility for tilling the land and feeding their families. As a result, they are often the first to become aware of environmental damage as resources become scarce and incapable of sustaining their families¨
~Wangari Maathai (2004).

2.1. Gender and ethnic politics in Kenya

2.1.1. Gender diversity in politics in Kenya

Gender representation in politics is a challenge that deserves serious attention in Kenya. Gender plays an important role in Kenyan politics and gender-related issues are currently on the rise especially in general elections and political appointments (Memusi & Madsen, 2022, p. 3). Kenya had an estimated population of over 47.6 million people in 2019 with females accounting for 50.5 per cent of the total population (Kenya National Bureau of Statistics, 2019). Most people are concentrated near Lake Victoria and Nairobi –the capital city. The Global Gender Gap Index Report in 2022, ranked Kenya in position 57 out of the 146 countries surveyed, with a parity score index of 0.729 (WEF, 2022, p. 214). This ranking was based on the country's cumulative performance in four different aspects: educational attainment (ranked 118th), political empowerment (ranked 81st), Health and survival (ranked 57th) and economic participation and opportunity (ranked 6th). These results showed a remarkable improvement compared to those in 2021, where the country was ranked 95th position out of 156 countries studied with an index score of 0.692 (WEF, 2021, p. 239). However, the 2023 index report ranks Kenya at 77 out of 146 countries, with a score of 0.708 (WEF, 2023). These data show why regular monitoring and evaluation of the country's performance in various sectors in terms of gender equality is crucial because it shows how the gender gaps vary over time and the need to look at trends rather than snapshots.

Women's role in politics can be traced back from the pre-colonial, colonial to post-colonial era (Oduol, 1993, p. 166; Ochwada, 1997, p. 2; Kamau, 2010, p. 11;

Kenyatta, 2023, p. 3). Even though women were largely invisible in political affairs, historical records reveal their important contribution to make Kenya what it is today (Oduol, 1993). For instance, during the colonial era when the country was struggling to gain independence, women steered peaceful protests that jeopardized their lives (Hanson, 2008; Kamau, 2010; Kenyatta, 2023, p. 3). Other efforts made by women included the formation of women's movements to promote and advocate for gender equality such as Maendeleo Ya Wanawake Organisations (MYWO) and the National Council of Women of Kenya (Ochwada, 1997, p. 16; Lutomia et al., 2016, p. 321; Lund, 2021, p. 12). According to Lund (2021), the MYWO is a national grassroots organisation formed by women in 1950s as a welfare organisation. MYWO later became a turning stone that dealt with women's rights issues and gender equity in Kenya, as well as provided a safe space for women, including those from rural areas. A report by European Institute for Gender Equality (2017) on gender equality in political decision-making highlighted that equal participation of women and men in politics is an important condition for good governance and effective democracy. The participation of women in political decision-making has many positive effects on the society such as development in education, higher standards of living, health, and infrastructure, strengthening and enhancing the democratic system, more equitable societies, and inclusive governance as well as a decrease in political corruption (Fraile & Gomez, 2017).

However, politically, women are still underrepresented, with lower proportions in elected bodies of government and political leadership often below 30 per cent (Lund, 2021). This contravenes the one-third gender principle threshold as stipulated in the 2010 Constitution (Lund, 2021). Kenya has never had a woman head of state or Vice-President since its independence. The highest position a woman has achieved in the last six decades since Kenya's independence is the office of the Chief Justice and governor position.

An examination into the challenges/obstacles faced by women politicians, root causes of gender discrimination/biases and reasons causing the persistent gender imbalance in political process in spite of the women's efforts, has revealed different factors or impediments (Lund, 2021, p. 6; Memusi & Madsen, 2022, p. 5). These include the deeply rooted patriarchal structures, power imbalances, stereotypes, cultural prejudices, competitive politics, political parties, lack of political will and exclusion of women from political decision-making processes, violence against women, shaming of female politicians and financial capability (Kamau, 2010; Lund, 2021; Memusi & Madsen, 2022; Kenyatta, 2023). Gender equality and empowerment of women are key aspects that should be promoted in politics to ensure that both women and men exercise their equal rights and freedom in political decision-making process. In order to achieve this, there is need to reduce patriarchal stigma about the perception of women's position in society, feminist movements and theories that have been developed to explore gender issues in politics and provide concrete solutions.

2.1.2. Ethnic politics in Kenya

Historic background of ethnic groups in Kenya

Kenya is ethnically diverse (Taaliu, 2017; Kisaka & Nyadera, 2019), although the number of ethnic groups has not been well-documented because of the inconsistencies of the figures given in different reports. These sources include the African Studies Center (n.d)[2] that reported over 70 distinct ethnic groups and Santhiapillai (2022), who reported over 150 ethnic groups in the country. However, only 42 official tribes are commonly recognised in Kenya (Taaliu, 2017, p. 21). While ¨ethnic groups¨ and ¨tribes¨ are terms with distinct definitions, in Kenya, they are frequently used synonymously, as many Kenyans colloquially refer to their ethnic groups as tribes. In the Kenyan context, the term ethnicity referred to as ¨belonging to a social group that share common identity based on socio-cultural values like culture, languages, religion, customs, and beliefs¨ (Taaliu, 2017, p. 26). It is used to express the identity and cultural affiliation of people in a population (United Nations Statistical Division, 2003, p. 2). Whereas the term ¨tribe¨ refers to a group of people within a geo-political region with common ancestry. In other words, tribe is associated with common ancestors while ethnicity is related to culture (Taaliu, 2017, p. 26). In this thesis, the researcher opts to use the term 'ethnic groups', as it is a more inclusive, encompassing and relevant term in this particular.

Kenya's ethnic groups came about many years before independence in 1963 when the British colonial government divided Kenya into groups (Cornell & Hartmann, 2007; Kiai, 2009; Taaliu, 2017; Muange & Kiptoo, 2020). These ethnic groups generally fall into three ethnolinguistic families: Bantu, Nilotic and Cushite. Based on three broad categories, the five largest and dominant ethnic groups among these families are the Kikuyu community with approximately 17.7 per cent of the nation's total population, followed by Luhya (14.2 per cent), Kalenjin (13.3 per cent), Luo (10.8 per cent) and Kamba with 10.4 per cent - commonly referred to as the 'big five' (Taaliu, 2017). Kenya's relatively stable economy has led to an influx of migrants and refugees who have been estimated to account for more than half a million people in the country, many from neighbouring South Sudan and Somalia. In addition to the African population, Kenya is home to groups who migrated to the country during British colonial rule. People from India and Pakistan arrived in the 19th century, although many left after independence. A substantial number remain in urban areas such as Mombasa, Nairobi and Kisumu, where they engage in various business activities. European Kenyans, mostly British in origin, are the remnant of the colonial population. The migration from rural to urban areas has accelerated since independence, spurred by greater economic development in urban areas.

[2] African Studies Center (n.d) East Africa living encyclopaedia https://www.africa.upenn.edu/NEH/kethnic.htm

The language of Swahili (also known as 'Kiswahili') has also helped shaped a common national identity that transcends ethnic boundaries. Swahili, a language sharing linguistic features with other Bantu-based languages in the country, became the national language in Kenya following its independence, largely due to its broad adoption among the population. The country also uses English as an official language which is mainly used for business, education and official purposes. Along with Swahili and English, each ethnic group speaks its language as a native tongue. Swahili is commonly used when Kenyans communicate with other Kenyans from different ethnic groups. Culturally, Kenyans identify with their ethnic groups with many of them following traditions that relate to their ethnicity, from the name they give their children to the way they serve their food. Alongside, this pride in their native languages, there is a strong sense of national identity. Many are proud of their cultural heritage, accomplishments, and the country's successful efforts to achieve economic growth.

Relationship between ethnicity and politics in Kenya

Ethnic politics is more pronounced in Kenya than many African countries. Becker (2015, p. 11) argued that ethnicity is an important structuring factor in society because political parties are organised mainly along ethnic lines. Lynch (2015, p.1) has defined ethnic politics as ¨a situation in which politicians tend to mobilize support on the basis of an appeal to ethnic identity and people tend to support leaders from the same ethnic group¨. Kenyan politics has been experiencing an ongoing competition for power which is often portrayed as a struggle between the major ethnic groups –the Kikuyu, Kalenjin and Luo. In most cases, different ethnic groups view each other as competitors (Njoroge, 2017). In fact, most people believe that they will not access opportunities, or they will be excluded from state's benefits and protection when a member of their ethnic group is not in power (Ajulu, 2002; Lynch, 2015).

The consequences of ethnic bias in politics have been a pressing challenge in socio-economic and political development for six decades now, a major stumbling block to democracy, and the major cause of social problems since independence (Taaliu, 2017, p. 21). This bias has been reported to ignore the interests of the minority ethnic groups and side-line them when it comes to job opportunities and decision-making processes, hence they always become politically marginalised during an era of a particular ethnic group (Lynch, 2006). Ethnic bias in politics is often implicated in a range of detrimental behaviours. These include election rigging, corruption, poor governance, and the unequal distribution of resources, as well as a lack of accountability (Masakhalia, 2011). Further, there is a dearth of meritocracy, with job opportunities frequently being made based on ethnic group affiliations rather than qualifications. This practice leads to an underutilization of human capital and skills (Masakhalia, 2011).

2.2. Higher education in Kenya

Various researchers have studied different issues in higher education in Kenya, including students' enrolment and recruitment of staff (Mukhwana et al., 2016; Taaliu, 2017; Odhiambo, 2018; Simson, 2019); growth of public and private universities, gender disparities and ethnic diversities (Oketch, 2003; Onsongo, 2007; Boit & Kipkoech, 2012; Mwebi & Simatwa, 2013). Higher education, specifically university education has been recognised as the most important factor in achieving development and economic growth in the country and is expected to play an increasingly greater role in socio-economic development through producing and disseminating the knowledge required to achieve a knowledge-driven and innovative economy (Mulinge & Arasa, 2017).

Kenya's education systems have transformed and expanded in the last six decades. There are different categories of higher educational institutions including teacher training colleges, technical training institutions, middle level institutions and universities (Mwebi & Simatwa, 2013). Over the years, higher education in Kenya has experienced remarkable growth caused by the introduction of national policies; the free primary education and free secondary education in 2003 and 2008, respectively. The aim of these two policies was to provide a free universal education system to everyone, regardless of income. This Education for All approach provided an emancipation to parents and opportunities to many students, especially women whose education was not prioritized and those from the marginalised groups. Consequently, the number of public universities has risen from seven in 2007 to twenty-four in 2010 (Mwebi & Simatwa, 2013, p. 353; Commission for University Education, 2022). The expansion of university education also led to the establishment of private universities to meet the growing demand. Currently, Kenya has 37 public universities and 33 private universities, however, there are still not enough places to accommodate all applicants according to the Commission for University Education (2016).

2.2.1. Gender disparities in higher education

Access to higher education is an indispensable element and crucial tool for substantial socio-economic development. University education has also been recognised as the most important exit route from poverty (Boit & Kipkoech, 2012, p. 44; Mwebi & Simatwa, 2013, p. 352; Rosa et al., 2020; Rosa & Clavero, 2022). Women's access to higher education exposes them to opportunities, higher income sources, gives them self-confidence and provides social networks (Mwebi & Simatwa, 2013). While Kenya has attained gender parity in primary education and recorded reduced gender gaps in secondary education levels, women are generally underrepresented in higher education compared to men (Mutula, 2002; Onsongo,

2006; Mulongo, 2013; Taaliu, 2017; Odhiambo, 2016; Migosi, 2018; World Economic Forum, 2020). This is especially the case in Science, Technology, Engineering and Mathematics (STEM) courses (Mbirianjau, 2018; Omukoba, 2018; Shannon et al., 2019; Amunga & Amadalo, 2020). Despite the adoption of the Education for All (EFA) and the education target of the Millennium Development Goals (MDGs) and Sustainable Development Goals (SDGs), gender inequalities clearly persist in higher education in Kenya.

2.2.2. Ethnic inequalities in higher education

A number of previous studies in higher education have discovered that there are ethnic disparities in Kenyan universities (Kramon & Posner, 2016; Mukhwana et al., 2016; Taaliu, 2017; Simson & Green, 2020). Ethnic biases are more pronounced and often witnessed in forms of admission of students to universities, and employment e.g., recruitment, transfer, deployment and promotion of staff both teaching and non-teaching staff, and provision of services in public office (Alwy & Schech, 2004; Mwiria, 2006; Taaliu, 2017; Muange & Kiptoo, 2020). Taaliu (2017) reported that the majority of students enrolled were from Kikuyu, Luhya, Kamba and Luo, the four dominant ethnic groups that accounted for 72.8 per cent of the total number of students in colleges and public universities. This means that the other ethnic groups shared only the remaining 27.2 per cent. Mwiria (2006) also confirmed that ethnic imbalance in representation exists in the public universities where the majority of students admitted, staff employment and in leadership positions, give priority to people from the region, mainly associated with their ethnic groups.

2.2.3. Understanding the relationship between parents' background and students' access to higher education in Kenya

The Kenyan Government claims that education can be accessed by every citizen and that every citizen has a right to education regardless of gender, age, ethnicity, and social status. Equitable education system ensures that a child whose parents have higher incomes does not get an education superior to a child from a less disadvantaged background (Wilkie, 2007). Unlike the primary and secondary education, access to higher education is more expensive and it depends on the availability of funding. Sources of funding in Kenyan universities vary from support from parents or other family members, loans, grants, scholarships to well-wishers, among others. Availability of financial resources often influence the students' learning opportunities (The Organization for Economic Cooperation and Development, 2012, p. 11).

Access to higher education is highly influenced by parental characteristics such as educational background, class, and income. These factors play a significant role in students' academic life and influence individual educational choice in many countries, including Kenya (Breen & Jonsson, 2005; Chege & Sifuna, 2006; Erola et al., 2016). Occupational class of parents, in turn act as a direct indicator for the material resources available for children's education. Previous studies have indicated that the parents' resources and attitudes also have a powerful influence on how gender intersects with educational outcomes, occupational attainment and wider social norms and practices (McCracken et al., 2015; Määttä & Uusiautti, 2020). For instance, a study by Farre & Vella (2012) argued that increasing the number of parents in education, especially mothers changes their traditional views about the role of women in society, hence more likely to have working daughters through increasing the educational attainment of their daughters. It can also be the case that in accordance with traditional gender stereotypes, low educated parents perceive STEM courses as less suitable for girls (Tomasetto et al., 2015).

2.3. Promoting gender and ethnic diversity in education in Kenya

To achieve gender equality and ethnic diversity in higher education and other sectors, the Government of Kenya has shown concerted efforts by developing various policies (Ministry of Education, 2015; Wango et al., 2012). At the international level, Kenya supported the Beijing Declaration of the Platform for Action (1995), MDGs in 2000 and SDGs in 2015. Apart from the international frameworks, the country has also developed national and institutional gender policies to enhance the achievement of gender equality at institutional level, including universities. EFA was to provide guidance to the country to achieve gender equality in education by increasing the enrolment of female students at different levels of education (Flora et al., 2014). To increase female students' enrolment, the Ministry of Education, Science and Technology in Kenya have since then developed policies and strategies that have shown considerable progress or improvements over the years, including the Education and Training Gender Policy (2015). In addition, other relevant policies include the 2010 Constitution of Kenya, the Sessional Paper No. 14 of 2012, the National Policy on Gender and Development (2019), the Universities Act No. 42 of 2012 and many institutional gender-related policies addressing gender inequality, sexual harassment and gender-based violence.

The Education and Training Gender Policy in Kenya (2015) is the second edition developed and adopted by the Ministry of Education, Science and Technology (MoEST) with the technical support of UNESCO. The aim of the national gender

policy was to 'eliminate gender disparity and achieve gender equality in the education sector' (Ministry of Education, 2015; Ojwala et al., 2022; Hailu et al., 2023), with references to various policy provisions from 2010 Kenyan Constitution and international frameworks such as the Universal Declaration of Human Rights (1948), the Convention on the Elimination of all Discrimination against Women (1979), to the Beijing Declaration and Platform for Action (1995). This policy is geared towards human rights-based approach to ensure equal rights to education for girls and boys, women, and men, addressing six key priority areas, namely: access, equity, quality education, safety, security, and gender-based violence, nurturing and mentoring, and governance and management (Ministry of Education, 2015). Institutions or universities are expected to ensure compliance in upholding the two-thirds principle in enrolment of students and deployment of staff as expressed in the 2010 constitution. The institutions or universities are expected by the government of Kenya to establish their individual gender-related policies, especially institutions with more than 20 staff members. The policy also outlines the implementation structure, with administrative framework in Ministry of Education, Science and Technology. For instance, the Cabinet Secretary ensures that the policy is adopted by all stakeholders and Principal Secretary oversees budgetary allocation and provide leadership in facilitating the implementation and review of the policy. Even though the policy document elaborated the implementation framework, there was no statement highlighting the direct financial and legal consequences for not following or complying with the requirements of the gender equality and ethnic diversity policies by the institutions.

2.4. Ocean governance in Kenya

2.4.1. Policies and legislation

Kenya is located in the East African Coast and borders the Indian Ocean. The ocean is recognised as playing an important role in human existence and in the Kenyan economy, as well as in regulating climate conditions (Odido, 1998; Kibiwot, 2008). To ensure effective ocean governance, Kenya has institutions and standards to manage ocean resources and maintain their quality through setting up domestic and international laws[3]. The domestic laws include Environmental Management and Coordination Act (2015), Fisheries Management and Development Act (2016), Wildlife Conservation and Management Act (2013), Merchant Shipping Act (2009),

[3] Nairobi Covention (n.d). Marine and coastal resources governance –Kenya Country profile. https://www.nairobiconvention.org/kenya-country-profile/marine-and-coastal-resources-governance-kenya-country-profile/

and National Oceans and Fisheries Policy (2008). Kenya is also a signatory to international laws, including the United Nations Convention on the Law of the Sea (UNCLOS-1982), East African Community Treaty and Protocols, the Convention on Biological Diversity (1992), the Convention on the Conservation and Management Measures of High Seas Resources, the Paris Agreement and the International Convention for Prevention of Pollution from Ships (MARPOL), the Nairobi Convention (1985) and the Food and Agriculture Organisation (FAO) framework.

At international level, the Nairobi Convention is a part of the United Nations Environment Programme (UNEP)'s Regional Seas Programmes adopted in 1985, with the aim of addressing the accelerating degradation of oceans and coastal areas in the world, through sustainable use and management of marine and coastal environment. This programme is for the protection, management and development of marine and coastal environment of the Eastern African region (Odido, 1998; Maina, 2012, p. 10). The FAO framework, on the other hand, is a voluntary instrument adopted in 1995, aimed at everyone working in, and involved with fisheries and aquaculture. For example, the FAO Code of Conduct is a set of international standards of behaviour for responsible fisheries practices (FAO, 1995). The Code has a global which is directed towards members and non-members of FAO, sub-regional, regional and global organisations, fishing entities whether governmental or non-governmental, and all persons concerned with the conservation, management and development of fisheries resources, including fisheries and those engaged in marketing and processing of fishery products as well as other users of the aquatic environment in relation to fisheries (FAO, 1995, p. 1). Besides, the Code provided principles and standards applicable to conservation, management and development of all fisheries.

The Kenyan government has also recognised the potential of ocean resources in boosting the country's economic outlook and has made the Blue Economy an economic pillar in its development blueprint (Obura, 2020; Thoya et al., 2022). Kenya also co-sponsored the end of plastic pollution resolution which was a global landmark during the United Nations Environmental Assembly. In addition, the Government of Kenya is currently participating actively in the UN Ocean Decade as evidenced in the 2022 UN Ocean Conference, where Kenya co-hosted the event together with the Government of Portugal (United Nations, 2022).

2.4.2. Institutional framework

In Kenya, there are many institutions and organisations responsible for making informed decisions regarding utilization, conservation, protection, education, research, and management of ocean resources, including formal and informal frameworks (Odido, 1998; Kibiwot, 2008). The institutions are mandated to

improve and protect the ocean in Kenya as detailed in Appendix 4 and their locations provided in Figure 6. These institutions play a vital role in support of ocean research and governance (Isensee et al., 2017). The institutions, especially those associated with higher education and research, are key instruments for empowerment and social change. In order to effectively address the ocean or environmental challenges and their impacts, the country has developed an integrated ocean governance policy –the Integrated Coastal Zone Management (ICZM) approach to bring all the ocean institutions to work together to achieve sustainable utilization and management of ocean resources (Kibiwot, 2008). However, women's participation in ocean science, research, conservation, and management institutions in Kenya is not well-documented (Akumu, 2015; CISP, 2018).

The main institutions responsible for the ocean sector in Kenya can be categorized into three (Figure 2) namely: government institutions, non-governmental organisations, and intergovernmental organisations (Odido, 1998; Maina, 2012). The specific examples of the government institutions include Kenya Marine and Fisheries Research Institute (KMFRI), Fisheries Department, Kenya Wildlife Service (KWS), National Environment Management Authority (NEMA), Kenya Maritime Authority (KMA), Kenya Ports Authority (KPA), Kenya Navy, local universities, Beach Management Units (BMUs) and Coastal Development Authority (CDA). KMFRI is a government research institute established under the Science and Technology Act Cap 250. Its responsibilities include conducting research on marine and freshwater fisheries, aquaculture, chemical and physical oceanography among others. The Fisheries Department is charged with the responsibility of regulating artisanal and commercial fishing in Kenya, and it was developed under Fisheries Act Cap 380 to carry out activities in relation to the development, exploitation, utilization, conservation, and management of fisheries resources. The department works together with the BMUs to strengthen co-management of marine fisheries resources. While Kenya Maritime Authority role is to help in the protection of the marine environment such as prevention of marine pollution and it was established under KMA Act 2006 to co-ordinate, regulate and oversee maritime affairs in Kenya, and the local universities are responsible for marine and coastal-related studies.

The non-governmental organizations (NGOs) are voluntary groups of organizations, usually not affiliated with any government. The majority of them are non-profit organizations formed to provide services and advocate a public policy. Examples of NGOs in the Kenyan Coast include Coastal Oceans Research and Development in the Indian ocean (CORDIO) East Africa, Worldwide Fund for Nature (WWF-Kenya), Wildlife Conservation Society (WCS), Coastal and Marine Resources Development (COMRED-Africa), Seascape, Ocean Sole, Community Based Environmental Conservation (COBEC) and Coast Development Research Organisation (CDRO). CORDIO East Africa conducts research related to coastal oceans and climate change. The work of WWF-Kenya entails environmental

conservation and management and WCS is mandated to carry out research and monitor coral reefs ecosystem and climate change. COBEC is a community-based organisation that work with the local communities in conservation, protection and restoration of species and their habitats.

Intergovernmental organisations (IGOs) also referred to as the international organisations however the later may also include non-governmental organisations as members, are usually established on the basis of a charter or treaty that sets out the scope and parameters of their functions (Sinclair, 2019). According to Chelotti et al. (2022), IGOs can act as a site and promoter of membership and socialisation since it offers various avenue and mechanisms for states to interact and be socialized. In addition, IGOs facilitates the diffusion of values at the societal level through engagements, seminars or media campaigns with civil society (Chelotti et al., 2022). Several IGOs exist within the United Nations system and are referred to as the United Nations agencies. Examples of IGOs dealing with ocean science in Kenya include UNEP, FAO, Intergovernmental Oceanographic Commission (IOC)-UNESCO and Western Indian Ocean Marine Science Association (WIOMSA). WIOMSA is a regional non-profit membership organisation established in 1993. The organisation has a particular interest in linking knowledge that emerges from research to the management and governance issues that affect marine and coastal ecosystems in the Western Indian Ocean region. It is dedicated to promote educational, scientific and technological development of all aspects of marine sciences in the WIO region. IOC-UNESCO, on the other hand, promotes international cooperation in marine sciences to improve management of the ocean, coasts and marine resources. The IOC is in charge of coordinating the United Nations Decade of Ocean Science for Sustainable Development 2021-2030 (IOC-UNESCO 2023)[4], and coordinates programmes in ocean science, ocean observations and services, ocean literacy and capacity development to promote the advancement of science and its application to achieve sustainable development in the country.

[4] IOC- UNESCO (2023). The IOC-UNESCO Assembly gathered in Paris to review achievements and plan future of global ocean science for sustainable development. https://www.unesco.org/en/articles/ioc/unesco-assembly-gathered-paris-review-achievements-and-plan-future-global-ocean-science

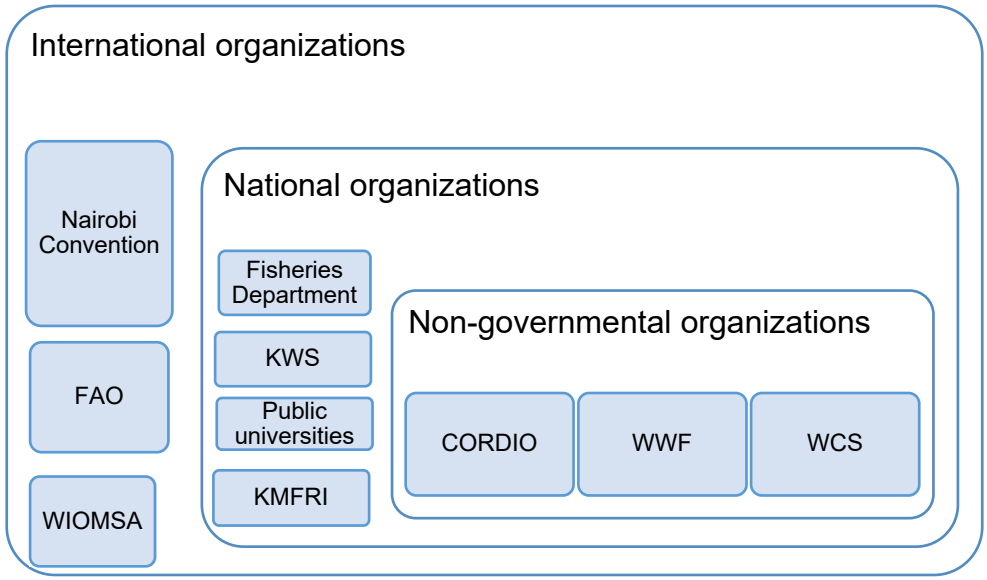

Figure 2: Summary of the categories of ocean science institutions in Kenya (see Appendix 4 for further details).

2.5. Gender and environmental management

Gender has been recognised as a critical factor in determining how natural resources are accessed and controlled, plying a significant role in sustainable development (Rocheleau et al., 1996; Sen et al., 2002; Elmhirst & Resurreccion, 2012, p. 5; Resurreccion, 2013). Correspondingly, gender is understood as a crucial determining factor of 'who does what', 'who has power', 'who decides' and 'who has what' in the society. In this study, gender roles or social norms are relevant since they inform the gendered power relations and division of labour which shape environmental issues such as access to and control over resources (Sida, 2016; Sen & Mukherjee, 2017; Sen, 2019; Buckingham, 2020; Murunga, 2021). Gender roles in the subsistence and household economies bring women closer to the environment as providers for their families. However, harmful cultural barriers such as traditions, stereotypes and superstitious claims often limit women's activities and restrict women from accessing and having control over natural resources (Geheb et al., 2008). Subsequently, most women in rural areas are forbidden from taking part in decision-making positions that target environmental management despite being the primary users (UN Women, 2016). For instance, in the rural Global South, women's relationship with the environment is made more explicit by their responsibilities in securing livelihoods such as subsistence farming, income generating activities e.g. marketing, and collecting food, water and firewood (Rocheleau et al., 1996).

Inclusion of women in environmental development and management plans that affect their lives is urgently needed to achieve a good governance (Gissi et al., 2018).

Globally, women manage environment and simultaneously provide a livelihood for their families. Although, women are often not counted as agents of change and their knowledge is often ignored (Sida, 2016, p. 1). With this in mind, gender analysis regarding gender aspects of the consumption of goods and services, use of natural resources and experiences of environmental degradation such as pollution and loss of biodiversity, is necessary in environmental management. Ideally, women and men should be agents in environmental management, including equal participation in decision-making and policy processes (Sida, 2016). Sida (2016) argues that addressing gender in the context of the environment, also means recognising that women and men are not homogenous groups. Women's and men's age, ethnicity, social class and other variables interact in shaping the links between gender and the environment, and this complexity must be accounted for in participation and gender analysis, including formal and informal norms that shape the behaviour of the actors, division of labour that outlines the tasks and responsibilities that women and men are expected to fulfil in different sectors, and access to and control over resources (Sida, 2016).

Discriminatory gender norms are often driven by power imbalances that ignore women's priorities, needs and knowledge, and exclude women from natural resource management, decision-making and leadership. The social structures and norms often influence the gender relations and affect the decision-making process and management of natural resources between women and men (UNEP, 2016; Huyer, 2015). UNEP (2016) has pointed out that women and men utilize and manage ecosystems differently because of differences in their roles, environmental knowledge, capacity and needs concerning natural resources. Consequently, gender equality is needed for sustainable environmental development worldwide[5]. Environmental problems usually have more severe impacts on women, because the majority of women lack alternative sources of livelihoods and income-generating activities compared to men (Coleman & Mwangi, 2013; OECD, 2020). Additionally, their time-intensive household and care duties often impede their ability to participate in decision-making processes and initiatives that are geared towards the sustainable management (Coleman & Mwangi, 2013; Fisher & Carr, 2015; Villamor & van Noordwijk, 2016).

It has been proposed that sustainable development is only attainable through gender equality, when the needs and interests of both women and men are fully

[5] Geneva Environment Network. (2023). Gender and the environment https://www.genevaenvironmentnetwork.org/resources/updates/gender-and-the-environment/

recognised (Irish Aid Gender Equality Policy, n.d, p. 7)[6]. UN Women (2018) describes gender equality as a driver of sustainable development in all its spheres (Agarwal, 2010; Agarwal, 2019; Płonka et al., 2022). Women play significant roles in informal environmental management and development, and the mounting global evidence establishes a link between enhanced environmental outcomes and gender equality (Westermann et al., 2005; Agarwal, 2010; Giakoumi et al., 2021). For instance, Gissi et al. (2018, p. 215) argued that ocean governance needs to incorporate women's role for its effectiveness. According to Giakoumi et al. (2021) women's participation brings different types of observations, knowledge, interpretations, and experiences that provide new perspectives to enrich management with concrete and innovative solutions. Subsequently, the vital contributions of women must be recognised and considered in all pillars of sustainable development and environmental restoration (Haraway, 1991; Agarwal, 2010; Agarwal, 2018). Indeed, studies have revealed that countries with better female representation in political and top ministerial positions in environment-related sectors are more likely to ratify environmental treaties leading to sustainable management solutions (Elwell & Williams, 2016; IUCN, 2020).

Unfortunately, across the fisheries and ocean sectors women often experience several challenges due to lack of gender-aware perspectives because these sectors are dominated by men (Aloo et al., 2000; Allison & Mvula, 2002; FAO & RECOFTC, 2016). Women are more likely to face gender discrimination hampering their access to fisheries and other ocean resources, participation in decision-making and by the irrational belief that women on-board fishing or research vessels brings bad luck (Harper et al., 2013; Koralagama et al., 2017; Harper et al., 2017; CISP, 2018, Johannesen et al., 2022). This calls for a gender-responsive approach in ocean management to maximise the full potential of women and men to contribute to environmental (ocean) sustainability effectively and equitably.

2.5.1. Overview on gender and sustainable development

Since the 1980s when the relationship between gender, environment and development began to be discussed, insights from researchers, activists and policy makers have helped to develop knowledge about gender as a concept and its connection with the environment (Lawanga, 2002), as well as to clarify how gender relations operate at different scales and places. Rocheleau et al. (1996), Nightingale (2011), Harcourt and Nelson (2015) and Buckingham (2020) have all acknowledged that it is critical at the start of every research project and management process to understand the gendered political, cultural, and socio-economic processes and

[6]Irish Aid (n.d). Environment and Gender equality. https://www.irishaid.ie/media/irishaid/allwebsitemedia/20newsandpublications/publicationpdfsenglish/environment-keysheet-13-gender-equality.pdf

structures. This creates better understanding when dealing with environmental problems, in order to establish gender-responsive approaches to achieve equitable development. Studies have examined the roles of gender in environmental discourses and their differentiated roles dealing with the environment, identifying some of the constraints that women face in accessing, using and managing natural resources. Studies in the Global South have viewed women as environmental managers and agents of change towards sustainable development because of their productive and reproductive roles, particularly in the household and at local levels in society (Nightingale, 2006). Notwithstanding, Elmhirst and Resurreccion (2012) noted some shortcomings in the efforts to integrate gender considerations into natural resource management and development policy. They found that while gender was incorporated into various institutional tools, it often lacked its transformative potential –a critical and politicised aspect within a feminist context.

With rising environmental degradation, feminist perspectives acknowledge that environmental crises are not gender neutral as they affect people disproportionately. Women bear the highest costs of environmental crises due to, but not limited to, household roles such as providing food and water for their family, and at community levels (Dankelman, 2002, p. 2; Dankelman, 2017). According to feminist scholars, environmental justice can only be achieved when resource destruction and discriminatory power relations that affect people already facing multiple forms of discrimination, including women, are seen as part of the same problem (Todes et al., 2010; Haeffner et al., 2021). Further, scholars argue that 'environmental problems cannot be adequately addressed without addressing gender and other forms of social inequality' ingrained in individual social identities (Buckingham, 2020, p. 6). The inequalities that affect women are not independent or mutually exclusive since not all women experience this inequality in the same way due to their individual social identities, as demonstrated by intersectional critiques of feminism (Buckingham, 2000; Moeckli & Braun, 2001; Warren, 2015; Buckingham & Le Masson, 2017; Crenshaw, 2017).

Previous studies have recognised the crucial role feminist and women's movements have played in climate and environmental actions since the 1970s. While women in the Global North were less directly linked to their environments, women in the Global South were found to have a typical relationship with the environment where they were primarily responsible for collecting water and firewood, among others (Rocheleau et al., 1996; Harcourt & Nelson, 2015). However, some shared disadvantages such as income and occupational imbalances affect all women regardless of their geographical location (Buckingham, 2020). On average, women are reported to continue to be poorer than men and suffer more from the environmental consequences of such inequality (Agarwal, 1992; Muyoyeta, 2007; Kitada, 2016), despite the initiatives that have been in place to better understand the relationship between women and environment or women, gender, and development. Women are very often excluded in the planning and

implementation of development; as a result, they have not benefited from development programmes, projects, and processes to the same extent as men (Muyoyeta, 2007). Besides, scholars and researchers have highlighted that development, like environmental degradation and natural disasters, also affects women and men differently, often with significant burden and negative impact on women (UN Women, 2018). Gender analysis in environmental work is necessary and relevant, as it makes gender differences and power structures visible in all areas such as waste management, water, energy, forestry, chemical and pollution, democracy, and livelihood, agriculture and fishing (Sida, 2016). For instance, gender division of labour in forest management differs and depends on many aspects, though in general the use of forest by men causes more environmental degradation. Nonetheless, women have less access to forest and land rights, and participate less in forest management and decision-making. Also, in coastal areas, men work predominantly with fishing and fish farming, while up to 90% of secondary sector workers are women (Sida, 2016, p. 3).

The United Nations' (UN) work on gender emerged over four decades ago when women were included in development plans at national and international levels (Muyoyeta, 2007). The UN's historical work on gender has shown some progress in addressing gender inequalities and theories of women's issues in development based on international frameworks, initiatives and conferences that were aimed at promoting gender equality (Figure 3). UN Women (2023) highlighted that the recognition of women's roles and contributions was intended to increase women's capacity and participation in development processes, as well as to empower them and improve their disadvantaged status. Some of these initiatives include Women in Development (1970s), UN Decade for Women conferences (from 1975 to 1995), Gender and Development (1998); Millennium Development Goals (2000) and the Sustainable Development Goals (2015). The feminist frameworks adopted a Women in Development (WID) approach in the 1970s, which was later replaced by a Gender and Development (GAD) approach (Parpart, 2000, Muyoyeta, 2007). Even though the WID approach increased the visibility of women in development issues and successfully helped secure women's issues a prominent place at the UN and other development agencies, it had some limitations because its main emphasis was on small income-generating activities and projects, and the issues addressed were based on women's reproductive roles, including nutrition, family planning and education. The WID approach, in an attempt to improve the position of women in society, sought to integrate women into the development programmes and planning they had initially been left out of (Muyoyeta, 2007). This approach saw women as a group lacking the opportunity to participate in development, and this exclusion was seen as detrimental to the development. The approach succeeded to increase awareness of gender inequality, enhance livelihoods, increase participation in decision-making and improve access to education and employment (Miller & Razavi, 1995; Momsen, 2008). However, some challenges associated with the WID

approach included limited resources, resistance to change, limited institutional support and lack of gender-disaggregated data[7]. The WID approach was problematic as it focused exclusively on women as the "problem" rather than on gender relations and power imbalances, issues which Gender and Development sought to address (The KOOTNEETI, 2022).

Prior to the formation of GAD, critics of WID gave rise to the Women and Development (WAD) approach which argued that women are an important part of development and have always been key economic actors (Miller & Razavi, 1995; Muyoyeta, 2007). Unlike WID, WAD focused primarily on the interaction between women and development processes and asserted that integration of women in development escalates inequality. WAD was criticized for this approach as it viewed global inequalities as the main problem facing people from poor countries, addressing women's exclusion from the global economic structures which disadvantaged women because of their social status (class) and led to unequal distribution of wealth (Koczberski, 1998; Parpart, 1993; Chowdry, 1995; Miller & Razavi, 1995; Momsen, 2008). The WAD approach was also criticized for assuming that women's position in society will improve with more equitable international structures, underplaying the role of patriarchy in social relations and undermining women's equal participation. Further reflection on women's experiences in development gave rise to Gender and Development (Miller & Razavi, 1995; Marchand & Parpart, 1995), which looked at the impact of development on both women and men. This approach sought to ensure that both genders participate in and benefit from development, with emphasis on equality of control and benefit (Muyoyeta, 2007). Other initiatives followed, including the Decade for Women (1976-1985) and women's conferences, notably those held in Mexico City, Nairobi, Copenhagen and Beijing (Figure 3).

During the fourth Women's Conference in Beijing (1995), a platform for action was adopted to ensure full and equal participation of women in economic, political, social, civic and cultural life at different levels, including national, regional and international. It also aimed to eradicate all forms of discrimination based on sex (Cornwall & Rivas, 2015). However, challenges like lack of acknowledgment of contextual knowledge of women and limited representation of women still remain. This platform has not been able to tackle issues that relate to long-standing concerns such as harmful traditional practices (Allotey & Denton, 2020). Since then, gender equality and women's empowerment have been central to all the UN agencies' work, including the Millennium Development Goals (MDGs) in 2000 and Agenda 2030 for Sustainable Development – SDGs (United Nations, 2015). From a gender lens, the MDGs highlighted the top-down nature of the processes that were established

[7] The KOOTNEETI. (2022). Women in Development (WID): Principles, success and challenges: https://thekootneeti.in/2022/09/21/women-in-development-wid-principles-success-and-challenges/#:~:text=Women%20in%20development%20(WID)%20is,in%20all%20aspects%20of%20development.

by a few UN officials and failed to address the issues of gendered power, resulting in women working for development rather than development working for their empowerment and equality (UN Women, 2014, p. 30). These shortcomings of the MDGs were addressed in the SDGs that aim to leave no one behind in developmental programmes and processes.

The UN's commitment to promoting gender equality led to centralizing the several UN functions of working on gender equality by establishing UN Women in July 2010. UN Women is mandated to accelerate the progress in advancing and achieving gender equality and women's empowerment (UN Women, 2013). This agency has been actively leading the annual celebration of International Women's Day globally, with different themes including Empowering Women-Empowering humanity, Planet 50-50 by 2030: Step it up for gender equality, Women in Leadership: Achieving an equal future in a COVID-19 world, and Gender equality today for a sustainable future tomorrow. Besides this, various other UN international agencies have also shown their commitments by integrating gender in their programs and projects. These include FAO, the United Nations Development Programme (UNDP), the United Nations Framework Convention on Climate Change (UNFCCC), the United Nations Environment Programme (UNEP) and the United Nations Educational, Scientific and Cultural Organisation (UNESCO). For instance, FAO adopted its Gender Equality Policy in 2012 to mainstream gender in its project cycle to better achieve food security, reduce poverty, and ensure rural development as per its mandate (FAO, 2013; FAO 2020). The UNFCCC also developed an enhanced gender action plan (through the Lima Work Programme) that sets out activities and objectives aimed to advance understanding and knowledge of gender-responsive climate action[8]. In order to achieve a transformative social change, institutions need to apply gender and social equality perspectives to environment and development (UNFCCC, 2017). Apart from UN Women, other organisations working for gender equality include[9]: Association for Women's Rights in Development, Womankind Worldwide, Women for Women International, Women's Environment and Development Organisation, and International Centre for Research on Women.

These platforms provide transformative and intersectional approaches to promote gender mainstreaming and social inclusion in development and management of natural resources, and provide the opportunities for researchers to present case studies on women and environmental crises at different levels e.g., local, national and global levels (Feenstra & Özerol, 2021). However, researchers still report persistence in gender pay gaps and gender inequality in decision-making positions

[8] United Nations Climate Change (2017). Gender Action Plan. lhttps://unfccc.int/topics/gender/workstreams/the-gender-action-plan

[9] Ada Hasanagic (n.d). 25 organizations fighting for gender equality. https://www.humanrightscareers.com/magazine/organizations-gender-equality/

in different sectors including education and labour market around the world, with the largest affected group being from developing countries (UN Women, 2014). In fact, women were reported to be the majority of those dismissed when jobs are cut, as observed during the period of COVID-19 (Afridi et al., 2022). Moreover, women's search for work has been observed to be limited by the need for 'family-friendly' hours and accessible locations, which leads most women to resort to low-paid service jobs, especially in urban areas or richer countries (Buckingham, 2020, p. 2). In contrast, men are repeatedly reported to dominate senior and higher paid positions. The underrepresentation of women is alarming in all sectors related to the environment including ocean science. The next sub-section discusses the plight of the global oceans, ocean sustainability, the interaction between gender and oceans e.g., women's role in relation to marine environment and ocean science (fisheries, coastal management and conservation), the existing challenges, the goal of the Ocean Decade to improve ocean health and why gender equality is key in ocean sustainability.

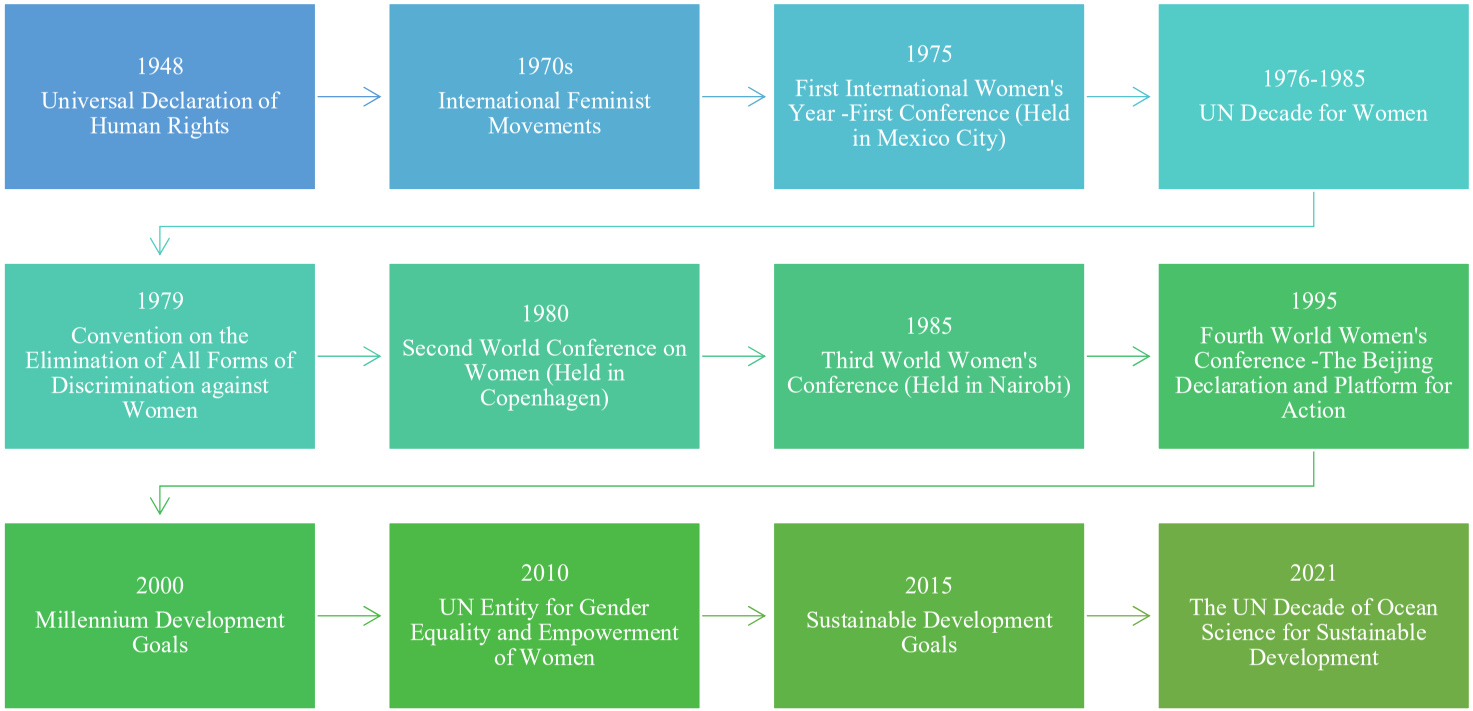

Figure 3: International frameworks and initiatives to promote gender equality

2.6. Ocean Sustainability

The oceans are the largest ecosystems in the world, supporting rich biodiversity and providing vast goods and services which support the human population in coastal and island States and beyond. They are strongly interconnected and integral to both the global ecosystem functioning, security, and economy (National Research Council, 2001; Lacroix et al., 2016; Rasowo et al., 2020). The benefits range from provisioning to regulating ecosystem services, including food supply, employment, and income-generating opportunities (Fröcklin, 2014; Kleiber et al., 2015; Barbier, 2017; Franke et al., 2020; OECD, 2022), providing wellbeing benefits to all humanity. Importantly, all these benefits are linked to human rights, e.g., in the fisheries sector (Francis & Bryceson, 2001; Diamond et al., 2003; Biswas, 2012; de la Torre-Castro et al., 2017; FAO, 2022). According to FAO (2022), more than 58.5 million people depend either directly or indirectly on capture fisheries and aquaculture around the world, with the vast majority coming from developing countries (Medard et al., 2002; Lwenya et al., 2016; Matsue et al., 2014; Nunan & Cepić, 2020). The multiple benefits can only be derived from healthy and resilient oceans (Ryabinin et al., 2019; OECD, 2022).

Meanwhile, growing threats to ocean ecosystems and human beings are on the verge of causing unprecedented damage to the world's oceans. Despite the oceans' vastness and complexity, they are becoming vulnerable due to the growing pressures causing more and more challenges in the marine environment. For centuries, many people took for granted the dazzling biodiversity of life in the oceans[10]. However, as threats to the marine natural environments escalate and extinction rates increase, it is time for humankind to work harder to preserve the breadth of species living here (Partelow et al., 2023). Scholars have studied and observed changes and challenges including loss of biodiversity, marine pollution, overfishing, climate change, oil drilling, illegal poaching, rising sea-levels, ocean acidification and coastal development (Lacroix et al., 2016). These threats remain global problems with profoundly negative environmental, economic and social consequences (Owuor et al., 2019; Nina et al., 2023; Partelow et al., 2023). For example, the percentage of stocks fished at biologically unsustainable levels rose from 10 per cent in 1974 to 35.4 per cent in 2019 (FAO, 2022, p. 46).

Overfishing is having serious impacts on the oceans as it wipes out some fish stocks. The manifold variety of life forms in the oceans have been affected by anthropogenic activities, which in turn have affected the ocean processes and functions, and detrimental not only to the ocean's health, but also to aspects of

[10] PEW (2018). Plight of ocean species shows need to preserve earth's variety of life. https://www.pewtrusts.org/en/research-and-analysis/articles/2018/05/21/plight-of-ocean-species-shows-need-to-preserve-earths-variety-of-life

human life and infringing the rights attached to them (Pomeroy & Douvere, 2008; Owuor et al., 2019). FAO estimates that over 70 per cent of the world's fish species have been entirely exploited or depleted; by capturing fish faster than they can reproduce, which is harming the entire ecosystems that interact with those species, from the food they eat to the predators that eat them. Additionally, many extensively used fishing methods are quite destructive. For example, pulling the catches and bottom trawling destroy sea floor habitat and scoops up many unwanted fish and animals (bycatch) that are later tossed aside, by which time they are either dead or severely injured. There is also massive loss of diversity, and some marine species are on the verge of extinction according to the World Ocean Assessment Report (United Nations, 2021). It is also estimated that most seas already need long-term fishing bans if certain species are to recover at all.

There are also increasing numbers of dead zones – hypoxic (low-oxygen) areas in the oceans caused by excessive nutrient pollution from human activities, coupled with other factors that deplete the oxygen required to support most marine life in bottom and near-bottom water (OECD, 2022). According to OECD (2022), eutrophication and ocean dead zones are a growing global challenge. These dead zones result from water quality challenges –eutrophication, which is a water pollution caused by excess use of nutrients that trigger toxic algal blooms. The blooms cause spots 'dead zones' in the oceans where life no longer exists or lead to significant loss of marine biodiversity. Over the years, the amount of plastic pollution in the oceans has also increased and it has become inevitable that human activities have detrimental effects on ocean life (Thompson et al., 2009; Andrady, 2011; Partelow et al., 2023). A huge amount of trash finds its way into the ocean in the form of debris which can easily entangle and trap animals. These plastics often destroy delicate sea life like sponges and corals. Besides, sea turtles and dolphins often mistake plastic bags for their favourite foods, like jellyfish and squids, choking them or clogging their digestive system. Ocean acidification, on the other hand, results from excessive absorption of carbon dioxide (CO_2) emitted worldwide and makes the ocean much more acidic. The ocean acidification has the effect of limiting the calcium carbonate needed by corals, plankton, and other marine life to build the skeletal frames and shells that protect them. In addition, excessive nutrients (nitrogen) in the ocean also contributes to climate change. Numerous activities with high economic benefits performed by humans e.g., fisheries and aquaculture coupled with the increased ocean utilization and lack of awareness of the unbalanced ecological footprint by humans have resulted to the declining ocean health (Lacroix et al., 2016; Siles et al., 2019). Unfortunately, only around 3 per cent of the oceans are fully protected, very far from the 30 per cent that marine scientists say is needed to ensure a healthy marine environment.

The current status and situation of ocean degradation requires an urgent integrated vision of knowledge and resources, and new perspectives and solutions in order to tackle the challenges arising from human activities both onshore and at sea (Cicin-

Sain & Belfiore, 2003; de la Torre-Castro, 2019). In order to help increase the awareness of the problems that marine debris causes in the oceans and consider ocean sustainability issues e.g., ocean protection and representation justice, UN agencies including FAO, UNEP, and IOC-UNESCO have developed a number of initiatives and measures of the conservation strategy to improve the health of the ocean, including Stockholm Declaration and London Convention (1972), UNCLOS implemented in 1982, as well as the World Ocean's Day which is celebrated annually. These initiatives place environmental issues including ocean pollution at the forefront of international concerns to enhance ocean protection. As human health and well-being depend on the healthy marine ecosystem services underpinning the ocean economy and providing critical supporting functions (OECD, 2022).

2.7. The UN Ocean Decade and gender

The call for a more sustainable use of the ocean led to the formulation of many initiatives such as the UN Sustainable Development Goal 14 (SDG 14: Life below Water) in 2015 and the UN Decade of Ocean Science for Sustainable Development (the Ocean Decade) in 2021 by the IOC-UNESCO. SDG 14 aims to 'conserve and sustainably use the seas, ocean and marine resources for sustainable development' (United Nations, 2015). The UN Ocean Decade was initiated as a ten-year implementation plan to enhance the achievement of SDG 14. Its aim is to support innovative ideas, new discoveries and generate knowledge to find solutions that reverse the decline in ocean health (Kaluza et al., 2018; Ryabinin et al., 2019; Franke et al., 2020). According to de la Torre-Castro (2019), adopting an inclusive ocean management approach by incorporating gender aspects is beneficial to the oceans e.g., small scale fisheries, and to ensure a diversity of actors as it considers women and men, elders, and children as well as the ethnic minorities. In ocean management just like in other resource management systems, women have been largely excluded in decision-making processes in different governmental agencies (Diamond et al., 2003). For instance, women and men often perform different activities. In most cases, especially in developing countries like Kenya, women normally have roles that are carried out onshore such as fish processing, trading, and collecting invertebrates while men participate in fishing activities (Weeratunge et al., 2010; Abwao & Awuor, 2019).

The study reported in this PhD thesis addresses the interaction between two UN SDGs, that is Goal 14 (Life below Water) associated with the conservation and sustainable use of the seas, oceans and marine resources for sustainable development and Goal 5 (Gender Equality) concerned with achieving gender equality and empowerment of all women and girls (United Nations, 2015b). Until

now, discussions related to SDG 14 have not adequately considered gender-specific matters and this is perilous to the sustainable use and management of marine resources, possibly because of the exclusion of women, who are primary actors and whose contributions are often overlooked (Arulnayagam, 2020). None of the SDG 14 targets mention any gender-related indicators. According to Elwell and Williams (2016), more attention to the different needs, concerns, priorities and disparities between women and men is needed. The most important thing is that gender equality is currently addressed in the recently proclaimed implementation plan – the Ocean Decade (Ryabinin et al., 2019; IOC-UNESCO, 2020). The Ocean Decade is committed and has shown increasing interest and effort in gender equality in ocean science by endorsing some gender-focused programmes, such as Empowering Women for the UN Decade of Ocean Science for Sustainable Development programme (Empowering Women programme) at World Maritime University-Sasakawa Global Ocean Institute (WMU-GOI) to improve diversity, capacity building, equity, and inclusion. This programmes also ensures innovative discoveries and solutions to promote gender equality and diversity in ocean science globally that can help to find diverse solutions to ocean pressures and problems (DFO Canada, 2020; Sun et al., 2021).

Across many parts of the world, achieving gender equality in ocean science has been made more difficult by a lack of or inadequate gender-disaggregated data, both descriptive and substantive representation. According to Radel and Coppock (2013), having gender-disaggregated data helps acknowledge women's and men's substantial roles, recognise their contributions, and address the different concerns and interests separately. Understanding the relationship between gender, environment and sustainable development helps to explain who makes decisions on ocean-human systems, and how these decisions are made is critical to ocean resource governance (Gissi et al., 2018). The lack of research and publicity on gender inequalities in managing ocean resources has led to persistent unconscious biases and exclusion of women from developmental plans and projects, and from decision- and policy-making processes in the ocean sector. The data needed to track national, regional, and global progress for women's representation and contributions in ocean science are simply lacking.

Impacts of deteriorating ocean health are unlikely to be gender neutral as their effects increase the risk for the least empowered and most vulnerable group in society. Previous studies show clear evidence of a gender gap in ocean science (O'Connell & Holmes, 2005; Bonatti & Crane, 2012; Huyer, 2015; Isensee et al., 2017; Gissi et al., 2018; Michalena et al., 2020; Giakoumi et al., 2021; Brooks & Deniz-Gonzalez, 2021; Legg et al., 2023), where women are active environmental managers and primary actors whose expertise is often under-utilized in decision-making-related planning, research and management of the ocean; thus women rightfully demand inclusion in these processes. Gender equality is a cross-cutting theme in sustainable development discussions and the Ocean Decade encourages all

countries, particularly the developing countries, to incorporate a gender perspective on ocean science policies and practices, a perspective which is currently absent (Sun et al., 2021). Gender is important to consider within ocean science since such fields rely on access to education and job opportunities, all which favour men everywhere but more starkly in the Global South. There is currently a broad agreement on the urgent need for gender equality within the ocean scientific community as it crosscuts all sectors and issues that must be addressed to achieve ocean sustainability (Sun et al., 2021).

Even though IOC-UNESCO in 2020 recognised the need to include women in ocean science (Gillanders & Heupel, 2019; Haas et al., 2022), it is late relative to other international agencies which have already done so. The IOC-UNESCO, through the Ocean Decade implementation plan, also recognises the imbalances between women and men in ocean science. The concern applies to various disciplines in ocean science across developed, emerging, and developing countries. In the Global South, the under-representation of women ocean scientists is particularly acute. To address this, the Ocean Decade offers capacity development for women to improve their knowledge and skills to increase their participation in decision-making processes in ocean sciences for sustainable development (Ryabinin, 2020). Furthermore, the Empowering Women programme as one of the Decade Networks promotes and advocates for gender equality and women's empowerment in ocean science worldwide. However, the implementation plan does not address how the Ocean Decade is going to increase the use of a gender-responsive approach in actual ocean science research. The Empowering Women programme therefore aims to build capacity and advocate for gender equality or gender perspectives in ocean science governing bodies at national, regional, and international levels. This programme offers training and creates awareness on gender-related issues through creating a gender strategic plan and actions as a guiding principle to ensure gender equality is achieved at all ocean science disciplines and career levels – equal representation of 'the people we need for the ocean we want' (Sun et al., 2021).

Nevertheless, some of the issues that became clear from the previous studies on gender and ocean science was the inadequate research, little or limited information and lack of gender-disaggregated data, more specifically in developing countries (Kleiber et al., 2015; de la Torre-Castro, 2019). To date, the only available data is found in the two Global Ocean Science Reports by the IOC-UNESCO that presented the underrepresentation of women in ocean science at a global scale (IOC-UNESCO, 2020a; 2020b). Even though this report identified and quantified the key elements of ocean science such as workforce and publications, the figures presented on representation of female ocean science researchers and personnel did not give a good reflection of the current status of gender equality in ocean science at either national or global levels. The data used were extracted from the lists of participants who attended international conferences and symposia between 2009 and 2015 (Sun

et al., 2021). Therefore, the need for evidence-based research to provide the primary data led to this study with a focus on developing countries using Kenya as a case study.

3. Theoretical Framework

A feminist theoretical approach helped to examine gender equality and women's empowerment in ocean science and how and why gender inequalities in ocean science education disadvantage women in accessing ocean science careers. One theoretical perspective that addresses the multiple dimensions of gender in ocean science is that of feminist political ecology, which concerns the political and power relationships between gender and environment, and how these shape ecological processes, knowledges, and sustainable management (Rocheleau et al., 1996; Elmhirst, 2011; Elmhirst, 2015; Sundberg, 2017). FPE was developed to examine women's invisible and often neglected knowledge and contributions to sustainable development (Sundberg, 2017; Nam, 2018; Lau, 2020).

3.1. Feminist political ecology

Feminist political ecology (FPE) is a subfield of political ecology introduced in the 1990s (Rocheleau et al., 1996; Harcourt & Nelson, 2015) and inspired by ecofeminists, feminist poststructuralists, and feminist environmentalists. Political ecology (PE) understands that ecological concerns in connection with the political economy (Blaikie & Brookfield, 1987) and argues that power relations influence human's relationship with the environment and natural resources (Nyantakyi-Frimpong, 2017; Batterbury & Ndi, 2018). As an inclusive term, it involves diverse research into policy, environment, and politics, particularly concerning access and control over natural resources (Rocheleau et al., 1996). Political ecologists acknowledge that political, social, environmental, and economic perspectives and decision-making processes shape the lives of individuals or groups, environmental practices and policies. In other words, it helps explain how politics, conditions and implications create environmental changes (Bryant, 1992; Harcourt & Nelson, 2015; Sundberg, 2015). Though the central focus of political ecology is the uneven distribution of access to and control over natural resources, determined by factors such as ethnicity and class, the field of FPE has arisen in response to traditional PE lack of consideration for women's roles. This observation is notably pointed out by Rocheleau et al. in 1996. According to Rocheleau et al. (1996, p.1), ¨the convergence of gender and environment emerged under conditions of rapid

restructuring of ecologies, economies, politics, and cultures from global to local levels¨.

The FPE approach begins with positioning gender as a critical variable that influences resource access and control, shaping ecological practices and processes that, in turn, impact both women and men and their relationship to the environment (Rocheleau et al., 1996; Radel & Coppock, 2013; Sundberg, 2017; Nyantakyi-Frimpong, 2017). In addition, FPE does not assume shared identities. For example, not all women share the same life experience, nor do they behave in a similar way in a given situation. Thus, FPE posits that gender interacts with other social identities such as class, education, ethnicity, and age to influence gender and power relations –a term defined as intersectionality (Arora-Jonsson, 2011; Nightingale, 2011; FAO & Biswas, 2017; Odhiambo et al., 2018). This intersectionality is what shapes the struggles that women face in sustaining their survival and livelihoods ultimately influencing ecological change and the communities' prospect for sustainable development. In this context, FPE helps explain existing gendered differences and provides an understanding that helps to avoid generalizing all women as vulnerable or victims. FPE can help identify barriers that hinder the participation of women and men of particular identities. It seeks to understand, interpret, and explain the local experiences of economic and environmental change. According to Axelrod et al. (2022), an intersectional approach can inform sustainable and equitable environmental policy by highlighting distributional injustice through power relations associated with multiple components of an individual's social identity. The authors further pointed out that a lack of knowledge on these issues by policy makers and environmental managers may lead to harmful policies aggravating existing injustices rather than promoting equitable and sustainable development. Intersectionality moves beyond gender hierarchies and acknowledges the way patriarchy relates to class, age, ethnicity, and education to shape the nexus between humans and ocean. Gender is a source of powerlessness or power in any culture or society, and the power associated with gender can always change because societies and cultures also change (Gordon, 1995; FAO, 2017). Therefore, when the power associated with gender intersects with other sources of power such as class, education, age and ethnicity, the power may decrease or increase (Haraway, 1991; Akoyoko, 2014; Sundberg, 2015).

According to feminist political ecologists, much of the literature on gender and environment categorizes women as either: the problem, as victims or as saviours (Arora-Jonsson, 2011; Gay-Antaki, 2016). FPE can counter the woman-as-victim narrative and find solutions to the general failure to incorporate gender as an essential characteristic which determines access, control, decision-making and policy-making processes, as well as governance of natural resources. An FPE approach helps address the how- and why- questions that explain the variations in gender-environment interactions (Radel & Coppock, 2013). It provides new perspectives that recognise deeply rooted inequalities and are entrenched in the

concept of equality. According to Gay-Antaki (2016), FPE stresses how the social positions of women have enhanced their knowledge of environmental issues depending on where they live and made them expertly aware of the rising prices of water, consumables, and electricity, as well as develop adaptive strategies in the face of environmental degradation or climate crises. Rocheleau et al. (1996, p.4) sum up the approach when they state, 'FPE considers gender as a critical variable in shaping resource access and control and often interacting with class, ethnicity, race, and culture to shape processes of ecological change and the struggle of women and men to sustain ecologically viable livelihoods'.

FPE researchers also argue that knowledge is gendered and emphasize the importance of understanding gender as it is 'constituted in and through diverse and interlocking processes of differentiation' (Sundberg, 2015, p. 13) caused by social dimensions such as ethnicity and class (Nightingale, 2011; Resurreccion & Elmhirst, 2008; Elmhirst, 2015). The FPE approach illuminates why women and men engage in particular work and have access to and control specific resources such as fisheries and marine resources. It also outlines the complementary gender roles and uneven societal relationships (Nightingale, 2011; Mollet & Faria, 2013; Sundberg, 2017). The approach demonstrates how women are more likely to use the knowledge gained from their subsistence roles as family providers and portrays men's knowledge as more likely gained from training associated with conventional science (Rocheleau, 1995a; 1995b; Sundberg, 2015). Decision-makers and environmental managers often use scientific knowledge that undermines women's traditional or indigenous knowledge (Cvitanovic et al., 2015). FPE also increases the participation of minoritized groups in problem-solving and decision-making processes. According to Rocheleau et al. (1996), FPE introduces meaningful social knowledge and perspectives that would be ignored through biased representation and seeks to prevent the most powerful and dominant groups from controlling the ecological processes and resources. In other words, FPE positions gender as a crucial determining factor of ¨who does what¨, ¨who has what¨, ¨who decides¨, and ¨who has power? ¨ in society (UNESCO, 2003; Lamb, 2018; UNICEF, 2011).

FPE has been applied by researchers and scholars in a range of contexts from access to different natural resources to sanitation and hygiene (Table 1). Feminist political ecologists have drawn connections between ecological issues and social factors. They consider how aspects like gender and power relations within management institutions shape access to resources such as water, land, and energy. These relationships also dictate who is included in, or excluded from, decision-making processes and governance. To study these complex interactions, feminist political ecologists employ a variety of research methods (Appendix 5). For instance, Ankrah et al. (2020), in an investigation of gendered access to productive resources in the agricultural context in Ghana, highlighted ways in which gender influenced access to and control over agricultural resources. Another study by Haeffner et al. (2021) investigated the representation of justice in socio-hydrology

and water governance in the United States, drawing attention to gender politics and power relations that shaped the representation of the water sector and decision-making processes.

Table 1: References of the selected studies that applied feminist political ecology

Context	References
Access to and control over natural resources	Rocheleau et al., 1996; Arora-Jonsson, 2011; Nightingale, 2011; Elmhirst, 2011; Radel & Coppock, 2013; Elmhirst, 2015; Kerr, 2014; Harcourt & Nelson, 2015; Harris, 2015; Ankrah et al., 2020; Hernández, 2022; Andersson et al., 2022; Layman & Civita, 2022
Climate change issues and impacts	Garcia et al., 2022
Carbon markets	Gay-Antaki, 2016; Andrews et al., 2022
Access to communal land	Soto-Alarcón & González-Gómez, 2021; Mollett, 2022; Mollett & Faria, 2013
Hydropower development and solar energy	Buechler et al., 2020; Mangura, 2021
Forest resource management	Asumang-Yeboah et al., 2022; Ramcilovic-Suominen et al., 2022; Chipango, 2022; Murer & Piccoli, 2022
Dietary diversity	Nyantakyi-Frimpong, 2017
Water insecurity, access and governance	Adams et al., 2018; Haeffner et al., 2021; Nunbogu & Elliott, 2021; Truelove, 2021; Irbık, 2022; Nunbogu et al., 2023
Mariculture	Ruff et al., 2022
Biodiversity conservation	Lau, 2020; Elias et al., 2021
Education and conference spaces	Lloro-Bidart, 2017; Nelson, 2021
Sanitation and hygiene	Jewitt & Ryley, 2014; Nunbogu et al., 2023

FPE scholars have exposed the challenges faced in management institutions where women are excluded from natural resource management and how intersectionality issues affect environmental management. For instance, Harris (2015) investigated water projects in Turkey, where massive technology and infrastructures available in South-Eastern Turkey for irrigation purposes co-exist with daily domestic water needs being out of reach for women due to hegemonic approaches to water governance, that exclude women from management and decision-making practices. Harris noticed that the government's project regarding water rendered unequal benefits for women and men as the approach prioritized and valued water privatization and marketization. Also in Ghana, FPE researchers found out that land and extension services were discriminatorily distributed with limited access by most women compared to their male counterparts (Ankrah et al., 2020). Environmental issues are central to debates about the nature of society and the realities of justice in distribution. Therefore, increased participation of women who face difficulties in environmental struggles can ensure the survival of their families during ecological and economic crises. Highlighting gender inequalities in natural resource management in previous studies helped the researcher to understand how gender and power dynamics play crucial roles in different ways. FPE approach has helped the researcher to understand how access to ocean science education as a resource is important in environmental sustainability issues, including ocean sustainability.

Therefore, these insights provided inspiration to adopt how to investigate gender inequality in terms of access to higher education and career opportunities in ocean science.

3.2. Feminist political ecology of education

Education is not only an asset but also a resource to empower people by transforming individuals' lives, ensuring inclusiveness, social equality and driving progress towards sustainable development (Lawson, 2011; United Nations, n.d[11]; UNESCO, 2019, p. 3). Education is recognised as a powerful means of improving women's status in their community through boosting their economic status. Educating women means that daughters are more likely to be educated as well. Daughters of educated women are more likely to experience better educational and occupational attainment. Education is therefore capable of increasing women's sense of agency which will support wider reforms in promoting gender equality (McCracken et al., 2015). McCracken et al. (2015) explored the ways that education may overcome social norms and practices which have a pervasive effect on gender discrimination in society and found out that the discriminatory attitudes and practices originate in the family. For instance, in the home where women and girls are often excluded from decision-making processes and are thus denied developing confidence in their personal abilities. In this way, social norms of discrimination can undermine macro level reforms that are intended to benefit women (UNESCO, 2020). In addition, scholars argue that education of women is the most effective way of stopping the cycle between poor protection of women's rights and low regard for women's rights. This is usually achieved through empowering women in education system to become better advocates for themselves. The mechanism through which this can be achieved is by providing women with better economic outcomes (McCracken et al., 2015, p. 43). Quality education leads to better research, conservation and management skills and thus to more sustainable use of natural resources. Given the connection between gender and natural resource use, FPE can provide a framework to understand how access to and opportunity for education leads to gender dynamics and power imbalances that directly influence women's participation in research, governance, and decision-making processes.

There are studies in education that have analysed intersectional identities (Nichols & Stahl, 2019). Different individual identities, such as gender and ethnicity, have been found to affect access to higher education in Kenya (Taaliu, 2017; Tefera et al., 2018; Simson, 2019; Njagi, 2020). For instance, a study done by

[11] United Nations (n.d). Education as the pathway towards gender equality. https://www.un.org/en/chronicle/article/education-pathway-towards-gender-equality

Taaliu (2017), investigating ethnicity in Kenyan universities, highlighted the ethnic biases in enrolment of students as many university students were from the dominant ethnic groups in Kenya. In the context of sustainable management of natural resources and the ocean in Kenya, however there is very little known. The application of FPE in an educational context is also novel. The only example of applying FPE theory to higher education is Nelson (2021) analysed conference spaces as emotional sites for women becoming campus sustainability leaders. In her study, Nelson (2021, p. 8) concluded that 'FPE is useful for taking emotion seriously to make sense of and rethink conference spaces, professional norms and behaviours where green knowledge production proliferates.' This thesis uses FPE to understand the inequalities in ocean science fields in Kenya. The study aimed to discover where the inequalities arise, what causes these inequalities and why.

The research questions (section 1.3) were derived in the context of gendered knowledge and power relations, and intersectionality. It incorporated the insights of FPE and the researcher's situated knowledge and experiences (positionality) as a female scientist and an expert in an ocean science-related field to explore and understand the interconnectedness between gender and ocean science across public universities, government agencies, NGOs and IGOs. This study examines realities and personal experiences, practices and policies, which affect the opportunities of female students and female staff, especially in enrolment, employment, decision-making and governance positions (Figure 4).

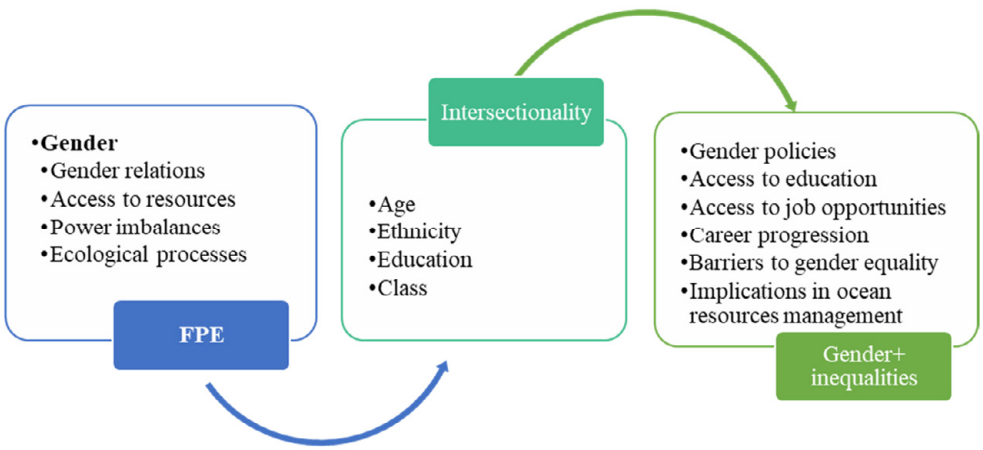

Figure 4: Theoretical framework of Feminist Political Ecology in ocean science based on the fundamental concepts of this study (Source: Author's illustration)

Using FPE as a theoretical framework, this study examined the inequalities among students and staff in universities, research and management institutions. FPE is used to evaluate how access to higher education resources, such as funding, was affected or influenced by gender and ethnicity within ocean science-related programmes. FPE expands the analytical categories and diversity of students and staff within the university as well as other ocean science institutions to overcome one-dimensional approaches (Tefera et al., 2018). FPE is also used to draw links between the material dimensions of education (e.g., enrolment patterns, graduation rates, completion rates, transitional rates, employment rates, promotion, etc.) and the non-material factors (e.g., age, ethnicity, power relations, class, values, norms, etc.). These links often shape access to quality education and inclusion in and exclusion from access, participation, governance, and decision-making positions (Adams et al., 2018; Lau, 2020). FPE also helps to clarify the importance of gender and intersectional identities in the selection of courses, resource allocation (funds) and social injustices, including discrimination and sexual harassment. This is because of the power imbalances and differences in gender relations that influence the privileges of a particular group, especially in higher learning institutions and other public institutions. Elmhirst (2015) emphasized that women and men experience environmental impacts differently due to their differentiated social responsibilities. Mangura (2021) also argues that gender differences in responsibilities for, experiences of, and interests in environment and nature are crucial when dealing with social inequality and marginalization on gendered axes (Sundberg, 2017; Haeffner et al., 2021). While gender shapes access to and control of resources, ethnicity is another critical variable in Kenya's social, economic, and political power relations (Kwatemba, 2008).

Drawing from the FPE insights, the research questions framed from this theoretical framework adopted a mixed method approach, both qualitative and quantitative approach to investigate, explore, and understand the existing gaps, inequalities, and differences in terms of access to education and job opportunities in ocean science institutions in Kenya. These include gender representation of staff and students, inconsistencies between written policies and practice, and the lived experiences of students and staff. A detailed research methodology is elaborated in the next section.

4. Research methodology

"*What is measured becomes visible, what is visible can be monitored and gets improved*"
~Anna Rita Manca (2015)

The complex real-world issues concerning gender in ocean science in Kenya were explored and analysed using a mixed-methods approach. This approach was composed of both quantitative and qualitative methods. Descriptive statistics were used to get a grasp of and understand the data, and thematic analysis was predominantly utilised in producing Paper 4. These methodologies allowed for major themes to be identified and a coherent picture of the topic under investigation to be provided. The choice of a mixed-methods approach allowed the researcher to explore diverse perspectives and uncover relationships that exist between the intricate layers of or the multifaceted research questions (Shorten & Smith, 2017, p. 74).

The mixed-methods approach entailed descriptive, explanatory, and exploratory research designs (Cresswell & Garrett, 2008; Cresswell, 2013). Descriptive research was used to unpack status of gender equality in ocean science among the students and staff and to determine areas with wider gender gaps. This descriptive approach established the baseline gender-disaggregated data through gathering quantifiable or evidence-based information for statistical data analysis and assisted in measuring the study characteristics in research questions. Explanatory research design complemented the investigation and sought to explain gender inequalities and their consequences based on selected perspectives, experiences, and barriers in the institutions. At the same time, an exploratory research design aimed to explore the intersectionality as the main aspect that has been under-researched in ocean science institutions in Kenya. This was done through interviews to examine the root causes of gender inequalities in ocean science in education and workplaces and have a better understanding of how and why they persist (Bryman, 2012; 2016).

4.1. Philosophical assumptions

In social research positioning, the researcher holds specific personal concepts or principles which combine to form a research philosophy. Here, the key concept employed was epistemology as a theory of subjectivity and objectivity (Crotty, 2003; Guba & Lincoln, 2005; Denzin & Lincoln, 2006; Bryman, 2012; Kiss, 2013; Moon & Blackman, 2014). Denzin and Lincoln (2006) argued that this concept increases the researchers' understanding of the lived experiences of different groups of people, critique and change the current conditions within which they live and strive to grow.

This notion of epistemology can be practically applied using specific theoretical lenses. For example, a feminist political ecology lens, for example, has an epistemological stance used to investigate and strengthen the understanding of the situations faced by women ocean scientists in Kenya using both quantitative and qualitative data collected from the participants. This means that the researcher's mind or epistemological position is thought to be separate of the problem being investigated and allow the data collected to explain how and why the reality exists or 'why we know what we know by providing a philosophical grounding for deciding what kind of knowledge are possible and how we can ensure that they are both adequate and legitimate' (Crotty, 2003 p. 3). Crotty (2003) also argued that the theoretical perspective is also positivism as it bases knowledge wholly on observable facts and avoid speculations about the problem under investigation. On the contrary, subjectivist epistemology holds that the researcher cannot be separated from the world of objects, as humans or the researcher is known to be part of the system. In this study, the researcher maintains a certain degree of objectivity when analysing and interpreting results guided by the data collected, theory adopted, but accepts that her personal experiences or perspectives introduce an element of subjectivity. Thus, this is the reason why the researcher included a self-reflexive positionality statement (section 3.4) at the end of the methods section of this thesis. This positionality statement describes the researcher's lenses and gives her personal experiences, beliefs and perspectives that could potentially influence the research process, including age, social class, gender, education, and ethnicity (Holmes, 2020; Fennell & Arnot, 2008; Arnot & Fennell, 2008). Positionality recognises experiences and perspectives that provide detailed insights into the research process and assumes it is possible to discover the truth that can be verified empirically, be valid, generalizable and independent of social thoughts and conditions (Harcourt & Nelson, 2015).

4.2. Kenya as a case study

Kenya was selected because, first, it has been actively involved in ocean-related initiatives globally over the past decades. For instance, the country hosted the Blue Economy Conference in Nairobi in 2018 (KMFRI, 2018; Muigua, 2020) and co-hosted the UN Ocean Conference with the Government of Portugal in Lisbon in 2022 (Obura, 2020). However, more is needed to understand who undertakes and participates in ocean science and governance in Kenya, and why and how the engagement of the stakeholders is gendered in the study among professionals, both women and men in ocean science. Second, over the past three decades, the country has shown commitment towards achieving gender equality in various sectors and levels, as evidenced in its current 2010 Constitution. According to the 2010 constitution of Kenya, institutions must adhere to the two-thirds gender rule/principle. In other words, not more than 70 per cent of one gender or ethnic group is allowed in an institution or position. However, gender disparity remains in the education sector and workplaces associated with ocean science. Third, the researcher is a Kenyan marine and freshwater scientist and has intimate experience of the country's education and employment systems. The researcher represents an insider-outsider' based on some commonalities and differences associated with her previous experiences and perspectives.

4.3. Sampling strategy

This study used purposive sampling based on specific criteria met by an institution or individual (Padilla-Diaz, 2015). For the universities, the selection criteria were based on the following: must be a public university, offer ocean science-related courses and have five years or more of active operation (to be able to assess the differences between enrolment and graduation of female and male students for a four-year degree programme). Students must also be undertaking ocean science-related courses and staff employed in teaching ocean science-related programmes. In the case of institutions other than public universities, the criteria used included those responsible for the ocean in Kenya (section 2.4.2 and Appendix 4), ranging from government agencies, NGOs and IGOs and carrying out activities related to ocean science research, conservation work, management, policymaking, and governance. The participants selected for interview included those performing these activities or responsibilities. In addition, gender focal points were interviewed to illuminate institutional performance and efforts in promoting gender equality. These criteria ensured that the selected participants had everyday experiences regarding ocean science and/or gender equality. Snowball sampling was also used to recruit participants through other participants, especially where participants were hard to

access due to COVID-19, as the majority of the employees were working from home.

The case study was conducted in 27 ocean science institutions in Kenya from June to October 2021 (Figure 6). These institutions were categorized into: i) public universities (n = 8), ii) government agencies (n = 9), iii) NGOs (n = 7) and iv) IGOs (n = 3). Full details of the data collected by gender in the study for each institution are provided in Appendix 6. Table 2 presents the number of academic staff who participated in the interview and Figure 5 shows the socio-demographic characteristics of the 102 students who responded to the questionnaire.

Table 2: Interviewees distribution by occupation

Type of organisation	Occupation of participants	Number of interviews
Public universities	Associate professors	5
	Senior lecturers	2
	Lecturers	8
	Tutorial fellows	1
	Graduate assistants	1
	Senior technologist/ technicians	2
	Technologists/ technicians	1
	Part-time lecturers/ PhD students	6
	Lab assistants	1
	Gender focal points	3
Total		30

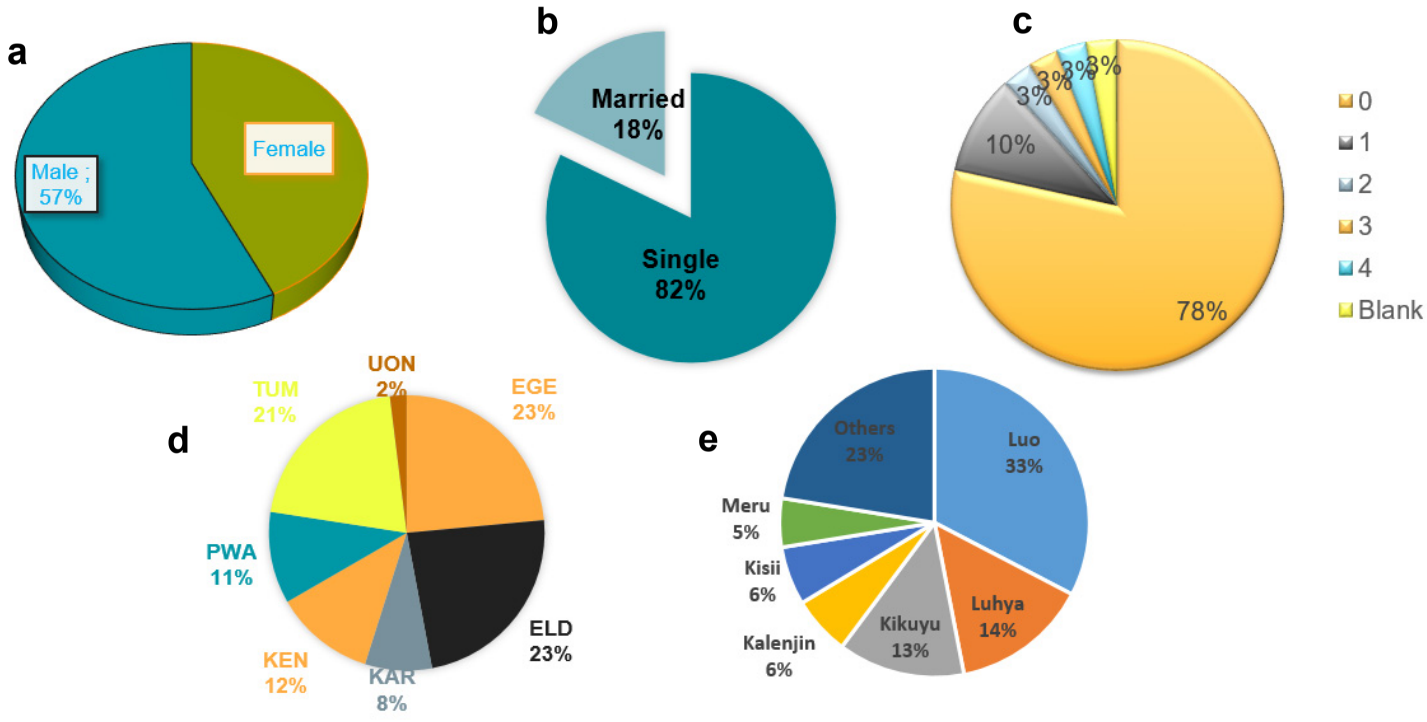

Figure 5: Profile of the students who responded to the questionnaires in public universities in Kenya, where illustrations a) gender, b) marital status, c) number of children , d) university (anonymized) and e) ethnic groups of the respondents (Author's illustration)

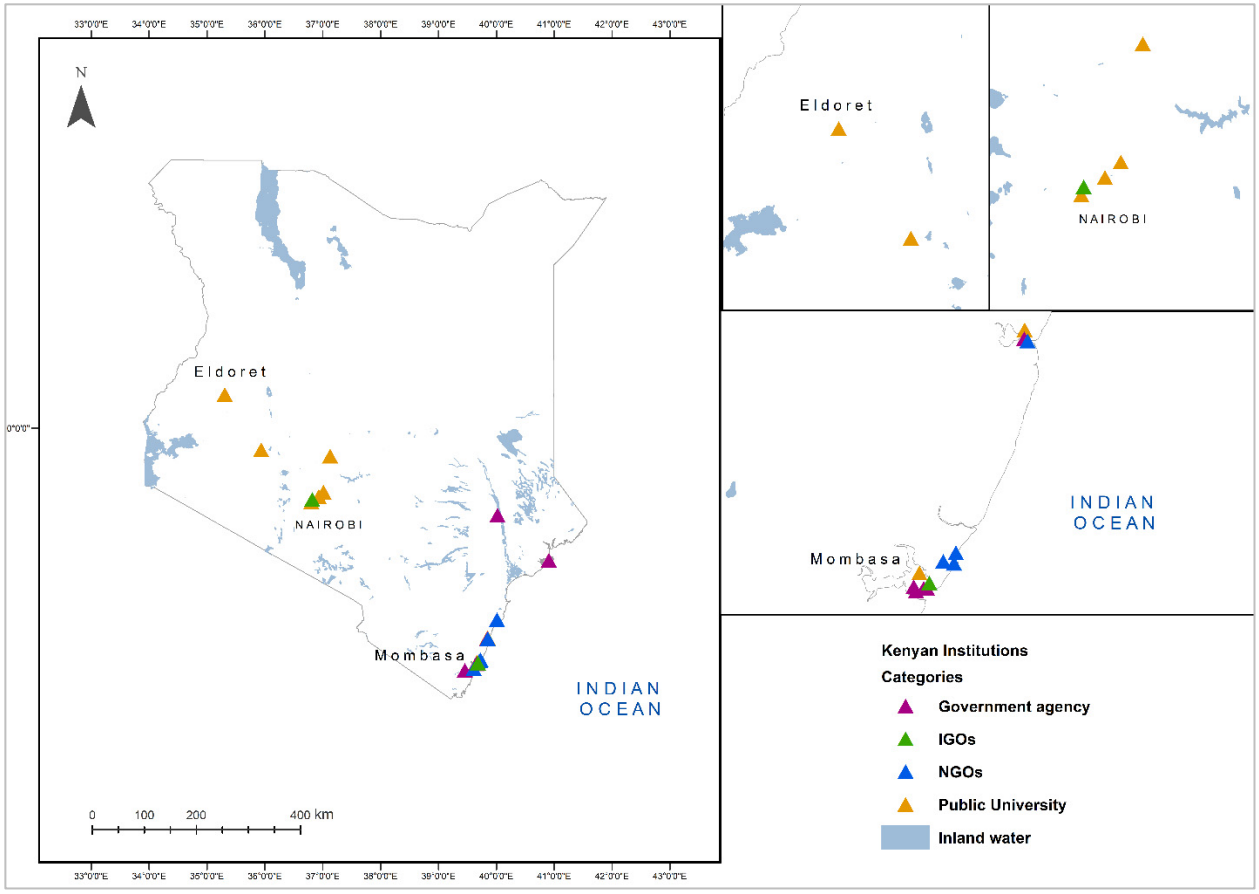

Figure 6: Geographic location of the twenty-seven selected ocean science institutions in Kenya (Author's illustation)

4.4. Data collection and analysis

To understand the complexities involving gender disparities in ocean science, data collection was done through mixed-methods approach to capture all dimensions of the problems. The mixed-methods approach used in this research was inspired by other authors including Barahona-Fuentes et al. (2020), McKague et al. (2021) and Kiss (2013). Barahona-Fuentes et al. (2020) evaluated the impacts of policies in maritime education and training institutions and analysed gender-disaggregated data and interviews to understand the gaps and barriers. The data collection methods included literature and policy reviews, collection of numerical data, surveys, questionnaires, and interviews (Figure 7) in four steps: 1) secondary data from national and institutional gender-related policy documents, 2) primary numerical data on gender ratios (gender-disaggregated data) of students and staff, 3) questionnaire to students, and 4) in-depth interviews with staff.

Policy documents were collected through Google search, others were retrieved from institutions' websites and the ones which were not publicly available were obtained in person with the help of the university's or organisation's gender focal points. During the document search, the researcher used terms such as 'gender policy', 'gender equality policy', 'sexual harassment policy' and other related words. The policy documents collected were scrutinized and the ones from the selected public universities and institutions were included in this analysis.

Collection of gender-disaggregated data was done through quantitative data collection method using a survey tool designed to collect the same data from all the 27 participating institutions. In public universities, gender ratios of students and academic staff were collected. The data included enrolment and graduation of female and male students in ocean science-related courses over a decade (2010-2019), both undergraduate (BSc) and postgraduates (MSc and PhD). Additionally, data on the gender representation of academic staff was collected, taking into account different institutions and career positions, including management positions. The researcher only collected gender ratios of ocean professionals in the remaining non-academic institutions by ranks. The aim of collecting gender-disaggregated data was to provide a picture of current status and trends in the ocean science education and governance sector.

Questionnaires were used to collect quantitative and qualitative data to gather information from students about their experiences or opinions. The researcher used a self-completion questionnaire which was shared with the wider range of participants via online Survey Monkey (due to COVID pandemic). However, 30 per cent of the questionnaire were administered in person, especially to the students who were on campus at the time. A set of questions used in the questionnaire range from the source of funding for studies to barriers facing female students participating in ocean science (See Appendix 1). It is important to note that not all questions

indicated in the questionnaire were used in this thesis, as part of it addresses a broader objective of the Empowering Women project which is still ongoing.

In-depth interviews were conducted with a diverse range of academic staff involved in teaching ocean science courses from part-time lecturers to professors (Table 3). The interview solicited information on the lived experiences of staff including their career progression, barriers, and some practices that they considered as good in promoting gender equality in their institutions. To capture the diversity, the participants were asked to identify their ethnic groups, age, highest level of education and class as presented in the interview guide in Appendix 2. It is important to note that an extensive interview guide was used to generate a comprehensive dataset, and some of the data lie outside the scope of this thesis. Thirty interviewees were identified through existing contacts and university's head of departments. Most interviews took place via zoom meetings (53 per cent), and the rest were done through face-to-face and phone calls (see Appendix 6). Interviews were conducted in English, and lasted 30 to 90 minutes, where audio were recorded with the participant's permission. The focus was on how women report and interpret their lives, decisions, and practices –known as women's subjective lived experiences.

Table 3: Socio-demographic profiles of the staff participants from the selected public universities in Kenya (n = 30)

Socio-demographic characteristics	Categories	Frequencies (n = 30)	
		Women	Men
No of participants	Gender	12	18
Marital status	Married	5	16
	Single	5	1
	Unassigned (Gender focal points)	2	1
Social class	Middle class	6	15
	Lower class	3	0
	Not specified	1	2
	Unassigned	2	1
Highest education level	PhD	6	9
	Ongoing PhD	3	1
	Masters	3	8
Children	Have children	9	14
	No children	1	3
	Unassigned	2	1
Age	<30	0	2
	30-39	3	4
	40-49	2	5
	50-59	3	4
	Above 60	2	2
	Unassigned	2	1

The field data collected in this study comprised of data by gender of students and staff, administered questionnaires to students undertaking ocean science-related courses and in-depth interviews with ocean science personnel and gender focal points (Appendix 6). A gender focal point is a person whose role is to ensure gender issues are mainstreamed within an institution, mostly the directors in Gender centres/institutes or in the Directorate of Gender affairs (UN Women, 2020).

Document analysis was adopted for evaluating institutional gender policies. The number or volume of gender-specific strategies in each institution was calculated as a percentage of total strategies, which was then evaluated against the gender ratios of students and staff of that institution to see if they translated to the intended gender balance in the institutions, specifically in ocean science fields (Ojwala et al., 2022). In this analysis, the role of policy documents was assessed as a proxy for changes and processes to promote gender equality in terms of the relationships between the policy documents and the gender balance of students and staff.

Data on staff and students were analysed using descriptive statistics to calculate means, measures of variation, the frequency distribution of ocean science professionals in each institution, and at all levels, percentages of female students' enrolment and graduation over the years (between 2010-2019) as well as women's representation in management positions. This analysis helped to understand the status and trends of gender equality in ocean science institutions in Kenya. All the tables and figures in this thesis were created by the author hence no citation was included.

Further, the thematic analysis was used when analysing students' and staff experiences in ocean science-related fields from the questionnaire and interview data. Interview data provided in audio or video format were transcribed using Otter.ai, where video or audio were transcribed and cleaned up before coding. Data was processed using NVivo Version 12, where the qualitative information (transcripts) from the interviews were analysed by categorization and theme formation (Figure 8). This process ensured prolonged immersion in the data and repeated interactions with the transcripts. It involved the identification of the most relevant factors and seeking patterns of participants experiences and perceptions by gender, ethnicity, age, education and class. Charts, project maps and word clouds were developed to visualize the general patterns. Figure 8 shows the hierarchy chart developed from NVivo software illustrating the themes and sub-themes (codes and child codes) that resulted from the selective coding, which was guided by the research questions of this study. The hierarchy chart helped to visualize the resulting patterns of themes after coding interviews transcripts. The main themes included employment status, career development, staff experiences, work-family balance, barriers to career progression, gender and power imbalances, work relation with colleagues, gender policies and good practices. The researcher further holds that knowledge is always partial and never bias-free and thus offers transparency about her positionality in section 4.6.

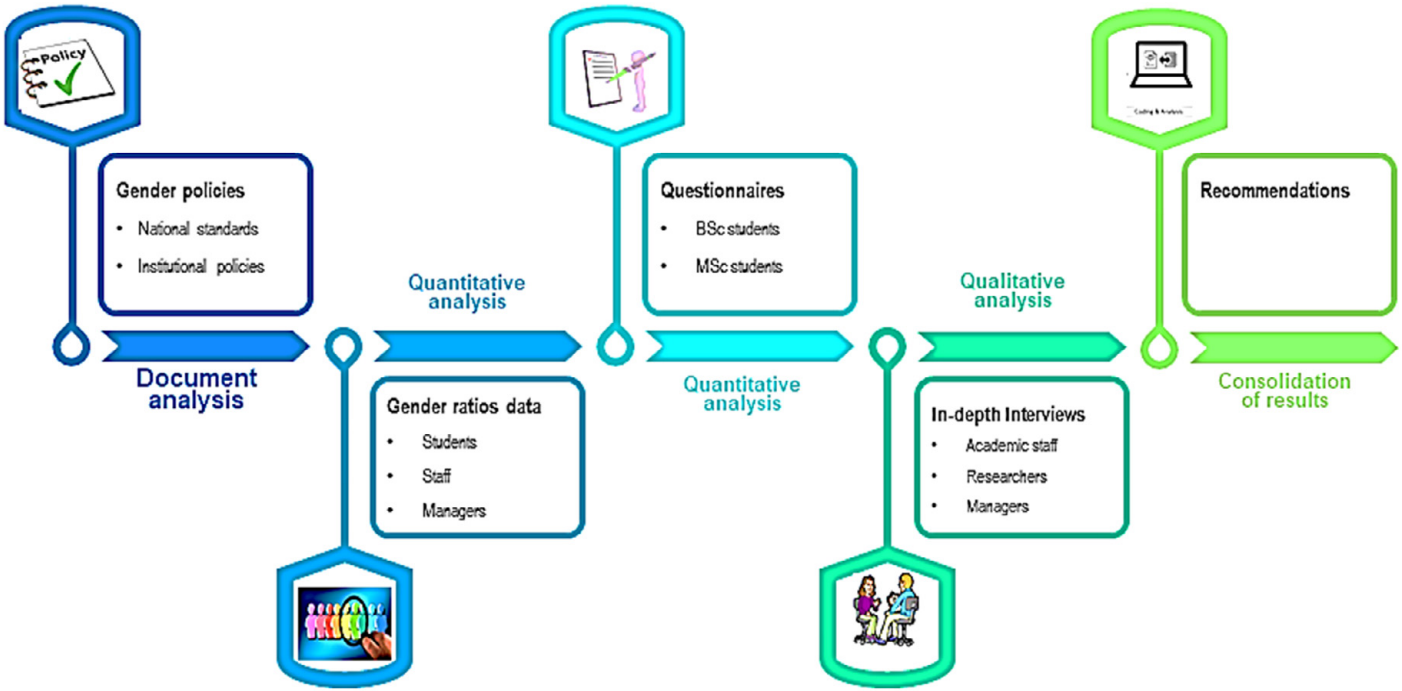

Figure 7: Methodological path of data collection and analysis (Author's illustration)

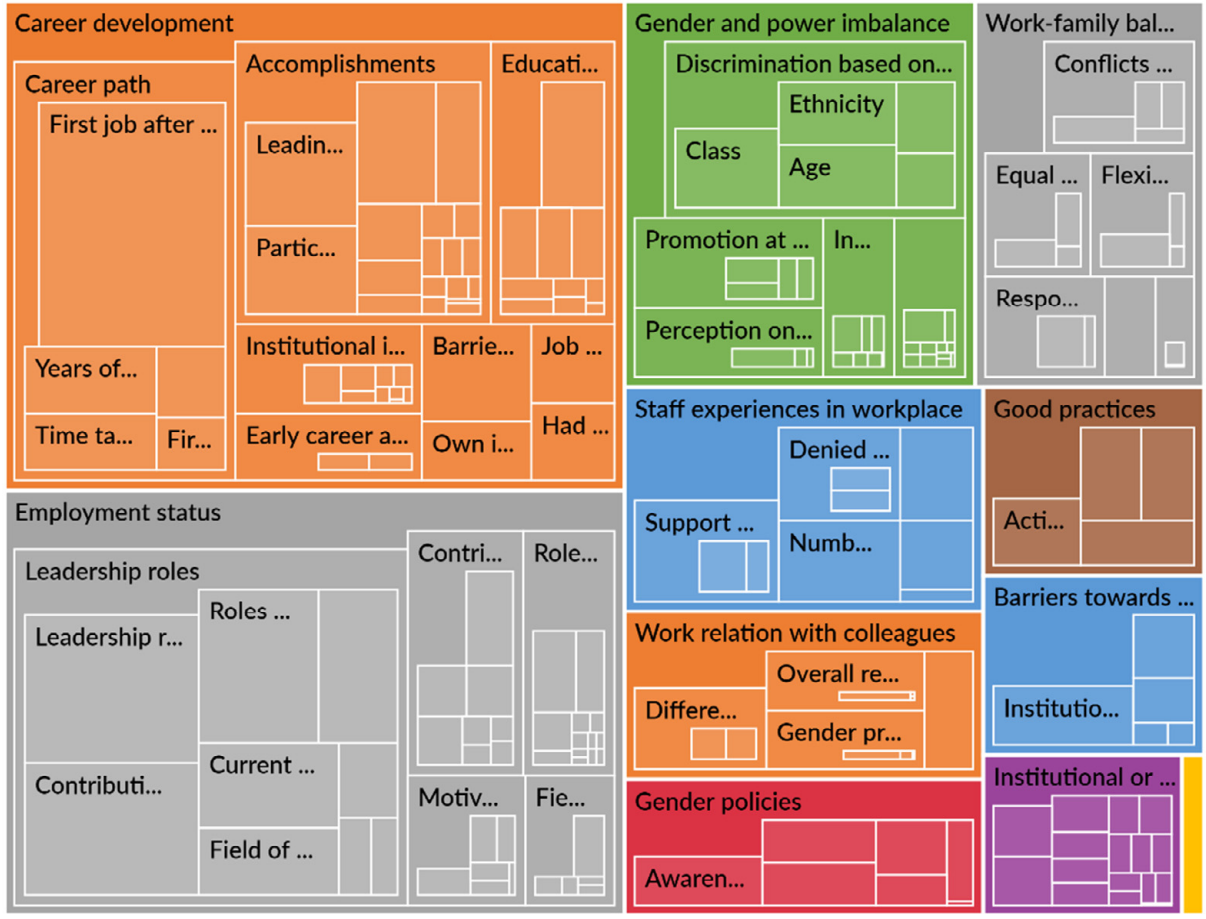

Figure 8: Summary of the themes and sub-themes generated from the interviews conducted with ocean science professionals (n = 30)

4.5. Ethical considerations

Before data collection, the Research Ethics Committee of WMU approved the questionnaires and interview guides. Also, the Kenyan National Council of Science, Technology and Innovation (NACOSTI) (License No. 824286) granted the researcher permission to conduct this study in Kenyan institutions. Questionnaires and interview guides had a short description explaining the purpose of the research to each potential participant and included a statement that guaranteed anonymity and confidentiality to participants and institutions. These data collection tools were piloted before fieldwork. The institutions studied were anonymized to ensure confidentiality following the approval protocol.

4.6. Positionality statement

Positionality refers to the stand adopted by a social researcher within the study (Holmes, 2020. P 2). It is a self-reflective piece that sets the scene of my research based on my lived experiences as a woman that have influenced and motivated me to enrol for my PhD studies in the Empowering Women for the United Nations Decade of Ocean Science for Sustainable Development programme. This research is therefore not entirely ¨objective¨ as a starting point, because as a woman researcher born and raised in Kenya I represent the inside observer. The challenges I faced are similar to many women in the country. Along these lines, I can express my own situated knowledge as part of a larger group of scholars seeking to find the root causes and solutions for gender inequalities in ocean science disciplines and institutions seen through the lens of a feminist political ecologist.

Regarding my positionality in this research, I represent an 'insider-outsider' based on some commonalities and differences associated with my previous experiences and perspectives. Although my position as insider was important, it allowed me to stay conscious about my biasness and assumptions when interviewing participants. As a result, I did not steer the participants to what I already expected and instead asked them open ended questions to allow them express their own experiences. The aim was to remain neutral during data processing and analysis to unravel the data as something new. In doing so, the researcher read the transcripts many times to ensure an in-depth understanding of the differences in the participants' experiences that emerged during the interview.

To begin with, I write as someone who roots in a patriarchal society from the Global South. I can be defined by various social identities based on ethnicity, gender, education, age, marital status, occupation and class, which influences access to higher education, power imbalances, access to job opportunities, and access to and control over natural resources. In our village, gender roles were differentiated

between girls and boys. The typical village girl's life involved primarily, reproductive roles and secondarily, education, including fetching firewood and water. In the village, women make up more than half of the workforce in the fishing industry and play a critical role in their communities. They are often involved in time-consuming small businesses like fish marketing, especially selling the famous 'omena' (*Rastrineobola argentea*). Due to cultural norms and beliefs, it was a 'taboo' for women to board fishing boats. Some female fish traders, particularly widows, known as *Mama karanga,* resorted to building relationships with the male fishers, documented in many articles as 'Fish-for-sex'. More often than not, women had to act as both father and mother and use the little income from their small businesses to provide for their families and pay school fees for their children. I also witnessed many of my primary school classmates drop out of school due to early pregnancies and lack of school fees, and most of those affected were girls. As a student in undergraduate studies, I convey my situated knowledge as part of a larger group of female students who have experienced difficulties in accessing higher education. I have had to depend entirely on government loans (Higher Education Loans Board – HELB) to complete my undergraduate degree. This approach raises issues of access to higher education, bias, access to funding, opportunities and awareness of potential sources of bias that can help in critical reflection. Hence, this study aims to identify the different experiences among students, especially those from marginalized groups.

During my undergraduate studies, I encountered attitudes and behaviours that I would consider gender and ethnically biased. In 2010, when I joined my BSc studies, most of the students enrolled in my course were from the western region of Kenya, with 36 per cent and 29 per cent coming from the Luo and Luhya communities, respectively. The best thing, though, was that in our class of 14 students, we had a better representation of female (57 per cent) than male (43 per cent) students. I also experienced some differential gender roles during fieldworks, where male students were most preferred for some kinds of activities like going to the boats to sample fish and water. For the MSc degree the opposite was true. In a class of 10 students, there were only three women. However, I have observed some improvement, where females and males were both given opportunities to participate in every activity including sampling water, fish and aquatic plants and laboratory analysis.

Having worked for various organisations engaging in multiple activities as a volunteer, a research intern and a part-time lecturer, with affiliations ranging from local, national and international NGOs to governmental agencies and universities. I observed gender and ethnic biases in hiring and recruitment processes, being excluded from field activities, sexual harassment and bullying in terms of offensive comments, pressure for dates, tight hugs, derogatory jokes, and unintentional microaggressions about my educational qualification, more specifically from less educated colleagues. I also noticed that most employers had no or little confidence

in women. In most of my work experiences, I had to volunteer for two or three months in each institution before getting a paid contract. I observed some male colleagues coming directly with paid contracts, even those younger than me. As a part-time lecturer in one of the public universities in Kenya, I experienced the lack of or delayed payment.

My self-reflective perspectives and experiences provide a sense of why, how and where this research was conducted. I am a female early career ocean (and freshwater) scientist who has volunteered, interned and part-timed in various science-related organisations in Kenya and experienced the impact of gender inequality regimes as a student and temporary staff. I have seen practices and discourses that undermine and deny women opportunities and exclude women in decision-making positions. As a female scientist without family responsibilities, this research has helped me to understand what it is like to be a working parent/mother and how they experience life differently. My experiences are not an exception. Many young girls, colleagues and women in my country and neighbouring regions find themselves in courses and careers that are male-dominated, and they may meet people who have different perceptions on gender equality. I wanted to understand more about existing gender inequalities among students and staff, their experiences based on access to higher education and job opportunities, and the barriers and challenges they encounter in their everyday life in ocean science which is still predominantly a male domain.

Having experienced discrimination and biases as a female graduate in ocean science-related programmes in Kenya in terms of employment, I have frequently asked myself the following questions: Why are ocean science courses so unpopular in my country? Why is it so hard for women to access higher education, especially in ocean science courses? Why are more students from my ethnic group enrolled in these courses despite coming from the lakeside and not coastal region? Why are there so few women students and staff in my discipline? Why are female graduates denied employment opportunities in this field despite several applications? Why do women take too long to secure a job in my discipline? How are the women in ocean science institutions perceived by their managers and male colleagues? What is the government doing to increase women's participation in my discipline? Are students and staff aware of the initiatives in place to promote gender equality in their institutions? My research together with the capacity building workshops, trainings, conferences and webinars organised by the Empowering Women's programme and other agencies have helped me to understand the breadth of these complex issues and answer these questions.

The persistent biases in terms of gender, ethnicity, class, education, and age in ocean science coupled with heightened power relations, institutional structure and culture, socio-cultural practices and stereotypes are the main drivers of this study, and put forward the need for transformative gender policies and more sustainable approaches to address these problems. In this context, the national and institutional

gender policies, gender-disaggregated data (gender representation) and lived experiences of students and staff undertaking ocean science are the major foci of this thesis. Despite the growing number of gender-related policies – institutional gender equality policies and sexual harassment policies developed to enhance gender equality in higher education and workplaces since 1970s – remarkable improvement has been recorded only in primary education, not in secondary and tertiary education in developing countries including Kenya. However, little information is available on gender representation and contributions in ocean science in Kenya. In order to gain more knowledge on progress in gender equality and the effectiveness of the policies and initiatives aimed at promoting gender equality in oceans science institutions, there was an urgent need for this research to provide a baseline empirical evidence and qualitative data to explore the strengths (successes) and weaknesses (failures) of the institutions and policies that have been repeatedly accentuated in the ocean science field.

5. Results and Discussion

Understanding the relationship between gender policies and gender equality in ocean science is a priority for the Decade of Ocean Science (Sun et al., 2021). The research presented in this thesis examined the status of gender equality and the effectiveness of gender policies in promoting gender equality in ocean science institutions in Kenya. This study produced four academic papers that focus on distinct but related aspects of gender equality within research and educational institutions in Kenya that have a remit in ocean science. The findings in Papers 1 and 2 were primarily based on descriptive statistics of gender ratios, whereas the finding in Papers 3 and 4 are discussed in relation to the core concepts presented in the theoretical framework section (feminist political ecology theory). While each paper can stand alone and be read independently of the others, there is a common thread or "Through-line" that runs across all. They need to be considered together to appreciate the full scope and complexity of the problem this thesis is attempting to address. It is therefore necessary to summarize the findings of each paper, highlight the themes or ideas that link them together and thus to find the key elements of this research that need to be conveyed to academics, practitioners and policymakers. The overall findings which emerged when all the papers are considered together are provided in the conclusion.

5.1. The Through-line

Figure 9 illustrates the "Through-line" approach[12,13,14] while Appendix 6 provides detailed information on the data collected. This approach provides a creative process to convey the data and information collected on gender policies, gender ratios and individual experiences and how they are interlinked. The ¨Through-line¨ concept has been used by storytellers and expert speakers in TED talks to outline their ideas to the audience and by students when writing their dissertations. This concept helps to consolidate the detailed understanding of the research questions and serves to achieve the overall research aim. The detailed answers to the research questions (emerging from the research objectives) are discussed in sub-sections below: Subsection 5.2 contributes to the first research question and in part, the second question (mainly gender representation in public universities), primarily based on the results from Paper 1, whereas Subsection 5.3 contributes to the second research question mainly based on the results from Paper 2 which focused on gender representation in non-academic institutions. Subsection 5.4, Subsection 5.5, and Subsection 5.6 are primarily based on the results from Papers 3 and 4, contributing to the third, fourth and fifth research questions. At the end of these subsections the researcher attempted to consolidate the main findings with a view towards future research needs.

[12]Bowman, D.J. (2021). Through-line/Throughline/Through Line –what does it mean? https://www.donnajanellbowman.com/2021/06/14/through-line-throughline-through-line-what-the-heck-is-it/

[13]Pacheco-Vega, R. (2020). Developing a coherent argument throughout a book or dissertation/thesis using The Red Thread (Throughline –Global Narrative). http://www.raulpacheco.org/2020/01/developing-a-coherent-argument-throughout-a-book-or-dissertation-thesis-using-the-red-thread-throughline-global-narrative/

[14]Johnston, R. (2018). Through-Line –The single most vital trick in writing a novel. https://rosiejohnstonwrites.com/2018/04/08/through-line-the-single-most-vital-trick-in-writing-a-novel/

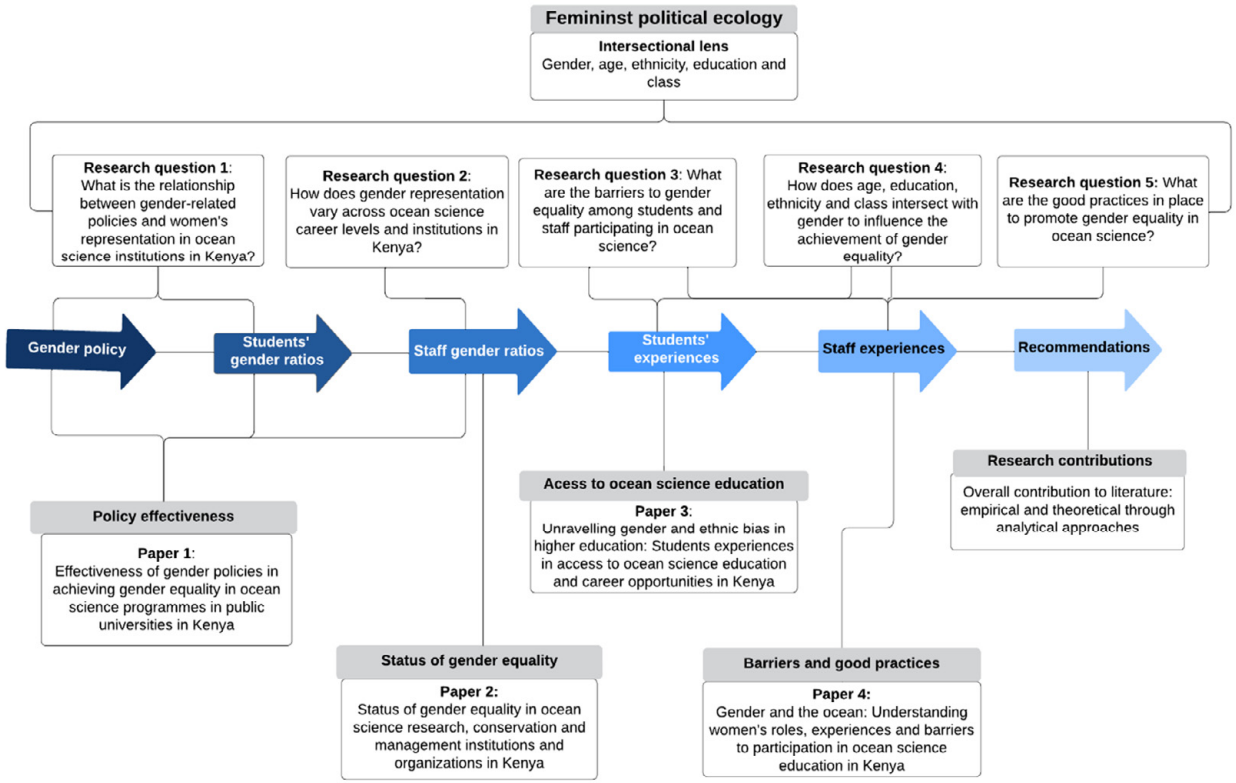

Figure 9: Schematic diagram of the ¨Through-line¨ illustrating the flow of the interconnected research ideas and outlining the relationships between the research questions and the outputs/publications (Author's illustration)

5.2. Effectiveness of gender policies in public universities in Kenya

The first research objective of this thesis was to evaluate gender policies against national standards and their impacts in ocean science institutions in Kenya. At the time of data collection, there was little information on gender in ocean science in Kenya, although there was a focus on women in fisheries at the local or community levels (Aloo et al., 2000; Matsue et al., 2014; CISP, 2018; Abwao & Awuor, 2019; Murunga, 2021). To date, the only available data was found in the Global Ocean Science Reports by the IOC-UNESCO (IOC-UNESCO, 2020), which did not present a complete picture of the status of gender equality because the sample used only conference attendees/participants. In most cases attendance in conferences are often unrepresentative since the participation fee is too expensive and not easily affordable by many, especially ocean scientists from developing or under-resourced countries. Therefore, this current study was timely to ensure that the gaps are accurately identified and addressed through an evidence-based research process using ocean science institutions in Kenya as a case study.

To answer the first research question 'what is the relationship between gender-related policies and women's representation in the ocean science institutions in Kenya?' I analysed policy documents and gender ratios of students and staff in public universities. In addressing this question, the policy documents gathered were evaluated using the Gender Integration Continuum (GIC) Framework adopted from the USAID Interagency Working Group as explained include the Research Methodology Section.

The evaluation of the policies was based on six themes: access, equity, quality education, safety, mentorship and governance which were in line with the key priority areas of the national gender policy. Using the GIC framework helped identify gender-blind and gender-aware policies, and further identified the gender-specific provisions or strategies, which were in turn compared with the representation of women denoted by the proportions of female students and staff.

The evaluation was done in three steps; the first step identified the gender-specific strategies and calculated them into percentages of the total provisions in each policy document. The second step, evaluated and compared the percentages derived from the gender-specific strategies of the national gender policy with those of the institutional (universities') policies. The third step, compared the percentage of institutional policy with the gender ratios (percentages of women) of students and staff in their respective universities.

From the analysis, the results revealed that both national gender policy and individual university policies had more gender-neutral strategies than gender-specific ones, and all the policy documents were outdated, including the national gender policy (Kenya's Education and Training Sector Gender Policy, 2015) of the

Ministry of Education (Paper 1). It is also important to note that the national gender policy recorded very low percentages of gender-specific strategies in almost all of the six themes with an average of 4 per cent compared to other policies.

Notably, the evaluation of the institutional gender policies against the national gender policy in education revealed that four out of the five documents reviewed were above the national standards based on the calculated or estimated percentages of gender-specific strategies or provisions (as indicated in dark blue) except one which was at the same level as (or meeting) the national standards (light blue) as presented in Table 4. The universities were later ranked and categorized based on these percentages ranging from highest (28 per cent) to lowest (4 per cent), indicating Universities A to E, where A is the University with better policy and E is the university with the weakest policy. This study showed that the universities used the same themes as those in national policy to formulate their own gender policies, however, there were no clearly defined standards that were to be strictly followed by the institutions. Hence, the strategies from various universities policies differed with regard to the way they were written or addressed gender issues in the universities (see Paper 1 for a more detailed analysis).

Table 4: Summary of the comparative analysis between national and institutional gender policies in public universities showing percentages of the gender-specific strategies in each document by themes (Analysis excluded three public universities without gender policies)

Gender policy assessment criteria	Access	Equity	Quality education	Safety, security and GBV	Nurturing and mentoring	Governance	Overall gender-specific strategies (%)
Education and Training Sector Gender policy	8%	0%	0%	7%	17%	0%	4%
University A policy	33%	67%	0%	7%	40%	50%	28%
University B policy	20%	20%	0%	0%	100%	25%	22%
University C policy	0%	75%	0%	0%	0%	20%	19%
University D policy	20%	43%	0%	0%	0%	0%	9%
University E policy	29%	0%	0%	0%	0%	0%	4%

*Note: The colours represent; Dark blue = Above, Blue = Meet, and Light blue = below national policy standards, in comparison with the Kenya National gender policy as a benchmark

The general objective of all the institutional gender policies was to establish measures and mechanisms for eliminating all forms of gender disparities and discrimination in university operations such as education, research, training and governance. The policy statement also outlined the universities' responsibility to create and sustain a fair and just academic environment to all students and staff,

where women and men have equal rights, opportunities, voices and access to resources. Therefore, gender equality policy was considered to be an essential input to increase the number and participation of women in ocean science. In order to evaluate the effectiveness of the policies in terms of performance or assess whether the general objectives were achieved, gender data collected on enrolment of students and employment of staff in ocean science-related programmes/departments, were used to determine if those universities with stronger policies were performing better on gender equality of their students and staff. Before comparison, the results from students and staff representation at all levels were presented as follows:

In terms of students' enrolment, the study showed that gender representation of students varied across ocean science disciplines at all degree levels and in all public universities studied in Kenya (see Paper 1). Fewer female students were enrolled in ocean science-related courses than their male counterparts at different degree levels (BSc to PhD). The overall percentage of female students' enrolment in BSc level was higher with an average of 35 per cent (n = 316) compared to that of female students in MSc level at 22 per cent (n = 23). Whereas, female students' enrolment in four of the selected public universities represented 39 per cent (n =9). That said, this showed a clear evidence of low students' transition rate from one level to the other in all the surveyed universities, with the proportion of female students often much lower than males. This is because the proportion of students who continue with their studies after undergraduate level differs depending on the availability of funding, family support, employment opportunities, economic activities of the parents, family background and socio-cultural factors as claimed by Ogolla (2013). The evidence overwhelmingly showed biases in enrolment of female students in ocean science, and the wide variations of female students between BSc and PhD need urgent attention to address the disparities between female and male students.

Further, the study also revealed declining trends in enrolment and graduation of female students at both undergraduate (Figure 10) and postgraduate levels (Figure 11) during the ten-year study period (2010-2019). Some of the universities were still using the analogue types of booklets to register students that had information and data that were not segregated by gender and took longer to retrieve (Kitada et al., 2023).

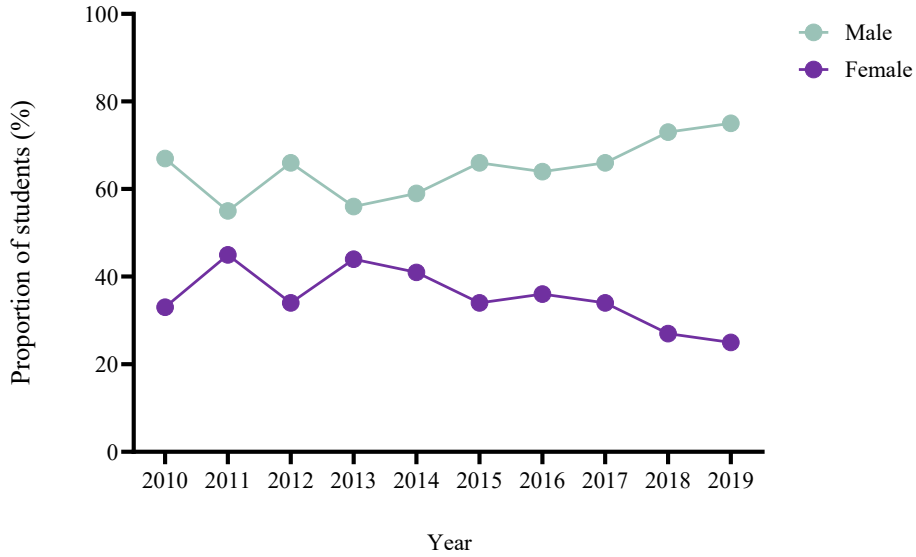

Figure 10: Undergraduate students' enrolment by gender in seven public universities in Kenya (excluding one university due to missing data)

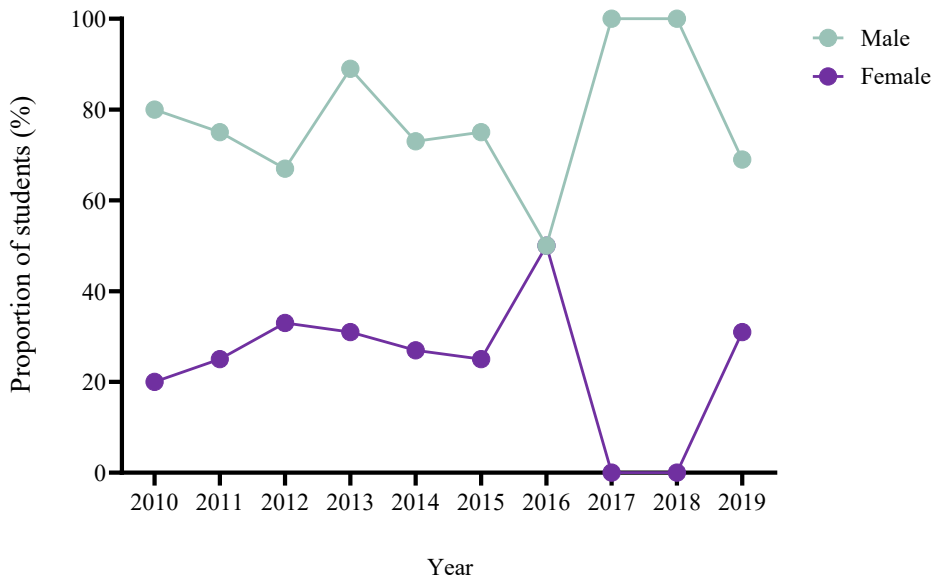

Figure 11: Students' enrolment in MSc degree in six selected public universities in Kenya (excluding two universities that did not provide gender data)

Possible reasons for the decline of numbers of students enrolled in 2018 and 2019, could be ascribed to the strict guidelines by the Ministry of Education that were intended to end cheating in the Kenyan national examination –Kenya Certificate in Secondary Education (KCSE) –which is the main university entry exams in Kenya. Since the implementation of these guidelines in 2017, the number of students that attained university grades dropped drastically, consequently resulted in a decline in university enrolment across the whole country[15]. This is because the number of students who qualified for university were less than the capacity of the many universities in Kenya[16], as the majority of the students opted to enrol in diploma courses in Technical and Vocational Education and Training Institutions (Njoroge et al., 2023). The decline in the number of new students for higher education has led to some university degree programmes/courses being scrapped by the Commission for University Education (CUE), especially those courses that attracted fewer students. This decision affected most of the ocean science-related courses, including BSc in Applied Aquatic Science offered in one of the public universities in Kenya, which was scrapped by the university management in 2022.

Apart from the student data, academic staff representation by gender was also analysed and the study showed that the percentages of women staff were found to be lower than their male colleagues with an overall proportion of 32 per cent. Women were underrepresented in all the universities as summarized in Figure 12a, with the best performance by University B which had 40 per cent female academic staff. Only half of these universities met or were above the threshold (33.33 per cent) of one-third gender principle enshrined in the Constitution of Kenya. The rest of the universities did not meet this threshold with a representation below 26 per cent in each. Figure 12b presents the overview of staff representation by gender and positions/ranks. More women staff (60 per cent) occupied non-tenured positions or entry level positions. Similar to the pattern observed in female students' enrolment, the findings also revealed an inequality in the recruitment of women as academic staff. In some universities data on gender ratios of the staff were not readily available upon request.

[15] University World News African Edition (2019). University enrolments drop as fewer qualify for entry. https://www.universityworldnews.com/post.php?story=20190430095806978

[16] Nation Team (2017). Why poor scores threaten parallel degree programmes in varsities. https://nairobinews.nation.africa/poor-scores-threaten-parallel-degree-programmes-varsities/

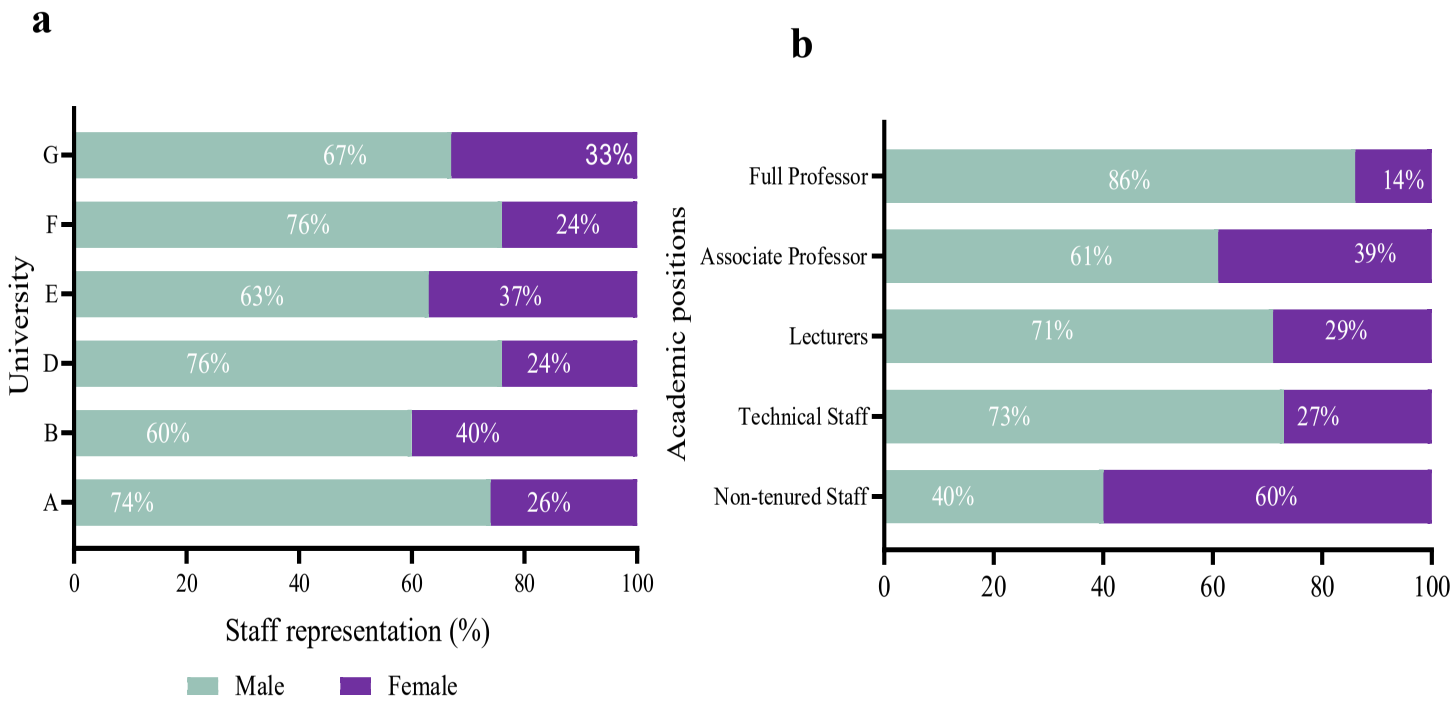

Figure 12: Differences in staff representation by gender in selected (a) universities and (b) positions

Similar findings were recorded in senior university management, where underrepresentation of women was observed in all four senior positions, including Chancellor, Vice-chancellor, member of university council and Head of the Department, with only two women as Chancellors and three women as Vice-chancellors out of the total (eight in each position see Figure 13). Men dominated all the top management positions despite having policy provisions aiming to balance the appointments to governance and leadership positions in the universities. Notably, most universities did not collect the data they need to understand the gaps and issues in order to formulate or review the policies to be more transformative to actively address the disparities (Onsongo, 2009; Ojwala et al., 2022).

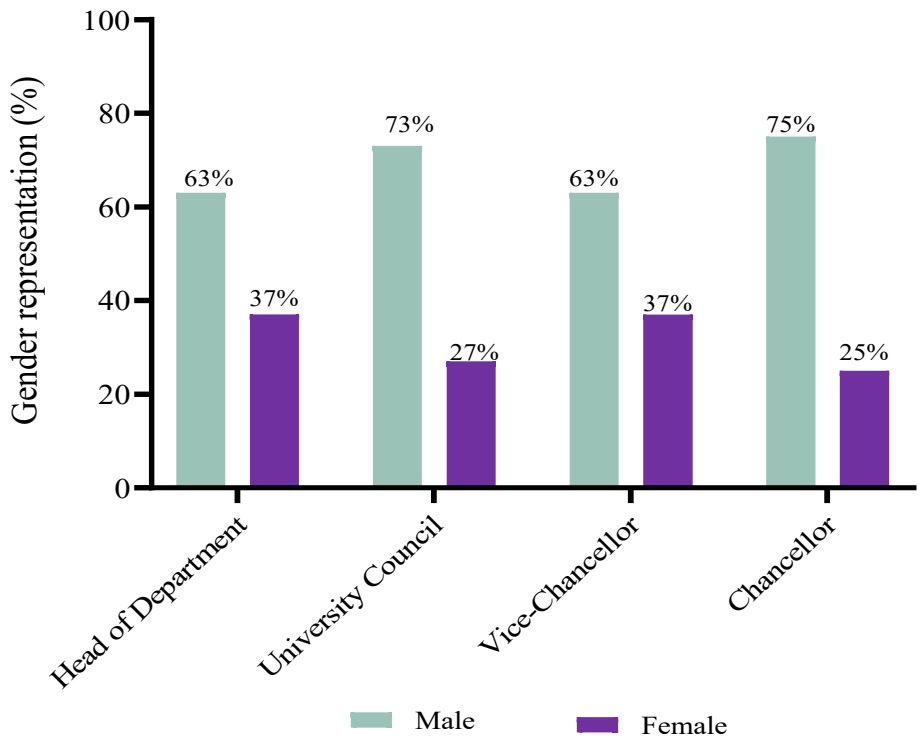

Figure 13: Proportion of women and men in four senior management positions in the eight selected public universities in Kenya (Head of Department = 8, Members of University Council = 48, Vice-Chancellor = 8, Chancellor = 8)

The study confirmed that the overall findings showed no relationship between having a gender policy and more equal representation of women in the institutions, whether as students or at academic and management levels. There was no relationship between having a gender equality policy and a better gender balance of academic staff. In fact, at academic career level, some universities without gender policies performed the same as those with policies. Analysis of the universities' management boards, for example, also revealed that the university with the best policy only had less than 30 per cent women in their leadership positions, with no woman as Chancellor, Vice Chancellor or Head of Department. These mismatches between the policy provisions and the gender balance of staff in the universities indicated the need for them to prioritize the policy implementation, evaluation and monitoring to develop gender-transformative policies with clear guidelines and measurable indicators to avoid the fluctuations or declining trends in enrolment of female students in ocean science-related programmes that were observed over course of the study. Even though there were declining trends in enrolment of female students, a slight relationship between a better policy and the gender ratios of female students was noticed. For instance, University A with the best policy had a better representation of female students in enrolment compared to University E with the weakest policy. However, this observation was only possible in female students' enrolment at undergraduate levels and was not the same in postgraduate degree levels (see Ojwala et al., 2022). The availability of gender-disaggregated data can help to identify who has access in terms of enrolment, and having clear digital records also help keep track of the progress and to enable concrete actions to be designed to address the identified gaps and avoid fluctuations in enrolment, retention and graduation rates of female students in ocean science programmes.

Although the existence of gender policies showed superficial commitments of the universities to enhance access and gender equality through various provisions such as affirmative action, the findings by Ojwala et al. (2022) and Ojwala (2023) clearly revealed the existing strengths and weaknesses of the policy documents reviewed. The strengths of most of these policies were that they were above the national standards and had some gender-specific provisions that were missing in all the themes in the national gender policy, though at lower percentages. However, the weaknesses outweighed the identified strengths, which is possibly the reason for their failure to achieve gender equality. These weaknesses include (i) having more policy provisions that ignored the gender inequalities (gender-neutral) in their respective institutions, (ii) all the policies being outdated without review showed lack of implementation, regular monitoring and evaluation, (iii) lack of gender analysis before formulation of policy, (iv) there was also an unclear implementation plan with the majority of the personnel listed as involved in the implementation process being on the top university management board led by Vice Chancellor of each university, (v) ineffective implementation of the policies was also apparent due to the inconsistencies and (vi) lack of resources and accountable personnel to

oversee the implementation process of the policies. As a result, all these policies failed to address the differences in gender balance to improve female students' and staff's access to opportunities in the ocean science-related programmes, including in education and decision-making roles.

These findings complement those of the study conducted by Onsongo (2009) on affirmative action, gender equity and university admissions in Kenya, Uganda and Tanzania. According to Onsongo, national gender policy appeared to take a long time to be widely disseminated to the respective universities. In addition, the universities received limited resources for the implementation of this policy, which is one cause for the slow-paced progress. Even though no previous study has been conducted in ocean science, similar trends as those of female students' enrolment, especially in science, technology, engineering and mathematics (STEM) courses have also been recorded in Kenyan universities even before the policies were formulated (Mbirianjau, 2018; Fisher et al., 2020; Amunga & Amadalo, 2020). For instance, Mbirianjau highlighted women's underrepresentation on STEM courses with a representation of between 30 per cent and 35 per cent. Furthermore, the participation of women in STEM was also found to drop progressively through the education levels and career ladder (Fisher et al., 2020). The women's representation in Kenyan ocean science universities generally reflects a similar tendency to that in the STEM fields of the region. The results of the present study confirm that the existence of a gender policy in the universities are only well-written on paper but are either not working in practice or have minimal impact in promoting gender equality, hence there is an urgent need to revise, update and implement them.

Even though the national policy aimed to eliminate gender disparities, it lacked clear indicators on how to achieve its objectives. Table 4 presents the variations of gender-specific strategies in each document including the identified national standards, which had only 4 per cent of its total policy provisions that were gender-specific. Arguably then the national gender policy in education was not the best policy model for the institutions to emulate, as all institutional gender policies reviewed were within and above the national standards. This reduces the universities compliance as the standards tended to be very lax or not sufficiently strict. The gender concerns led to formulation of gender-specific strategies by the universities, which outline ways to tackle harmful gender norms and are geared towards eliminating gender biases and stereotypes to increase women's access to and participation in higher education regardless of their social status and background, specifically in STEM courses. For instance, a few policy documents emphasized increasing scholarship or fellowship opportunities and others mentioned the need to enforce equity in scholarship and research to achieve 40 per cent female applicants, while others emphasized that making scholarships available that target well-performing female academic staff, as well as promoting supportive measures to retain all students, specifically females will be the most important factors in achieving gender equality in ocean science.

On the other hand, gender-neutral strategies ignore gender norms and gendered power imbalances that exploit the underrepresented gender, usually women, because such strategies primarily focus on the overall impact and are not explicitly aimed at either women or men. For example, some policy documents highlighted the need to ensure gender equality in appointing staff for leadership positions, mainstream gender-related courses and training modules for all students and staff. Further analysis of the implementation of these policies showed that the implementation processes were more high-level practice carried out by the management staff rather than at department levels, and departments lacked representatives to foresee gender issues at the departmental level. Another indicator of a failed implementation process was that outdated policies were still in action even though they specified that the policies would be reviewed after at least five years. The need to have a better understanding of the causes of the persistent gender inequalities and gender policy implementation led to next stage of the research to explore the experiences and perceptions of students and staff on ocean science-related fields and on the impacts of the existing gender policies, as discussed below.

5.3. Gender representation in non-academic institutions in Kenya

Gender equality was investigated in county and national government agencies, NGOs and IGOs dealing with ocean research, conservation, protection, and management. Overall, the average status of women in ocean science institutions was low, although with notable variations from one institution to another. The findings revealed that most institutions affiliated with the government had a lower representation of women than NGOs and IGOs. For instance, NGOs had a higher proportion of female staff (45 per cent) than government agencies, whereas women's representation was slightly above 30 per cent. Figure 14 presents the results from all four categories of institutions, including public universities for comparison.

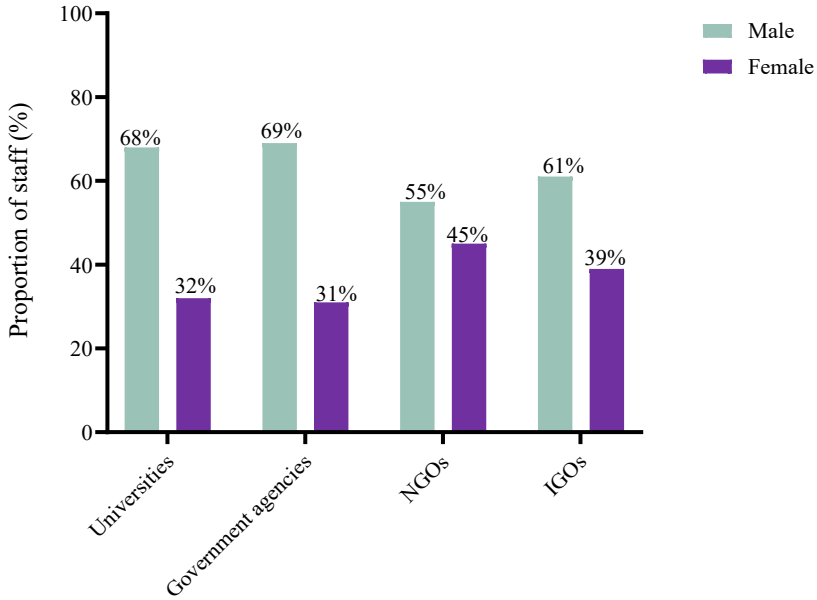

Figure 14: Average proportion of ocean science professional by gender in the selected institutions (universities = 8, government agencies = 9, non-governmental organisations = 7 and Intergovernmental organisations = 3)

From these results, it could be argued that the performance of the government agencies may have been influenced by the 2010 Kenyan Constitution, because these nine government institutions (both county and national) had no individual gender policies but were only complying with the two-thirds gender principle –one of the affirmative actions enshrined in the Constitution in Article 27 (8), which states that 'not more than two-thirds of any elective or appointive position in the government of Kenya shall be of the same gender'. Though some government institutions complied with the minimum required limit of one-third representation for women according to the Kenyan Government, this representation is very low in individual institutions and is unlikely to bring any transformative change to the current challenges faced in ocean management (see Paper 2; Ojwala, 2023).

The findings showed that the majority of women occupied junior or entry level positions in most institutions, which could be explained by the fact that these institutions including public universities were using two-thirds gender principle as a target or choice (or to tick the gender box) rather than to meet the minimum requirement by the government or obligation. The underrepresentation of women causes them to lag behind men in terms of career development and gets worse in senior management positions (also observed in Ojwala et al., 2022). Therefore, there is a need for each institution to establish its own gender policy after initial gender analysis to guide their institutions' culture or practices and ensure gender is

mainstreamed in all their operations, and to bridge all the identified gaps. Paper 4 explains how this may occur, including the limited opportunities for women in recruitment, hiring and appointments, male dominance in managerial positions and stagnation or relegation of women to non-leadership positions (Koralagama et al., 2017). Studies have shown that lack of control and representation of women especially in decision-making positions often leads to gender bias because of the power imbalances or relations that favour men (Hill et al., 2016; Ojwala et al., 2022; Shellock et al., 2022).

The analysis of women's representation by positions established that unlike government agencies and public universities, women in NGOs and IGOs were well represented in management positions, with about 75 per cent women managers in NGOs and 67 per cent women directors in IGOs. However, government agencies recorded the lowest percentages of women in senior positions with only 20 per cent women directors. In NGOs, a better representation of women was observed in most of the seven institutions surveyed under this category and in management positions. One reason for the better representation of women in NGOs might be that NGOs have to adhere to donor-funded specific requirements on women's representation before they can receive financial support. According to Shapiro (2019), women constitute over 70 per cent of staff in non-profit organisations in the United States especially in development and fundraising departments. However, the more prominent and well-funded a non-profit organisation is, the fewer women it has on its staff leadership and executive board. Another reason for more women in NGOs could be that women are often more drawn to social justice organisations and social services for experiential or moral reasons or they get attracted to working in institutions with female-dominated space (Shapiro, 2019).

Further analysis of staff representation in government agencies revealed that women continue to be underrepresented at every career level. In most of the nine institutions studied, women were more likely to occupy junior positions which often lack stability and job security, have less pay and lack social protection (ILO, 2012; ILO, 2016). Given that these are relatively high-status jobs, it is better to say women are more likely to be poorer and more vulnerable in the sector compared to their male counterparts, despite having the same educational qualifications. Similar studies outside Kenya have also indicated the lower representation of women in ocean science disciplines (O'Connell & Holmes, 2005; Bonatti & Crane, 2012; Huyer, 2015; Legg et al., 2023). In the Global Ocean Science Report that projected 38 per cent of ocean science staff were women based on conference attendance, referred to earlier (Isensee et al., 2017), considerable regional variations were noted ranging from Mauritania (4 per cent) to Croatia (62 per cent). The present study, however, gives a more accurate and detailed picture of gender representation in ocean science in Kenya ranging from access to higher education to labour market or employment opportunities, which may better reflect the situation in the Global South. That said, the underrepresentation of women staff and students in all the

ocean science institutions studied inspired and drew the attention of the researcher to evaluate the existing national and institutional gender policies to identify their goals, objectives, and gaps, and understand the reasons why the policies failed to promote gender equality in these institutions.

5.4. Barriers to gender equality among students and staff in ocean science

Evidence by Ojwala et al. (2022) and Ojwala (2023) in the first two papers clearly indicated that persistent underrepresentation of female students' enrolment in ocean science programmes in the selected public universities was evident between 2010 and 2019. This is likely to be related to the fewer women staff who were recorded in all institutions and in almost all ranks in Kenya, except leadership positions in NGOs and IGOs. In order to answer the research question – 'what are the barriers to gender equality among students and staff participating in ocean science disciplines in Kenya', this study focused on students' and staff experiences on studying and working in ocean science-related programmes to explore the reasons for their underrepresentation despite the presence or availability of gender equality policies according to the findings by Ojwala et al. (2022).

The existing patterns revealed that there is an urgent need to investigate and explore students and staff experiences, barriers and challenges to access to higher education and job opportunities, and to understand the gendered differences in treatment within their respective universities. Drawing from the insights of Feminist Political Ecology, gendered access to higher education and other forms of discrimination that students and staff often face in public universities in Kenya were examined. The FPE insights provided a better understanding of the nuanced or subtle differences in individuals' access to educational resources and job opportunities. These experiences of students' journey to ocean science programmes were gleaned through self-completion questionnaires (Appendix 1). Questions to students concerned sources of funding for their studies, awareness of their university's gender policy, experiences of sexual harassment behaviours, and other barriers that hindered full participation in these courses. Questions to staff focused more on causes of gender inequalities in workplaces and barriers to their career progression (Appendix 2). Questions were also addressed to the gender focal points to explore some of the challenges they encounter in the implementation of gender policies and in promoting gender equality in their universities (Appendix 3).

The survey and interviews identified barriers that often limit students access to higher education and staff career progression in Kenyan universities. Students identified six main barriers: lack of access to funding sources, cultural beliefs, gender discrimination, gender stereotypes, ethnic bias and sexual harassment. The

majority of the respondents, both female (58 per cent, n = 25) and male (58 per cent, n = 34), claimed that cultural barriers were one of the major obstacles that hindered female students' access to higher education and career opportunities. Most of the students strongly agreed that access to financial aid to cover their studies was a big challenge (see Paper 3).

Regarding access to financial support or aid, more male respondents were found to be supported by their parents or relatives (18 per cent, n = 11) than their female counterparts (11 per cent, n = 5). Instead, most female respondents more than 60 per cent, n = 26) received financial support for their education from a Higher Education Loans Board –HELB loan (Figure 15). Although the study loan provided access to higher education for some female students to access higher education, female graduates ended up in a vicious cycle of debts after graduation and vulnerable high interest rates, especially when they were unable to secure jobs immediately (see Paper 4). As a result, the loan holders, majority of whom are women in this study often face exorbitant fines or penalties associated with failure to pay this loan in time[17].

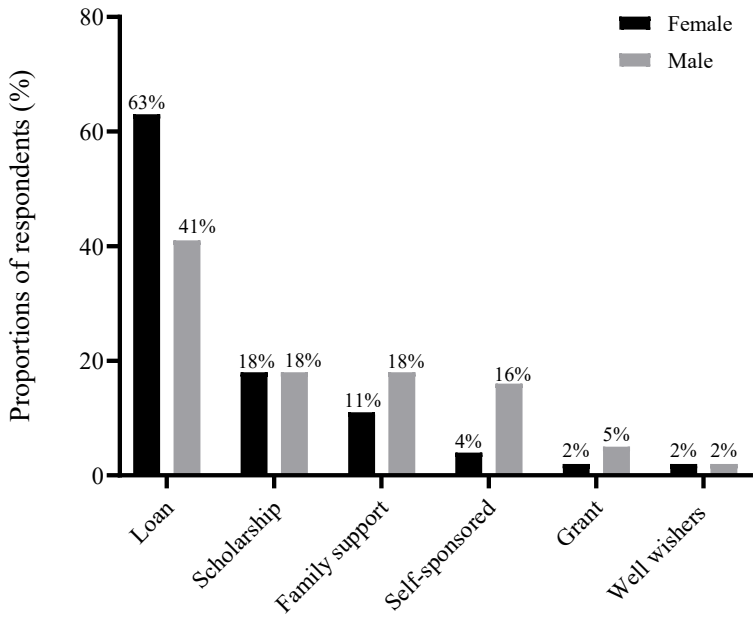

Figure 15: Funding sources for female and male students in public universities in Kenya (Female n = 43, male n = 59).

[17] Republic of Kenya (2020) Kenya Gazette Supplement: National Assembly Bills, 2020. Higher Education Loans Board (Amendment) Bill, 2020, p 827.

The support of female students by their parents was found to vary from one ethnic group to another, with the majority of female respondents who received family support coming from the Luo community. The researcher's main conclusion or argument from these findings is that government loans are not effective for supporting female students because it heightens their susceptibility and lower status due to lack of job opportunities, hefty penalties and inequitable employment rates. In order to support and empower female students, this research argues that provision of fellowship programmes that are specific to women can give them a better opportunity to develop and relieve them from constant debts. With these initiatives, students from poor backgrounds could compete on a level playing field (Adams & Von Pischke, 1992; Okurut et al., 2004).

Examining students' perceptions of their future career prospects, the extent to which female and male students expect to work in marine scientific careers after graduation was determined on a Likert scale of 1-5, where 1 =definitely not likely and 5 = extremely likely. Higher percentage scores range from 'very likely' to 'extremely likely' for the statements indicated that the majority of respondents (both females and males) were positive that they will definitely work in the field of marine science in future. More male respondents (47 per cent, n = 28) responded 'Extremely likely' than their female counterparts (42 per cent, n = 18), whereas, more female respondents (44 per cent, n = 19) responded 'Very likely' than the males (34 per cent, n = 20). These responses showed that all the respondents were positive and had interest to work in ocean science disciplines in future. However, the highest score of male respondents as 'extremely likely' showed that they were possibly more confident of getting job opportunities than females. During the analysis, it was also revealed that male respondents dominated ocean science courses, which confirms the argument by feminist political ecologists that gender is a critical variable influencing the expectations of the students and shaping their prospects in access to job opportunities in future. This argument can be attributed to the gender norms, stereotypes, lack of role models and the notions about ocean science as a male domain. The distinct gender relations in society shaped by patriarchal ideology have heightened the gendered division of labour and power imbalances which are manifested in the early stages of ocean science careers.

Conflicts between studies and family responsibilities were also mentioned by more female student respondents who were married and had children. One of them described the situation as hectic and tiresome as both the family roles and school activities required time in equal measure, often referred to as double work. Women are often expected to commit to strenuous caregiving responsibilities.

Other barriers that were mentioned in this study were, sexual harassment behaviours and gender bias as well as lack of awareness on gender equality and sexual harassment policies. In this study, more male students than females expressed having experienced sexual harassment or gender bias while at their respective universities. This finding contradicts with those of other scholars, such as

Bondestam and Lundqvist (2020) who highlighted that female students often experience sexual harassment during their academic lives. Based on these differences, the researcher argues that the responses may be attributed to the male respondents witnessing the act happen to their female colleagues rather than themselves. This argument will become clearer when looking at the staff barriers since the interview gave more elaborate responses than questionnaires. Sexual harassment pervades most universities in Kenya and is an epidemic throughout higher education systems worldwide (Bondestam & Lundqvist, 2020).

When students were asked if they were aware of both the gender equality and sexual harassment policies and how they would report sexual harassment, the majority of women and men both answered 'No'. However, fewer female respondents were aware of the policies than their male counterparts. The respondents also admitted that there was no training or awareness creation to make them aware of the reporting procedures in cases of harassment.

The findings also showed that there were various social identities that affected female students' participation in ocean science apart from gender. Ethnicity played a major role in access to ocean science-related courses and access to educational resources such as financial support. In addition, the respondents confirmed that cultural barriers and stereotypes are the root causes of the gender disparities in Kenyan public universities and society. All these findings support the arguments of the feminist political ecologists who claim that gender intersects with other social identities to exacerbate the challenges and continue to disadvantage people from marginalized groups as discussed in detail in section 5.5 on intersectionality.

The interviews also explored the experiences and barriers faced by academic staff working in ocean science-related departments in the university. Several barriers were commonly mentioned among staff participants in this study. Prior to the analysis of these barriers, the study determined the different patterns in career paths between women and men staff using ten parameters: first job after graduation, time taken before getting the first permanent job, first permanent job, years of work experience, number of publications, number of publications as first author, number of conferences attended, trainings, promotion rates and current employment status as well as their roles and responsibilities. Table 5 presents the overall themes that resulted from coding of the interviews and the number of times they were mentioned by participants.

Table 5: Summary of the themes coded from the interviews

Theme	References	Sample size
Employment status	213	30
Career development	215	22
Staff experiences	250	27
Work relation with colleagues	148	27
Work-family balance	191	27
Barriers to career progression	165	26
Gender and power imbalance	198	30
Gender policy	203	27
Good practices	172	27
Institutional gender issues	118	3

The findings showed that fewer women mentioned getting jobs immediately after graduation than men. More women staff experienced difficulties finding jobs after graduating with ocean science-related degrees, as the majority of female staff who participated in this study had no permanent jobs at the time. Some of them had even longer than five years of work experience in temporary positions compared to their male counterparts. In fact, more women experienced taking longer than three years before finding a permanent job, and some of them are yet to be employed after being in part-time positions for over five years. The women staff in part-time positions complained of not being paid for their services and sometimes had delayed payment, while none of the male participants mentioned lack of payment. In fact, one university had all its women staff on a short-term contractual basis in ocean science-related departments. Surprisingly, most of these female participants were more qualified than most of their male counterparts. The majority of women staff were PhD degree holders while others had ongoing PhD studies at the time. However, male participants were found to have easier access to job opportunities since some of them had already secured permanent and pensionable jobs with an MSc degree. Unlike female participants, most male participants indicated that they got jobs immediately after graduation. These findings confirm the results and arguments reported in Paper 1 which showed that women academic staff were more likely to be underrepresented in ocean science departments in all universities and at all career stages.

Concerning career progression for both female and male participants, it was clear that most female staff faced barriers, and some took many years at one career level before getting promoted. For instance, when the participants' ages and years of experience were compared, it was notable that most male participants in lecturer positions were younger than the female participants in the same position even though they had fewer years of work experience. Two-thirds of the male Associate Professors were in their early 50s, whereas both females in the same category were in their 60s. In addition, one female lecturer thought that she was overdue for promotion since she was promoted over ten years ago. She claimed to have all the qualifications for promotion, including required publications, number of students

supervised, conference participation, research grants, research, and had mentored many students. These two figures (Figure 16) compare the career paths between a female and male staff member who each had family responsibilities and have previously worked in other institutions. This illustration reveals that it is easier for men to change institutions but still progress in their career. For women, it takes a longer time to progress in all circumstances, whether they are established in an institution or not.

Women's participation has been found to face many challenges and has been observed to decline with seniority as presented in Papers 1 and 2. Similar findings were highlighted by O'Connell and McKinnon (2021) in their study on perceptions of barriers to career progression for academic women in STEM. Giakoumi et al. (2021) also pointed out the underrepresentation of women begins at early employment stages and continues with career advancement. Barriers to career progression and gender equality were frequently mentioned in all the themes analysed (Table 5), including staff experiences, gender and power imbalances, work-family conflicts, work relation with colleagues, and gender policies. When the participants were asked about some of the barriers that hindered their career progress, most of the female participants mentioned the discriminatory promotion policies with the strict requirements such as number of publications as a first author, number of conferences attended, number of students BSc, MSc and PhD supervised and has to have a PhD degree. These requirements are applied depending on the university management, but they seemed stricter on women than men as most men compared to women staff got jobs without a PhD degree. To some participants, these promotion guidelines were often altered by new management.

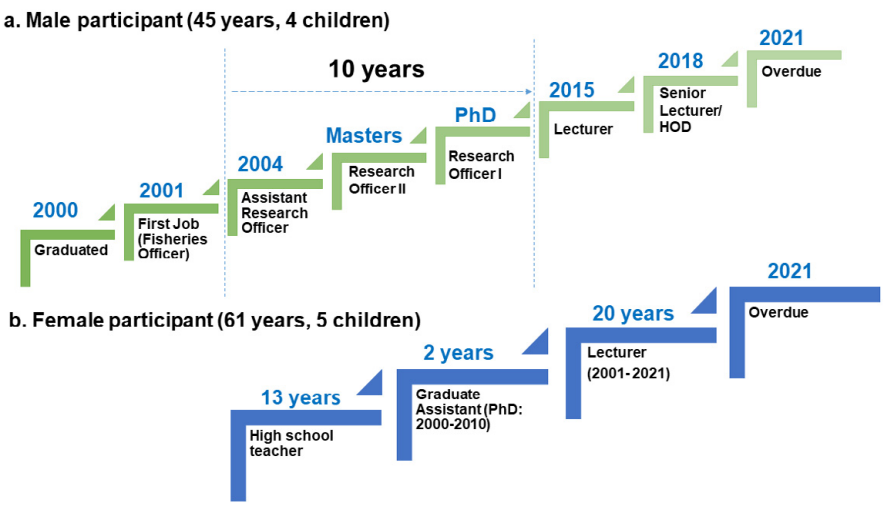

Figure 16: Comparing the career paths of female and male staff in public universities (Author's illustration)

In addition to the institutional barriers to promotion, other practical barriers many of which were related to parenthood were mentioned. As women engage more in care work at home, their careers often suffer. Here, some of the barriers mentioned by women participants included work-family conflicts, lack of support and recognition, sexual harassment, and bullying. Work-family conflicts were mentioned as one of the hindrances to career progression by most female participants who had family responsibilities (Wandahi & Njoroge, 2021). Some of the causes of work-family conflicts mentioned were lack of adequate spousal support, having young children to care for, lack of childcare facilities or support from the institutions, family demand, inflexible schedules, and long working hours. Balancing work with family responsibilities was challenging to many female participants, creating time- and strain-based conflicts. These results confirmed that balancing these two time-consuming and conflicting responsibilities without support from the house help and spousal support is hectic. Many confirmed that they had house help when the children were younger or still have house help to support them with the house chores.

Secondly, the lack of promotion among women staff was also highlighted by participants and showed how disadvantaged women were when it comes to access to opportunities like appointments to senior positions. Despite their qualifications and achievements, less attention is given to their concerns and interests, which sometimes demotivates them and hinders their full and effective participation. Apart from the lack of career advancement opportunities, some female participants also claimed that inflexible schedules or lack of flexible working arrangements in the institutions make them unable to actively participate or engage in research activities or to publish papers which are some of the fundamental promotion requirements. The problem that arises from this is that most women are assigned lower ranks with heavier lecture duties and have less access to research networks and funding opportunities that men have. On the contrary, their male counterparts were less likely to experience conflicts in relation to balancing work-family responsibilities (see Paper 4). Most male participants mentioned that work-family responsibilities did not affect their work in any way. This indicates the burden working mothers experience when they have to perform double roles at work and at home often without or with inadequate spousal support.

Another barrier mentioned by almost all participants is that they have experienced, heard or witnessed sexual harassment and bullying, although only one female participant admitted to having been sexually harassed. Sexual harassment includes unwelcome requests for favours and advances of a sexual nature, including verbal and physical conduct or behaviours. It is important to note that a female participant also highlighted the positive changes she has observed over the years due to the increased awareness about sexual harassment, that has led to reduced incidences of sexual assaults in most universities.

Other barriers and obstacles emerged from the interviews and are discussed in Paper 4. These included the lack of support and recognition by their male counterparts and management, lack of role models and mentorship programmes, lack of awareness of gender issues, lack of institutional gender policies, cultural barriers, gender stereotypes, and discriminations. These obstacles were recognised and mentioned by the participants as the major impediments to women's participation in ocean science spheres, especially in academia, research, and leadership positions. These results resonate with those of Shellock et al. (2022) who found out that barriers to women's participation in ocean science include limited institutional support and capacity, poor leadership within institutions, lack of institutional structures and policies, and lack of career progression and job security. All the findings confirm the arguments by feminist political ecologists that workplaces which are male dominated, in particular ocean science often fail to incorporate gender as an essential characteristic which determines access to and control over natural resources (Arora-Jonsson, 2011). FPE also posited that knowledge is gendered therefore understanding gender and other social dimensions helps to generate diverse ideas for effective (ocean) governance (Sundberg, 2015). In addition, FPE insights revealed that women and men engaged in particular activities and had access to and control over specific resources in marine resources, in this case access to junior or entry level positions.

Further to the barriers, this study introduced the intersectional lens to explore and understand the other social dimensions such as ethnicity, age, class and education to intersect with gender, and to influence the achievement of gender equality in ocean science sector/departments. The following subsection answered this research question on intersectionality.

5.5. The influence of intersectionality in achieving gender equality

For ocean science students, the intersectional lens provided a better understanding of the nuanced or subtle differences in individuals' access to educational resources. This aspect helped the researcher to understand whether all female students were undergoing the same experiences or treatment because of having the same gender or if there were other factors that intersected with gender to make the situation worse for other women or exacerbate discrimination in their institutions. Firstly, the students were asked to identify their socio-demographic details including gender, age, ethnicity, and education (year of study). Out of the 102 respondents, 42 per cent (n = 43) identified themselves as females and 58 per cent (n = 59) as males, and their ages ranged between 18 years and 47 years old. Based on class, about 80 per cent (39 females and 42 males) claimed that they were from the middle- or working- class

families and over 60 per cent of the respondents (31 females and 33 males) were in their final year of study. With regard to ethnicity, most of the student respondents enrolled in ocean science-related courses were found to be from the dominant ethnic groups in Kenya, led by those from the Luo community (Figure 17).

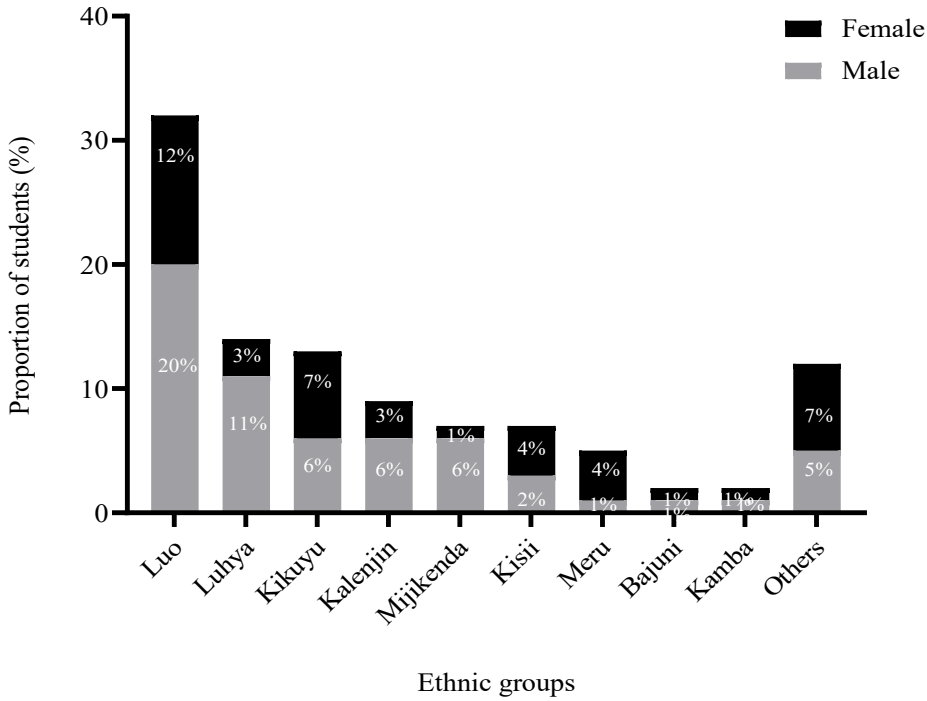

Figure 17: Gender and ethnic representation of students undertaking ocean science-related programmes in Kenya based on the responses from the questionnaires (n = 102)

The findings indicated that gender and ethnic biases played a crucial role in the enrolment and participation of female students in ocean science-related courses in public universities in different ways. These two factors dictated who to support financially to access educational resources (financial aid/support), and the selection criteria to the higher education programmes. For instance, this study identified that female and male respondents (students) from the Luo community in Western Kenya were more likely to apply or be selected to undertake ocean science-related courses than those from other ethnic groups in other parts of the country, including the Central, Northern and Coastal Kenya (Figure 17). Gender and ethnic biases were also examined using feminist political ecology to explore how they influenced gender equality, in particular students' access to higher education in Kenya.

To determine whether the above-mentioned intersectional identities influenced gender equality in ocean science education, the respondents were asked if they have experienced discrimination based on their gender, age, education, ethnicity and class, and the majority of the students responded to this question providing intersectional discrimination they experienced as presented in Table 6.

Table 6: Various forms of discrimination affecting female and male students in the selected public universities

	Question: Have you ever been discriminated at your university because of the following factors?					
	Female respondents % (n = 43)			**Male respondents % (n = 59)**		
	Yes	**No**	**Blank**	**Yes**	**No**	**Blank**
Age	21% (9)	70% (30)	9% (4)	8% (5)	90% (53)	2% (1)
Gender	23% (10)	70% (30)	7% (3)	19% (11)	81% (48)	0% (0)
Education	21% (9)	70% (30)	9% (4)	14% (8)	83% (49)	3% (2)
Social status	33% (14)	63% (27)	5% (2)	34% (20)	66% (39)	0% (0)
Ethnic group	26% (11)	67% (29)	7% (3)	20% (12)	78% (46)	2% (1)

Even though discrimination based on social class had the highest number of respondents, it was excluded because the majority of the students' respondents indicated that they belonged to either the middle class (70 per cent female and 49 per cent male) or working class (21 per cent female and 22 per cent male). Similar responses were noted among the staff, where most of them (60 per cent women and 88 per cent men) mentioned being in the middle class. Lack of access to education based on these social characteristics means that women have less access to decision-making positions regarding sustainable development. Subsequently, they cannot enjoy the right to environmental justice (Muigua, 2018).

Apart from the findings about the existing gender disparities among students in enrolment using the gender-disaggregated data (Paper 1), this study revealed that students were also discriminated against based on other intersectional identities such as ethnicity, age, education and class (Table 4). As ethnicity was referred to by a majority of respondents, this was selected for analysis along with gender. In Kenya, ethnicity is one of the major determining factors of power relations and privileges. Even during national elections and public appointments, for example, people vote along tribal lines (based on one's ethnic group rather than on party manifestos). Using a feminist political ecology lens, this study exposed some of the barriers that resulted from politics of place and provided insights and understanding of gendered power relations in higher education institutions. With this in mind, better actions can be developed to promote equality in all sectors through elimination of discrimination along ethnic lines.

Also concerning ethnic biases, female students from the Indian ocean coastal region were less likely to get a placement or less likely to apply to ocean science-related courses, with only 1 per cent recorded in this study (Figure 18). Failure to include students from the coastal region in ocean science programmes means that

the people who are close to, benefit from and directly affected by the deteriorating ocean's health are often left behind. This supports the arguments of FPE theory that the existence of gender relations and power imbalances between women and men and among ethnic groups influence the access to and distributions of resources, and influence who decides, in this case educational rather than natural resources (Rocheleau et al., 1996). These findings confirmed the claim that women's education is less valued in most patriarchal countries like Kenya, where parents are more likely to prioritize educating their sons over daughters.

Drawing from feminist political ecologists' insights, these findings used empirical data to investigate the challenges experienced by students in the context of how they accessed higher education and how their education was supported, as well as to know how their gender intersects with ethnicity to reproduce inequalities in ocean science (Elmhirst, 2011; Nightingale, 2011; Truelove, 2011; Tomislav, 2018). The findings clearly showed that not all female students received equal treatment both at home and at the university, as we have seen that the majority were not privileged in terms of financial aid and had to resort to applying for loans. Though not in education, scholars have used feminist political ecology to highlight everyday inequalities (Rocheleau et al., 1996; Nightingale, 2011; Sultana, 2011).

The findings associated with barriers that impede female students' access to higher education and career opportunities in the ocean science confirmed that cultural barriers, gender discrimination and gender stereotypes are the major obstacles for female students in Kenyan public universities. This finding is connected to ethnicity and explains why some ethnic groups had no women in higher education, such as the Maasai community. The Maasai culturally excludes women from accessing education. Until recently, Maasai girls were being married at an early age and most of them underwent forced marriages. This illustrates FPE's suggestion that culture contributes greatly to the variations in gender spaces and powers over access to resources, in this case education. In most communities in Kenya, every ethnic group has cultural expectations that reinforce gender inequality. Cultural norms and gender stereotypes play a crucial role in gendered divisions of labour, where women and men are expected to play differing roles in family activities and workplaces.

Questions were asked of the staff on additional forms of discrimination apart from gender. Understanding staff's participation in ocean science based on intersectional identities showed that the majority of women unlike men were discriminated against based on their gender, ethnicity, age, education and social class. Notably, due to fewer female participants in this study, most of the career positions were not represented by females compared to males. However, the sample collected clearly reflected the positions that women are more likely to occupy. The career levels were examined with the age groups, education, class and ethnicity. However, because most of them had PhD degree and more than 90 per cent (n = 27) claimed to be from the middle class, these two parameters were not included in detailed analysis.

This study discovered that the majority of participants' ages were between 30 and 60 years old. Three age groups (30-39 years, 40-49 years and 50-59 years) had the same number of participants (26 per cent each), while between 60-69 years and <30 years had 15 per cent and 7 per cent, respectively. However, some positions were distributed in almost all age groups. For example, the lecturer position had younger (30-39) and older (60-69) staff participants. The findings showed that age was not directly proportional to or related to academic positions (Figure 18). Regarding career progression by gender and age, one instance worth mentioning is that a female participant between 40-49 years was still working as a part-time lecturer, while all male participants in this age group already had permanent positions. Based on gender, participants' distribution showed that most of the male participants were between 40 and 49 while the majority of women were between 50 and 59. This suggests that the employment opportunities for women in the selected public universities were very low. Based on education level of staff, more women had higher qualifications than men, with most of them having or studying for PhD degrees compared to their male counterparts. However, these did not translate to their career progression, as women's progression was slower than men's, with most men being in senior positions than women.

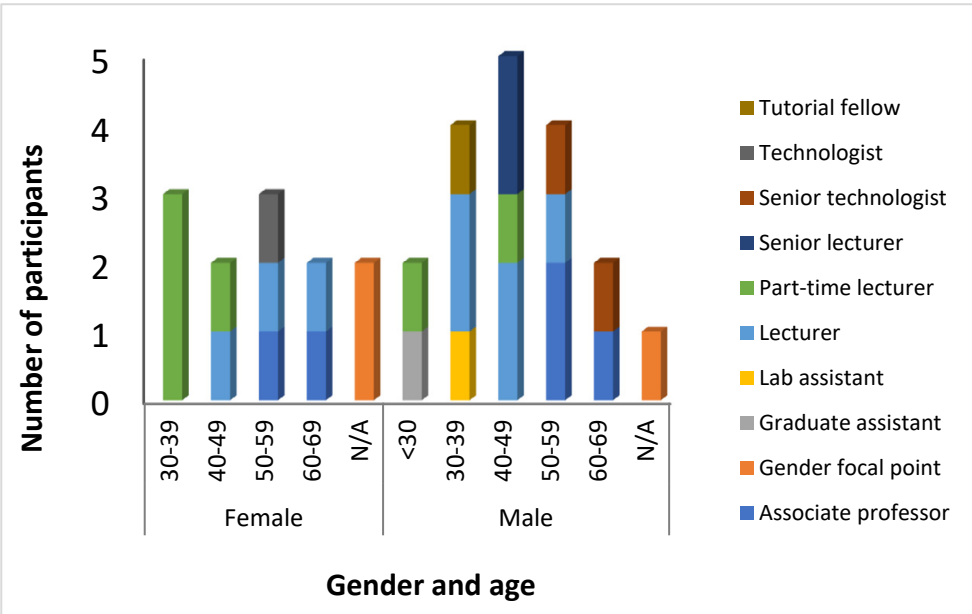

Figure 18: Relationship between the current positions of the participants by gender and age in ocean science-related departments in public universities in Kenya

Apart from gender, age and education, this research also examined the representation of academic staff by ethnic groups and the findings revealed that more women participants were from the Kikuyu community (50 per cent, n = 6), while more men participants were from the Luo community (33 per cent, n = 8). The remaining ethnic groups each had a representation of fewer than five staff members. Even though the Luo community had most male participants, the highest rank they occupied was that of a lecturer; no member held a senior lecturer or associate professor position. These findings confirm the arguments by the feminist political ecologists that suggests that ethnicity play a crucial role in power distributions and shaping the access to opportunities, in this case job and career advancement opportunities. Ethnicity is one source of power in Kenya that can influence who can access which opportunity in an institution because of the power relations rooted in tribal discrimination that resulted from national politics which are skewed towards dominant ethnic groups (Figure 19). Further, this study also confirms the FPE claim that bias representation ignores the knowledge and perspectives that can ensure a better ocean governance and emphasize that need for the involvement of women and minorities in decision-making positions (Axelrod et al., 2022).

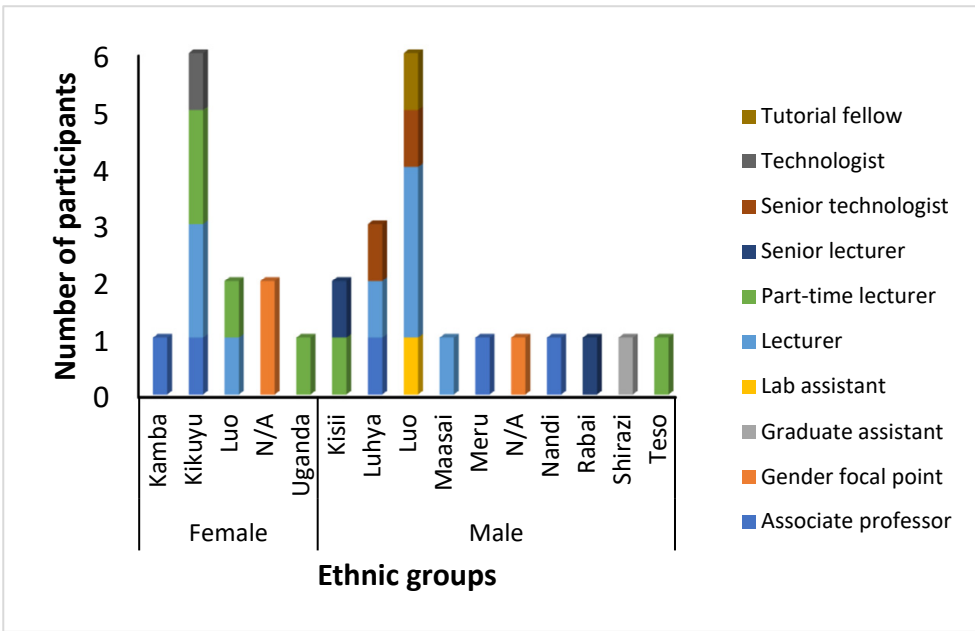

Figure 19: Ethnic representation of participants in the selected public universities

In terms of promotion, these results showed that female staff from the Kikuyu community are more likely to be favoured than women from other tribes. It was also being observed that women staff from the Luo community who happened to be the majority in terms of student enrolment as outlined in Paper 3 were disadvantaged when it comes to recruitment as shown by their low representation (only two women were recorded). Also, Luo men were disadvantaged when it comes to promotion despite being the majority in academia as highlighted in Paper 4. Studies have highlighted that when the management is composed of people from a particular ethnic group, they tend to favour and promote staff from their ethnicity–a term also referred to as tribalism (Taaliu, 2017). In fact, two of the women participants from the Kikuyu group got employed in ocean science institutions without the ocean science degree or relevant degrees. They had to enrol for ocean science courses while on the job and change their field of study at Masters and PhD level after being employed. These findings suggested that the participants from dominant ethnic groups are more likely to be favoured for job opportunities even without the right qualifications. This favouritism for positions can possibly lead to hiring unqualified or low-skilled staff who cannot provide the expertise needed for working in ocean science to achieve ocean sustainability.

Failure to address these exposed challenges, persistent barriers faced by students and staff, and the rooted gender and ethnic biases will have constant negative consequences as they will continue prolonging the achievement of gender equality in ocean science education sector in Kenya. Therefore, the need to develop interventions and actions to find solutions that are holistic and can help address gender inequality in ocean science is timely and urgently needed, as many of these solutions will in turn help protect the ocean health through diverse research and management skills. In the next sub-section, the researcher examined some initiatives that the participants considered as good practices in their respective institutions, the impacts of those interventions in promoting gender equality and the participants' suggestion for improvements or areas that need to be improved.

5.6. Good practices towards gender equality

To tackle these barriers and obstacles, some institutions had initiatives that the participants considered good practices. This section answered the fifth research question; 'what are the good practices in place to promote gender equality in ocean science institutions in Kenya?'. These initiatives were seen by participants to create a conducive environment for both female and male staff and increase the participation of female staff. They included the availability of gender policies; having a university gender centre or institute and gender focal point; and allowing both female and male staff to take study leave to further their education. Three

participants highlighted university gender policies as a good practice (see Paper 4). Even though these initiatives existed, most of them such as gender policies were not well-known to the participants and their effects in improving gender equality were not felt or had very minimal impact in the selected public universities. Importantly, a few participants acknowledged that the existence of sexual harassment policies in their institutions has led to the reduction of the incidences of sexual harassment within their university.

The majority of participants (8 women and 5 men) were not aware of these policies. The lack of awareness can possibly be explained by inadequate or no training on gender-related issues in the institutions and staff exclusion from formulation and implementation of the policies. Even though most male participants (n = 12) knew about the existing gender policies, they were not able to substantiate the effects of these policies or were not able to identify the aims and objectives or the contents of the policies. Almost all (n = 27) the participants admitted that they had never participated in formulation and implementation of these gender policies, except the three gender focal points interviewed.

Three participants mentioned that their universities had mentorship programmes where some students were assigned to one professor to advise and guide them in their studies. However, these mentorship programmes or empowerment hubs were not so active based on the perceptions of the participants. Regarding women in leadership positions, three participants mentioned that in their universities, top management positions such as Chancellor and Vice-chancellor were balanced, where a female Chancellor had a male Vice-chancellor and vice versa. The majority of respondents equated gender equality with relatively low proportions of women, and the majority male participants narrated how their universities gave equal opportunities for both women and men just because they had one woman in a leadership position such as Vice Chancellor while lacking women in most senior positions. Almost half of the interviewees (n = 14) mentioned 'giving equal opportunities to all staff' as the best practice in their university. The majority of them, who were men, felt that women were so many or already enough in their department. However, the figures and evidence in Paper 1 revealed that most women staff were in junior positions and were not more than 30 per cent in terms of staff representation.

The establishment of gender institutes or centres was also mentioned by participants as good practice in public universities. All the universities studied had a gender directorate whose director reported to the Vice Chancellor and acted as gender focal point in the university. A quote from one of the participants suggested that the gender centres were actively committed in promoting gender equality in the campuses:

> *"The fact that we are the only university with a Gender Institute in Africa. So, our university has always been way ahead in terms of gender matters. We even have a gender director, and there is a lot of awareness, and a lot of trainings because almost every semester like now, I just sent two of my staff for a gender awareness workshop"* (Participant 18, female, Associate Professor).

The interviews with the institutional gender focal points helped the researcher to understand the universities' commitments in promoting gender equality in Kenya. The questions asked included their role and responsibilities, if they collect gender-disaggregated data of students and staff, what they do with these data, their perception of gender equality in the university (if they thought that their university is gender equal), what has worked or good practices, the challenges they faced in implementing gender-related policies and their suggestions for future improvements.

The findings indicated that the roles of these gender centres or gender focal points, according to the key informant interviews, is to ensure gender is mainstreamed in the campus and in all the activities within the university. They collect staff data quarterly and report to the government through the Ministry of Gender. Even though this was a requirement by the ministry, it seemed that the data was not actually used internally to give guidance on how to reduce gender inequality. In addition, the gender data reporting excluded students' information which is one of the important aspects of this research and it is looking to address this gap. In fact, almost all universities lacked digital students' records, they had manual registers for students' enrolment, and graduation documentation which were not segregated by gender. The gender focal points also confirmed that their universities were not gender equal in terms of students and staff representation. Even though all the three key informants revealed that their universities were not gender equal at the time, they had initiatives and policies to improve the situation. One of them expressed that their university or department is specialised in science and technology which often had fewer female enrolment, thus women tended to be fewer than men as compared to other universities with Humanity and Art courses. However, all of them said that they have noticed some positive changes in the university over the years, where the management positions have been occupied by a few women which was an improvement as compared to several years ago.

Regarding the implementation of gender-related policies, two of the three informants confirmed that they had both gender equality and sexual harassment policies while one of them admitted having their policy in draft format awaiting senate approval. They also confirmed that the policy implementation was carried out by a high-level committee comprising those in top management positions rather than at the faculty or departmental levels because it involved disciplinary issues, especially when tackling sexual harassment cases. According to these gender focal

points, the implementation of the existing gender policies at the university level was faced with many challenges, including the lack of both human and financial resources, resistance from some male colleagues, lack of clear reporting procedures and clear guidelines on how to address or deal with sexual harassment cases between staff and students. One gender focal point said that in her directorate implementing policies and initiatives was made difficult as there only two staff, both of whom were women –herself and the secretary. This also made it harder to advocate for gender equality across the university, including at faculty and departmental level.

In terms of areas of improvements, the gender focal points highlighted the need to commit resources to ensure effective implementation of the policies, regular training and creating awareness on gender issues to all staff and students and to be gender sensitive. Also, there was the need to have nursing rooms for working mothers or child-care facilities where nursing mothers can leave their small children while they are at work. For students, they suggested talking to the girls or having mentorship programmes to attract more women in ocean science programmes.

6. Conclusions and recommendations

6.1. Conclusions

This study examined gender equality and women's empowerment in ocean science institutions in Kenya, using gender-disaggregated data of students and staff, the existing institutional gender policies, the experiences, and barriers faced by students and staff in this field as well as the good practices that the institutions already have to promote gender equality. The application of the gender integration continuum framework was found to be an effective method to analyse the policies and insightfully identified and evaluated the policy provisions into gender-neutral strategies and gender-specific ones. The application of FPE as the theoretical framework was found be useful in guiding the research objectives and questions and in understanding the complex interplay between gender and other social factors (intersectionality). Specifically, this led to novel insights on how age, education, class, and ethnicity shape access to and participation in ocean science fields/programmes. In Kenya, a gender perspective should be sensitive to intersectionality as it is a component of power relations that determines who dominates in the institutions. This approach provided insights and deepened understanding of the invisible gendered power relations, diversity and how these shape or influence inequality. It contributed to a more inclusive research approach and knowledge on how gender perspective is supposed to be analysed to tackle disadvantages facing students and staff through a holistic approach and address discrimination, biases and marginalization experienced in ocean governance in Kenya at different levels. In short, FPE has proved very helpful in understanding the inequalities in ocean science fields in Kenya.

This study clearly shows that the existing gender policies were all outdated and did not translate to gender equality in public universities in terms of staff employment and access to top management positions. However, it is notable that a weak relationship was found between the gender policies and the gender balance of female students enrolled. The percentages of female students in undergraduate degrees were proportional to the percentages of gender-specific strategies, where the university with stronger policy had better representation compared to the one with the weaker policy. Nevertheless, some public universities with gender policies performed the same as some universities without gender policies.

It was evident that the percentages of female students enrolled were lower in all degree programmes and their transition to PhD degree was much lower than males. Furthermore, the female students' enrolment was generally found to decline over the ten years under study in the selected public universities in Kenya. Regarding ocean science professionals'/staff representation, women academic staff were also found to be lower than their male colleagues in all the selected public universities and in most ranks/positions, with the majority of them occupying junior positions. Women ocean scientists were underrepresented in all the other studied non-academic institutions. Although a better performance was recorded in NGOs compared to public universities, government agencies and IGOs. With changes in ocean stressors and the need for more experts to address the ocean challenges, the world's attention is currently focusing on the Ocean Decade to reverse declining ocean health. The Ocean Decade is an opportunity to advocate for increased women in ocean research, protection, conservation, and management and help ensure more integrated and inclusive ocean governance.

The issue of barriers to career progression and for women in the studied institutions was an important finding. The majority of women participants mentioned different factors that they felt hindered their active participation. These included work-family conflicts, lack of support and recognition at workplace and at home, discriminatory promotion guidelines, cultural barriers and sexual harassment and bullying. The inclusion of women in the establishment of the ocean development projects has been equated to accelerate the attainment of the Ocean Decade's overarching goals.

There was strong evidence that gender intersects with other factors in the enrolment of students and recruitment or appointment of staff. Insights from the FPE lens provided clarity of power imbalances and uncovered ethnicity as an additional critical variable of concern that shapes inequalities in Kenya coupled with gender. Students' and staff responses provided new knowledge of understanding women's lived experiences which were mostly connected to their gender and ethnicity. Most female students and staff felt that they were more likely to be affected negatively by their gender and ethnicity when it comes to accessing higher education, funding sources and job opportunities. Indeed, these findings provided better understandings of the intersectionality in career progression among women and men staff in ocean science, underlying what makes them lack promotional opportunities and support in ocean science fields to effectively contribute to ocean sustainability in Kenya.

Lastly, the findings highlight some actions that the participants felt were good practices in their respective institutions. These include having institutional gender policies (even though this thesis has highlighted the shortcomings of the existing policies), having gender centres to address gender issues within the university, and having mentorship programmes. Such finding can identify the specific gender gaps, barriers, and best practices to promote gender equality in ocean science which can

guide the development of more concrete solutions by innovative ways of addressing this persistent problem.

This thesis has discussed five key areas of gender equality concerns in ocean science institutions in Kenya and has argued that gender equality is critical for achieving equitable and sustainable ocean in Kenya. The commitments toward gender equality in ocean science have shown minimal progress and are often faced with many challenges, resulting in persistent gender gaps at institutional and career levels nationally.

6.2. Recommendations

This study generated five overall recommendations that can improve gender equality in ocean science in Kenya and other countries that still face the same problem (Table 7). The overarching recommendation is that the ocean science institutions should formulate comprehensive gender strategies and action plans. These plans need to be equipped with clear, quantifiable objectives that will not only set forth a vision to combat gender inequality within these establishments, but also reinforce gender mainstreaming across all organizational activities. Institutional accountability can thus be ensured, a culture of gender equality can be fostered, and the overall productivity and success of the institutions can, in turn, be elevated. This is visualized in Figure 20.

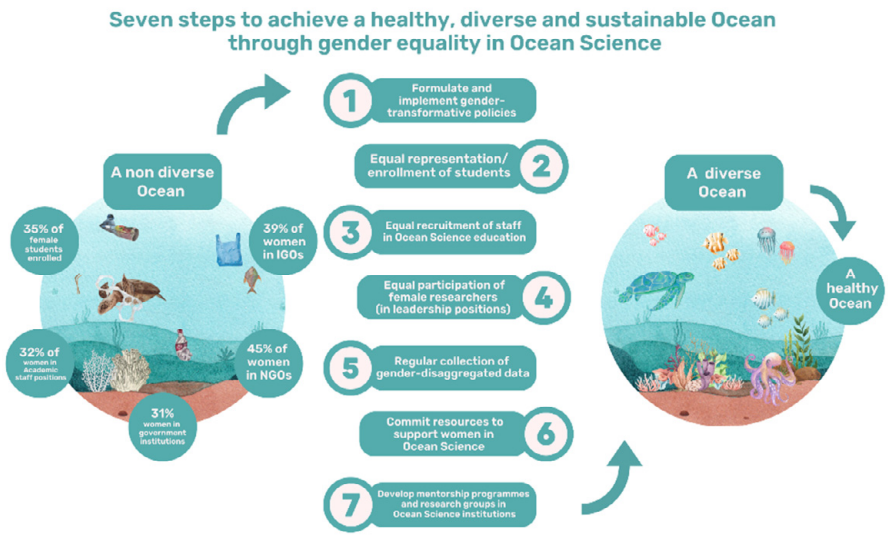

Figure 20: A conceptual framework illustrating interventions needed to achieve ocean sustainability based on the research findings (Author's illustration)

Table 7: Summary of the key findings and recommendations from this study

No.	Key findings	Recommendations
1.	The existing gender policies were ineffective	Ocean science institutions should conduct gender analysis to identify the gender gaps before policy formulation. The outdated universities' gender policies should be reviewed to have more gender-transformative strategies. All the ocean science institution should have a gender strategy and action plan with measurable indicators. Further awareness raising is needed to both students and staff in ocean science institutions in Kenya on gender issues and policies. The university management or gender focal points need to carry out regular monitoring and evaluation on the performance of the policies. The Kenyan universities should commit resources both in financial and human form to enhance policy implementation, accountability, and transparency in gender mainstreaming.
2.	Lack of gender-disaggregated data	Ocean science institutions, both public universities and non-academic institutions in Kenya without updated students and staff records by gender, need to ensure regular collection of gender-disaggregated data of students and staff at different degree and career levels to ensure accurate record are kept and track on the gender equality progress.
3.	Inadequate support structures for women to access to higher education, research and jobs	Ocean science institutions in Kenya need to develop and strengthen women's support structures to increase their participation in ocean science research and management such as grants, scholarships, fellowships, trainings, and mentorship programmes and having role models.
4.	Limited opportunities for women, especially in leadership and decision-making positions	Ocean science institutions in Kenya should ensure fair and equitable admission and recruitment panels/committees to eliminate discrimination and enhance transparency and accountability.
5.	Gender and ethnic biases in the ocean science institutions	Ocean science institutions in Kenya should create and increase awareness, training and capacity building on barriers that hinder women's participation of female students and staff, such as cultural barriers, gender, and ethnicity. Ocean science institutions in Kenya should develop good practices or interventions to enhance diversity and promote gender equality among students and staff.

6.3. Significance and contributions of the study

This research is the first of its kind on gender equality in ocean science education and research in Kenya and has provided new knowledge and baseline information regarding the relationship between gender and ocean science in Kenya. The study has filled a research gap, with original data gathered through quantitative and qualitative methods in ocean science institutions that had not been researched before. The study is also novel in putting gender in the context of intersectionality in ocean science and applying FPE in an educational context. The findings of this study reveal the gender, ethnic and other inequalities in ocean science and can be used to develop solutions to increase the participation of women and marginalized groups undertaking ocean science courses.

Consequently, the universities and other institutions that apply these recommendations from this study will be better placed to increase diversity by including all 'people we need for the ocean we want' to conduct innovative research as summed by Sun et al. (2021), discover new ideas and generate knowledge needed to achieve ocean sustainability. The low employment rates of female graduates with an ocean science background have been observed throughout this study and justifies the need for more effective and transformative approaches to achieve gender equality in ocean science, both in higher education and employment opportunities.

The findings of this research will be important inputs for more effective gender policy formulation, evaluation, and implementation. For institutional management, the study will guide them on how to promote gender equality through regular collection and monitoring of the gender-disaggregated data to keep track of the institution's progress to perform better, and on what concrete actions or measures to emphasize when formulating and implementing gender policies. It will also provide the information to inform individuals of their accorded equal rights and opportunities to participate without discrimination based on gender or ethnicity. In this research, it is argued that there is a need for institutions to review and update existing policies as well as to formulate and implement gender-aware policies.

Applying FPE in education and research institutions established its utility in a context not generally used by feminist political ecologists and therefore could be said to develop its conceptual flexibility. Thus, the intended empirical and methodological contribution of this research is an original contribution to the knowledge base of policy evaluation, gender analysis and the application of feminist political ecology.

In addition to its significance, this research had both practical and theoretical contributions. The practical contributions of this research include a detailed analysis of the institutional gender policy and gender-disaggregated data of students and staff in Kenya. No previous study to the best of researcher's knowledge and through search in peer-reviewed databases has empirically explored the gender equality in ocean science for sustainable development in Kenya. This case study reveal that there was no relationship between having gender policy and gender equality among students and staff due to gender neutral provisions. This implies that for effective implementation of the policies, emphasis should be placed on the gender-specific provisions with clear indicators based on the identified gender gaps in and organisation or institution. This will help increase women's participation at all levels, including decision-making positions.

Another practical contribution of this research is the Gender Integration Continuum framework for analysing the provisions or strategies in the policy documents, in order to identify the gender neutral strategies from the gender-specific ones. The study extends the limited research on understanding women's representation in management and decision-making positions. This contribution helped to understand the characteristics of a good policy and how it can be

implemented at different levels, including faculty and department of ocean science, especially through training and capacity building to persuade the actors to join the campaign of achieving gender equality and adoption of the policy in the institution. It is among the first studies to consider gender equality in ocean science for sustainable development.

The theoretical contribution for this study involve application of FPE theories in a new context. FPE has been widely applied in access to and control over natural resources such as water and land. However, no study has used the theory to understand the existing inequalities in ocean science education and employment opportunities. In this study, FPE was a compelling theory for understanding the gender relations and power imbalances that shape the access to ocean science sector. This theoretical approach extends the research of gender in ocean science by investigating the persistent underrepresentation of women in a male dominated with respect to an intersectional lens. It helps to analyse the findings and explore how gender intersect with other intersectional identities such as ethnicity to influence the achievement of gender equality in ocean science in Kenya.

6.4. Limitations and suggestions future research

As this study only targeted ocean science institutions in Kenya, the findings cannot be directly extrapolated to other universities or research institutions. Furthermore, data was not always complete; a few universities and other institutions did not have readily available records of the enrolment and graduation of students by gender, and staff gender data and had to manually search for the data from the registration booklets. This meant that some universities provided only graduation data or could not provide complete data within the time frame of this project. This could result in bias and results should be interpreted with caution. In terms of policy, most institutions did not have policies publicly available and in some cases few institutions were not ready to share their gender policies which they had in drafts.

It should be recalled that the study was carried out during unprecedented times of the COVID-19 pandemic when travel restrictions existed in some counties in the western region of Kenya, which complicated access to those universities. Alternatively, those universities were contacted using emails, but often with low response rates. The researcher, therefore, only evaluated the policy documents that were available and analysed the gender ratios of students and staff that the universities provided, as well as analysed the responses and interviews that the researcher managed to obtain from the participants. Thus, the study cannot claim to be representative of all institutions, government agencies, IGOs and NGOs.

This study identified areas that need further research to expand the application of feminist political ecology, including analysis of women's contributions to the Ocean

Decade goals, and barriers hindering their participation in non-academic institutions where they undertake various activities apart from teaching and supervising students: ocean scientific research, conservation and governance in Kenya and assessment of the role mentorship programmes play in advancing gender equality in ocean science. Also, future research should look at the opportunities for comparative research within the East African region and beyond.

This study used both quantitative and qualitative research which involves objective and subjective approaches, respectively. Qualitative research often requires the researcher to interpret subjective data collected from the participants such as students' and staff experiences. In this case, the subjectivity is often equated with bias. However, the researcher, provided her positionality statement to minimize potential or conscious biases while analyzing and interpreting the data.

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Appendix 1: Questionnaire for students

WMU-GOI Women's Empowerment Project

Questionnaire for the Ocean Science Institutions in Kenya –Survey on BSc and MSc students' experiences in ocean science disciplines

Aim: To explore and understand the role of gender equality and empowerment of women in the conduct and delivery of ocean scientific research

A. Introduction

Dear BSc/MSc student,
Hello! This questionnaire is part of a study about gender equality in ocean science for sustainable development with a focus in ocean science institutions including public universities. It is carried out by a PhD student in Maritime Affairs under the programme on Empowering Women for the UN Decade of Ocean science for Sustainable Development from World Maritime University, Sweden. The questionnaire is directed to both female and male students at selected public universities. It covers 21 questions and takes approximately 10-15 minutes to answer. Answers will be kept strictly confidential, and you will not in any way be personally identified in the report of the study, in statistical summaries or in any other information resulting in the study. Participation in this study is voluntary and you may decline to answer any questions you feel uncomfortable doing so and feel free to exit the study any time or withdraw the consent, without needing to explain why. All information will be kept anonymously.

B. Respondent's Profile

Date	
Name of the Institution	
Age	
Gender	
Marital status	
Number of children	
Ethnic group/Tribe	
Home Town	

C. Questionnaire

Part 1: Student Admission Status

1. What degree (BSc, MSc etc.) and which subject are you studying for at the University?
   Degree: _____
   Subject/Course: _____

2. To which department do you belong?
   _____

3. Which year did you start your course/programme? _____

4. How do you support your study?
   i. Loan [ ] (Specify_____
   ii. Grant [ ] (Specify) _____
   iii. Scholarship [ ] (Specify) _____
   iv. Other [ ] (Specify) _____

5. Are you the first in your family to go to the university? **Yes** [ ] **No** [ ]

6. Which of the following best describes your social status?
   i. Upper class
   ii. Middle class
   iii. Working class
   iv. Other (Specify) _____

7. Who/what motivated you to undertake ocean science-related course?
   _____

8. As a marine scientist, which of the following options best describe how you would like to contribute towards ocean health? (Tick as many as apply)
    i. A clean ocean e.g. addressing pollution problems [ ]
    ii. A healthy and resilient ocean e.g. protecting marine ecosystems and biodiversity [ ]
    iii. A productive ocean e.g. working towards sustainable fisheries [ ]
    iv. A predicted ocean e.g. developing oceanographic models [ ]
    v. A safe ocean e.g. preventing marine natural disasters [ ]
    vi. An accessible ocean e.g. ensuring open access to data and research [ ]
    vii. An inspiring and engaging ocean e.g. increasing education and public awareness [ ]

9. At the end of your degree/study, would you consider a marine scientific career? Please tick one.
    i. Extremely likely [ ]
    ii. Very likely [ ]
    iii. Moderately likely [ ]
    iv. Less likely [ ]
    v. Definitely not likely [ ]
10. How many persons are there in your year/ course?

    _____

11. What percentage of students in your year/course are female?

    _____

Part 2: Student Experiences at the University

12. Do you know if your university has a gender equality policy? **Yes** [ ] **No** [ ]

13. Do you know if your university has a sexual harassment policy? **Yes** [ ] **No** [ ]

14. Have you experienced any behaviours that you would consider as gender biased or sexual harassment while at the university? **Yes** [ ] **No** [ ]
    - Gender bias: **Yes** [ ] **No** [ ]
    - Sexual harassment: **Yes** [ ] **No** [ ]

15. If you witnessed or experienced gender bias or sexual harassment, would you know how to make a complaint? **Yes** [ ] **No** [ ]

16. Can you suggest any actions to help empower women and other underrepresented groups at the university? _____

17. Do you find that female students have less opportunity for higher education and careers in ocean science?
    - Higher education: **Yes** [ ] **No** [ ]
    - Research careers: **Yes** [ ] **No** [ ]

18. What do you think are the main obstacles for female and male students in higher education? (Tick all that apply)

For female students	**For male students**
Gender discrimination [ ]	Gender discrimination [ ]
Gender stereotypes [ ]	Gender stereotypes [ ]
Cultural barriers [ ]	Cultural barriers [ ]
Other (Specify) _____	Other (Specify) _____

19. Have you ever been discriminated at your university because of the following factors?
    i. Age **Yes** [ ] **No** [ ]
    ii. Gender **Yes** [ ] **No** [ ]
    iii. Education **Yes** [ ] **No** [ ]
    iv. Social class **Yes** [ ] **No** [ ]
    v. Ethnic group **Yes** [ ] **No** [ ]

20. Have you experienced any conflict between your studies and family responsibilities?
    Yes [ ] **No** [ ]
    - If so, can you describe your experience_____

21. What area (s) do you think can be improved to ensure a fair future for all students in the University? Tick all that apply.
    i. Equitable student financing [ ]
    ii. Role modelling [ ]
    iii. Mentorship programme [ ]
    iv. Safety at campus [ ]
    v. Improved gender-related policies [ ]
    vi. Other (Specify)_____

*****

Thank you for your participation!

Disclaimer: An extensive questionnaire was used to generate a comprehensive dataset. Some of the data lie outside the scope of this PhD

Appendix 2: Staff interview guide

WMU-GOI Women's Empowerment Project

Interview Schedule for the Ocean Science Institutions in Kenya – PhD students, Academic and Research Staff Interview

Aim: To explore and understand the role of gender equality and empowerment of women in the conduct and delivery of ocean scientific research

Interview Date: …… Interviewee Code: ……

A. INTERVIEW QUESTIONS

PART 1: ENROLMENT/EMPLOYMENT STATUS

a. Could you tell me what your current position is at [name of institution]?
b. What are some of your roles and responsibilities in your department?
c. Do you see yourself as having a leadership role or senior position in the future?
d. In which field of science have you led your research/career?
e. How did you get to your current position?
f. Of the seven Ocean Decade societal goals which one does your research most closely align with?

Part 2: WORK RELATIONS WITH COLLEAGUES
(Let's talk about your department/institution)

a. Overall, how would you describe your relationship with your seniors (e.g. supervisors and colleagues at the institution?
b. Do you notice that women and men tend to take on different work/roles in your department?
c. Would you prefer a female or a male leader in your department/ institution?

PART 3: STAFF EXPERIENCES AT WORKPLACE

a. Do you feel that your work has been supported, recognised and valued? If so, how?
b. How do you feel you contribute to your institution's goals?

PART 4: STAFF CAREER DEVELOPMENT

a. Have you taken up any initiatives that (name of institution) has run to help advance or prepare for your career?
b. In your opinion, did your gender affect your early career aspirations, experiences or plans? If yes, how?
c. Have you at any time thought you have not been supported or been denied a career development opportunity?

PART 5: WORK-FAMILY BALANCE

a. Do you have responsibilities outside of work?
b. Does your institution have flexible time or place of work arrangements?
c. Do you think that women and men have the same opportunities to take parental leave?

PART 6: GENDER AND POWER IMBALANCE

a. What does gender equality mean to you?
b. How do you think gender is perceived in ocean science by professionals?
c. Are there initiatives to promote gender equality in your institution?
d. Have you ever applied for promotion? If yes, how many times? Were you successful?
e. Have you ever been discriminated because of your age, ethnicity, education or class? Please explain how each of them has affected your opportunities or privileges.

PART 7: POLICY

a. Are you aware of any gender policies/sexual harassment policies in your institution? If yes, could you tell me what they are and what they address?
b. Have you experienced any behaviours that you would consider as gender biased, or sexual harassment while in your institution?
c. If yes, how would you know to whom or how to register a complaint?
d. Have you experienced any change/impact since the implementation of the gender policy/sexual harassment policy in your institution?
e. Have you received any training related to recognizing gender bias, gender policies and sexual harassment policy?

PART 8: OTHER INTERVENTIONS

a. Could you identify any good practices in your institution that encourage women to participate fully at all levels?
b. What is your contribution towards gender equality in your institution? research or projects?)
c. Looking ahead 5 years, what would you like to see change in your institution in relation to gender equality?
d. Could you suggest any actions to help empower women and other underrepresented groups in your institution?
e. If you would like to have your career choice again, how would you go about it?

B. RESPONDENT PROFILE

Highest level of education	Bachelors	Masters	PhD	Other (Specify)
Age	<30	30-40	40-50	50-60	>60
Gender				
Marital status				
Number of children (and age)				
Ethnic group				
Social class	Lower [ ]	Middle [ ]	Upper [ ]	
Position in Organization	Director	Manager	Researcher/ Technician	Other (Specify)
	[ ]	[ ]	[ ]	[ ]
Name of the institution				
Years in the institution				
Ocean science programs				

Do you have anything to add or feel is relevant which has not been covered?

*****

Thank you for your participation!

Disclaimer: This thesis only analysed a subset of the questions in the interview guide, leaving the remainder for future research.

Appendix 3: Administration interview guide

WMU-GOI WOMEN'S EMPOWERMENT PROJECT

Administrative Staff Interview Schedule (Gender Focal Point) in Ocean Science Institutions in Kenya

Aim: To explore and understand the role of gender equality and empowerment of women in the conduct and delivery of ocean scientific research

Interview Date: …… Interviewee Code: ……
Warm up start:

- What position do you hold in [name of institution]?
- Do you think your institution is one which is gender equal and/or welcoming to women?
- Which ocean science programme(s) do you offer in [name of institution]

A. OVERVIEW ON GENDER INFORMATION

1. What does gender equality means to you?
2. Is information and data on gender collected in [name of institution]?
3. Has your institution developed any gender equality measures?
4. Does your institution have gender-sensitive indicators that can be monitored?
5. Do you think your institution gives equal opportunities for both women and men staff?

B. POWER DISTRIBUTION

Do you think there is equal representation of women to men in senior management and research positions? Can you estimate a proportion of that?

6. Do you have designated gender focal points? What are their roles in [name of institution]?

C. POLICY

7. Does your institution have policies on gender equality and sexual harassment?
8. If there are policies, how often are the training workshops on gender equality and sexual harassment policy awareness conducted in your institution?
9. How are these policies implemented in [name of institution]?
10. What are the impacts of these gender policies?
11. Does your institution have flexible time/place of work arrangements for the staff?
12. Do female and male staff have the same opportunity for parental leave? How many paid leave days for each?
13. How does your institution operationalize gender mainstreaming?

D. BARRIERS

14. Which barriers to achieving gender equality do you think exist in your institution? Could you identify any that are present in your institution?

E. OTHER INTERVENTIONS

15. Could you identify some good practice measures in your institution that encourage women to participate fully at all levels?
16. What measures do you think could be established in [name of institution] to promote gender equality?
17. What support structures are there for women scientists in [name of institution]?
18. Is there any more information on gender equality you would like to share?
19. Do you have any questions you would like to ask?

*****

Thank you for your participation!

Disclaimer: This thesis only analysed a subset of the questions in the interview guide, leaving the remainder for future research.

Appendix 4: Institutions governing the Indian Ocean in Kenya

Table 8: Mapping Ocean science institutions in Kenya and aligning their mandates to the Ocean Decade's societal goals (Including the institutions that did not participate in this study)

Institution	Mandates in ocean governance	Relevance to UN Ocean Decade Goals
Coastal & Marine Resource Development (COMRED)	Nurture practical solutions to problems facing coastal and marine environments and communities for sustainable development- Advancing the socio-economic well-being of the coastal population	**Goal 7**: An inspiring and engaging ocean
Community Based Environmental Conservation (COBEC)	Protect and conserve natural ecosystems through education, habitat restoration and preservation and wildlife management	**Goal 2:** A healthy and resilient ocean
Seacology	Protect threatened islands ecosystems through preservation of the indigenous culture and improve the lives of the community	**Goal 7:** An inspiring and engaging ocean
Ocean Sole	Prevent and alleviate pollution of land and sea through turning the discarded flip-flops from the Kenyan coast to incredible art and functional products	**Goal 1**: A clean ocean
Wildlife Conservation Society (WCS)	Saves wildlife and wild places worldwide through science, education, conservation and inspiring people to value nature.	**Goal 5**: A sustainably harvested and productive ocean
Coastal Oceans Research and Development Indian Ocean (CORDIO)	Research on climate vulnerability of coral reefs, impacts of fishing on reef systems, adaptive capacity of coastal communities	**Goal 2:** A healthy and resilient ocean
World Wide Fund for Nature (WWF-Kenya)	Stop degradation of the planet's natural environment and build a future in which humans live in harmony with nature.	**Goal 5**: A sustainably harvested and productive ocean
Western Indian Ocean Marine Science Association (WIOMSA)	Advance regional co-operation in all aspects of coastal and marine sciences including socio-economic and management, and to support sustainable development in the WIO region, while promoting interdisciplinary and multidisciplinary approaches.	**Goal 3**: A predicted ocean **Goal 4**: A transparent and accessible ocean
A Rocha Kenya	Conserve and restore threatened habitats and biodiversity through research, environmental action, advocacy and community empowerment	**Goal 5**: A sustainably harvested and productive ocean
Nature Kenya	Connect people with nature and take action for biodiversity conservation	**Goal 5**: A sustainably harvested and productive ocean
The Nature Conservancy	Conserve the lands and waters on which all life depends by addressing the biodiversity and climate crises	**Goal 5**: A sustainably harvested and productive ocean
County Fisheries Departments	Improve livelihoods of the people through promotion of competitive, innovative research, equitable distribution and sustainable management of fisheries resources in various counties	**Goal 5**: A sustainably harvested and productive ocean

Kenya Marine and Fisheries Research Institute (KMFRI)	Undertake research in marine and freshwater fisheries, aquaculture, environmental and ecological studies, and marine research including chemical and physical oceanography in order to provide scientific data and information for sustainable development of the Blue Economy	**Goal 3**: A predicted ocean **Goal 4**: A transparent and accessible ocean
Kenya Maritime Authority (KMA)	Ensure sustainable safe, secure, clean and efficient water transport for the benefit of stakeholders	**Goal 4:** A safe ocean
Kenya Wildlife Service (KWS)	Conserve, protect and manage wildlife (biodiversity) in Kenya and to enforce related laws and regulations	**Goal 5**: A sustainably harvested and productive ocean
Kenya Fisheries Service (KeFS)	Conserve, manage and develop Kenya's fisheries and aquaculture resources	**Goal 5**: A sustainably harvested and productive ocean
National Environment Management Authority (NEMA)	Ensure sustainable management of the environment through exercising general supervision and coordination over matters relating to the environment and to be the principal instrument of government in the implementation of all policies relating to the environment.	**Goal 1**: A clean ocean
Kenya Forest Service	Conservation, sustainable development, management and utilization of the country's forest resources including mangroves for equitable benefit of present and future generations	**Goal 5**: A sustainably harvested and productive ocean
Kenya Forestry Research Institute (KEFRI)	Conduct research and provide information and technologies for sustainable development of forestry (mangroves) and allied natural resources for socio-economic development	**Goal 4**: A transparent and accessible ocean
National Museum of Kenya (NMK)	Gather, store and disseminate information of Kenya marine life with a view to preserve and protect the biodiversity	**Goal 4**: A transparent and accessible ocean
Nairobi Convention	Address the accelerating degradation of the world's oceans and coastal areas through the sustainable management and use of the marine and coastal environment by engaging the countries that share the Western Indian Ocean in actions to protect their shared marine environment	**Goal 1**: A clean ocean **Goal 4**: A transparent and accessible ocean **Goal 5**: A sustainably harvested and productive ocean
Intergovernmental Oceanographic Commission of UNESCO (IOC-UNESCO)	Provide strong scientific understanding and systematic observations of the changing world ocean climate and ecosystems shall underpin sustainable development and global governance for a healthy ocean, and global, regional and national management of risks and opportunities from the ocean	**Goal 2:** A healthy and resilient ocean **Goal 5**: A sustainably harvested and productive ocean
International Union for Conservation of Nature (IUCN)	Work supportively and in collaboration with other members and partners, including NGOs and governments to achieve a new paradigm for sustainable development based on the concept of people centred development.	**Goal 2:** A healthy and resilient ocean **Goal 5**: A sustainably harvested and productive ocean
Food and Agriculture Organization of the United Nations (FAO)	Aims to defeat hunger and improve nutrition and food security worldwide by increasing the efficiency of agriculture and fisheries thereby improving the situation of the rural population in its member countries	**Goal 3**: A predicted ocean **Goal 5**: A sustainably harvested and productive ocean
Universities (Technical University of Mombasa, University of Nairobi, University of Eldoret, Kenyatta, Egerton, Pwani, Karatina, etc.)	Educate and research on coastal and marine resources. They offer course like marine biology, marine resource management, fisheries and oceanography, applied aquatic science, etc.	**Goal 7:** An inspiring and engaging ocean

Appendix 5: Summary of the literature on Feminist political ecology in natural resources

Table 9: Overview of some literature on FPE and the research methods used

No.	Author(s) and title	Type	Target population	Field of study	Research question	methods
1.	Kerr, R. B. (2014). Lost and found crops: agrobiodiversity, indigenous knowledge, and a feminist political ecology of sorghum and finger millet in northern Malawi. *Annals of the Association of American Geographers*, *104*(3), 577-593.	Article	Rural Malawi Case study: Ekwendeni Region Northern Malawi	Indigenous, drought-tolerant grains (finger millet and soghum)	Combined FPE and Indigenous knowledge	In-depth interviews, focus groups, archival documents and observations
2.	Gay-Antaki, M. (2016). " Now we have equality": a feminist political ecology analysis of carbon markets in Oaxaca, Mexico. *Journal of Latin American Geography*, *15*(3), 49-66.	Article	Oaxaca city and Mexico city	Gender dynamics of carbon markets - Differences between wind and forest carbon projects	Effects of a wind project and a small scale reforestation project and the convergence of environment, gender and development	Case study research: archival research, semi-structured and in-depth interviews A series of informal semi-structured and in-depth interviews, focus groups
3.	Melissa Haeffner, Dana Hellman, Alida Cantor, Idowu Ajibade, Vinka Oyanedel-Craver, Maura Kelly, Laura Schifman & Lisa Weasel (2021). Representation justice as a research agenda for socio-hydrology and water governance, Hydrological Sciences Journal, 66:11, 1611-1624, DOI: 10.1080/02626667.2021.1945609	Article	Water sector employees in United States (496) – one year data collection from October 2018 – September 2019	Water governance	How power and politics shaped the composition of the water sector and decision-making processes?	An exploratory survey consisting of closed- and open-ended questions to explore workers' lived experiences in water sector

4.	Soto-Alarcón JM and González-Gómez DX (2021). Collective Rural Women Access, Use, and Control Over Communal Land in Mexico: A Post-Capitalist Feminist Political Ecology Approach. Front. Sustain. Food Syst. 5:695344. doi: 10.3389/fsufs.2021.695344	Article	Manzanas members - strategies to access, use, and control communal resources in Mexico Fieldwork – at irregular intervals between 2012 and 2019	Land	Identifying patterns and developing a sense of the whole phenomenon by recognizing how the gendered access and use of communal property were interdependent of the interaction of the commons.	Case study approach-Participant observation, Focus discussion groups and interviews
5.	Nelson, I. L (2021). Conference spaces as emotional sites for becoming campus sustainability leaders. Emotion, Space and Society, 39, 100785, 1-10	Article	Campus Sustainability Professionals (CSP)	Conference	How SHE (Annual Sustainability in higher education in the USA) conference events co-produce CSP (Campus Sustainability Professionals) subjectivities and expertise emotionally	Event ethnography and auto-ethnography
6.	Buechler, S., Vázquez-García, V., Martínez-Molina, K. G., & Sosa-Capistrán, D. M. (2020). Patriarchy and (electric) power? A feminist political ecology of solar energy uses in Mexico and the United States. *Energy Research & Social Science*, *70*, 101743.	Article	Women's experiences with small-scale solar energy projects in Urban and rural Arizona, USA and Zacatecas, Mexico.	Small-scale solar energy projects	Interviewed both women and men	A comparative study: participant observation, individual and focus group interviews and stakeholder meetings
7.	Jewitt, S., and Ryley, H. (2014). It's a girl thing: Menstruation, school attendance, spatial mobility and wider gender inequalities in Kenya. *Geoforum*, *56*, 137-147.	Article	Girls in primary and secondary schools		Semi-structured interviews and focus groups (FGs)	
8	Irbık, D. E. A (2022). Systematic Literature Review of Water-Migration-Gender Nexus Towards Integrated Governance Strategies for (non) Migrants. *Frontiers in Water*, 104.	Article	People who were affected by the exposures to climate change/water related hazards and migrated to another country.	Water governance		A systematic literature review based on PRISMA guidelines

Appendix 6: Summary of the data and information collected from the selected ocean science institutions

Table 10: Data obtained from the eight selected public universities in Kenya

Public University	Data on students' enrolment	Data on students' graduation	Data on staff gender ratios	Gender Equality Policy	Sexual harassment policy	Survey	Interviews
A	√	√	√	√	√	√	√
B	√	√	√	√	√	√	√
C	–	–	–	√	√	–	–
D	√	√	√	√	√	√	√
E	√	√	√	√	√	√	√
F	√	√	√	–	–	√	√
G	√	√	√	–	–	√	√
H	–	√	–	–	–	√	–

Table 11: Data obtained from the nineteen (19) selected ocean science institutions (Government agencies = 9, NGOs = 7 and IGOs = 3)

Institution	Number of institutions	Data on staff ratio	Gender policy	Interviews
Government agencies	9	√	None (-)	√
NGOs	7	√	One	√
IGOs	3	√	Two	√

Table 12: List of organizations and occupations of the interviewed participants

Type of organization	Occupation of participants	Number of interviews
Public universities	Associate professor, senior lecturer, lecturer, tutorial fellow, graduate assistant, senior technologist/ technician, technologists/ technicians, part-time lecturer/ PhD students, lab assistant	30
Government agencies, NGOs and IGOs	President, Directors, managers, coordinatiors, Principal fisheries officers, Senior research scientists, Chief fisheries officers, Research scientists, Assistant researchers, Fisheries officers, Assistant fisheries officers, Conservationists, Gender focal points, Coxswains, Interns	52

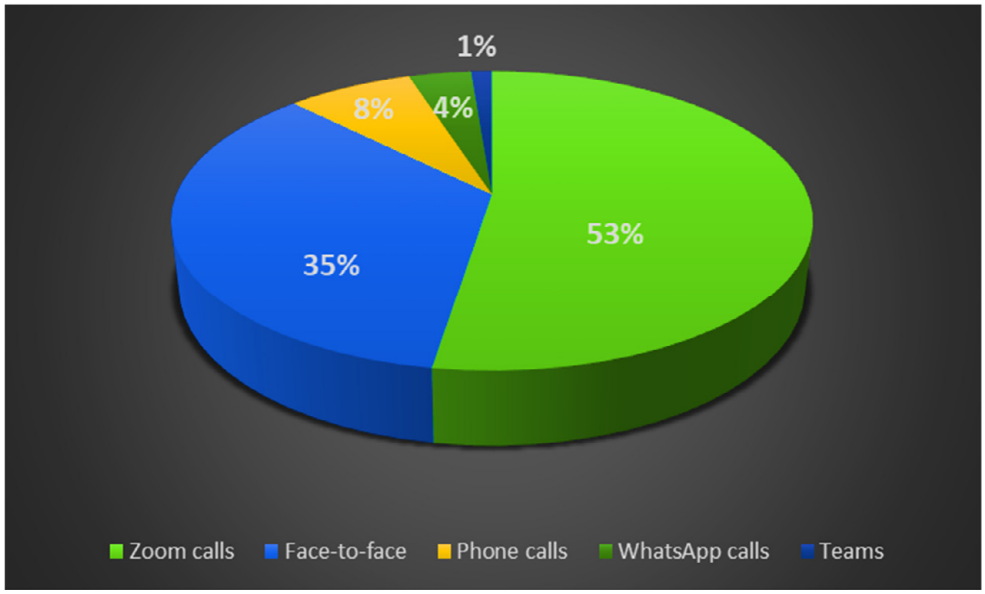

Figure 21: Different techniques used during interviews in this study

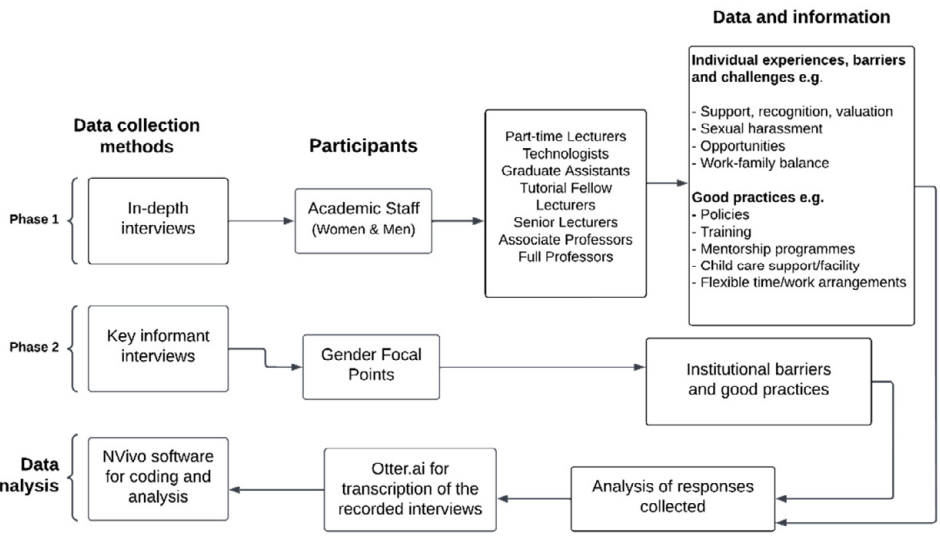

Figure 22: Data collection process during the interviews

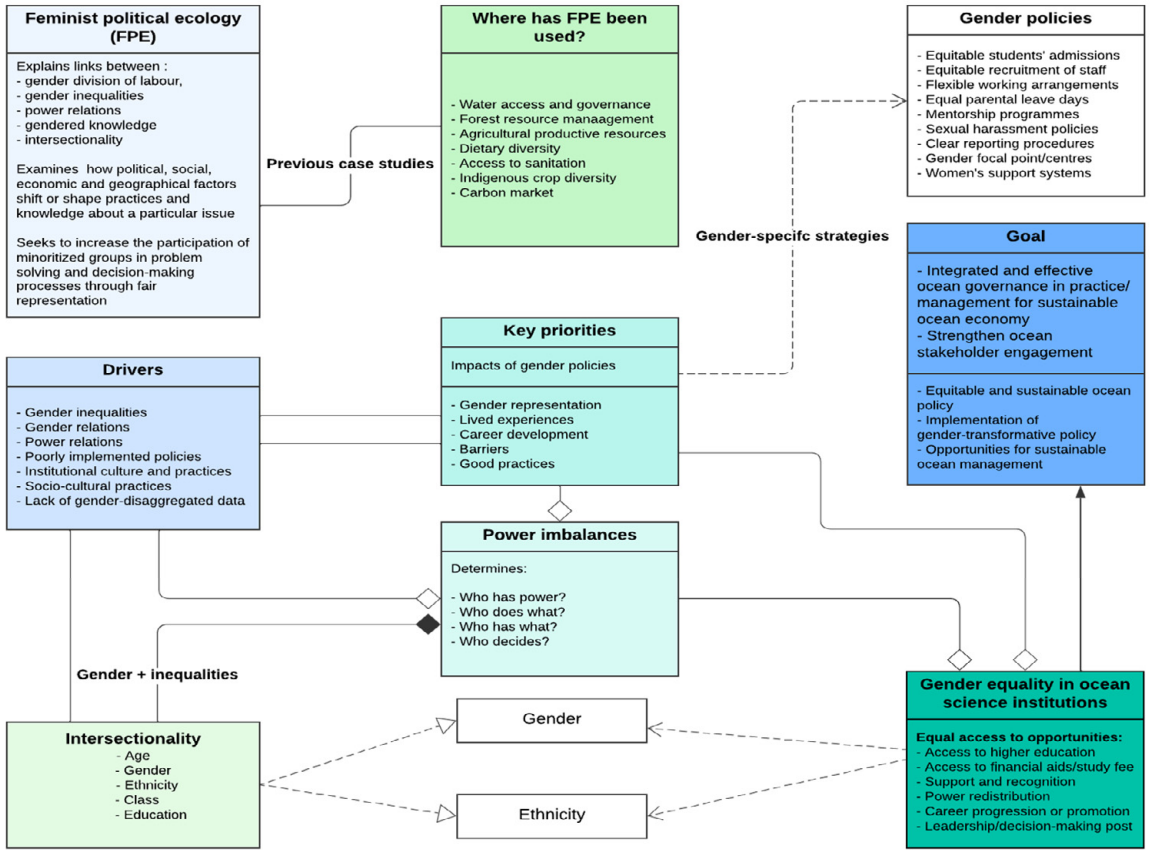

Figure 23: Concept map of relevant issues investigated in this research

Appendix 7: Papers included in this dissertation

Paper 1 Ojwala, R. A., Kitada, M., Neat F., & Buckingham, S. (2022). Effectiveness of gender policies in achieving gender equality in ocean science programmes in public universities in Kenya. Marine Policy, 144: Article 105237, pp. 1-12. DOI: https://doi.org/10.1016/j.marpol.2022.105237.

Paper 2 Ojwala, R. A**.** (2023). Status of gender equality in ocean research, conservation and management institutions and organizations in Kenya. *African Journal of Marine Science*, 45 (2), 1-11. DOI: https://doi.org/10.2989/1814232X.2023.2213724.

Paper 3 Ojwala, R. A. (2023). Unravelling gender and ethnic bias higher education: Students experiences in access to ocean science education and career opportunities in Kenya. *Higher Education* (*Under review*).

Paper 4 Ojwala, R. A., Buckingham, S., Neat, F. & Kitada, M. (2023). Gender and the ocean: Understanding women's roles, experiences and barriers to participation in ocean science education in Kenya. *Ecology & Society* (*Under Review*).

Paper 1

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Effectiveness of gender policies in achieving gender equality in ocean science programmes in public universities in Kenya

Renis Auma Ojwala *, Momoko Kitada, Francis Neat, Susan Buckingham

World Maritime University-Sasakawa Global Ocean Institute, Fiskehamnsgatan 1, 211 18 Malmö, Sweden

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ABSTRACT

The recently proclaimed Ocean Decade by the United Nations General Assembly is committed to gender equality and women's empowerment in ocean science research and governance. This paper examines the status of gender equality in ocean science research across higher education institutes in Kenya. Kenya has ratified international conventions for gender equality and developed national and institutional gender equality and sexual harassment policies as its commitment to promoting equitable access to education. However, it is poorly understood whether the implementation of these policies has been successful at the institutional level. This study explores the effectiveness of the institutional gender policies in public universities delivering ocean science-related degrees. Existing policies were analysed using the Gender Integration Continuum and gender ratios of enrolled students and recruited staff in ocean science-related fields investigated. The study identified that while some policy provisions included gender-transformative strategies to increase women in science-related courses, many were outdated. Gender-disaggregated data showed fewer female students and female staff in management positions compared to men. Additionally, the proportion of women in academic posts declined with the seniority of employment level, and women were more likely than men to occupy non-tenured positions. In conclusion, it appears that the presence of gender policies does not necessarily translate to gender balance across the universities. We offer some explanations as to why this should be and where to direct future research needs.

1. Introduction

There is a rapidly growing recognition of the importance of gender equality in realising UN Sustainable Development Goals (UNSDGs) across sectors [24,25]. Gender equality (itself one of the UNSDGs) can accelerate progress towards a more equitable and sustainable future for all [3,71]. Increasing access to educational opportunities for women and men needs urgent attention to ensure better and effective governance, enhanced productivity and socio-economic growth [8,17,76]. Achieving gender equality in education also, critically, promotes equitable power distribution and sustainable management of resources at all levels [61, 64,74]. The UN's Decade of Ocean Science for Sustainable Development has committed to gender equality and women's empowerment to achieve a sustainable future for the oceans. Gender equality provides equal opportunities to both women and men to participate in and increase the research, discoveries and innovations needed to reverse declining ocean health [19,25,65].

In Kenya, despite progress toward gender equality in specific academic programmes like arts and social sciences, a significant gender gap is still reported in Science, Technology, Engineering and Mathematics (STEM) education [34,52,54]. Reports indicate persistent gender inequality in public and private universities, with glaring gender disparity reported in STEM fields ([35]; [39]; [9]). The "education for all" slogan of the national government appears to be more on paper than in practice, resulting in a lack of progress towards gender equality in STEM subjects [42,47,70,72]. According to the 2020 and 2021 Global Gender Gap report ([79]; [80]), Kenya has attained gender parity in primary education, and the gender gap has reduced in secondary levels, but disparities tend to deepen in higher education, with a much lower representation of women in sciences where men make up the majority of students and academic staff. Onsongo [52] reported 30% lower enrolment of female students in selected public universities and 40% in private universities. Cultural barriers, gender stereotypes, gender discrimination, sexual harassment, lack of role models and mentorship programmes have all been found to hinder the active participation of women in higher education [54]. Elsewhere, sexual harassment has

* Corresponding author.
E-mail addresses: renisauma@gmail.com, w1904051@wmu.se (R.A. Ojwala), mk@wmu.se (M. Kitada), fn@wmu.se (F. Neat), susanbuckingham07@gmail.com (S. Buckingham).

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been documented throughout the higher education sector, and public universities have been described as some of the most dangerous spaces for female students and staff [10,75,77]. Kenyan public universities are no exception as highlighted by the Kenyan media and previous studies [43,60,75].

Kenya has ratified critical international legal frameworks concerning gender equality. These frameworks include the Beijing Declaration and the Platform for Action [7] (UN [1,57,67]), the UN Sustainable Development Goals (2015) [22,44], and the UN Decade of Ocean Science for Sustainable Development [41,59], some of which have informed national legislative and gender policy measures [44]. Kenya has also developed national gender policies, including Gender Equality in Education (2007) and the Education and Training Sector Gender Policy (2015). As a result, gender equality and sexual harassment policies have been developed in many universities. However, it is not clear how effective these frameworks for gender equality have been, and it is evident that gender disparity remains, particularly in top-level decision-making positions ([32]; [31]).

Ocean science has become a global priority with the launch of the UN Decade of Ocean Science for Sustainable Development in 2021 [58]. As co-host with Portugal of the UN Oceans conference in 2022, Kenya is at the forefront of international ocean policy. To date, there has been no systematic evaluation of the role of women in ocean science in Kenya, nor of the effectiveness of national and institutional gender policies in the ocean science sector. This is, then, a timely opportunity to champion the participation of women in ocean science research and governance in Kenya. According to Gasper [23], 'effectiveness' is one of the criteria of policy evaluation which typically refers to the fulfilment of policy objectives. A policy is considered adequate if its outputs have contributed to achieving the intended objectives [49]. Evaluation of gender policy in education has been performed by a number of scholars in developed and developing countries, including Kenya [5,6], but this study is the first of its kind to explore gender equality specifically in ocean science education and research. Ocean scientific research is crucial in understanding the complexity and interconnectedness of marine ecosystems and developing socially, ecologically and economically sustainable solutions for the ocean [11,16,25]. Inadequate access to education and decent employment opportunities in ocean science fields are impediments to gender equality and sustainable development [6], despite women playing an essential role in ocean science sectors such as fisheries and aquaculture, thus significantly contributing to the national economy ([14,38]; UN [69]). Here, we ask what effect gender policies have had on the participation of women students and staff in ocean science programmes in eight public universities in Kenya.

This study evaluated the policies using the Gender Integration Continuum (GIC) framework adopted from the USAID Interagency Working Group [28]. The GIC is based on six thematic areas derived from the national gender policy in the education sector: access; equity; quality of education; safety and gender-based violence (GBV); nurturing and mentoring; and governance and management [56]. The institutional policies were evaluated against the national gender equality policy. Gender-disaggregated data were collected from the universities allowing an exploration of the relationship between these policies and equality of women and men students and staff.

2. Materials and methods

Gender policy addresses gender inequality in different sectors, such as higher education [37]. Gender policies often provide the foundation for tackling biases against one gender (most often women) in terms of access to quality education, resource allocation, division of labour, cultural expectations, decision-making and other socially constructed or defined privileges and activities [6,13,63]. The effectiveness of gender policy can be used to determine the extent to which the direct results of interventions contribute to the sustainable achievement of policy objectives (promoting gender equality) at all levels of education [23,49].

2.1. Ethical statement

This research was approved by the World Maritime University's Research Ethics Committee and the National Commission for Science, Technology and Innovation (Research License Approval 824286) prior to data collection. The universities were anonymised to ensure confidentiality in accordance with the approval protocol.

2.2. Methodological framework

The GIC adopted as a conceptual framework for this research, was developed by the USAID Interagency Gender Working Group (IGWG) to analyse gender policies [28,40]. In this study, the GIC framework has been used to analyse the national and institutional gender policies of Kenyan public universities to evaluate the strength of each gender policy (Fig. 1).

One gender-blind and three gender-aware categories were used to understand inequalities in higher education (see Fig. 1). These categories demonstrate how the policies treat gender norms and roles as well as disparities in enrolment of students and recruitment of staff.

The term, "gender-blind" refers to the policies that ignore gender norms and power dynamics between women and men at different levels among the students and within the university management. Gender-blind policies may intentionally or unintentionally fail to address the problem of gender stereotypes in staff recruitment [28]. Being "gender-aware" refers to policies that adopt a gender-responsive approach to address gender inequality, although these vary in degree. This framework is a modified version of the original by IGWG [28]. It was modified by replacing the 'gender-exploitative' sub-category with one that is defined as 'gender-neutral'. Here, the sub-categories of gender-aware policies include gender-neutral, gender-accommodating and gender-transformative. This approach gives a better understanding of policy provisions based on their meaning and how the strategies were framed in the reviewed policy documents.

Being "gender-neutral" focuses on overall impact, and it is not explicitly aimed at either women or men and is assumed to affect both sexes equally [33]. The gender-neutral policy ignores that some policies can consolidate gender norms and power imbalances to exploit the underrepresented gender, particularly women; for example, a policy that does not have parental leave protection and flexible working arrangements. Gender-accommodating policies, on the other hand, acknowledge and respond to existing gender relations and inequalities. For example, policies that encourage women to enrol in science courses but fail to address stereotypes hindering women's participation in these fields. Strategies may be developed and implemented by actively meeting the different needs of women and men though they are not designed to change gender norms [28].

Gender-transformative policies are specific and attempt to promote equitable gender norms which support gender equality and lead to improved education for all. These policies actively and explicitly question, examine and change existing harmful gender norms and power imbalances between women and men. They encourage critical awareness of gender roles, support women's empowerment, and challenge resource distribution and allocation of duties between women and men [28]. These transformative policies equally engage women and men in decision-making and policy implementation to advocate for women's rights and strengthen women's influence and voice in governance. With the help of the above criteria together with gender assessment sub-criteria modified from Aura et al. [4], institutional gender policy documents were systematically evaluated.

2.3. Data collection and analysis

The study was conducted in eight public universities in Kenya from June to October 2021. Kenya was chosen as a case study because it is one of the models for the Blue Economy Initiative championed by the Food

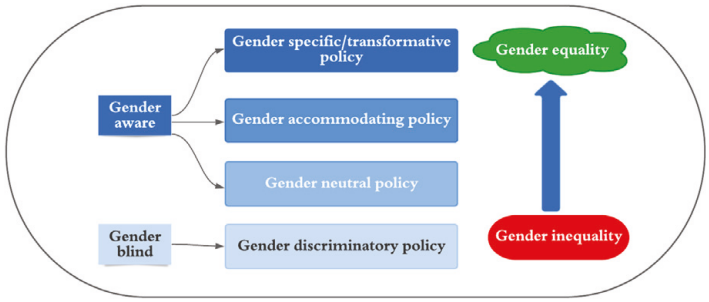

Fig. 1. Adaptation of the GIC conceptual framework on gender policy analysis illustrating the different steps along the continuum (Source: Modified from [28]).

and Agriculture Organization of the United Nations (FAO) in 2018 as a strategy for achieving integrated, sustainable, and socio-economically sensitive management of oceans [14,21,45]. Moreover, the 2022 UN Ocean Conference was co-hosted by the governments of Kenya and Portugal, highlighting the need for urgent measures and actions to protect and manage oceans sustainably.

Public universities were selected for this study because they offer programmes at a lower fee than private ones and thus encompass an economically more comprehensive range of society. Therefore, we expected more diverse students from public universities from different ethnic groups, income levels and socio-economic status. Ten out of thirty-seven public universities in Kenya (Ministry of Education, 2018) were selected purposively based on the criterion that they offer ocean science-related courses [48,66], as per the aim of this paper, which was to analyse gender policies and women's representation in ocean science universities. The baseline for gender policy analysis was the Kenyan national gender policy, and public universities play a vital role in its implementation. However, only eight of these ten selected universities (80%) participated in this study by providing some or all of the requested data.

This study used a similar approach to Barahona-Fuentes et al. [5]. They examined the possible impact of gender equality policies on women in maritime education and training institutions offering marine engineering and nautical sciences and maritime transport studies in European and non-European universities. The study was conducted in three steps: 1) Gender policy analysis, 2) Gender ratio analysis of students and staff, and 3) Comparing the two results. We used both document analysis and quantitative methods to evaluate the relationship between gender policies and staff and students' statistics [18].

Kenya's National Education and Training Sector Gender Policy (2015) and gender policies of five public universities were assessed. For Step 1, the study began with document analysis of national and institutional gender policies to identify the degree of gender awareness. Gender policy documents were collected from the universities' websites or by request to the university Gender Centre. The number of gender-specific strategies as a percentage of all policy provisions associated with access, equity, quality of education, safety, mentoring and governance, was used to calculate and rank the level of gender awareness of each policy based on the GIC framework. Following evaluation of the policy documents, the universities were ranked based on the policy awareness, and subsequently coded (Code A being the most aware, Code H the least aware). Data obtained from each university is shown in Table 1. Institutional policies were compared to the national standards and recorded as being above, meeting or below these standards, represented by dark blue, blue and light blue colours respectively.

In Step 2, data on student enrolment in and graduation from ocean science departments, between 2010 and 2019 in long-established universities, and from 2013 to 2019 in recently established universities, enabled change over time to be measured. Data on staff and students were analysed using descriptive statistics: means, the measure of variations, the frequency distribution of academic staff, percentages of female students' enrolment over the years and women's representation in management positions. This analysis helped to establish and understand the status and trends of gender equality.

Table 1
Data obtained from the eight selected public universities in Kenya.

University	Data on students' enrolment	Data on students' graduation	Data on staff gender ratios	Gender Equality Policy	Sexual harassment policy
A	√	√	√	√	√
B	√	√	√	√	√
C	–	–	–	√	√
D	√	√	√	√	√
E	√	√	√	√	√
F	√	√	√	–	–
G	√	√	√	–	–
H	–	√	–	–	–

Finally, in Step 3, the degree of gender awareness expressed in each university's policy was compared with the gender ratios of students and staff positions to explore the relationship between gender policy and gender balance.

2.4. Methodological limitations

It is important to note that this study has limitations. Firstly, the study only targeted departments at the universities offering ocean science-related programmes, and the findings cannot be directly extrapolated to the entire university. Secondly, data was not always complete; a few universities did not have readily available records of the enrolment and graduation of students by gender and had to manually search for the data from the registration booklets. This meant some universities provided only graduation data or could not provide complete data within the time frame of this project. Lastly, the study was carried out during unprecedented times of the covid-19 pandemic when travel restrictions existed in some counties in the western region of Kenya, which complicated access to those universities. Alternatively, those universities were contacted using emails despite low response rates. We, therefore, only evaluated the policy documents that were available to us and analysed the gender ratios of students and staff that the universities provided.

Table 2
Overview of the national and institutional gender policy strategies, mainly two categories identified as gender neutral and gender specific strategies (only five universities with gender policies were included in this analysis).

Gender policy assessment criteria with six themes and three policy cycle aspects	Six analytical themes						Three policy cycle aspects		
	Access	Equity	Quality education	Safety, security and gender-based violence	Nurturing and mentoring	Governance and management	Implementation strategies	Monitoring and evaluation	Policy Review
Education and Training Sector Gender Policy (2015)	Out of thirteen (13) policy strategies, only one refers to a gender specific action e.g. re-entry for school girls who become pregnant (Section 2.1)	All the seven (7) policy strategies are gender neutral e.g. enhance gender equity in education through grants, scholarships, loans and other awards (Section 3.1)	All the twenty-three (23) policy strategies are gender neutral e.g. build capacity of instructors and teachers (Section 4.4)	Out of the fifteen (15) policy strategies, only one is gender specific e.g. re-enrol girls who get pregnant (Section 5.4)	Out of twenty-four (24) policy strategies, four are gender specific e.g. ensure one third of student enrolled in STEM are female (Section 6.4)	All the fifty-six (56) policy strategies are gender neutral e.g. ensure gender balancing in the composition of BoMs, Councils and administration (Section 7.2)	Capacity building, advocacy, accountability, gender analysis, partnerships, sustainability, monitoring and evaluation and policy review (Section 8.3)	Collection, analysis and utilization of data disaggregated by age and sex at all levels (Section 8.3)	Every five years (section 8.3)
University A Gender Policy (2011)	Out of the six (6) policy strategies, two are gender specific e.g. advise student mothers to defer if necessary (Section 3.3.4)	Out of the six (6) policy strategies, four are gender specific e.g. enforce equity in scholarship and research to achieve 40% female applicants (Section 3.6.4)	All the seven (7) policy strategies are gender neutral mainstream gender related courses and training modules to all students and staff (Section 3.2.4)	All the nine (9) policy strategies are gender neutral e.g. improve lighting and security on campus (Section 3.4.4)	Out of the five (5) policy strategies, two are gender specific e.g. involve women role models in the academic and professional fields in marketing the university (Section 3.7.4)	Out of six (6) policy strategies, three are gender specific e.g. increase women's participation in the University governance (Section 3.1.4)	Gender mainstreaming, accountability, gender analysis, raise awareness, capacity building, create networks, monitoring and evaluation of gender policy through an institutional framework (Section 4.4)	Capacity building, surveys, mainstreaming gender, affirmative action, organize workshops (Section 4.6)	Not mentioned in the document
University B Gender Policy (2008)	Out of the five (5) policy strategies, one is gender specific e.g. Lowering cluster cut-off points to increase female enrolment (Section 3.3)	Out of the five (5) policy strategies, one is gender specific e.g. make scholarships available that target good female academic staff (Section 3.2)	All the three (3) policy strategies were gender neutral e.g. ensure curriculum is designed and developed in a gender sensitive way (Section 3.4)	All the seven (7) policy strategies are gender neutral e.g. strengthen security systems throughout the University (Section 3.5)	All the three (3) policy strategies are gender specific e.g. present positive female role models in all University's activities (Section 3.6)	Out of the four (4) policy strategies, one is gender specific e.g. increase the number of women in senior management positions (Section 3.1)	Raise gender awareness, advocacy, outreach programmes, sensitization, participatory monitoring and evaluation, public-private partnerships (Section 4.1.3)	Evaluation done every two years, develop indicators, the collection and analysis of data, (Section 4.2)	Every five years (Section 4.3)
University C Gender Policy (2009)	All the nine (9) policy strategies are gender neutral e.g. encourage both male and female students to enrol in STEM subjects (Section 2.1)	Out of the eight (8) policy strategies, six are gender specific e.g. implement affirmative action for qualified females in admission (Section 2.2)	All the four (4) policy strategies are gender neutral e.g. allocate resources to promote research and publications by males and females (Section 2.8)	All the six (6) policy strategies are gender neutral e.g. formulate a Gender Based violence and sexual harassment policy (Section 2.7)	All the five (5) policy strategies are gender neutral e.g. enhance mentoring programmes for students (Section 2.6)	Out of the ten (10) policy strategies, two are gender specific e.g. encourage female appointment and participation in leadership positions (Section 2.4)	Education, training and research, gender mainstreaming, resource mobilization; Advocacy, partnerships accountability, monitoring and evaluation of gender programmes (Section 3.1.1)	Collection, analysis and use of the data, periodic evaluation of programmes, identify indicators and targets, training (Section 3)	Every three years (Section 3)
University D Gender Policy (2014)	Out of the five (5) policy strategies, only one is gender specific e.g. promote supportive measures to retain all students especially the female (Section 3.2)	Out of the seven (7) policy strategies, three are gender specific e.g. implement strategies for supporting female employees especially the reproductive group through maternity leave (Section 3.4)	All the five (5) policy strategies are gender neutral e.g. curricula review for gender sensitivity and responsiveness, (Section 3.3)	All the ten (10) policy strategies are gender neutral e.g. monitor the implementation of sexual harassment and discrimination policy (Section 3.6)	All the ten (10) policy strategies are gender neutral e.g. create a culture of positive-mentoring at the university (Section 3.6)	All the nine (9) policy strategies are gender neutral e.g. embrace affirmative action in appointing staff for leadership positions (Section 3.5)	Gender mainstreaming, capacity building, gender awareness, resource mobilization (Chapter 4, section 4.5 and 4.6)	Generation, analysis and use of data training. regular monitoring and evaluation (Section 4.7)	Not mentioned in the document

(*continued on next page*)

Table 2 (*continued*)

Gender policy assessment criteria with six themes and three policy cycle aspects	Six analytical themes						Three policy cycle aspects			
	Access	Equity	Quality education	Safety, security and gender-based violence	Nurturing and mentoring	Governance and management	Implementation strategies	Monitoring and evaluation	Policy Review	
University E Gender Policy (2011)	Out of the seven (7) policy strategies, two are gender specific e.g. encourage women to enrol in science-based subjects (Section 2.1)	All the six (6) policy strategies are gender neutral e.g. seek funds from development partners and other well-wishers to support the vulnerable groups (Chapter 2.3)	All the four (4) policy strategies are gender neutral e.g. help male and female staff to develop their research skills (Section 2.6)	All the four (4) policy strategies are gender neutral e.g. implement Gender based violence and sexual harassment policy (Section 2.5)	All the thirteen (13) policy strategies are gender neutral e.g. mentorship programmes to support all male and female staff (Section 2.2)	All the thirteen (13) policy strategies are gender neutral e.g. ensure gender balance in appointments to governance and leadership positions (Section 2.2)	Sensitization, implementation of the two policies, seek funds, outreach programmes, capacity building, gender mainstreaming (Chapter 3)	Collection, analysis and use of the data, periodic evaluation of programmes, develop indicators and targets, training (Section 3.8)	Every four years (Section 3.9)	

3. Results

3.1. Evaluation of gender policies

The second edition of the Kenyan Ministry of Education's gender policy (2015) was used for this study. Even though it was outdated, it incorporated the new legal framework ushered in by the Constitution of Kenya 2010. The second edition focused more on equal rights for women and men, girls and boys than the first, which focused more on education performance in critical areas. Some of the objectives of the second edition include reducing gender inequalities in access to education, increasing participation for women in STEM courses and ensuring a safe and secure work and learning environment that is free from sexual harassment to all staff and students [56].

Of the eight selected public universities responding to this study, only five had the policy documents publicly available. The contents of these gender policy documents were analysed against the national gender policy as a benchmark using the GIC framework. Six categorical themes were identified in gender policy analysis: access; equity; quality of education; safety, security and gender-based violence; nurturing and mentoring; and governance and management. Further, gender policy analysis also considered three policy cycle aspects: implementation strategies, monitoring and evaluation, and policy review. A detailed comparison, presented in Tables 2 and 3, revealed a gap between the national and institutional policies, with the majority of policy provisions in the national policy document being gender-neutral and only 4% being gender-specific. The universities' policies, however, were found to have more gender-specific strategies, ranging from 4% to 28%. Affirmative action, role models, mentoring and allocation of scholarships were mentioned as strategies used to increase the participation of female students in most universities. These policies are ranked by examining the percentage of gender-specific strategies in every policy (Table 4). Based on this analysis, the five institutional policies were ranked: the best being University A (28%), followed by University B (22%), University C (19%), University D (9%) and, the lowest, University E (4%). Four of the five policies exceeded the national standards. University A had more robust gender-specific strategies in access, governance and management than the other universities. University B was relatively higher in nurturing and mentorship, and University C was higher in equity but had no specific provision on access to higher education (Table 3).

The institutional policy documents reviewed in this study were all outdated and beyond their stated review period. Three universities indicated that their policy review period was already behind schedule. For instance, University A was to review its document every five years but was eight years late, University B had committed to reviewing after every three years but was nine years late, and university D was due to review every four years but was six years late.

3.2. Gender representation of staff in public universities

3.2.1. Female representation in governance and management positions

The low representation of women was recorded in all four senior management positions: Chancellor, Vice-Chancellor, university council members and head of department (Table 5). Out of the eight Chancellors, only two were women. Three out of the eight Vice-Chancellors and heads of department were women, that is barely above the 30%, which constitutes the bare minimum or acceptable limits stipulated in the Constitution of Kenya 2010. In university councils, only two universities had women's representation above 30% (University C with 43% and University G with 33%), while the rest had the lowest proportions of women, recorded below 25%.

As shown in Table 5, overall findings showed that top management positions tend to be occupied by men in all the universities and that there was no positive relationship between the policy quality and the representation of women in management. Notably, most universities with gender policies performed the same as those without gender

Table 3
Analysis of the percentages of gender-specific strategies for all the six different themes concerning the Gender Integration Continuum framework.

Gender policies	Percentages of gender specific strategies in each thematic area					
	Access	Equity	Quality education	Safety, security, and GBV	Nurturing and mentoring	Governance and management
Education and Training Sector Gender Policy	8%	0%	0%	7%	17%	0%
University A Gender Policy	33%	67%	0%	0%	40%	50%
University B Gender Policy	20%	20%	0%	0%	100%	25%
University C Gender Policy	0%	75%	0%	0%	0%	20%
University D Gender Policy	20%	43%	0%	0%	0%	0%
University E Gender Policy	29%	0%	0%	0%	0%	0%

Table 4
Comparative analysis between national and institutional gender policies.

Gender policy assessment criteria	Access	Equity	Quality education	Safety, security and GBV	Nurturing and mentoring	Governance and management	Gender specific strategies (%)
University A Gender Policy							28%
University B Gender Policy							22%
University C Gender Policy							19%
University D Gender Policy							9%
University E Gender Policy							4%

*Note: The colours represent; Dark blue = above, Blue = meet, and Light blue = below national policy standards, in comparison with the Kenyan national gender policy as a benchmark.

Table 5
Gender representation in management positions of the eight public universities.

University	Gender-specific Policy	Chancellor	Vice-Chancellor	Male Council	Female Council	% Female Council	Head of the Department
A	28%	Male	Male	7	2	22%	Male
B	22%	Female	Male	No council	No council	No council	Female
C	19%	Male	Female	4	3	43%	Female
D	9%	Female	Female	6	2	25%	Male
E	4%	Male	Male	7	2	22%	Female
F	No policy	Male	Female	7	2	22%	Male
G	Unknown	Male	Male	4	2	33%	Male
H	Unknown	Male	Male	–	–	–	Male

Note: Dash (-) shows not accessible.

policies regarding representation in the council. Indeed, the best gender equality policies were found in University A with 28%, while the University (C) with the third-ranked policy had the best female council representation at 43%. The second best performing University G (33%) either had no gender policy or it was not publicly available.

3.2.2. *Representation of women staff in academic positions*

Except for universities C and H, six public universities provided staff gender-disaggregated data. The highest total number of staff (women and men) recorded was in university B with 31% (n = 57) and the lowest number in university G with 7% (n = 12) of the total number of staff (n = 181) obtained during the study. Overall, the universities' gender representation indicated that the percentage of men staff (68%) was twice as high as women staff (32%). Of the 32% women, the majority were recorded in university B comprising 40%, and the lowest percentage in universities D and F at 24% each (Fig. 2a). Similarly, gender disparities were revealed at five different university academic levels: non-tenured, technical staff, lecturer, associate professor and full

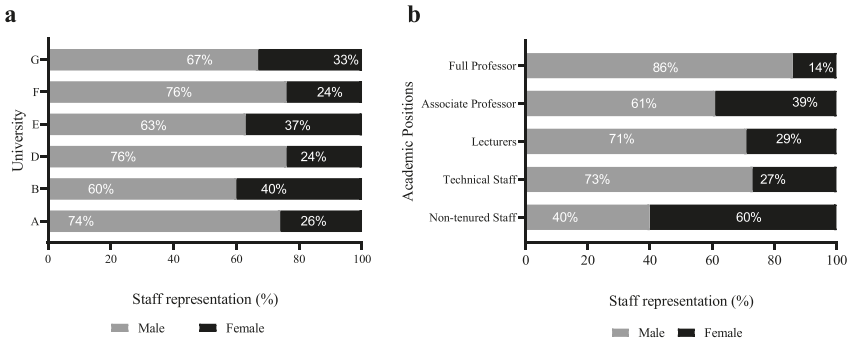

Fig. 2. Differences in staff representation by gender in selected universities and positions.

professor. These five positions were categorized as follows: Non-tenured position, which constitutes Assistant Lecturers, Tutorial Fellow and Teaching Assistants; Technical Staff position, which constitutes Laboratory technologists and Administrators; Lecturer position, which comprises of Senior lecturers and lecturers; Associate Professors and Full Professor. The highest percentage of females was recorded in non-tenured positions with 60%, and the lowest proportion at 12% in full professor positions (Fig. 2b).

Concerning the distribution of women and men staff, individual universities showed variations in staff distribution from non-tenured to permanent positions. Out of the six universities, only one university (B) had women and men in all of its five academic positions, although they were not equally represented. The remaining five universities lacked women in either one or more positions. The university with the highest proportion of women in lecturer positions was university E with 19%, and the lowest was University G, which had no women staff in permanent positions in the department (all were employed on a contract basis) (Fig. 3).

This data suggests that there was no relationship identified between gender equality of staff and the strength/presence of gender policies. For example, the highest proportion of women staff was found in University B, whose policy was ranked second, and the lowest female staff proportion was recorded in universities D and F at 24% each, showing the same performance despite university F having no policy.

3.3. Gender representation of students in ocean science disciplines

The Marine Resource Management course had the widest gender gap compared to the other courses (Fig. 4). The gender-disaggregated data obtained for students enrolled in ocean science courses shows that no course had equal or more female students than males. Female students were primarily concentrated in Marine Resource Management, followed by Applied Aquatic Science, and the lowest female representation was recorded in Fisheries and Oceanography courses.

3.3.1. Enrolment and graduation trends of female students

3.3.1.1. Enrolment of undergraduate students. Overall average female student proportions in ocean science-related courses were low, although this varied between different years and universities. The academic year with the highest average proportion of women students (45%) was 2013 and the lowest (6%) was in 2018. However, there were considerable variations recorded in individual universities between years. There were also considerable variations between universities, as in Fig. 5. For instance, while University A varies between 30% and 60%, it had six out of ten academic years recording more females with a range between 49% and 57%. University E, on the other hand, had an average female enrolment below 30%, ranging between 17% and 33%. These results show a positive relationship between university gender equality policy and the number of females enrolled. A positive relationship was recorded in University A with the best gender policy, contrary to University E, which ranked fifth. The universities with no or unknown policies (F and G) showed large variations in female enrolment from one year to another (Fig. 5). The graphical presentation of the results excluded two years of the study, 2018 and 2019, when only one university enrolled students in ocean science-related courses. The low enrolment in these two years can be attributed to the strict regulations implemented by the Ministry of Education to curb exam cheating. These exam regulations led to a drop in the number of students who qualified for university entry, which affected the student populations in all the universities in Kenya, with most universities recording zero students in natural sciences, including ocean sciences.

3.3.1.2. Graduation rates. The results indicate that fewer women graduate because their enrolment is lower than men. Out of the six universities included in this analysis, only University A was consistently closer to parity with an average of 49%. However, the completion rates of female students revealed that, proportionately, more females than males completed their higher education. For instance, in 2010, Universities D and E had 100% completion rates of female students while the male students' completion rates were 89% and 83%. The inconsistencies can be seen in Fig. 6.

3.3.1.3. Enrolment of postgraduate students. The enrolment of postgraduate (MSc and PhD) students, both female and male, was numerically low in the study period (2010–2019), with universities registering a range of one to five students for an MSc degree each year (on average three students per year). PhD students' enrolment was similarly low, where most universities, especially universities A and F, had no students enrolled in ocean science-related PhD programmes in the 10 years under study (Table 6).

4. Discussion

4.1. Policy evaluation

The first problem this study clearly exposed is that none of the gender policies had been reviewed in the time specified. There is a pressing need to review and update policies to ensure that they are aligned to the current strategies and relevant indicators both at national and institutional levels. The gender policy analysis performed by the GIC framework helped compare national and institutional policies and identify the

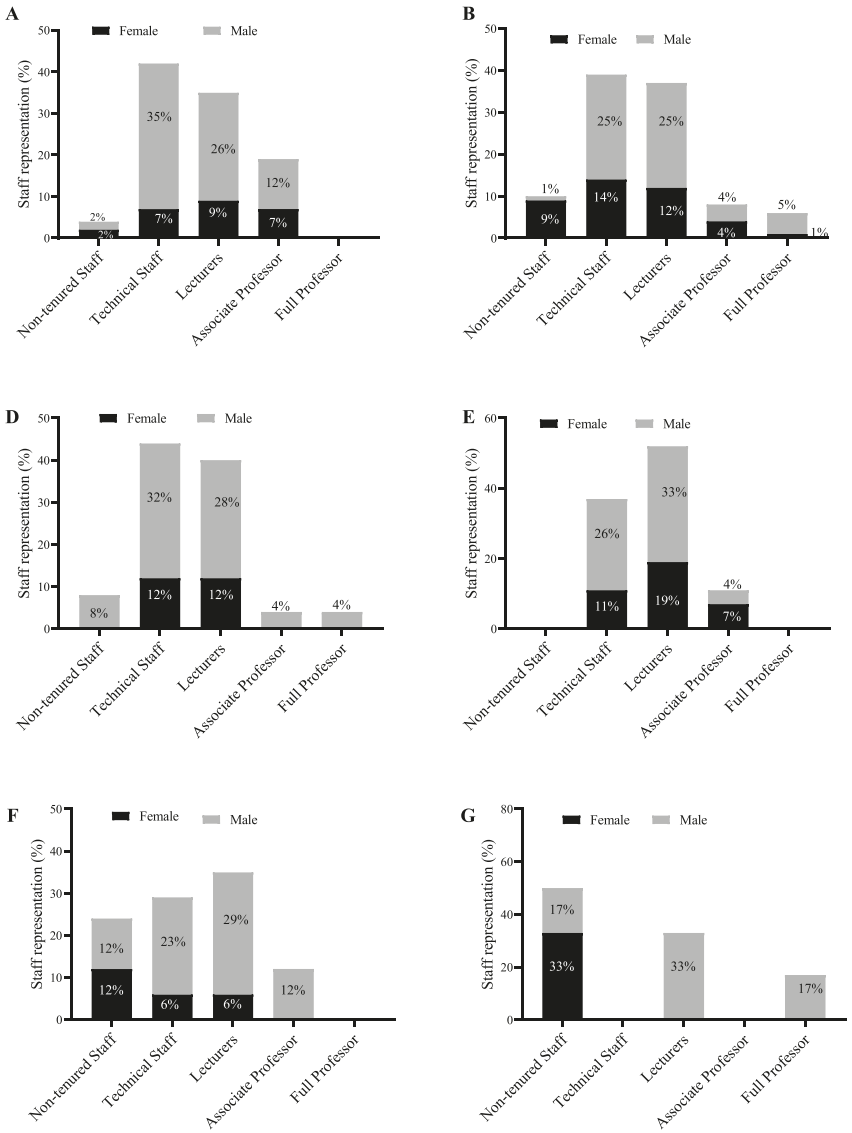

Fig. 3. Gender representation in five academic positions in six selected public universities (A, B, D, E, F and G, excluding C), No. of female staff = 58 and No. of male staff = 123 (Each graph adds to 100%).

most gender-sensitive policies. The National Gender Policy in Education [56] addresses gender disparities through six thematic areas: access; equity; quality of education; safety and gender-based violence; nurturing and mentoring; and governance and management, which were used to assess the universities' commitments to national recommendations. There were differences established between these policies in that some of the university policies tended to be more transformative than others, especially in enhancing the participation of female staff and students. The GIC analysis revealed that most policy provisions were gender-neutral, with only a few being gender-specific such as the use of affirmative action and mentoring, both identified as necessary by Onsongo [53] and Onsare [50].

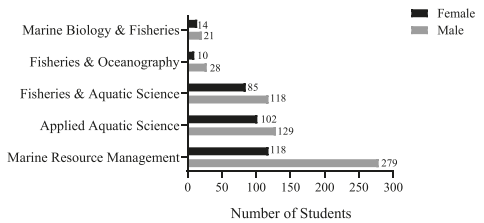

Fig. 4. Students in marine and aquatic courses offered in the selected public universities between 2010 and 2019 (n = 904).

The effectiveness of the institutional policies was evaluated using gender-disaggregated data of the staff and students collected from university registries at the departmental level. The results exposed the gender disparities in management, academic levels and student enrolment despite having gender policies, focal points, centres and institutes dealing with gender issues in all the universities.

4.2. Relationship between gender policies and female staff representation in management

Female representation in governance was relatively low in all the universities, and in some cases, there was not a single woman in a senior post. Nevertheless, some universities performed well, with women as Chancellor, Vice-Chancellor and departmental heads, and there was a considerable representation of women in two universities' councils. However, the presence of women in management positions did not seem to influence the gender balance of staff appointments. Interestingly, the universities with better gender policies did not appear to perform any better on gender equality than those without policies. For example, University A had no women in three of its top management positions: Chancellor, Vice-chancellor and departmental head, and fewer females in the university council despite having the best gender policy. The underrepresentation arguably reflects a lack of implementation and enforcement of the existing policies to ensure equal recruitment and appointments of leadership positions at the university and the need for further exploration [62]. The council plays a crucial role in universities: employing staff, approving university policies, appointing executive board members and deciding who manages the university. Gender equal membership is fundamental for the fair selection and recruitment of staff at all levels and practical implementation of the policies. More interestingly, University G, which did not have its policy publicly available, did have a higher proportion of women in the council compared to others with policies, which warrants further investigation to explore the reasons behind this performance.

Even though this study found the representation of women in management positions to be generally low, there was an improvement compared to 2002, when no woman held a Vice Chancellor position [51], and only one woman was head of a science-related department. Amondi [2] recorded similar findings in Kenya, with fewer women represented in top educational management positions (33.3%) than their male counterparts. Factors that these and other studies have argued hinder women's participation in senior positions included the criteria for appointing and recruiting staff, such as administrative experience; composition of committees responsible for appointments;

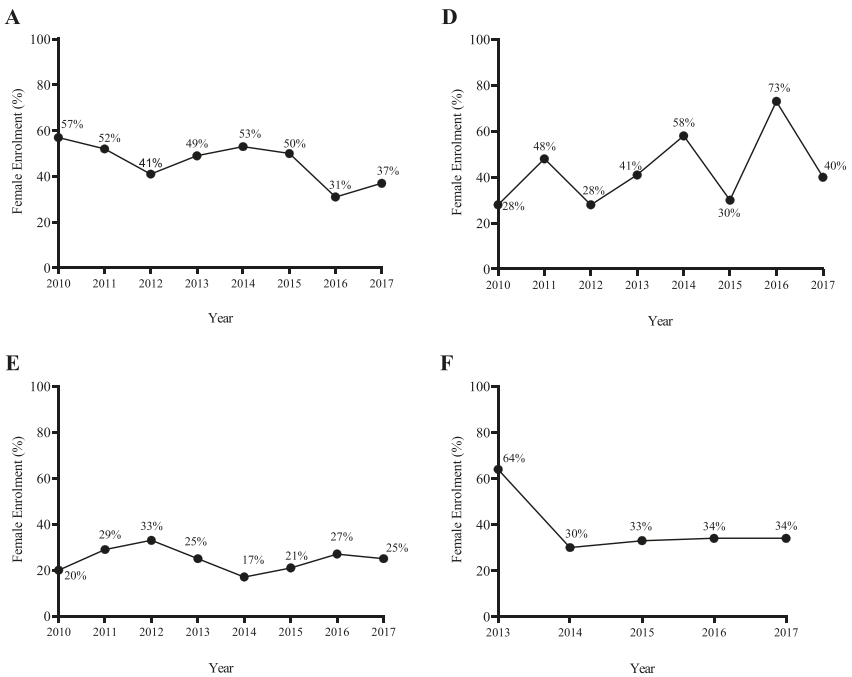

Fig. 5. Enrolment of undergraduate female students in the five selected public universities over time (University G was excluded from the graphical presentation because the data provided was incomplete).

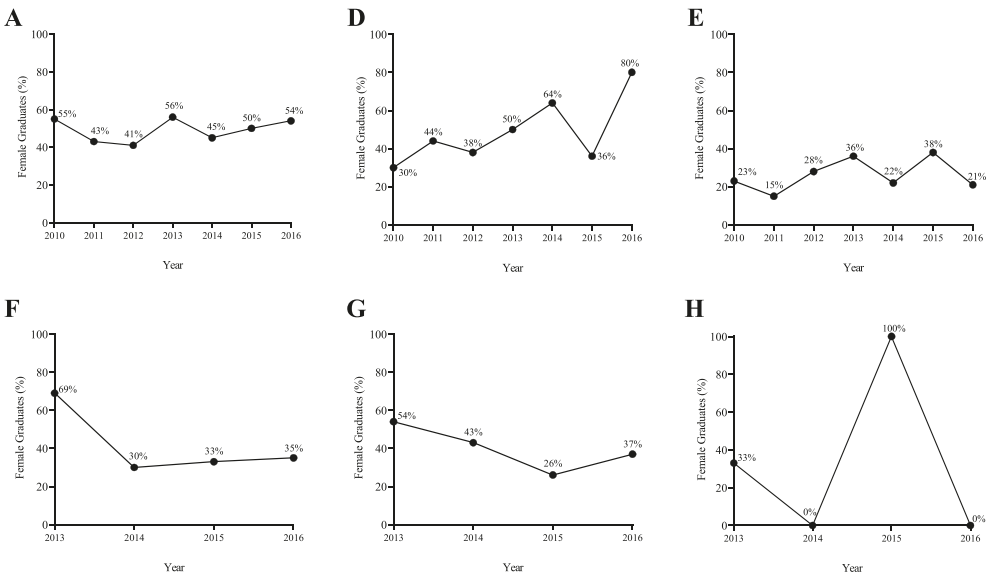

Fig. 6. Temporal variations of the graduated female students in the six public universities.

Table 6
Enrolment status of MSc and PhD students between 2010 and 2019 in public universities.

University	MSc Total students enrolled	MSc Female students enrolled (%)	PhD Total students enrolled	PhD Female students enrolled (%)
A	34	18%	0	0
B	13	31%	14	29%
D	21	57%	6	33%
E	8	25%	2	100%
F	6	50%	0	0
G	23	35%	1	100%
H	–	–	–	–

*Note: Dash (-) shows no data provided.

and a predominantly patriarchal society with long-standing cultural beliefs that view women as incapable of holding public offices [12,20,47,51,55]. Onsongo noted that gender, networks, ethnicity and political affiliations also play a crucial role in Kenyan universities' recruitment and promotion process.

4.3. Relationship between gender policies and female academic staff representation

Recruitment and progression to different positions among academic staff depicted some gender gaps, with more women found in junior positions than senior ones. In this study, most women were in non-tenured and technical positions or part-time lecturers, tutorial fellows, teaching assistants and laboratory technicians/technologists. Again there were mismatches between the best policies and the proportions of women staff as shown in Universities A, D and E except University B, which had more women staff and the second-best gender policy.

According to this study, women still lag in almost all the essential fora in the universities. Similarly, a persistent low representation of women in various academic ranks was reported by Malelu et al. [36], with 40% of Tutorial fellows, 35% of Lecturers, 32% of Associate Professors and 8% of Full professors between 1999 and 2013 in a Kenyan public university. These results conformed with those of Mukhwana et al. [46] who reported underrepresentation of women among academic staff in Kenyan universities.

Non-tenured positions often disadvantage women and exacerbate their level of vulnerability. According to the International Labour Organization [29], non-tenured forms of employment such as part-time contracts and casual employment opportunities are preferred as a matter of necessity by some women because of their benefits associated with flexible working hours. However, these kinds of jobs deepen the segmentation in the labour market. Besides, most part-time workers are often prone to job insecurity and inferiority and lack full access to social protection like healthcare, leave provisions and pension benefits [29]; [26,30,73]. Moreover, workers in this category often lack access to training opportunities and earn lower wages, placing them at higher risks of losing their jobs and falling into poverty. Therefore, legal and institutional frameworks for promoting gender equality in universities urgently need to prevent discrimination [68,78]).

4.4. Relationship between gender policies and female student enrolment and graduation rates

On average, enrolment of female students in ocean science-related courses was found to be lower than the males in most universities with weak or no policies. There was a positive relationship between the best policy and the percentage of enrolled female students in University A, which had a consistent average enrolment of 49% over ten years. This showed consistencies with its policy provisions compared to other universities with low-ranked policies. This better performance can arguably be due to the effective implementation of the gender-specific provisions that promoted female access to higher education. Not all universities provided enrolment data; some universities took a long time to gather gender-disaggregated data suggesting poor or irregular record keeping. The transition from undergraduate to postgraduate studies was less than

10%, with female students recording the lowest proportion of students in master's and PhD degrees. This low transition rate can possibly be due to the lack of access to financial resources required to pay tuition fee and research; hence prefer studying abroad [15,27].

5. Conclusions

Sufficient data has been collected to establish that gender equality in ocean science and higher education in Kenya is problematic. Most of the public universities that participated in this research had gender policies, although these were outdated and had not been reviewed. Better gender policies did not necessarily translate to better gender balance, as evidenced by the consistent underrepresentation of women as students, academic staff and decision-makers over the years. Simply having gender policies is insufficient, but alignment to the national and international strategies, such as the UN Decade of Ocean Science for Sustainable Development, as well as monitoring and evaluation to facilitate a policy review process, may help improve the situation. Further research will be needed to understand the barriers hindering women's participation in ocean science in higher education. In particular, qualitative analysis will be needed to explore the reasons for the lack of progress on gender equality. It will be necessary to understand how institutional gender policies are understood and implemented (or not) and the experiences of women staff in ocean science and higher education in Kenya.

Declaration of Competing Interest

None.

Data availability

Data will be made available on request.

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Paper 2

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Status of gender equality in ocean research, conservation and management institutions and organisations in Kenya

RA Ojwala

WMU–Sasakawa Global Ocean Institute, World Maritime University, Malmö, Sweden
Corresponding author, e-mail: w1904051@wmu.se; renisauma@gmail.com

Gender equality is key to achieving the objectives of the United Nation's Decade of Ocean Science for Sustainable Development. In patriarchal societies, men's dominance has long overshadowed women's participation in science-related fields, including ocean science. The lack of gender-disaggregated data in ocean science has made it difficult to establish the extent of gender bias across institutions and at all levels. Providing baseline data can help to address the difficulty of women accessing employment opportunities in managing coastal and marine resources. This study aims to fill the gap in gender data in ocean science in Kenya by presenting a case study on gender ratios of ocean science professionals in Kenyan research institutions. Data on the gender composition of staff were collected from a range of local to international ocean research, conservation and management organisations situated in Kenya. The results show fewer women were represented in government agencies than in nongovernmental organisations (NGOs) and intergovernmental organisations (IGOs). There was also an underrepresentation of women in senior positions, with only two out of nine directors in government agencies being women. The majority of women occupied junior positions. Further research through in-depth interviews will be needed to establish the reasons for the disparities in representation and career advancement.

Keywords: baseline study, East Africa, gender-disaggregated data, gender inequality, hierarchies, ocean science institutions, senior positions, sustainable development

Introduction

The oceans provide essential ecosystem goods and services to human beings and societies, and their use needs to be sustainably managed if they are to provide for future generations (Francis and Bryceson 2001; Barbier 2017; Kaluza et al. 2018; Virto 2018; Brodie Rudolph et al. 2020). To a large extent, the responsibility for ocean governance and management lies with governmental and intergovernmental organisations and, to a lesser extent, nongovernmental organisations and coastal communities (Boesch 1999; Hoel et al. 2005; Cho 2006; Kibiwot 2008; Haas et al. 2022). Gender equality needs to be a policy priority for such organisations and is considered essential for the sustainable use of marine resources and effective ocean governance (Gissi et al. 2018; Michalena et al. 2020; Sun et al. 2021).

Coastal management often fails if there is inadequate engagement with the stakeholders, especially if those excluded are predominantly women (Diamond et al. 2003; Kibiwot 2008; Brugere 2014; Gissi et al. 2018). While women and men may play differentiated roles in different workspaces, the contributions of women to research, policy and governance regarding marine resources are often unnoticed even though they are the primary users and influencers of marine ecosystems through pursuit of their livelihoods across countries in the Global South, especially in the African context (Fröcklin 2014; Michalena et al. 2020; Giakoumi et al. 2021). For example, women play an essential role in mangrove regeneration and fisheries management in many developing countries, including Kenya[1] and Cambodia[2] (FAO 2015; King and Cordero 2015; Harper et al. 2017; IUCN 2017; UN Women 2018a; OECD 2022).

In fisheries, as fish traders and processors, women comprise over 90% of those involved in post-harvesting activities (Harper et al. 2013; Matsue et al. 2014; Shah and Bukhari 2019; Siles et al. 2019), and there may be more subtle influences both at the community and household levels (Gissi et al. 2018). However, women are underrepresented in fish harvesting and seagoing research activities (Johannesen et al. 2022), and their contribution to fisheries and marine management is often overlooked in statistical summaries and reports (Allison and Mvula 2002; Kleiber et al. 2015; Biswas 2017). Indeed, women tend to be restricted from engaging actively in science-related academic programmes, seagoing research undertakings and decision-making processes, and are more likely to occupy junior positions in ocean management (Kitada and Langåker 2016; Zhao et al. 2017; Gissi et al. 2018; Arulnayagam 2020; Johannesen et al. 2022; Ojwala et al. 2022). Other studies have also highlighted the persistent gender bias in marine science and the challenges inhibiting women's participation in ocean management and

[1]See https://www.nature.org/en-us/about-us/where-we-work/africa/stories-in-africa/women-kenya-mangrove-forest
[2]See https://www.oneearth.org/women-are-leading-the-charge-rewilding-mangroves-in-cambodia

career progress both in developed and developing countries (Fröcklin 2014; De la Torre-Castro et al. 2017; Giakoumi et al. 2021; Shellock et al. 2022a, 2022b).

Oceans are increasingly threatened by human activities, with marine pollution, global warming and overfishing negatively affecting ocean health around the world. The United Nations adopted the Sustainable Development Goals (SDGs) in 2015 as the 2030 Agenda for Sustainable Development to provide a universal call to action to protect the planet and improve livelihoods (United Nations 2015, 2022). One of these goals is SDG 14: 'Life below water', which aims to "conserve and sustainably use the oceans, sea and marine resources" and is concerned about the health of the ocean. Even though the SDGs advocate for inclusive involvement of all stakeholders in environmental action as defined by the slogan 'Leaving no one behind', SDG 14 remains gender blind without any gender-specific indicators in its targets. Addressing the nexus between gender and ocean health is therefore key in advancing towards equitable, fairer and more-sustainable use of the ocean. To enhance the implementation of SDG 14, a 10-year plan (2021–2030), called the UN Decade of Ocean Science (hereinafter the Ocean Decade), was adopted by the Intergovernmental Oceanographic Commission of UNESCO (IOC-UNESCO) to generate knowledge and innovative solutions to reverse the decline in ocean health. Although SDG 14 does not reference gender, the Ocean Decade is committed to achieving gender equality in ocean science and provides the opportunity to accelerate efforts towards ocean sustainability.

SDG 5: 'Gender equality' aims to provide equal opportunities for both women and men to, *inter alia*, participate in ocean research and management, and accelerate progress towards a more equitable and sustainable ocean for all (Ojwala et al. 2022). Gender equality, therefore, should be mainstreamed into all international development programmes. However, a lack of gender-disaggregated data masks the true extent of gender inequality in many programmes and institutions. Gender-disaggregated baseline data are crucial for understanding the gaps and help to keep track of and enhance progress in promoting gender equality. Additionally, they can provide a way forward to acknowledge and recognise the substantial roles and contributions of women in ocean science and the benefits that gender equality brings to organisations. Without the systematic collection of gender-disaggregated data, there will be no way to assess whether programmes like the UN Decade of Ocean Science have succeeded in delivering their promise of gender equality.

Historically, women have been underrepresented in science-related jobs, including marine management and fisheries in developing countries, such as Kenya (Agarwal 2001, 2010; Todes et al. 2010; Hicks 2011; Gillanders and Heupel 2019). In fisheries, for example, women are typically limited to nearshore activities using small handnets, which have lower income returns than the activities usually undertaken by men (WorldFish 2010, 2016; FAO 2015). This gender bias against women stems from cultural and superstitious beliefs that women on board research and fishing vessels represent a bad omen or taboo, which hinders their participation in offshore activities (Aloo et al. 2000; Medard et al. 2002; Lwenya et al. 2006; Geheb et al. 2008; CISP 2018; Nunan and Cepić 2020). There are also deeply rooted cultural norms and distinct gender roles across many cultures, including in Kenya, that recognise women as caregivers rather than as ocean professionals or managers of natural resources (Matsue et al. 2014; CISP 2018; Muigua 2018a; Owuor et al. 2019; Murunga 2021). Such cultures and norms are not only unfair but also stand in the way of innovative and creative ideas, diverse perspectives and novel solutions that are needed for successful ocean management (Kleiber et al. 2015; DFO 2020; Sun et al. 2021).

Promoting gender equality by eliminating gender biases in ocean science institutions is a crucial contribution to efforts in ocean conservation, protection and governance systems (Ojwala et al. 2022). Consistent efforts are needed to address the various challenges that prevent women from accessing ocean science-related jobs, including gender bias, stereotypes, harmful gender norms, lack of role models, lower wages, sexual harassment, and discrimination in workplaces (Orcutt and Cetinić 2014; Arulnayagam 2020; O'Connell and McKinnon 2021). If we are to be in a position to evaluate the impact of such initiatives, it is vital to assess the extent to which women actively participate in ocean research, management and governance. For this, there is a need to collect gender-disaggregated data so that an accurate scale of underrepresentation and the actual contribution of women to ocean sustainability can be presented.

In Kenya, resource governance, including that pertaining to ocean resources, has been devolved to county levels as enshrined in the 2010 Constitution: "The Constitution establishes national values, rules and principles that facilitate the realisation of equality and inclusiveness in governance which include establishing mechanisms that ensure fairness in sharing of national resources and devolution of governance to county levels" (Ruwa 2011, p 11). National and county governments are distinct but interdependent and conduct their mutual relations on the basis of consultation and cooperation (Government of Kenya 2010). Thus, the purpose of devolution is to ensure inclusive citizenship in the formulation and implementation of public policy and to enhance grassroots participation in decision-making to avoid marginalisation. This should include promoting the democratic and accountable exercise of power and fostering national unity by recognising diversity and protecting and promoting the interests and rights of minorities and marginalised communities (Ruwa 2011; Muigua 2018b). The county government is, therefore, responsible for implementing policies under its jurisdiction.

According to Odido (1998), there is no single institution responsible for all aspects of marine affairs or resources in Kenya. Many institutions have been created to oversee and deal with specific aspects of ocean-related projects and programmes to facilitate adaptive management and achieve sustainable oceans (Odido 1998; Kibiwot 2008). These institutions operate at county (local), national, regional and even international levels, and they include government institutions and other relevant organisations that address legal, policy and institutional arrangements,

such as nongovernmental organisations (NGOs) and intergovernmental organisations (IGOs) (Ruwa 2011). The governance systems are mandated to carry out activities such as education, research, conservation, restoration and management. The government institutions with a mandate for ocean resources management include the Fisheries Department, Coast Development Authority and Kenya Wildlife Service, whereas research institutions and universities together with NGOs and IGOs provide synergy or collaborate in ocean management in Kenya.

As the ocean plays a critical role in the Kenyan economy and climate, ocean governance has always received much attention. Collaborative efforts to achieve sustainable oceans led to the development of UNEP's Regional Seas Programme, known as the Nairobi Convention,[3] which implements regional action plans at national levels based on global strategy (Kibiwot 2008). However, the concerted efforts and strategies to address the growing problems of overfishing, acidification, marine litter and plastic pollution, among others, in the oceans have shown minimal progress. Some of the reasons for this include the lack of an integrated approach in mapping ocean resources, ineffective implementation of policies and a lack of diversity and equality in management. To address these issues the governance mechanism must be inclusive and integrated horizontally (across departments, disciplines and specialised agencies both in public and private sectors) and vertically (across local, national, regional and international levels). Therefore, there is an urgent need to address inequalities in ocean governance, to address exclusion of women in ocean spaces at both local and national levels, and to reverse declining ocean health that is causing a massive loss of marine biodiversity.

To address issues of gender inequality, Kenya has ratified international legal frameworks on gender equality including the Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW) and the Beijing Declaration and the Platform for Action, which guided the formulation of national gender policy of the Ministry of Gender and partly the Kenyan Constitution. The Consitution and national gender policies have been adopted by a number of institutions to inform their gender equality and sexual-harassment policies. The establishment and implementation of gender-related policies at institutional levels, however, have faced several changes, including a lack of human and financial resources (Onsongo 2009; Ojwala et al. 2022).

This study focused on the non-academic ocean research and management community in Kenya, which comprises governmental, nongovernmental and intergovernmental organisations. Kenya has developed national and institutional gender policies, including the Kenya National Policy on Gender and Development (NPGD) 2000, revised in 2019 to incorporate the recommendations outlined by the 2010 Constitution of Kenya, which introduced the 'Two-thirds gender principle' to help accelerate the achievement of equality in all institutions. This principle is one of the affirmative actions enshrined in the Constitution in Article 27 (8) and it states that "not more than two-thirds (66.67%) of any elective or appointive position in the government of Kenya shall be of the same gender". However, no study has yet been conducted to investigate the gender representation of women and men staff as well as their distribution at different hierarchies (ranks) in ocean science institutions in Kenya. Thus, the present study investigated the gender ratios of staff in government agencies, NGOs and IGOs. The objectives were to determine the ratios of women and men among staff in ocean science professions in Kenya and to investigate how gender ratios vary across the different ocean science institutions and at different career levels. The overall goal was to create baseline data from which progress can be measured and to facilitate openness and transparency in ocean science staffing.

Materials and methods

Case study

The study was conducted in Kenya from June to October 2021. Kenya was selected because of its active participation in ocean-related initiatives (Obura 2020) such as the Ocean Decade, under which it co-hosted the UN Ocean Conference with the Government of Portugal in Lisbon in 2022. Kenya's commitment to sustainable use and management of the ocean can also be traced back to 2018 when it hosted the inaugural Sustainable Blue Economy Conference, considered the African historical event to fast-track marine environmental protection (KMFRI 2018; Muigua 2018a; Bennett et al. 2019). This initiative reflected the importance of the ocean to the Kenyan economy, particularly in the fisheries and tourism sectors (CISP 2018). Several institutions in Kenya work together to ensure that the ocean's health is restored and maintained through collaborations and partnerships. According to Odido (1998), no specialised agency is mandated to conserve and manage the ocean in the country, which partly explains why there are many institutions in the Western Indian Ocean region. Kenya needs equitable and integrated ocean management to successfully implement the Ocean Decade, involving all the institutions and stakeholders, and women and men alike. Having a successful management regime in the marine environment depends on identifying and understanding different stakeholders, expectations and interests (Pomeroy and Douvere 2008). The ocean science institutions have demonstrated attempts to reverse degraded ocean ecosystems because their mandates align with the seven overarching societal goals of the Ocean Decade (Ryabinin et al. 2019).

This study was carried out in 19 ocean science institutions in Kenya, which were identified through criteria based on each institution's work to conserve, protect, study and manage coastal and ocean resources in Kenya (Figure 1). These institutions included: five county government agencies, four national government agencies, seven NGOs and three IGOs. They were selected using purposive sampling methods based on their mandates and contributions towards the Ocean Decade goals and their roles in ocean management and governance (Barahona-Fuentes et al. 2020).

[3]See https://www.nairobiconvention.org/kenya-country-profile/marine-and-coastal-resources-governance-kenya-country-profile

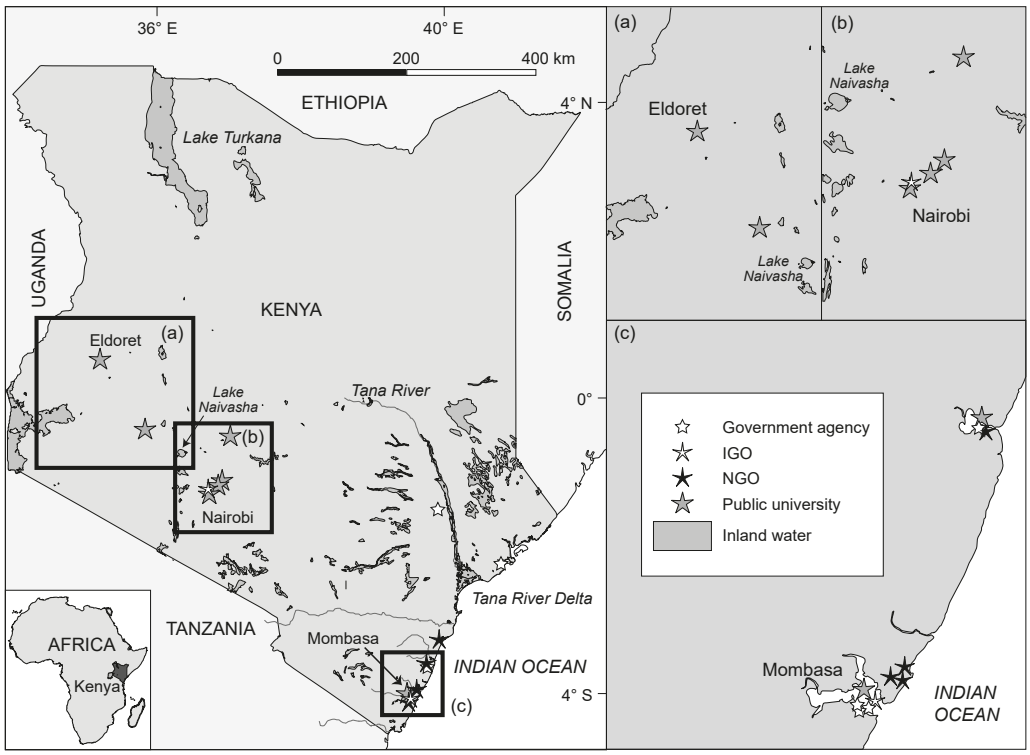

Figure 1: Locations of the selected ocean science institutions in Kenya included in this study

Data collection and analysis

The fieldwork gathered numerical data on staff composition by gender, with the help of the human resource personnel in the IGOs, NGOs and government agencies. The names of the institutions were anonymised using codes to ensure confidentiality. The World Maritime University's Research Ethics Committee (Sweden) and the National Commission for Science, Technology and Innovation (NACOSTI) (Kenya) approved the study procedures before data collection. Primary data on staff representation were analysed quantitatively through descriptive statistics, such as the frequency distribution of ocean staff, means and percentages, using SPSS 22.0. Percentages were used to compare staff distribution by gender and position across the institutions.

Results

Status of gender equality in the selected ocean science institutions

Overall, data obtained from ocean science institutions in Kenya regarding staff representation by gender and position (rank) demonstrated a clear pattern and persistent bias in all institutions. In Figure 2, the percentages clearly

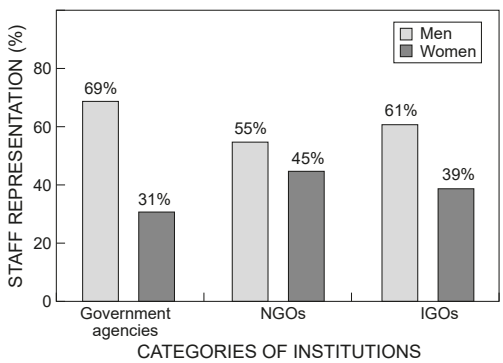

Figure 2: Representation of women and men staff in ocean science institutions in Kenya, June–October 2021. Numbers of participating institutions (staff included): government agencies = 9 (904); NGOs = 7 (69); IGOs = 3 (180)

indicate that women's representation was lower in all three categories of organisation studied as compared with their male counterparts. However, the proportions were inconsistent across the institutions. The government agencies (31% women) were slightly below the minimum threshold of 33.33% set by the Kenyan Constitution, whereas the other two groups exceeded this threshold: NGOs had 45% women and IGOs 39%.

Representation of women in government agencies

The percentages of women in government agencies provided the most marked example of the gender gap, with the lowest or barely compliant representation of women in most institutions in this category. The institutions surveyed were anonymised using codes that distinguished county from national institutions: those from counties start with 'C' and national institutions start with 'N'. There was no apparent difference in women's representation between county and national agencies. The findings showed that the average representation of women in county institutions was lower (32%) than that of men (68%). Similar findings were recorded in national institutions with an average representation of 30% women and 70% men. Figure 3 illustrates the variation in representation of women between individual county and national institutions.

Another measure of gender equality is the representation of women in the hierarchy of an organisation. In this study, this was quantified across individual organisations in county and national government institutions (Figure 4). The figures indicate that women were more likely than men to be underrepresented at all the levels of the hierarchy, with less than 33% in each position in national government institutions (Figure 4b) compared with the county government institutions which exhibited better representation of women above the threshold in two positions (director and technical staff). Fewer women were observed in the more senior positions, such as director and assistant director, which is similar to findings in ocean science in other countries (Thompson et al. 2011; Huyer 2015) that showed the higher the rank, the lower the proportion of women, especially in decision-making and leadership positions. Women are more likely to occupy junior positions, such as support staff and technical staff positions. The individual government institutions were analysed to investigate how well the women staff were represented. Among the five county government institutions, women were more concentrated in junior or technical positions, with two women filling five of the director positions (Figure 4a). In addition, there was no government agency that had an institutional gender policy. Some of the institutions' gender focal points—the head or director of gender centres that are mandated to monitor and report on gender equality aspects in the institutions[4,5]—mentioned that their gender policies were still in draft format and awaiting senate approval. This finding shows that to date the adoption and implementation of the national gender policy has not been widely disseminated, even 10 years after its formulation.

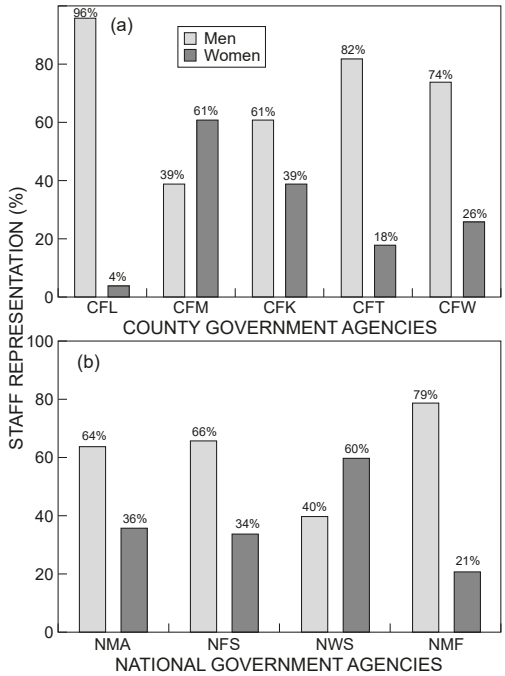

Figure 3: Gender representation among ocean science professionals in (a) county and (b) national government institutions in Kenya (county agencies: n = 151; national agencies: n = 753). Institution names are encoded for anonymity

Representation of women in NGOs

NGOs appear to have performed better in staff gender balance than government agencies and IGOs. Like government agencies, the NGOs surveyed were also anonymised with codes derived from their names. The findings showed that three out of the seven NGOs studied had better representation of women staff than governmental and intergovernmental organisations. These organisations were COD, OCS and COM, with the highest percentage of women recorded in COD and the other two having representation of 50% each. Despite lower numbers than COD, OCS and COM, all but one (COB) of the remaining four NGOs had 30% or more women constituting their workforce. These percentages were above the averages for most government agencies (Figure 5).

A further assessment of the overall representation of women staff in NGOs was also done for the hierarchical rankings. The results showed that the gender gap is smaller at the junior positions such as technical staff than at the

[4]See https://www.unwomen.org/en/how-we-work/gender-parity-in-the-united-nations/focal-points-for-women

[5]See http://gender-chemicals.org/what-is-a-gender-focal-point: "The Gender Focal Points role is advocating for increased attention to and integration of gender equality and women's empowerment in the agency's policy and programming."

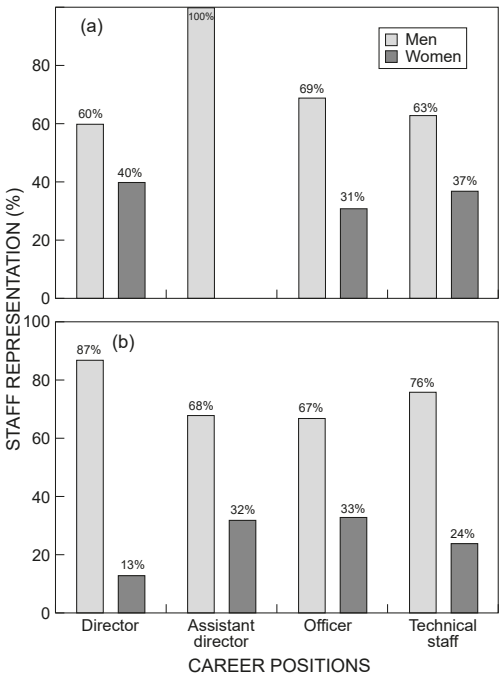

Figure 4: Staff composition by gender and position in (a) county and (b) national government agencies dealing with ocean science in Kenya (*n* = 904: 627 men, 277 women)

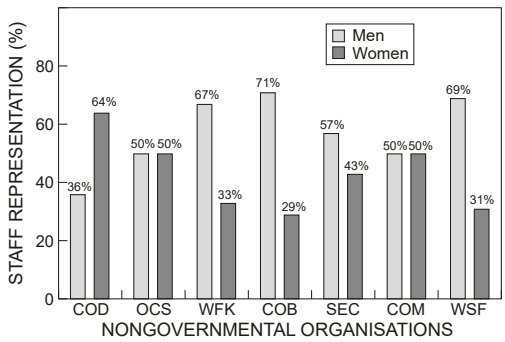

Figure 5: Gender representation among ocean science professionals in nongovernmental organisations in Kenya (*n* = 69: 38 men, 31 women)

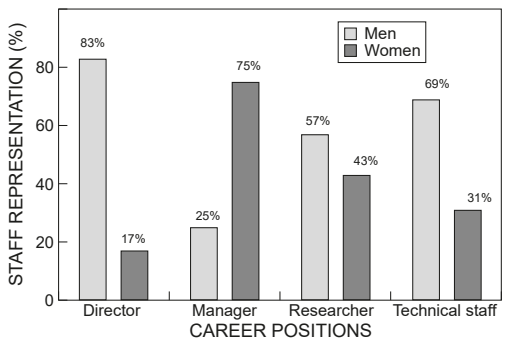

Figure 6: Representation of staff by gender and position in nongovernmental organisations dealing with ocean science in Kenya (*n* = 69: 38 men, 31 women)

senior ones, like director or manager. While women were well represented in the category of manager as compared with men, this was an anomaly, as their numbers were less in all other positions. The widest gap was at the director level—the most-senior leadership position in all the NGOs investigated, where the survey results found almost five-times fewer female directors than male directors (Figure 6).

Further analysis of each NGO by gender and position suggested that more than half of the institutions were missing women in one or more positions, such as manager and researcher. For example, one of the conservation NGOs (anonymised as WFK) had a woman director yet no women in other positions in the organisation. Notably, only COD had women distributed in all five professions/career positions reviewed in this study, and atypically these women were in greater numbers than men.

Of the seven NGOs assessed, only one NGO (WFK) had an institutional gender-equality policy. However, this policy document had largely gender-neutral strategies that did not address specific barriers that hinder women's access to employment opportunities as well as fair recruitment processes. Studies have revealed that funding mandates have helped to shape the increase in women's representation in NGOs based on the donors' requirements. Most donors, such as the World Bank,[6] Government of Canada[7] and Global Environment Facility (GEF) in Kenya, allow strategic opportunities to be leveraged to address gender gaps critical to the achievement of global environmental (ocean) benefits (GEF 2017).

Representation of women in IGOs

An assessment of the representation of women in IGOs in Kenya yielded mixed results. One of the three IGOs (IWO) had representation of women of greater than parity, followed by another (INO) close to parity, and one that recorded the lowest percentage (IFO), but that was also above the threshold deemed acceptable by the Kenyan Constitution (Figure 7). Based on the staff distribution by gender in each of the three

[6]See https://www.worldbank.org/en/topic/gender/overview

[7]See https://www.international.gc.ca/gac-amc/campaign-campagne/gender_equality egalite_des_genres/what_we_heard-que_nous_entendu.aspx?lang=eng

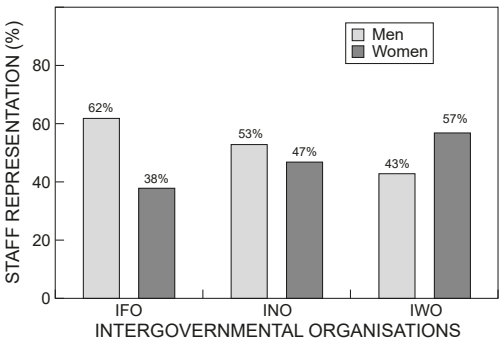

Figure 7: Gender representation among ocean science professionals at three intergovernmental organisations in Kenya (*n* = 180: 109 men, 71 women)

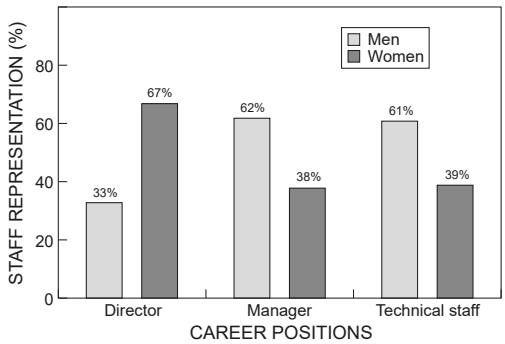

Figure 8: Staff representation by gender and position in intergovernmental organisations dealing with ocean science in Kenya (*n* = 180: 109 men, 71 women)

IGOs, there was a better ratio of women to men as compared with either the government institutions or the NGOs.

Unlike other organisations, the IGOs had women represented in all the positions; however, the majority were recorded in junior positions (Figure 8). Remarkably, two of the three directors of IGOs in Kenya were women, although men were in the majority across all the managerial positions in all three IGOs.

A deeper analysis on positions by gender in each of the three IGOs showed that women were represented in almost all positions in the organisations studied. Women were more likely to be employed in technical staff positions than in management positions. Notably, two of the three organisations (IWO and IFO) had institutional gender policies, although the existence of these policies did not always translate to gender equality, and INO, with no such policy, had a better gender balance than IFO.

Discussion

The underrepresentation of women in ocean science indicates the need to continue to raise awareness and build capacity to understand and address the problem. However, this is only possible if gender gaps are identified and quantified. This study addresses the context of ocean governance in non-academic institutions and provides baseline gender-disaggregated data, which were previously unavailable. These data can be used to evaluate gender inequalities in ocean science disciplines, institutions and hierarchies in Kenya. Such data are essential when evaluating or considering whether gender policies and gender-sensitive approaches in ocean science and governance are achieving success. The data reveal gender gaps in ocean science across institutions, ranging from local to international organisations, despite the existence of a national gender policy, and in some instances the existence of institutional policies and other initiatives to promote gender equality, such as gender centres or gender focal points within the institutions.

The results reveal consistent patterns, where women in the three categories of institution in ocean governance in Kenya were fewer than men. The average employment ratio of women to men was 38% to 62%. This is similar to the global average of women in ocean science reported by the IOC-UNESCO in the 2020 global gender gap report (IOC-UNESCO 2020), as well as the findings of previous studies that highlighted the low representation of women in science-related fields (e.g. Huyer 2015; Mackenzie 2015; Wallet 2015; UNESCO 2021). The findings conform with those of Huyer (2015) who pointed out that women were underrepresented in natural science professions in South Africa in 2006, accounting for only 16% of the employees. Huyer (2015) highlighted that women's participation is likely to decrease at every step of the career ladder in scientific research and decisionmaking positions at the highest echelons. Ojwala et al. (2022) also found that women academic staff in ocean science-related programmes were more likely to occupy non-tenured positions in public universities in Kenya, at 60%. Shaw and Stanton (2012) also noted an ongoing gender imbalance in academia through career transitions from junior to senior positions.

This study indicates varied performance in terms of staff representation by gender in the three categories of institution, but women were nevertheless underrepresented in all of them. NGOs and IGOs performed better—with close to 50% representation of both genders—than government institutions, which was well above the threshold of 33.33% enshrined in the Kenyan Constitution. These findings may be attributed to the fact that both NGOs and IGOs are viewed as being more flexible, participatory and open to change and innovation (Srivastava and Austin 2012). NGOs participate in advocacy programmes, such as influencing policies and conducting issue-based campaigns; in developmental programmes, such as increasing the capacity of the community to address its own basic needs; and in promoting economic empowerment of women through providing access to microfinance and improving the health and education of women in developing countries. Also, NGOs have been at the forefront of documenting discrimination against women from the viewpoint of

women's rights as human rights, and promoting the need for a gender-sensitive approach in all sectors (Streeten 1997), especially in science education, as well as exposing violence against women (Handy et al. 2007). Moreover, government and donor agencies have increasingly relied on local NGOs in developing countries owing to their proximity to grassroots communities and profound insight into women's concerns (Mehra 1997). Since most of these NGOs have been funded by international development organisations, such as the GEF and World Bank, with stricter gender equality requirements than stipulated by nationally funded ones, the NGOs surveyed were more likely to adhere to their requirements to qualify for a research grant or for funds, and this has shaped the representation of women among the staff in NGOs (GEF 2017). Even though NGOs tend to have some advantages that attract women, they have been identified as insecure workplaces because they often depend on short-term projects and are prone to end because of the lack of fund availability (ILO 2012, 2016). Hence, jobs are usually contractual, with some having non-renewable contracts. As a result, staff lack social protection in the workplace. These factors can be disadvantageous to all employees and the majority in this case are women.

Women's representation (31%) in government agencies did not meet the threshold of 33.33%, unlike in NGOs and IGOs. However, conformity with the threshold set in the constitution does not necessarily mean adequate representation of women. The reason for this is that the majority of women were found to occupy junior positions or entry-level positions that do not allow them to participate and engage fully in research and management of the ocean. The general conclusion from the data is that, across the board, institutions need to improve the gender balance both in senior and junior positions, as men overwhelmingly occupy these positions currently. This type of bias appears to be part of the tradition in most government agencies in Kenya and corresponds with similar findings of a study of ocean science programmes in public universities in Kenya (Ojwala et al. 2022). Kenya's public universities recorded a percentage of 32% women to 68% men as academic staff in the departments offering ocean science courses. In combination, these findings provide clear evidence of the difference in performance of the government-affiliated organisations compared with the private ones. Moreover, previous studies have noted that institutions associated with government tend to have many challenges that exclude women from the ocean science fields, including lack of institutional gender policies, inadequate support and training opportunities, and gender stereotypes. These result in fewer women leaders, as well as a lack of mentorship programmes (Onsongo 2006).

Another key finding of the present study was that, in addition to inequality in staff composition by gender in various institutions, gender biases were also found in the hierarchies of each of these institutions. The study established that women were generally fewer in most management or senior positions, except in some IGOs. Gender-biased occupational segregation can possibly be ascribed either to demanding institutional promotion guidelines, including extensive educational qualifications, publications, the number of postgraduate students supervised and research funds attracted to the university, or to the lower numbers of female students taking up university ocean science courses (Ojwala et al. 2022). All these prerequisites of higher level management positions are more likely to favour men than their women counterparts, who are more likely assumed to have additional responsibilities such as caring roles, resulting in work-family conflicts (Buckingham 2020; UN Women and ILO 2021). Therefore, it is recommended that the ocean science institutions carry out regular gender analyses to keep track of representation and avoid unconscious biases that may arise when women are excluded from decision-making positions and ocean management plans.

With regard to ocean governance, even if women are represented in equal proportions, if their representation is not felt and their voice not heard,[8] this does not constitute equality (Agarwal 2010; UN Women 2014; Djerf-Pierre and Edström 2020). These inequalities limit the participation, decisionmaking and voice of women in ocean management and governance negotiations, projects and policies (GEF 2017; UN Women 2018b). According to the European Institute for Gender Equality (EIGE 2016, p 16), "gender equality is not only about complying with legal requirements or individual cases, but also sheds light on working conditions and career path." It matters for all categories of staff beyond traditional distinctions between permanent and non-permanent staff. Within this context, these findings call for in-depth qualitative research to determine the reasons why there has been slow, no, or very little progress in achieving gender equality in these institutions.

Conclusions

This study has established baseline gender-disaggregated data in major institutions responsible for ocean science and management in Kenya. The study presents the current status of gender (in)equality in ocean science in Kenya and identifies patterns of bias at different levels across institutions. There is clearly much work to do if gender equality is to be achieved in ocean science in Kenya. A key finding is that gender equality cannot be achieved by including women only in junior positions to check the gender box according to the Kenyan Constitution. Women need to be equally represented at all levels in an organisation's structure.

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[8]See https://www.unwomen.org/sites/default/files/Headquarters/Attachments/Sections/Library/Publications/2018/SDG-report-Chapter-3-Why-gender-equality-matters-across-all-SDGs-2018-en.pdf

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ORCID

Renis Ojwala: https://orcid.org/0000-0002-8151-7030

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Paper 3

Unravelling gender and ethnic bias in higher education: Students experiences in access to ocean science education and career opportunities in Kenya

Renis Auma Ojwala*

Affiliation

World Maritime University (WMU)-Sasakawa Global Ocean Institute, Fiskehamnsgatan 1, 211 18 Malmö, Sweden

*Corresponding author: Email addresses; w1904051@wmu.se; renisauma@gmail.com (R. A. Ojwala)

Abstract

The lack of highly-trained ocean science professionals constrains sustainable development and management of the oceans. In Kenya, the government is committed to improving access to education for all, regardless of gender, ethnicity, and social status. Increasing female student enrolment has been one of the top priorities, particularly in science-related courses, which have long been male-biased. Feminist political ecology is applied as an analytical framework to understand how gender and ethnicity influence student access to, participation in, and experience in ocean science-related programmes. Data was collected through a questionnaire survey with students undertaking ocean science courses in seven public universities in Kenya. The findings revealed an underrepresentation of women and minority ethnic groups. Fewer female respondents than males received financial support from their families, and more female respondents than males reported that they had experienced discrimination related to their ethnicity and gender. In addition, a higher percentage of female respondents reported having fewer opportunities in higher education and ocean science careers than males. These

findings reveal the persistent inequalities among students and suggest that Kenyan public universities need to pay more attention to how intersectional identities, such as gender and ethnicity, influence and shape the distribution of resources and opportunities if equitable diversity and inclusion are to be achieved. Also, they need to strengthen their gender policies and actions to tackle these social inequalities to promote gender equality in ocean science education.

Keywords: Gender bias, ethnic inequalities, feminist political ecology, ocean science, university students' perceptions, intersectionality

1. Introduction

Understanding inequalities in higher education, especially in science-related fields, is attracting increasing attention in the academic and public sectors (Onsongo, 2006; OECD, 2012; Makarova et al., 2019; Amunga & Musasia, 2021). Gender inequality is evident in tertiary levels of education in most developing countries, including Kenya (Onsongo, 2006; WEF, 2020; Ojwala et al., 2022). According to Ojwala et al. (2022), gender inequality in enrolment and recruitment has risen from failure to implement gender policies and cultural practices that hinder women's empowerment. Even though there are reports of increased female student enrolment at universities globally (Hango, 2013; UNESCO, 2015; Huyer, 2015; Amunga & Musasia, 2021), there has been a decline in enrolment at the graduate level and low transition rates to Science, Technology, Engineering and Mathematics (STEM)-related jobs, including ocean science (Corbett et al., 2010; Mbirianjau, 2018; Were, 2020; Ojwala et al., 2022). According to Mbirianjau (2016), female participation in STEM at public universities is less than 30% in Kenya, despite concerted action to balance the gender ratios in education (Jones et al., 2000; Chetcuti & Kioko, 2012; Madara & Namango, 2016; Onsongo, 2009; Omukoba, 2018; Akala, 2019). Ocean science, in particular, is perceived as a male domain, and scientists or researchers are predominantly male (IOC-UNESCO, 2017; Isensee et al., 2018; Kitada et al., 2019; World Bank, 2019; Kamm et al., 2020; Brooks & Déniz-González, 2021).

In addition to gender bias, ethnic bias is also reported to be a problem in education in Kenya, with a biased representation of certain ethnic groups (Alwy & Schech, 2004; Li, 2018; Kisaka et al., 2019). Kenya is ethnically diverse (42 ethnic groups), with the largest group being the Kikuyu (accounting for 17.7% of the total population) (Kwatemba, 2008; Taaliu, 2017). The government requires Kenyan public universities and workplaces not to exceed one-third of total employment from one ethnic group as stipulated in the constitution. However, to improve ethnic diversity in the workplace, there should be equal opportunities in the enrolment of students from all ethnic groups. Most of the previous studies found that ethnic patterns in students' enrolment (Alwy & Schech, 2004; Taaliu, 2017; Kisaka et al., 2019) and employment (Munene, 2013; Monyoncho, 2014; Mukhwana et al., 2018)

in most public universities are skewed, with some ethnic groups being over-represented than others. For example, Taaliu (2017) and Mande (2020) highlighted that ethnic bias remains a significant social problem, resulting in fewer students being enrolled from minority ethnic groups in Kenya.

Gender and ethnic inequalities can be usefully analysed using Feminist Political Ecology (FPE) as a theoretical framework (Rocheleau et al., 1996; Ajibabe et al., 2013; Nunbogu & Elliott, 2021). FPE considers gender and the politics of place, focusing on the division of labour, roles, treatments, and power relations (Elmhirst, 2011; Elmhirst, 2015; Harcourt & Nelson, 2015). FPE also identifies rights to, use of, and control over resources by examining who has access to resources, who depends on them, who is responsible for using them productively, and who oversees resource management (Rocheleau et al., 1996, Ibrik, 2022). As Rocheleau et al. (1996) noted, FPE treats gender as a critical variable in shaping access to and control over natural resources. Rocheleau argues that gender accounts for differences in production, reproduction and community roles between women and men and is a primary source of social injustice. The theory provides a framework for understanding the complex interrelationships, and the drivers and impacts of inequalities or differences. Importantly, FPE juxtaposes gender with other social characteristics such as age, class, ethnicity, and education –a term referred to as intersectionality (Nichols & Stahl, 2019). Studies have used the FPE lens to understand the inequalities in access to and control of natural resources (Douma et al., 2002; Akoyoko, 2014; Sundberg, 2015; Nunbogu & Elliott, 2021). For example, Ankrah et al. (2020) used FPE to understand gendered access to productive resources in Ghana. They pointed out that the access to gendered resources (land, agricultural extension services etc.) and ungendered resources (labour, credit, and information, etc.) intersect with age, education, class, and socio-cultural norms in shaping access to and control over these resources.

In many ways, access to education is similar to access to natural resources because being educated leads to more opportunities, jobs, and wealth creation (United Nations, 2015; NGEC, 2016). Further, education can lead to better conservation and management of marine resources and increase women in decision-making positions. As such, FPE provides an appropriate and reasonable theoretical basis for this study. While access to education is much less studied in the context of FPE, there are notable exceptions, such as a study by Jewitt and Ryley (2014), who investigated the perspectives of school girls in primary education in Kisumu, Kenya. They analysed the cultural and spatial limitations associated with menstruation and puberty to examine gendered inequalities in access to social capital resources, especially education between better-off girls and those from poor backgrounds. However, no study has analysed the influence of gender and ethnicity on students' enrolment in ocean science courses in Kenya. Therefore, there was an urgent need to examine and understand the interactions between gender and ethnicity in

enrolment rates of female and marginalized students, which is particularly important in ensuring gender balance in ocean science programmes.

In this paper, I use an FPE approach to understand how access to higher education is affected or influenced by gender and ethnicity within ocean science-related programmes. FPE expands the analytical categories and diversity of students within the university to overcome one-dimensional approaches (Tefera et al., 2018). Here, FPE is used to draw links between the material dimensions of education (e.g., enrolment patterns, graduation rates, completion rates, transitional rates) and the non-material factors (e.g., age, ethnicity, power relations, class, values, and norms). These links often shape access to quality education and inclusion in and exclusion from access, participation, governance, and decision-making positions (Adams et al., 2018; Lau, 2020). FPE can help elucidate the importance of gender and intersectional identities in the selection of courses, resource allocation (funds) and social injustices, including discrimination and sexual harassment. Elmhirst (2015) emphasized that women and men experience the environment differently due to their differentiated social responsibilities. Mangura (2021) also argues that gender differences in responsibilities for, experiences of, and interests in environment and nature are crucial when dealing with social inequality and marginalization on gendered axes (Sundberg, 2017; Haeffner et al., 2021).

This study uses the concept of intersectionality (interaction between gender and ethnicity) to understand the experiences, inequalities, and challenges of students in ocean science programmes. While gender shapes access to and control of resources, ethnicity is well-known as another critical variable in Kenya's social, economic, and political power relations (Kwatemba, 2008). This study explores some of these issues and asks the following questions:

a) Are there gendered and ethnic differences in access to ocean science education in Kenyan public universities?
b) What are the barriers to gender and ethnic equality perceived by students participating in ocean science?
c) Does access to career opportunities in ocean science fields differ between female and male students as well as among ethnic groups?

2. Materials and Methods

The study was conducted from June to October 2021 in 7 out of 37 Kenyan public universities which offer ocean science-related courses. The study targeted undergraduate and postgraduate students. The rationale for choosing public universities is that they offer programmes at a lower fee than private ones, and they are committed, at least on paper, to ensuring that gender equality policies are

implemented at the institutional level to increase the participation of women in higher education, particularly in STEM fields (Onsongo, 2009; Odhiambo, 2018).

2.1 Data collection

Data were collected using self-completion questionnaires either in hard copy or online through Survey Monkey to solicit information on the experiences and challenges of female and male students and to allow comparisons to be drawn from different ethnic groups. Heads of department and class representatives helped disseminate the survey link in each of the seven universities. The questionnaire was chosen as a research tool because it is a fixed form that presents items in a standardized way to different respondents so that responses can be aggregated and compared between sub-samples (Ogembo et al., 2015; Nteere et al., 2017; Taber et al., 2021; Jackson et al., 2022).

Since it was hard to estimate the total number of students under ocean science-related programmes in public universities in Kenya, this study used a similar approach to Osiecka et al. (2022) who examined the experiences of early-career marine scientists and conservationists worldwide. The questionnaire was structured into four sections: (1) socio-demographic details of the respondents (e.g., age, gender, marital status, number of children, and ethnicity/tribe), (2) students' admission status (funding sources, year of enrolment and programme of study), (3) students' experiences, including sexual harassment, awareness of gender-related policies, and obstacles they face at the university, and (4) access to job opportunities (e.g., job prospects or career aspirations). It consisted of 21 questions: seven closed questions that required a 'YES' or 'NO' answer, five multiple-choice questions, and two single-choice questions, with one requiring a response on a 5-point Likert scale; the remaining seven were open-ended questions.

The questionnaire collected both quantitative and qualitative data with closed- and open-ended questions. The qualitative data generated from open-ended questions provided opportunities for critical insights into understanding students' perceptions of ocean science-related programmes. The questionnaires were anonymous and not linked to specific universities to ensure that the student's identities remained confidential. The response rates varied from one university to another, ranging from 2% to 24% of the total responses (n = 102).

2.2 Data analysis

The data gathered were analysed using NVivo software version 12, where the responses were coded and analysed by themes. The closed-ended questions were analysed using descriptive statistics such as mean, standard error, and percentages. While, the responses to the open-ended questions were analysed thematically. The themes formation followed a deductive approach derived from feminist political

ecology as the theoretical framework of this study. These themes included access to financial support, experiences of gender and ethnic biases, awareness of the existing institutional gender-related policies and career prospects. The analysis helped to understand the gender and ethnic differences in terms of access and experiences of students.

3. Results and Discussion

3.1 Respondents profile

Table 1 provides a socio-demographic profile of the respondents (42% female and 58% male), most of whom were undergraduate students. More than half of the female respondents were in their final year of study (Fourth year) compared to their male counterparts. The mean age of female respondents was lower than that of males. Moreover, most female respondents were single, while a greater percentage of males were married, and most males had children. Half of the female and male respondents mentioned that they were not the first in their families to attend university.

Table 1: Socio-demographic characteristics of students by gender (means ± standard error, unidentified refers to those who did not respond to a particular question, and others refer to those who answered questions with 'unspecified' choices)

Characteristics	All	Female	Male
	(n = 102)	(n = 43)	(n = 59)
Age Mean (SE) age	25.36 (± 0.48)	23.67 (± 0.36)	26.63 (± 0.75)
Marital status			
Single	81% (83)	86% (37)	78% (46)
Married	18% (18)	14% (6)	20% (12)
Unidentified	1% (1)	0% (0)	2% (1)
Number of children			
With children	19% (19)	12% (5)	24% (14)
Without children	78% (80)	88% (38)	71% (42)
Unidentified	3% (3)	0% (0)	5% (3)
Degree level			
BSc	76% (78)	79% (34)	75% (44)
MSc	24% (24)	21% (9)	25% (15)
Year of enrolment			
Below 2016	17% (17)	21% (9)	14% (8)
2017	46% (47)	52% (22)	42% (25)
2018	2% (2)	2% (1)	2% (1)
2019 and above	34% (35)	23% (10)	42% (25)
Unidentified	1% (1)	2% (1)	0% (0)
First in the university			
Yes	49% (50)	47% (20)	47% (28)
No	49% (50)	51% (22)	51% (30)
Unidentified	2% (2)	2% (1)	2% (1)
Family social status			
Upper class	0% (0)	0% (0)	0% (0)
Middle class	58% (59)	70% (30)	49% (29)
Working class	22% (22)	21% (9)	22% (13)
Others (Specify)	20% (21)	9% (4)	29% (17)

3.1.1 Respondent composition by ethnicity

Respondents were also asked to indicate their specific ethnic identity. The results showed that less than half (43%) of Kenya's ethnic groups were represented amongst the respondents (Figure 1). Of those who responded to the ethnicity question, 32% identified as belonging to the Luo community, the fourth-largest ethnic group in Kenya (constituting 10.8% of the total population). The geographical location of their home is on the western side of Kenya near Lake Victoria, with no proximity to the Indian ocean. Therefore, the overrepresentation of the Luos in these courses can possibly be attributed to their large population and traditional preference to inhabit near lakes and rivers. On the contrary, most ethnic groups from Kenya's coastal region (e.g., Bajuni and Mijikenda) recorded the lowest percentages. This can be explained by the persistent low transition rates to higher education in the Coast

region due to high school dropout rates (Alwy and Schech, 2004). According to Alwy and Schech (2004), students from the Coast region are disadvantaged due to the large regional differences in the allocation of government resources (such as the establishment of schools and transport facilities) and lack of school fees.

In a similar study conducted by Taaliu (2017), the overrepresentation of ethnic groups was also recorded, with four major ethnic groups: Kikuyu, Luhya, Luo, and Kamba, constituting approximately 72.8% of the total number of students enrolled in the public universities and colleges nationwide. In contrast to the higher enrolment of students from these four ethnic groups, lower representation of the minority groups was recorded, with the remaining 27.2% of the students enrolled found to be shared amongst the other 38 ethnic groups. The findings in this study resonate with Alwy and Schech (2004) and Taaliu (2017), who similarly found that Kenyan education is influenced by ethnicity. Ethnicity also plays a role in students' participation in ocean science by influencing 'who' enrols in 'what' subjects. However, these two studies by Alwy and Schech (2004) and Taaliu (2017) provided overall enrolment of students and were not specific in terms of courses and gender.

In this study, most represented ethnic groups had more male respondents than females, except the Kikuyu, Kisii and Meru communities. The rest of the ethnic groups (minority groups) were combined into ‘others’ as each had only one respondent. Therefore, these findings reveal that diversities in students’ enrolment in Kenyan public universities go beyond gender in terms of the students' representation.

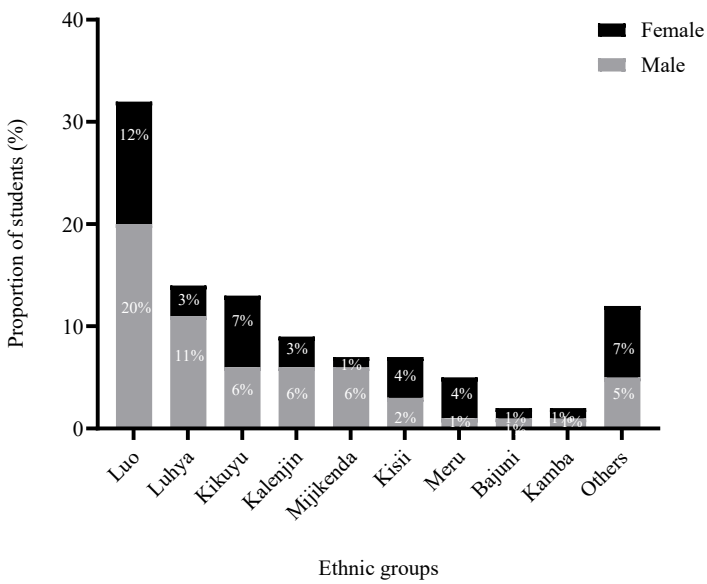

Figure 1: Proportion of student respondents by ethnicity and gender in the selected seven public universities in Kenya (n =102)

3.2 Gender, ethnicity, and access to higher education

To unpack the prevailing inequalities in access to education between female and male respondents, the study analysed the availability/accessibility of financial aid/support sources for their educational expenses and compared amongst the ethnic groups. The results showed that female education was less likely to be supported by family/parents than their male counterparts. Instead, most female respondents mentioned that their financial support or funding comes from external sources such as government loans, which they must repay after completing their studies (Figure 2). For example, one of the conditions of the government loan – provided by the Higher Education Loans Board (HELB) states that all loanees are required to start repayment within one year of their studies (the Republic of Kenya, 2015). Failure to do so comes with hefty penalties, such as fines of not less than five thousand Kenyan shillings every month. For many recent graduates, starting to pay this loan within a year is nearly impossible due to the high unemployment rates in the country. Many graduates spend long periods moving from one internship to another before getting a permanent or payable job. In addition, many employers, especially government institutions, require applicants to have clearance from HELB Board before applying for any advertised position, which is a disadvantage to 'unintentional' loan defaulters. This implies that women are more likely to be disadvantaged if they default on their loan repayments.

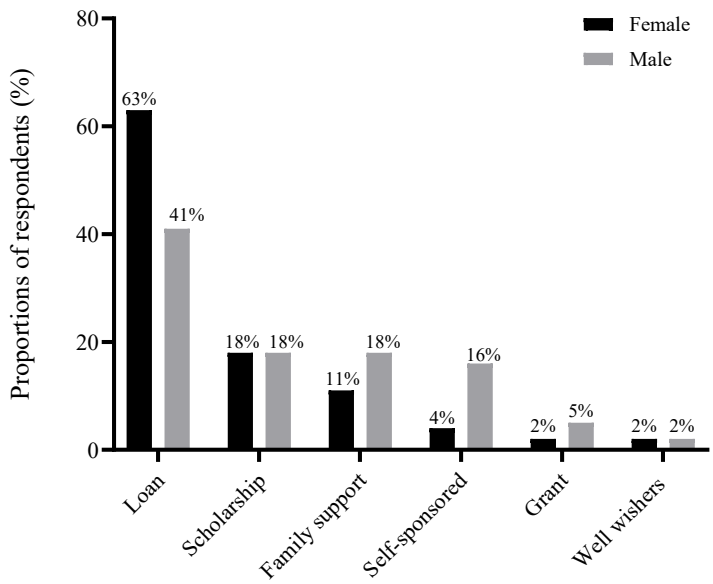

Figure 2: Funding sources for female and male students in public universities in Kenya (Female n = 43, male n = 59).

Regarding financial access by ethnicity, the responses varied from one ethnic group to the other. Most female respondents from all the ethnic groups received loans for their studies, with the highest percentage of females who mentioned receiving loans coming from the Luo community at 18.6%, followed by the Kikuyu at 9.3% and the Kisii at 6.5%. Fewer female respondents indicated that they were funding their studies through scholarships, with 4.3% from the Kikuyu community. The Kisii and the Luo communities recorded 2% each. While the rest of the female respondents from the other communities recorded zero support from scholarships. Only one female respondent from the Luo community reported being supported financially through grants while no female respondents from other ethnic groups mentioned grants. Those female respondents who were financially supported by family or parents were from the Luo community (4%), Kikuyu (2%) and Meru (2%). On the other hand, male respondents from different ethnic groups also recorded considerable differences in terms of financial support, with the majority of those who received loans being from the Luo community (16.9%), followed by Luhya (10.2%) and Kikuyu (6.8%). More male respondents from the Kalenjin community (5.1%) received scholarships than those from other ethnic groups, and more males from the Luhya community (3.4%) received the grants than others. The majority of the male respondents who were supported by parents/family were from the Luo community, with 8.5%. These differences can be explained by Alwy & Schech (2004), who pointed out that the ethnic inequalities in education in Kenya are often compounded by and closely related to other socio-economic disparities. Also, many ethnic groups prioritize the education of their male children compared to the females (UNICEF, 2017). Most minority ethnic groups were more likely to educate male students up to tertiary levels than females (Lorentzen, 2020). The preferences for educating males can be supported by the FPE, which confirms that male education is more valued than female in a patriarchal society and, in case of limited resources (such as funding sources) available to the minority groups, it leaves them with no choice but to give priority to the male gender.

In this case, feminist political ecology can help to explain the gender and ethnic differences in access to educational resources, specifically funding (Pommells et al., 2018). The findings showed that three different sources of funding- scholarship, grants, and parental support (those that do not require refund)- were more likely to be available or easily accessible to male respondents in dominant ethnic groups than their female counterparts. These inequalities in access to non-refundable finance resources are disadvantageous to most female and minority ethnic groups with limited resources. These findings confirm that a combination of gender and minority groups makes women more disadvantaged than other combinations, such as one with dominant ethnic groups. In this case, more female respondents from the minority groups were more likely to depend entirely on government loans because no respondent reported being supported by parents/family, grants, and scholarships from these groups.

Kenya is a patriarchal country with a male-dominated power structure that affects the privileges between women and men in all the communities. However, some ethnic groups are more conservative, making gender disparities more pronounced in such communities. For example, deeply-rooted old traditional and cultural practices such as Female Genital Mutilation (FGM) are widely practiced in some communities (UNICEF, 2019), including among the Maasai, Meru and Kisii. These are detrimental to girls and disrupt their everyday life, augmenting school dropouts and early marriages. The FPE approach helps explain differential funding by its argument that patriarchal gender norms inform the fundamental conceptions of how knowledge is produced (Ndiga & Mumiukha, 2022). It shows how women and minority groups are disadvantaged in accessing conventional scientific practices. In this system, men tend to have more power than women or have some level of privileges to which women are not entitled (Ndiga & Mumiukha, 2022). These results also confirm that male students tend to be more privileged when it comes to funding to acquire conventional scientific knowledge than females.

3.3 Gendered experiences and ethnic inequalities faced by students at the university

Generally, the underlying themes expressed by respondents as their lived experiences were gendered and based on their intersectional identities regarding treatment, awareness creation and challenges. The themes included main obstacles, study-life balance challenges, particularly conflicts between study and family responsibilities, persistent gender bias or sexual harassment, participation barriers, the lack of information on gender policies, reporting procedures and career opportunities for women in ocean science.

There was frequently expressed concern relating to the main obstacles faced by female students at the university, with more than half of the female respondents reporting cultural beliefs, gender stereotyping and gender discrimination as the most common barriers to female participation in ocean science courses. At the same time, male respondents identified cultural beliefs as the primary factor hindering women's participation in higher education (Figure 3). However, a greater percentage of male respondents also identified other obstacles, such as a lack of information about ocean science, financial constraints, and the female perception that science is complex. In contrast, the only other barriers cited by women were financially related and pressure from parents to start a family. These male responses confirm the existing stereotypes and cultural beliefs about women in Kenya, where women's education in science-related courses is less likely valued than males. This bias can possibly be due to the perception that such courses are more suitable for men than women. Also, women are often associated with reproductive roles and believed to be homemakers, less intelligent and inferior to men and mostly expected to be getting married at an early age (Lorentzen, 2020; Lau, 2020).

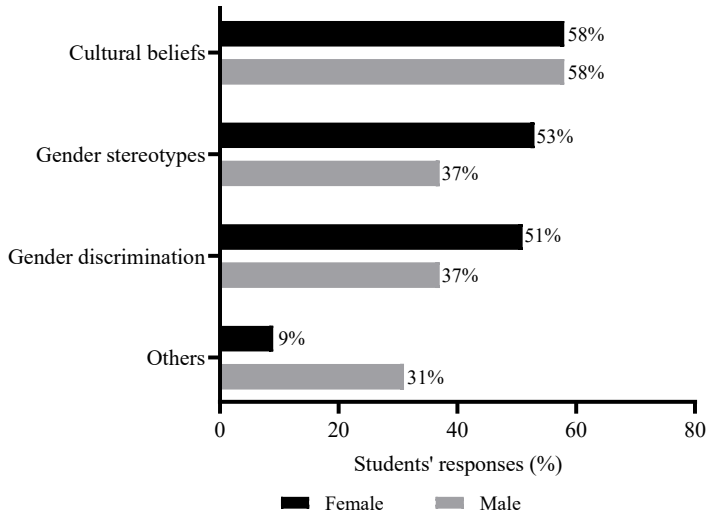

Figure 3: Main obstacles faced by female students in public universities (Female, n = 43; Male, n = 59).

The obstacles faced by the respondents were also analysed based on ethnicity. The results showed that the majority of the respondents who mentioned cultural barriers as the main obstacle to women's participation in higher education were male respondents from the Luo and Luhya communities, with 20.3% and 13.6%, respectively. Most female respondents mentioned gender discrimination as the main obstacle and were from the Luo (16.3%) and Kikuyu (11.6%) communities. Gender stereotypes and cultural barriers had equal percentages (11.6%) of female respondents from the Luo and Kikuyu communities.

Power relations affect and shape gender experiences and determine who counts in society. According to FPE, these negative perceptions about women often result in a deepened gender-biased enrolment of students because only people from a specific gender who are perceived to have interest and knowledge about a particular subject would be given priority (Rocheleau et al., 1996; Sultana, 2011), and in this case, male students were more likely to be given support and privileges to further their education. The findings of the previous studies support this claim through the low percentages of female students enrolled in ocean science which is perceived as a male domain (Ojwala et al., 2022). FPE perspective on how cultural barriers build gendered differences in experiences reveals that female students have unequal rights or are denied rights to access education, knowledge use, labour obligations, and inclusion of their voices in natural/marine resource management (Sultana, 2011; Adams et al., 2018).

Under the second theme, conflicts between studies and family responsibilities, most of the respondents (67% female and 53% male) reported that they had not experienced study-family conflicts. The majority of those who had experienced study-family conflicts were male respondents, with a greater percentage of 44% than females (26%), while the rest did not respond (7% female and 3% male). One of the reasons why most female respondents did not experience conflicts between study and family responsibilities is that most of them were single and younger than males. The situation may be different or more difficult for women to go to university once they are married and have children.

Some comments exemplified the conflicts that respondents faced in their studies. For instance, one of the male respondents explained: *¨As the only son, most is expected of me at home and school, it's an overwhelming experience and a real challenge¨* and another one reported: *¨It is basically hard since you have to split your time over education and home responsibilities¨*. A few examples of female respondents who spoke of study-family balance issues are explicitly associated with children and family. One female respondent described the situation as: *¨It's tormenting, annoying and can pull you down to earth¨* and another shared her experience by saying: *¨Taking care of the baby, being a wife and a student is very tricky because they all need full attention¨*. Also, traditional and cultural beliefs hindering female students' full participation in ocean science courses were mentioned. One female respondent (from the Kalenjin community) wrote: *¨The need to support my siblings in their schooling and pay my school fees is challenging. Also, my culture does not encourage women to do some courses, including what I am currently involved in. My parents would prefer I marry a rich man instead than continuing with schooling in a fisheries course¨*. Work/study-family balance has been reported by previous researchers as an emerging challenge brought about by the increased participation of women in the workforce globally, and it affects students, employees, and employers equally (Gayle & Lowe, 2007; Hendriks, 2020; Akuamoah-Boateng, 2020). For example, Cinamon and Rich (2005) and Musya (2020) showed that employees, especially females with caregiving responsibilities with inadequate support at home, face more work-family conflict. Musya (2020) found out that female teachers experienced strain and time pressures due to work-related and home-related roles, with the main stressors including a lack of adequate support at home and interruption in work and family schedules (e.g., a child falling ill). These conflicts often result in the inability to perform duties to perfection, reduced productivity and poor working relationship with the boss or colleagues. In the case of education/studies, the consequences include poor performance, school dropouts, poor working relationships with university lecturers, and poor study-life balance (Hendriks, 2020). This resonates well with the findings in this study because most female respondents who had experienced conflicts between their studies and family roles mentioned that balancing the two was challenging as both family and studies required the same or equal amount of time. The previous and current findings highlight early marriages in Kenya as a unique context for understanding extra

challenges for women in ocean science because the family responsibilities affect the access to higher education as well as the participation of women in workplaces.

Concerning gender bias or sexual harassment, both female and male respondents mentioned that they had experienced gender bias or sexual harassment. However, the number of male respondents who experienced gender bias or sexual harassment was higher (see Figure 4b) than females (see Figure 4a), which can be explained by further research. Most female and male respondents confirmed that they were aware of the reporting mechanisms within their respective universities (see Figure 4c).

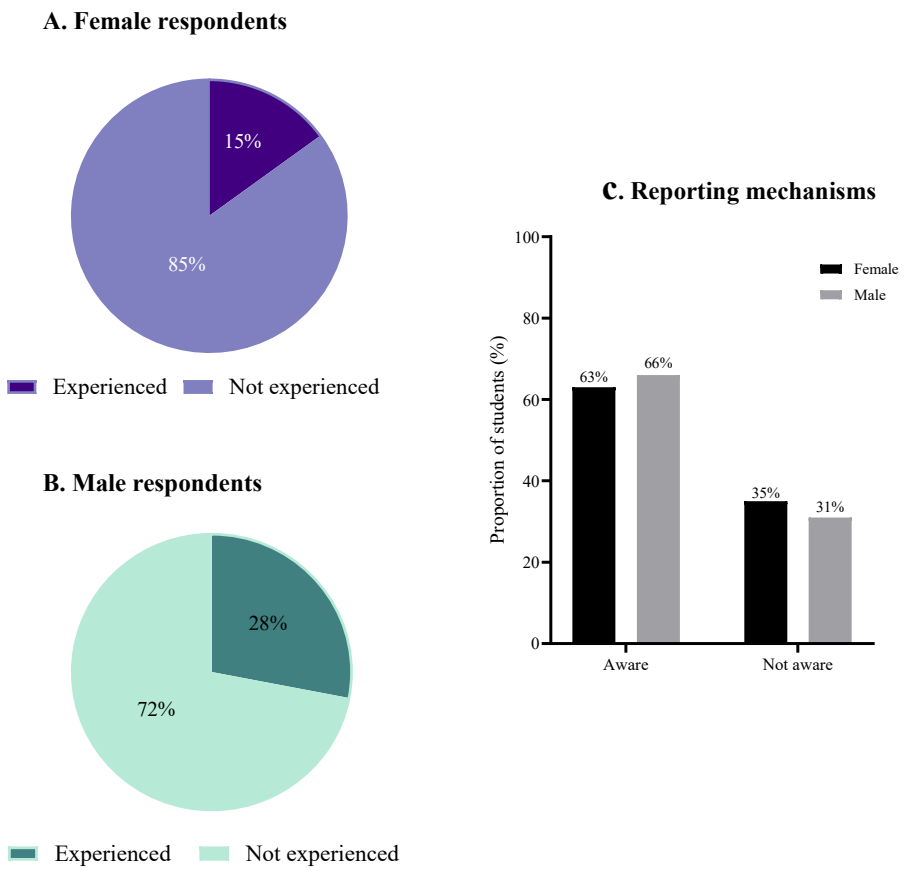

Figure 4: Experiences with gender bias or sexual harassment and the awareness of reporting procedures in the selected public universities (Female, n = 43; Male, n = 59).

Regarding the university gender-related policies, the findings showed that only four of the seven universities in this study had gender equality and sexual harassment policies. Most respondents, 53% female and 66% male, stated that they were aware of the existing gender equality policies. While 49% of female and 71% of male respondents reported that they were aware of their universities' existing sexual harassment policies. Interestingly, in the universities with no gender-related policies, more male respondents than females still reported that they were aware of gender equality and sexual harassment policies. These results could be due to the biased responses of online surveys where respondents provide the information they think the administrator would like to hear or claim something beyond their experience (Bird, 2009; Osiecka et al., 2022).

Some of the findings support the explanations given by feminist political ecologists on how different obstacles manifest in different ways for women (Haeffner et al., 2021). The comments on the experiences of gender bias and conflicts also revealed that the respondents from minority ethnic groups were more likely to face various biases and conflicts with their studies. Some female and male respondents from less well-off backgrounds were forced to help their parents finance their siblings' education with the little stipend or loan they received to support their studies. One married male respondent mentioned this as his major conflict or challenge: *¨Looking for money to feed the extended family while in school, I have to share my little stipend¨*. These findings confirm the arguments by feminist political ecologists that access to resources and challenges are often determined by unequal economic power relations that reproduce patterns of gendered inequalities (Nunbogu & Elliott, 2021).

3.4 Gender, ethnicity, and access to career opportunities in ocean science

More female students agreed with the statement that females have fewer opportunities in higher education and ocean science careers than males, as illustrated in Figure 5. In contrast, male respondents reported that females have more opportunities in these two sectors (68% in higher education and 66% in ocean science careers). The views of male respondents go against the reality identified by the International Labour Organization (ILO, 2017). According to ILO, women in the labour market are more likely to be unemployed than their male counterparts. Also, ILO highlighted alarming female unemployment rates in developing countries, including Kenya, suggesting men belittle women's experience.

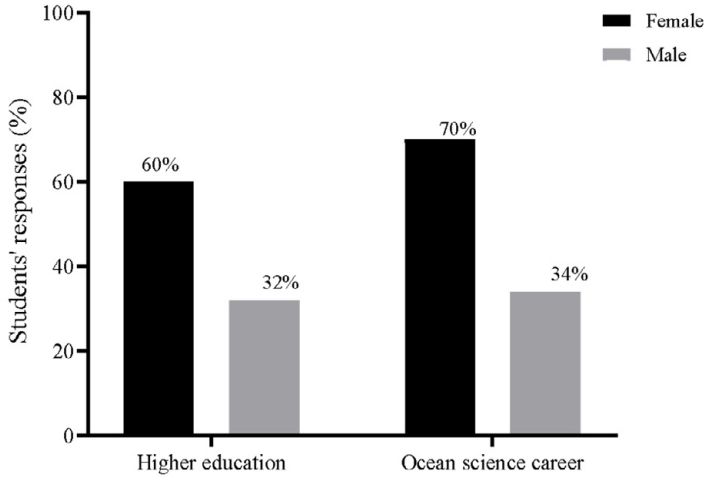

Figure 5: Responses to questions on female students having fewer opportunities for higher education and ocean science careers only include respondents who answered 'Yes' (Female, n = 43; Male, n = 59).

The male respondents' perceptions are not in line with their female colleagues that women have fewer opportunities in the labour market, which could be an example of gendered power relations. According to Flood (2015), many men resist gender equality because they benefit from gender inequalities, including interpersonal power and material rewards. Additionally, Hearn (2001) highlighted that men's resistance to gender equality comes with several reasons, including sexism, maintenance of power, patriarchal practices, complicity in current arrangements and the definition of gender equality as women's business. That said, these findings might presumably be attributed to the fact that men feel disenfranchised because more attention is currently shifting to increasing women's education and empowerment in Kenya. However, the study highlights patterns for which further research is needed to explain. A study by Roksana (2018) in Sweden highlighted that women and men can only have equal opportunities in 'dynamic network' organizations and not in the 'static hierarchy' ones with the traditional patriarchal structure like in most developing countries. The dynamic network is those organizations with flexible power structures, and everyone's contribution is compulsory, making women more visible. The 'static hierarchy' includes older men having full authority and a tendency to keep or recruit other men.

Further analysis based on the ethnic differences was done, and the results showed that the majority of the female respondents who agreed with the statement that females have fewer opportunities in higher education (14%) and ocean career opportunities (12%) were from the Kikuyu and Luo communities, respectively. On the other hand, the males who responded positively to this statement on higher

education were from the Luo and Kalenjin communities, with 8% and 7%, respectively. At the same time, the male respondents who reported fewer opportunities in career were from the Luo and Luhya communities, with 10% each.

Regarding job prospects, most female and male respondents were hopeful or believed that they would find a job in ocean science after completing their studies, with the majority rating their career prospects highly (see Figure 6). Interestingly, the career aspiration of women was as high as men. However, the confidence of the male respondents showed that men tend to think that the workplace in ocean science is more attractive and suitable for them. The feeling of entitlement to job opportunities by men can be explained by feminist political ecology, which states that patriarchy and cultural stereotypes often codified some job opportunities as masculine hampering women's participation (Nunbogu & Elliot, 2021).

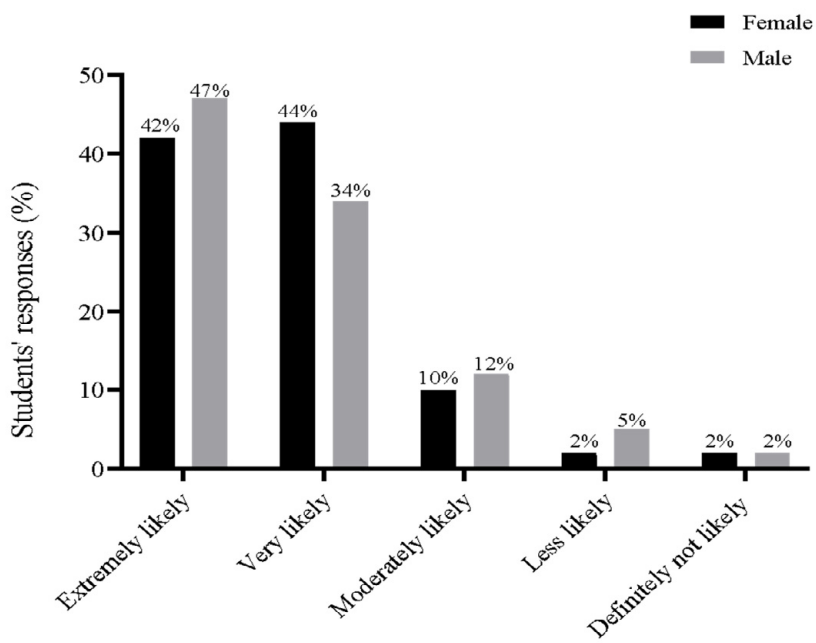

Figure 6: Career aspirations between female and male respondents in ocean science fields (Female, n = 43; Male, n = 59).

The career aspiration in the ocean science field was also analysed in this study based on ethnicity. The findings revealed that most of the respondents who reported that they were 'very likely' and 'extremely likely' to work as marine scientists in future were from the Luo community, with 29% male and 26% female, followed by male respondents (15%) from the Luhya community and female respondents (14%) from the Kikuyu community. In contrast, male and female respondents who answered

with ‘definitely not likely’ and ‘less likely’ were fewer, with only one female respondent from the Embu community and three male respondents from the Luhya, Kalenjin, and Mijikenda with one respondent each. These findings can be explained by the fact that most of the respondents were from the Luo community.

In Kenya, job opportunities usually rely on a person's connections and networks or through sharing ethnicity with a senior person in an institution rather than an individual’s educational background within a particular field. FPE explains the inequalities between women and men as well as the dominant and minority ethnic groups in access to labour market. It exposes how these power relations influence access to resources, including job opportunities, which often exacerbates discrimination among women and minority ethnic groups. Women's access to job opportunities tends to be lower than for males, and the few who make it to the job market are more likely to be in junior positions (Orcutt & Cetinić, 2014; Huyer, 2015; Johannesen et al., 2022). Also, discrimination can be more disadvantageous to females from minority ethnic groups (Taaliu, 2017).

FPE challenges gender norms and beliefs that expect women to be caregivers in the household and beyond while men are expected to be breadwinners (Arora-Jonsson, 2011). FPE also calls for an intersectional approach that considers how a person's experiences are shaped by particular geographical locations and the links between multiple social identities and axes of organizational inequality, such as gender, ethnicity, class, and age (Kaijser & Kronsell, 2014). The theory exposes and describes the multiple interconnecting experiences and challenges faced by women and minority groups by investigating the interlocking differences based on gender and ethnicity. Inadequate financial support for female students' education may be one of the reasons for the lower representation of females in ocean science. Thus, the intersectional lens revealed that women from the Luo community were more likely to access higher education and receive support from their families than those women from other ethnic groups. Neglecting women's substantial role as ocean managers and knowledge bearers could escalate ocean degradation.

It should be noted that the study was conducted during the COVID pandemic when most universities were struggling to adapt to teaching online and hybrid classes. Consequently, most students were off-campus, which may be one reason for the low response rate and could have influenced the results. Further, this research was purely based on a questionnaire without a follow-up interview; therefore, future research should consider interviewing students to clarify what kinds (specific) of gender bias or sexual harassment female and male students often experience while at the university.

4. Conclusion

The adoption of the Feminist political ecology framework identifies the structural sources of gender and ethnic differential access to education and job opportunities as important. FPE proved to be a useful theoretical framework for explaining the social differences that influence the access to higher education, experiences, and challenges of female and male students in ocean science programmes in public universities in Kenya. This paper discusses the responses to three research questions: (1) are there gendered and ethnic differences in access to ocean science education in Kenyan public universities? (2) what are the barriers to gender and ethnic equality perceived by students participating in ocean science? (3) does access to career opportunities in ocean science fields differ between female and male students as well as among ethnic groups?

The findings in the first research question showed clear evidence that gender and ethnic inequalities play a key role when providing financial support to students in ocean science courses since fewer female respondents than males accessed financial support from their families. Also, most female respondents relied on government loans to finance their studies. All female respondents from minority ethnic groups depended entirely on loans. The second research question revealed that female access to higher education was more likely to be hindered by cultural barriers. Intersectional identities such as ethnicity also played a significant role in students' access, treatment, and power relations. Apart from gender, most female respondents felt they were discriminated against based on their ethnicity. Lastly, most female respondents strongly agreed that they have fewer career opportunities than males even though their career aspirations in ocean science were as high as males. Based on ethnicity, more respondents from the Luo community were more likely to work as marine scientists after completing their studies than other ethnic groups in this study.

The study recommends increasing non-refundable financial support to female students and minority ethnic groups; creating awareness and capacity building on gender-related issues such as sexual harassment, gender-related policies and reporting mechanisms; mentorship programmes to populate ocean science courses in all the ethnic groups; and developing effective and transformative gender-related policies to address cultural norms, ethnic barriers and stereotypes to promote gender equality in ocean science courses.

Ethical Considerations

Before data collection, the questionnaires were approved by the Research Ethics Committee at World Maritime University, and permission was granted from the Kenyan National Council of Science, Technology and Innovation (NACOSTI) (License No. 824286). Questionnaires had a short description explaining the purpose of the research to each potential participant and included a statement that guaranteed anonymity and confidentiality to participants.

Conflict of Interest

None.

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Paper 4

Gender and the ocean: Understanding women's roles, experiences and barriers to participation in ocean science education in Kenya

Renis Auma Ojwala[1*], Susan Buckingham[1], Francis Neat[1] and Momoko Kitada[1]

Affiliation

[1] World Maritime University (WMU)-Sasakawa Global Ocean Institute, Fiskehamnsgatan 1, 211 18 Malmö, Sweden.

*Corresponding author: Email addresses; w1904051@wmu.se; renisauma@gmail.com (R. A. Ojwala), susanbuckingham07@gmail.com (S. Buckingham), fn@wmu.se (F. Neat), and mk@wmu.se (M. Kitada).

Abstract

Global visions of effective ocean governance consider gender equality as critical to transformative action and change towards sustainable ocean management. However, women are often excluded in most of the ocean science-related programmes, including education despite their substantial roles and contributions in ocean ecosystems. The commitment to promoting gender equality in ocean science, especially in the United Nations Decade of Ocean Science for Sustainable Development, aims to ensure women as much as men engage in ocean science education, research and management. By doing so, diverse knowledge and innovative ideas to find solutions to reverse declining ocean health are better encouraged. However, gender inequality among academic staff still persists in ocean science education, especially in developing countries such as Kenya. This paper investigates the roles of women in ocean science education, the challenges they face, root causes of these inequalities and the existing interventions to advance gender equality in ocean science in Kenya. The paper uses a feminist political ecology lens to explore academic staff experiences, perceptions of gender

(in)equality, barriers and good institutional practices. The data gathered through in-depth interviews were analyzed based on the emerging themes from participants' responses. This revealed that the career progression of women was slower than men, women were more likely to be discriminated against during promotions, denied opportunities to develop their careers, received little or no support and recognition, faced sexual harassment and bullying, and experienced work-family conflicts. These factors adversely impacted women's participation and career advancement as well as affected their contribution to a sustainable ocean. This research also revealed some good practices universities had in place, such as having gender policies and gender centers to tackle gender inequalities. In conclusion, we stress the importance of having gender-transformative policies, an effective implementation process, and having women in leadership positions as crucial for promoting gender equality and ocean sustainability.

Keywords: Gender equality, women's participation, sustainable ocean, barriers, good practices, ocean science.

1. Introduction

In recent years, the UN Decade of Ocean Science has focused on supporting innovative research and creative ideas to generate the knowledge and science needed to achieve an equitable and sustainable ocean to maximize the benefits from ocean resources to meet the needs of future generations (Ryabinin et al., 2019; Sun et al., 2021; Axelrod et al., 2022). Two of the essential aspects of the Ocean Decade are inclusivity and equality, which allows the engagement of all stakeholders to ensure 'we have the people we need for the ocean we want' in the institutions and decision-making processes (Sun et al., 2021), especially women and other marginalized groups.

Women's participation in and substantial contribution to education, research and management of oceans are critical in all aspects of sustainable development (Michalena et al., 2020; Shellock et al., 2022a). The inclusion of women has long been viewed by practitioners and development scholars as a pathway towards enhancing livelihood opportunities, promoting sustainable use of the ocean and improving ocean governance (Gissi et al., 2018; Satterthwaite et al., 2022; Shellock et al., 2022a). Giakoumi et al. (2021) and Shellock et al. (2022a) highlight that increasing the number of women in ocean science education is essential and can generate diverse perspectives required to solve the complex socio-ecological challenges of sustainable marine management. There is an urgent need for a transformative education that provides equal opportunities for both women and men academic staff to bring their perspectives in pedagogy to share their knowledge about ocean resource use and management (Peterson & Spencer, 1990). Education

is the direct link between women's literacy and job security and is recognized as the incubator for future ocean leaders.

Historically, science-related disciplines, including ocean science education, have been overwhelmingly occupied by men worldwide. Women in academia face many career progression challenges blocking them from reaching senior academic, research and management positions (Onsongo, 2006; Huyer, 2015; Popp et al., 2019; Ojwala et al., 2022). In Kenya, the recruitment, retention and promotion amongst female staff in public universities are not only getting worse over time but also higher up the career ladder, with fewer women likely to be holding senior management positions (Onsongo, 2009; Ojwala et al., 2022). Previous studies have also reported a low representation of female students in STEM subjects at 27% in Kenya (Onsongo, 2009; Mbirianjau, 2018; WEF, 2020) and low transition rates from undergraduate to postgraduate levels in STEM fields (UNESCO, 2015). The unequal access to science educational opportunities and underrepresentation (and stagnation) of women in academic careers remains today despite the efforts and commitments by the Kenyan Government on paper, and the success of women academically.

Establishing a diverse and inclusive ocean science education is a significant challenge in most universities in Kenya. While it has been shown that women are underrepresented in academic positions at all levels in public universities and leadership roles in ocean science-related departments (Ojwala et al., 2022), there has been no research on why this is and how academic staff experience gender inequality. Having more women staff in science-related departments has been documented in order to attract more female students to these courses, because they act as role models and offer mentorship opportunities. According to Jones and Trotman (2016) and Ndegwa et al. (2016), patriarchy in countries such as Kenya highly influences women's participation because of the absence of gender-transformative polices and the presence of socio-cultural stigma against women where some courses and jobs, such as ocean science, are viewed as men's work.

In order to reflect women's concerns in ocean matters, gender equality and women's participation must be integrated in marine conservation, science and governance. To understand the knowledge gap on persistence of gender inequality in academic career paths in ocean science teaching and research, this paper focuses on the academic staff experiences and good institutional practices towards gender equality. Gender equality and improved ocean governance can only be achieved by understanding barriers in ocean science departments, their roles, and their accomplishments in the professional realm. Three research questions inform this analysis:

1. What roles do women play in ocean science education and how does career progression differ between female and male staff across academic career levels in ocean science-related departments in Kenyan public universities?

2. What are the barriers to career progression and gender equality among staff participating in ocean science disciplines in Kenya?
3. What are good institutional practices in place to promote gender equality in ocean science in Kenya?

2. Theoretical framework

Gender and environment are an important interdisciplinary subject in research (Buckingham, 2020). Among various feminist perspectives, this research adopted feminist political ecology (FPE) as a theoretical framework which helped understand gender relations and power imbalances among academic staff in public universities in Kenya. FPE applies feminist theory, objectives and practices to understand ecological issues (Rocheleau et al., 1996; Nyantakyi-Frimpong & Bezner-Kerr, 2015). Though previous studies have used FPE to examine the uneven access to and control over natural resources (Rocheleau et al., 1996; Harcourt & Nelson, 2015), this study draws from these insights to understand the multiple stressors in ocean science education. An FPE approach considers gender and the politics of place, focusing on the division of labor, roles, treatments and power relations and how power differences influence and shape ocean governance (Elmhirst, 2011; Elmhirst, 2015; Harcourt & Nelson, 2015). Feminist political ecologists argue that gendered divisions of power and their intersection with ethnicity and other variables, are a fundamental component of use, conservation and management of natural resources globally, including oceans (Rocheleau et al., 1996; Sundberg, 2017). The FPE approach has been used to explain why certain decisions are made especially when it comes to who should have access to and control over natural resources, and the consequences for sustainable environmental change and management (Rocheleau et al., 1996; Haeffner et al., 2021). As noted by Rocheleau et al. (1996), FPE argues that gender accounts for differences in production, reproduction and community roles between women and men and is a primary source of social injustice. Previous studies on FPE have concentrated on water, agriculture, forest and land (Harcourt & Nelson, 2015; Adams et al., 2018; Lau, 2020; Ankrah et al., 2020). However, no study has used feminist political ecology to explore the differences in gender representation in higher education, although Nelson (2021) applied an FPE approach to explore views on how higher education conference spaces are emotional sites to co-produce the expertise of campus sustainability professionals. Given that education can be seen as a 'resource' and ocean science education as a resource for the health of oceans, we argue that FPE is appropriate to study gendered and intersectional inequality and power relations in ocean science-related higher education programmes in Kenya. FPE as used in the research reported here draws links between the material dimensions of education (e.g., career

progression, promotion, support and recognition) and non-material factors (e.g., age, ethnicity, power relations, class, values and norms).

In Kenya, ethnic bias is one of the social problems which has heightened inequalities in all sectors of the economy, including education and employment (see Alwy & Schech, 2004; Mwiria, 2006; Munene, 2013; Taaliu, 2017; Odhiambo et al., 2018; Muange & Ng'etich, 2020; Mande et al., 2020; Njagi, 2020). For the purpose of this research, we use the definition of ethnicity which includes factors such as customs, values, language and beliefs which determine belonging to a cultural group (Monyoncho, 2014; Taaliu, 2017). Kenya is a multi-ethnic country with 42 ethnic groups (Kisaka & Nyadera, 2019) which form one of the bases of discrimination in the country, especially in public universities as a workforce. Ethnic bias can be seen in the recruitment, promotion, deployment and transfer of academic and non-academic staff (Mande et al., 2020). More importantly, during national elections people usually vote along ethnic lines which has led to power being given to the dominant group since Kenya attained its independence in 1963.

This study uses the concept of intersectionality (Macias & Stephens, 2017) to explore the gendered experiences together with other social identities to understand the challenges facing staff in ocean science programmes. An intersectional analysis of an issue allows for a deeper, more thorough understanding of societal frictions, which may help develop better responses, actions and solutions to longstanding problems. This analysis sought to map the multiple social metrics, gender and ethnicity that intersect to create systems of oppression (Hancock, 2007).

Gender is known as a source of power or privilege in any culture and society, and the privilege associated with gender can always change because societies and cultures also change and vary from time to time (FAO & Biswas, 2017). Therefore, when the power or privilege associated with gender intersects with other power sources, such as ethnicity and class, the power/privilege may decrease or increase promotional opportunities, support and other advantages or disadvantages. The FPE lens reveals the need to pay attention to the many differences (such as age, class and ethnicity) that shape everyday life of women staff and also how staff experience access to opportunities, treatments and stereotypes in ocean science departments in Kenyan public universities. FPE, then, elucidates the importance of gender and intersectional identities in the appointment to senior positions, resource allocation (funds) and social injustices, including discrimination and sexual harassment. This paper builds upon and contributes to the works and applications of FPE to show how the theory could be applied to expand the scholarship on gender inequality and power relations in ocean science fields. To explore the staff experiences and challenges, in-depth interviews were conducted with the participants, as described in the next section.

3. Materials and Methods

3.1 Study site

The study was carried out in six public universities which offer ocean science degrees in Kenya between June and October 2021. Public universities often provide less expensive education than private ones, to students regardless of their socio-economic status, which should then result in a more diverse student population.

3.2 Data collection

The study adopted an exploratory and qualitative research design aimed at understanding the in-depth experiences of academic staff and highlighting the differences and similarities in their career pathways, and barriers that they felt hindered their career progression. Data was collected through interviews designed to obtain information on the different career patterns among female and male staff. Interviews were also designed to explore the obstacles that restrict the participation of women staff in ocean science programmes. The target population for this study was staff working in ocean science-related programmes, ranging from part-time lecturers, technicians, lecturers, senior lecturers, associate professors and full professors. Three key informants were also interviewed, representing gender focal points from three of the universities. The purpose of including the gender focal points was to get institutional information on the status of gender equality in their respective universities, factors contributing to gender inequalities and good practices or initiatives in place to promote gender equality.

The six public universities that accepted to participate provided a list of potential interviewees who were officially invited through e-mail to participate in this research, and meetings were scheduled based on their availability. The interviews were conducted face-to-face, by zoom meetings, or through phone calls based on participants' preference, and lasted between 30 and 90 minutes. This study involved 30 professionals, representing early- to late-career professionals, junior and senior staff, and those in permanent and non-tenured positions, to ensure the inclusion of diverse perspectives. The majority of the participants were identified through purposive sampling, though some participants were identified through snowballing selection. The authors developed two interview guides for: (i) the academic staff and (ii) the gender focal points. The questions about individual perception of gender equality, career journey and factors that affected their career development and progression were asked to academic staff. By asking the participants open questions on their experiences, we gained insights into how academic staff perceived gender equality and the causes of gender inequalities in general as well as their personal experience. We asked the gender focal points for information regarding institutional

initiatives and strategies towards gender equality. Interviews were conducted in English in which all interviewees were fluent, and were audio recorded.

3.3 Data processing and analysis

The recorded interviews were transcribed using Otter.ai, and transcripts were manually edited to ensure their accuracy. The transcripts were analyzed using NVivo version 12, where the qualitative information (transcripts) from the interviews were analyzed by categorization and themes formation with relevance for the study and coded into main three groups: career paths, barriers and good practices. The research questions formed the basis of the coding, and the thematic analysis of the transcripts followed a deductive approach based on the themes derived from FPE.

4. Results

4.1 Socio-demographic profile of participants

The participants represented a diverse group of academic staff in ocean science-related departments from the selected public universities in Kenya. Table 1 summarizes the participants' demographic information as intersected by gender, age, highest education attainment, marital status, number of children and current employment position.

Table 1: Socio-demographic profiles of the participants from the selected public universities in Kenya (n = 30)

Socio-demographic characteristics	Categories	Frequencies (n = 30)	
		Women	Men
No of participants	Gender	12	18
Marital status	Married	5	16
	Single	5	1
	Unassigned (Gender focal points)	2	1
Social class	Middle class	6	15
	Lower class	3	0
	Not specified	1	2
	Unassigned	2	1
Highest education level	PhD	6	9
	Ongoing PhD	3	1
	Masters	3	8
Children	Have children	9	14
	No children	1	3
	Unassigned	2	1
Age	<30	0	2
	30-39	3	4
	40-49	2	5
	50-59	3	4
	Above 60	2	2
	Unassigned	2	1

4.2 Staff understanding of gender equality and causes of gender inequalities

This analysis included the recognition of the term ¨gender equality¨, its meaning and causes of gender inequalities in ocean science workplaces. All the participants interviewed indicated that they had heard about gender equality. Among the interviewees, 11 women and 13 men said gender equality means giving equal opportunities to both women and men, while one woman and three men said it refers to equal treatment of women and men; two male participants said it means no discrimination based on gender. The extracts from participants showed that the participants were knowledgeable about gender equality, however, two of them (a woman and a man) seemed to have difficulties differentiating between gender equity and gender equality. Going by their explanations, however, they still mentioned giving equal chances to all without discrimination.

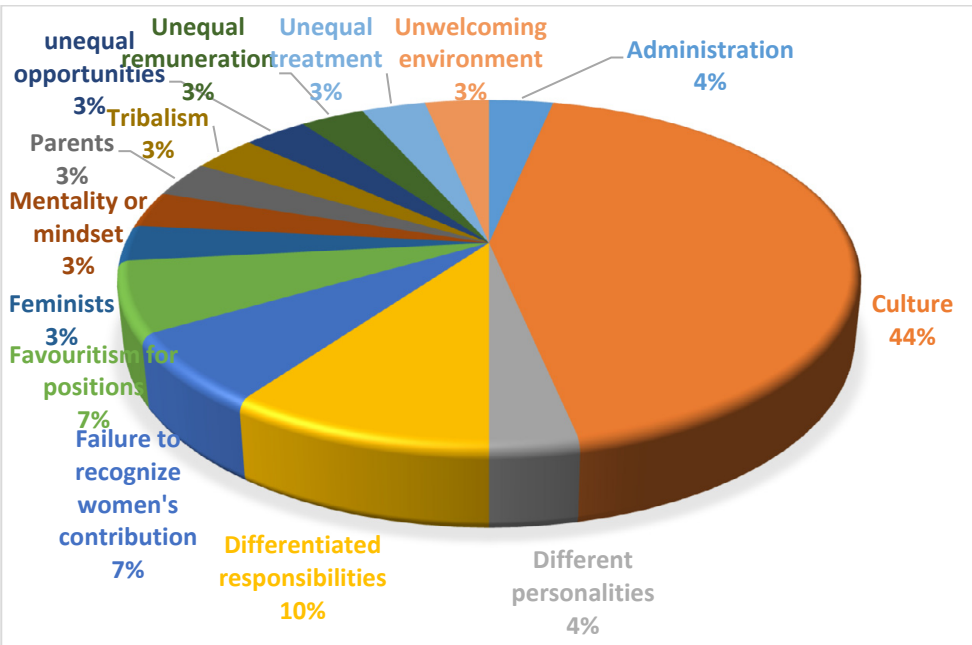

Figure 1: Perceptions of the staff about causes of gender inequalities in the selected public universities in Kenya

When participants were asked how they thought gender inequality arose at workplaces, most of them highlighted that gender inequality originates from culture and society where boys and girls are taught how to behave and act while they are young. These ingrained socio-cultural norms and barriers lead to women and men being given differentiated responsibilities and roles at home and at work and result

in favoritism for positions and the failure to recognize women's contributions (Figure 1). The administration (4%) and unfriendly work environment (3%) are also believed to be the causes of gender inequality.

4.3 Career path of ocean scientists after graduation

The three major roles and responsibilities mentioned by participants were teaching, conducting research and supervising undergraduate and postgraduate students. A previous study of gendered staff distribution found evidence of varied patterns in career paths of women and men participants, with underrepresentation of women in various academic positions in ocean science recorded; most female participants held non-tenured jobs (Ojwala at al., 2022). Similarly, in this study more women academic staff interviewed were part-time lecturers, followed by lecturers, associate professors; more senior academic positions were held by only one or no female participant. Notably, most of the positions were held by fewer female participants than males. Male participants were well-distributed across almost all academic ranks, from graduate assistant to associate professor, with the majority being lecturers (Figure 2).

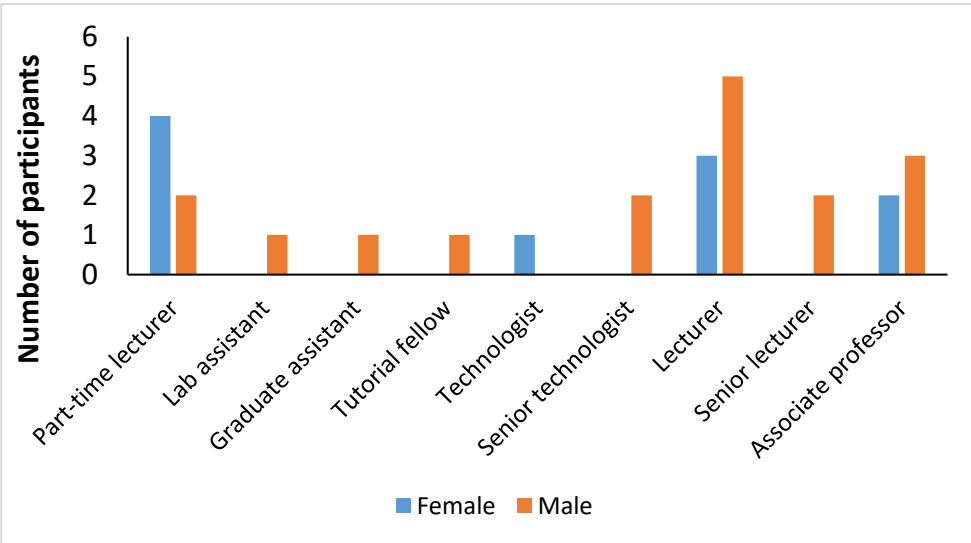

Figure 2: Current position of the participants by gender, excluding gender focal points (n = 27)

The majority of participants were aged between 30 and 60 years old. Three age groups (30-39 years, 40-49 years and 50-59 years) had the same number of participants (26% each), while between 60-69 and <30 had 15% and 7%, respectively. This indicates that the early career professionals were the smallest group in this study. Comparing age and positions, we noticed that some positions were distributed in almost all age groups. For instance, lecturer positions had

participants from different age groups, between 30 and 69. The findings also confirmed that men were more likely to have been promoted than women despite women exhibiting higher educational attainment. For instance, the results showed that 75% of the women participants had a PhD degree as their highest level of education and one of them had an advanced research position (postdoc). The remaining 17% indicated that they had ongoing PhD studies, and only one (8%) had an MSc degree as her highest qualification. Among male participants, 67% had PhD degrees, 11% were enrolled for PhD studies and 22% had MSc degrees as their highest degree. The majority of the male participants were between the age of 40-50 years while the majority of women were between 50-59 years. One of the three participants who noted that there has been lack of recruitment in their respective universities, and that the universities have taken a longer time to employ new staff claimed:

> I hope there will be some employment because they are not employing and people are retiring and there are so many graduates out there looking for jobs. All the senior ones have retired and the age gap is very little. In fact, the youngest staff in our department is 45 years old (Participant 79; Female, Lecturer).

The interviewees were asked to summarize their career journey, including their initial job, the time they took to get the first permanent jobs, their first permanent job, years of work experience, and their accomplishments. The initial activities that most participants, especially women engaged in before getting their first permanent jobs, including volunteering, internships, business and marketing and part-time teaching.

More male participants (79%) than female (21%) indicated that they got their first permanent positions immediately after graduation. Figure 3 shows that most women take longer to get a permanent job, ranging from two to over five years. Of the three women participants who got a job immediately after graduation, two were over 50 years old. This suggests that in the past securing jobs directly after graduating might have been less difficult as there were very few people with university entry grades then. The number of university students in the country has increased over the past 20 years. One of the female participants expressed:

> I think the good thing I went to the University those days when there were not many people who were going to the university during my time. Getting a job was actually not a problem, because I remember when we were finishing our last semester in fourth year, all the companies used to come and camp in the university to recruit people (Participant 18; Female, Associate Professor).

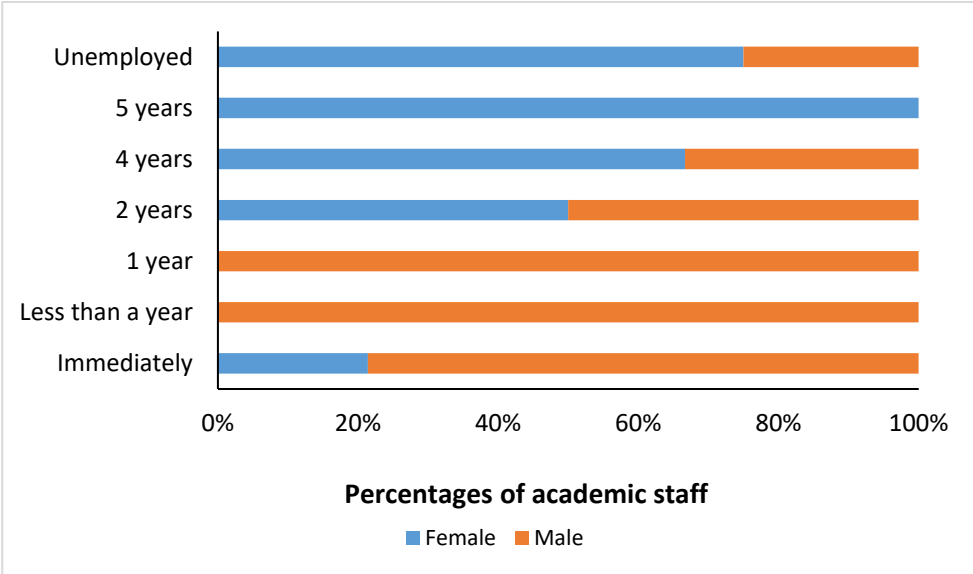

Figure 3: The time taken by male and female participants to get their first permanent jobs

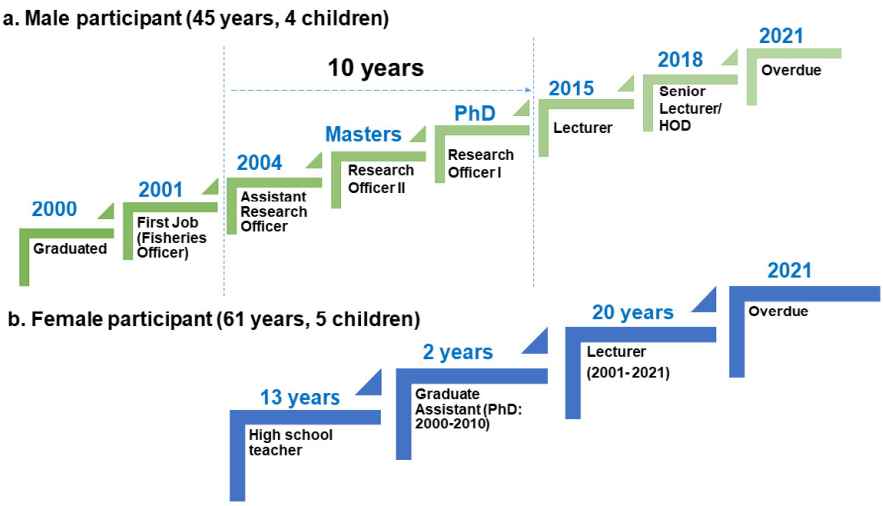

Figure 4: Contrasting career paths and progression between male and female staff in the selected public universities in Kenya

Fifty-three percent of male and 70% of female participants had more than ten years of work experience, however, males were more likely to be in senior positions. This indicated that more men were more likely to be promoted than women. For instance, Figure 4 compares the career progression of two representative participants (female

and male) with family responsibilities as well as professional roles. Whereas the career progression of the male participant was straightforward without apparent obstacles and with promotion every three years, the female participant with over 21 years of experience was still in a university lecturer position. She complained of being denied promotion opportunities several times, while her male counterparts with the same years of work experience were in the ranks of associate professors.

4.4 Gendered barriers to career progression and gender equality in universities

Women were underrepresented at all academic career levels except in junior positions. In academia, the possibility of women progressing or transitioning to higher levels is constrained. The gendered differences in perceptions of the obstacles that hindered career progression are presented in eleven sub-themes, ordered by the frequency of their mention (Figure 5). These findings help identify the problems and drivers of gender inequalities in higher education. Five of the most frequent barriers are discussed in detail below.

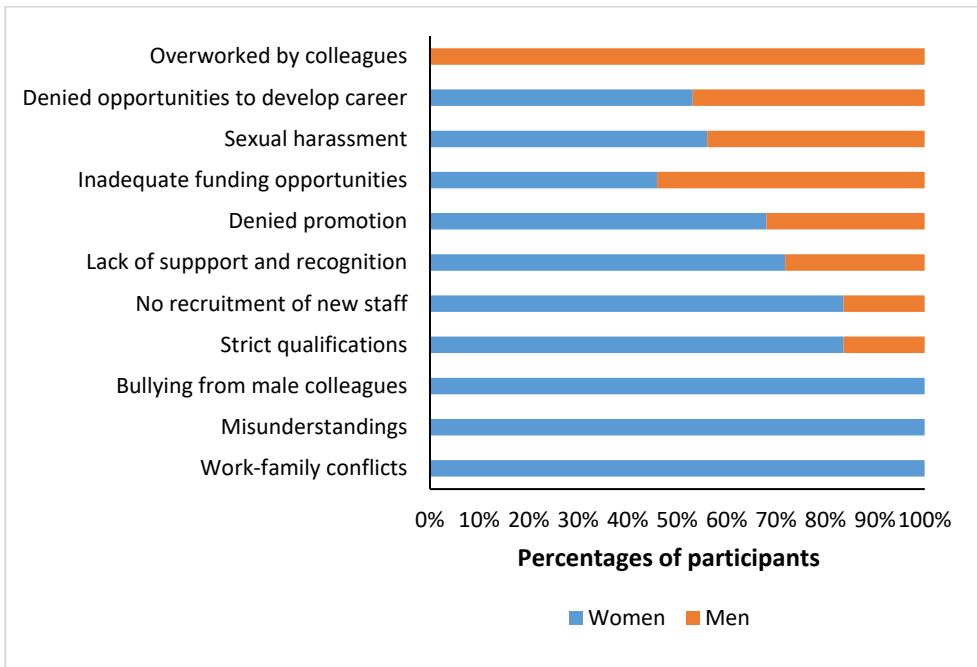

Figure 5: Barriers to career progression and gender equality in the selected public universities in Kenya

4.4.1 Work-family conflicts

Eighty percent of participants had family responsibilities, while 20% had other duties apart from family-related ones such as leadership in church. Among women participants, 90% who had children whether married or single expressed having experienced work-family conflicts in one way or the other. One female participant articulated:

> As a woman, it's just that like for me to get the one publication, I probably will be getting one paper when the men already have three papers. Because when I have left or gone to pick my children up, men will still be working, and they can afford to work until late. But for me, as soon as it reached four o'clock, I know I have to leave. And probably I will not be seated anywhere near a computer or doing any work-related assignments until tomorrow or the next day. So that makes a lot of difference (Participant 82; Female, Associate Professor).

Most women participants mentioned some factors that hamper work-family balance in their institutions. Some of these factors included the lack of child care facilities or support, inflexible working schedules/arrangements, unequal access to parental leave and the lack of support from their partner/spouse. When the participants were asked how they managed their time to strike a balance between work and family responsibilities, only three of them said through good planning and time management while the rest mentioned that they had house helps. However, when those claiming to have better time management were probed, they also admitted having delegated some house-work to their house helps or to their older children. All participants with younger children confessed to having contracted someone to assist with household chores while at work:

> Yes, I've always had house help. Otherwise, it would be impossible, and I liked it because I always found support from her (Participant 82; Female, Associate Professor)

The responses from men gave a different picture as the majority of men who declared having family responsibilities claimed it was normal and they had nothing to worry about as it did not affect their work. Among male participants, 80% had never taken paternal leave to support their spouses. The remaining 20% had only taken 14 days which is stipulated in the national law on parental leave for employees:

> Those are normal expectations. So, I wouldn't say it affected my participation…Their mother is at home with them. She does her own business so she is able to divide the time between the children and her business (Participant 10; Male, Lecturer).

> It is manageable. In the morning, the mother drops them at school and picks them up in the evening. So it is just normal (Participant 16; Male, Tutorial fellow).

4.4.2 Lack of support and recognition

From the interviewees' perceptions, staff support and recognition tended to be absent or generally limited in public universities in Kenya. When they were asked whether they felt that their work had been supported, recognized and valued, most of them disagreed. Instances of lack of support and recognition were mentioned by some female part-time lecturers who complained of not being paid for several years or having delayed payments, which made them vulnerable and having to live with debt. This survival tactic has been observed among most graduates because of a lack of employment opportunities; therefore, most of those in temporary positions are often exploited. A female part-time lecturer explained this situation and how the university management expected them to survive:

> They used to pay after every semester before I joined. I was told that they used to pay after a semester, but when I joined, they used to pay after one year then they stopped (Participant 40; Female, Part-time lecturer and PhD student).

Despite having a PhD degree and qualifications for a permanent position, she still had yet to get any opportunity, and part-timing was the only option for her. She went on to say that her university claimed that it had no financial resources for more lecturers.

4.4.3 Lack of opportunities for career development

The interviews showed that practices and policies for women to develop their career in the selected public universities were minimal and were more likely to affect women's career development than men's. Out of the 12 female participants, 58% said that they had been denied promotion at least once compared to 30% of male participants who claimed to have experienced discrimination with regard to promotion. Some claimed that they were denied promotion on technical grounds, while others are yet to learn why they did not get promoted. Most of the women staff participants perceived being denied promotion to be associated with their gender, education qualifications and years of experience. Most female participants felt that their gender was the reason why they did not get promotion, while most male participants thought the cause for them was ethnicity. However, all participants blamed the university management. One female participant pointed out how changes in the university management team have complicated issues on promotion:

> Management has really changed things until we don't know what is happening. And, of course, the terms also go up to do publications and supervision. So currently, everybody I'm supervising is not even taking me anywhere. It is just piling up (Participant 79; Female, Lecturer).

In her case, she said that her last promotion was ten years ago, and she does not understand why it is taking the management so long to promote her despite having fulfilled all the requirements. The interviews suggest that lack of or poorly-managed promotion caused job dissatisfaction and demoralized staff, with participants often feeling frustrated and demotivated. For instance, there was a female participant who sounded melancholy and concerned about the future of the university or department and said:

> I'm telling you where I want to be. And I don't even know whether I will reach it because it depends on very many factors. Like now, I was promoted to be a lecturer in 2011. And they have frozen promotions. For a long time, and with new changes, things are even messed up (Participant 79; Female, Lecturer).

Some participants also emphasized that the promotion guidelines kept changing to benefit a particular group of people, especially the older staff. For instance, the number of years of work experience as a criterion prevents younger academic staff from progressing despite having many publications and ongoing research projects. We observed that these changes affect not only female career advancement but also the progress of young male academic staff. Apart from promotion guidelines and management, the participants also alluded to the rigid schedules at the university being a hindrance to their career progression. Inflexible schedules did not allow academic staff to take up some other activities or initiatives to advance their career, such as capacity building and training, workshops, conducting a research project and attending conferences. Some young male participants also confirmed that nothing extinguishes morale and work performance like being denied promotion or advancement opportunities.

Some participants also mentioned that the number of publications as a crucial part of the promotion criteria needs to be revised due to the high cost of publications and the flexible time to teach and research. These participants narrated some of the ordeals they go through to get their publications published by reputable or international journals. The challenges associated with publishing were said to include the high cost of open access publications which was unaffordable to most women staff, and the gender bias in some international journals that reject papers submitted by women claiming that they are for local consumption. The outcry of one female participant was that the journals rejected her articles when she was the sole author, but published the ones she wrote or co-authored with her students. These claims indicate that women-led or single authored papers still lack credibility despite their efforts to participate equally and achieve scientific excellence in addressing the world's oceans' significant challenges.

The findings also revealed the need for more financial support from the universities regarding funding publications. Most participants observed that the university management's financial constraints and lack of facilitation could lower the number

of publications by the staff. The majority of female participants felt that the university was not supporting their research projects, and they often lacked funding for their publications. One female participant suggested that the university should find a way to assist or finance publications. When the participants were asked if the university has initiatives to promote their staff's careers, most participants, including men, disagreed and responded that most of their achievements are self-driven or individual-based initiatives such as attending short courses, training and attending conferences were by their own means.

4.4.4 Sexual harassment and bullying

The interview responses showed that many female and male staff had experienced, heard or witnessed behaviors that they could consider as sexual harassment (70% of all participants). Only one male staff member admitted that he had been harassed sexually or bullied, but others had heard about cases of sexual harassment in their universities. The forms of harassment experienced or identified by both female and male staff were all sexual, with the majority reported between staff and students. One female participant who was sexually harassed while she was a student shared her experience:

> Sexual harassment is there, not as a staff but as a student. I didn't know the seriousness of it, so I dealt with it in a very calm way. I felt like I was the one who was in the wrong but I wasn't in the wrong. But I thought, well, that that was bound to happen. And those days when I was a student, there was not much talk about that (Participant 82; Female, Associate Professor).

Similar views and concerns were expressed by other participants, including another female participant who explained how sexual harassment by lecturers and supervisors affects female students, especially those pursuing MSc degrees. She recounted that:

> It happens to undergraduate students, but this also happens to master students, especially with their supervisors, because for the master's level, your supervisor is the closest person that you have, so everything you have to report to them. You have to see them daily, they have to mark your thesis, and if they don't mark your thesis, you won't go anywhere. Some students would do what the supervisors ask of them before they mark their thesis (Participant 2; Female, Technologist).

As well as sexual harassment, some female participants recalled being bullied by their male colleagues, especially when they were in junior positions. One female participant narrated the difficulties she had to go through as a junior employee in a male-dominated department. She said she went through different kinds of harassment and bullying, including negative comments about her dress and not being allowed to speak in the departmental meetings. She explained how her male

colleagues took too long to accept her as one of the staff members and her way of doing things. She explained:

> I was more or less one of the first ladies to work in this department. If you look at the people, I've worked with all my journey are male people. But what I have realized most of the time, I remember when I was employed as a staff, what shocked me then was that women were not allowed to wear trousers. I'm the first woman to wear trousers at the [Name of the university], and everybody was like, you can't dress like (Participant 18; Female, Associate professor).

She further noted that women were not allowed to talk or give their opinion in meetings:

> I remember even when I came to the department, we would be having a meeting and then when we are talking, people would look at you as a woman. I would keep on reminding them, if you're not used to a woman talking in this department, there is one now. There was quite a lot, and you really had to focus your way towards it. It has never been an easy journey anyway as expected (Participant 18; Female, Associate professor).

Most of the participants from the universities with institutional gender equality and sexual harassment policies were not aware of them. Also, a few participants, both women and men, were unaware of the reporting procedures or did not know whom to talk to or where to register their complaints in case of sexual harassment, discrimination or bullying.

4.4.5 Intersectionality in career progression

Apart from the discrimination based on gender explained above, our findings unveiled the different treatments experienced by the participants and opportunities that they were denied to advance their careers because of social identities such as age, gender, ethnicity, education, class or combination of these factors. When the participants were asked if they had felt discriminated against because of their ethnicity, one female participant said:

> Yes, that one has been there. Especially some of the scholarships that I have applied for. Some of them, if someone is from a different tribe, always choose someone from their tribe. So that one has affected me in a way (Participant 1; Female, Part-time lecturer).

Another female participant elaborated that:

> Yes, the ethnic group also play an aspect. Again, you'll find that even if you work in a place with a majority of a particular ethnic group, sometimes your ethnic face is put in a meeting to show or in a board to bring up the ethnicity…We are Kenyans; when

> the Vice Chancellor comes from this tribe, they will tend to appoint people from their tribe (Participant 18; Female, Associate Professor).

Some male participants also expressed their concerns about discrimination based on ethnicity. A male participant confirmed this claim:

> Ah, there are two factors that shape your career in Kenya. That is the tribal angle, and the other one is gender. But in my career, gender is not a problem but the tribal angle. Yes, I lost the scholarship twice because I did not belong to a tribe. And you can also tell that during that time, you could not get a house within the university if your name did not decide. So, those are the things that, even now, are affecting employment, recruitment, promotions and so on, not gender. If you are in Kenya, I don't think gender is a big issue; it's tribal. If you are a boss, and a female is from your tribe, I don't think you will look at gender; gender now takes second placement (Participant 7; Male, Associate Professor).

Age also is a factor that was examined, and our findings established that most participants did not have a problem with their age. They reported not having encountered discrimination because of it. However, there are a few female participants who felt their age denied them some opportunities or made them discriminated against. For instance, one female participant narrated how age affected her during her study:

> Negatively, because when I apply for anything, especially these postdoctoral or even courses, they don't want older people you might go and collapse there (Participant 79; Female, Lecturer).

Nevertheless, other participants had different experiences. One older female participant recounted that age has many opportunities that positively impact her:

> My age, not really. The older you are; the more opportunities you have on your way. Age is a positive thing because of maturity, people look at maturity. It really gives you wisdom. So that's why you find many things come to you as you mature. For me; it is more positive than negative (Participant 18; female, Associate Professor).

4.5 Good institutional practices in public universities

In the majority of the public universities studied, the participants were able to point out some actions and measures that they perceived as good practice for promoting gender equality. Figure 6 summarizes these good institutional practices based on the frequency of mentions. These results include the responses from the gender focal points.

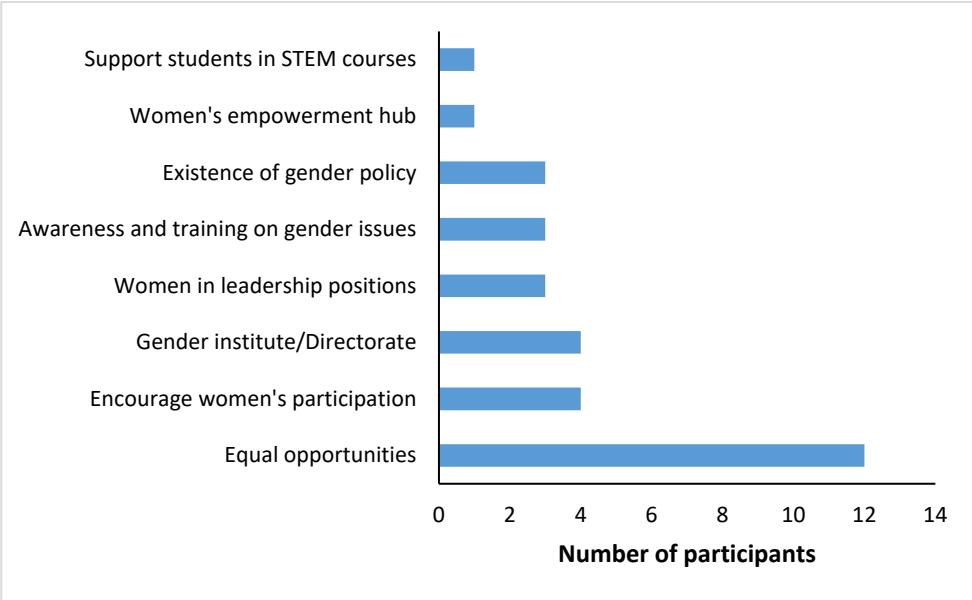

Figure 6: Summary of the good institutional practices perceived by the participants (n = 30)

Figure 6 shows that about 40% (12) of the participants felt that their universities were committed to gender equality through giving all women and men staff opportunities to participate and carry out their roles and responsibilities equally, without any discrimination. The majority of those participants who claimed their universities were gender equal were male. Some of these participants also claimed that the universities' appointments often follow the two-third gender principle enshrined in the national policy and that the opportunities are based on merits or qualifications of an individual not gender:

> Yes, because most of the appointments we have two-thirds gender rule. It is being enforced in the university (Participant 12; Male, Senior Technologist).

The second good practice mentioned was having gender centers, institutes or directorates in the universities that are mandated to address the gender issues including factors that hinder the pursuit of academic excellence of female students and staff in the university. Approximately 13% of the participants noted that the gender institutes carry out training and workshops on gender-related issues in the campus and organize the celebration of International Women's Day annually:

> The fact that we are the only university with a Gender Institute in Africa, our university has always been way ahead in terms of gender matters. We even have a gender director, and there is a lot of awareness, and also a lot of trainings because

> almost every semester like now, I just sent two of my staff for a gender awareness workshop (Participant 18; Female, Associate Professor).

Thirdly, 13% of the participants mentioned that their universities encourage women to participate and apply for every opportunity, including study leave. Additionally, they mentioned that women are often encouraged to apply for positions and scholarships as most of the university's job advertisements state 'for this vacancy we actively encourage women to apply'. One female participant expressed:

> What I would say is a good practice, that normally whenever we have those adverts being put out, there is that statement of women are encouraged to apply (Participant 21; Female, Part-time lecturer).

Fourthly, only three of the participants expressed that they considered having university's gender policy is a good practice. This gender policy aimed to promote women's access to higher education and academic career positions as well as university management positions. However, these results are not encouraging because the majority of the staff were not aware of the existing institutional gender policies and resonate with an earlier phase of the research project, which established that the presence of a gender equality policy did not translate to gender equality in public universities (Ojwala et al., 2022). Therefore, there is a need to develop gender-transformative policies, strengthen the implementation plan of existing gender policies, and create awareness of these policies which currently seem to have a very low uptake. There was very low awareness among women and men participants, with fewer (about 13%) women acknowledging the existence of the policies than men (43%).

The fifth good practice cited was having women in leadership positions. Three of the participants claimed that their universities had women represented in top management positions such as Dean, Director and Vice Chancellor. However, this was not the case in all the universities studied, which had lower representation of women in management positions (Ojwala et al., 2022). Other good practices included: awareness and training on gender-related issues, support structures to female students in STEM courses and mentorship programmes.

4.6 Status of public universities' gender equality

The university gender equality status was gathered from the interviews conducted with the gender focal points from three public universities. Each of them admitted that their universities are currently not gender equal. They added that they have initiatives to promote gender equality in their respective institutions, including having gender policies in place, collection of gender-disaggregated data and mentorship programmes. However, they also mentioned that the policy implementation was inadequate due to lack of human and financial resources. One

of them mentioned having only two staff members in her gender directorate, and also lacking an office where staff can go to report their concerns. Regarding the collection of gender-disaggregated data, these participants acknowledged that they only collected data for staff and not students, and that this was sent to the national Ministry of Gender, but not used by the universities to monitor progress in gender equality. One female gender focal point also indicated that gender related issues were not given priority in her university, and that the management seemed to neglect the gender directorate. This suggests that while having the directorate shows compliance with the requirements by the Government of Kenya, gender equality is not being enforced at the university level.

5. Discussion and Conclusions

It was evident that women and men participants had different career paths ranging from the time taken to get permanent jobs to access to promotion opportunities. These differences in career progressions can be attributed to the delays in getting employment opportunities, maternity leave breaks, access to education, especially in communities where men's education is prioritized, early marriages, sexual harassment, power imbalances, perceptions about women being weak, perception of ocean science as a field that requires stamina and not suitable for women, denial of promotions and discriminatory promotion guidelines.

The critical area emerging from discussions of the career path is that most female participants felt that they were overdue for promotion. Most of the barriers mentioned in this study were associated with institutional practices, structure and culture. These findings confirm the claims by the feminist political ecologists that male dominated institutions render unequal benefits for women and men as the system tends to favor men (Harris, 2015; Harcourt & Nelson, 2015; Tierney & Lanford, 2018). According to Harcourt and Nelson (2015), institutional culture means 'the deeply embedded and collective patterns of organizational behavior and the shared values, beliefs, assumptions, practices, norms or ideologies that members have about their organization'. In addition, FPE helped to identify the barriers that hinder the participation of women, especially those from the marginalized groups. The resulting barriers included discriminatory policies, sexual harassment, lack of support and recognition, work-family balance or conflict, lack of flexible working hours, limited parental leave days, lack of child care support or facilities, and high cost of publications are the major contributing factors that stagnate female staff.

Institutional barriers and gender bias lead to inequalities between women and men, often in complex ways, including stereotyping that undermines performance, lack of promotion opportunities, and sexual harassment. Our findings concerning the discriminatory promotion guidelines as a hindrance to career progression

complement and extend the study done by Onsongo (2006), who identified aspects of gender inequalities as access to higher education, low recruitment, training and promotion of women staff, unfriendly work environment which entail sexual harassment issues, and discriminatory appointment and promotion practices and policies that primarily affect women's progress. Similar results were reported by Shellock et al. (2022b) in their study of women leaders, who identified the barriers to gender equality in interdisciplinary marine research institutions, including stereotyping, limited institutional support and capacity, poor leadership within the university, isolation and underrepresentation, sexual harassment, lack of suitable funding opportunities, parenthood and caring responsibilities, and institutional structures (Mahajan et al., 2020).

There is clear evidence of sexual harassment in Kenyan universities based on the interviews reported here. We found out that women are more likely to be exposed to sexual harassment and bullying than men and the lack of proper reporting mechanisms has exacerbated the incidence and prevalence of sexual harassment. The worst affected group mentioned in this study are the female students and junior female staff. The main reason for this could possibly be power imbalances, lack of awareness, lack of policies on sexual harassment or gender-based violence, unequal opportunities between women and men, male staff outnumbering female staff, and when women are not respected and valued in the workplace (Equileap, 2019). Power relations can be defined as the possession of control, influence or authority over others, and the misuse of power is central to the causes of sexual harassment. For instance, the perpetrator might be in a powerful position in the university or department that can influence the future career prospects of the person being harassed. According to Clancy (2020), public universities have been recording higher rates of sexual harassment despite being mandated as an institution that should inspire change in society. Similarly, Agardh et al. (2022) highlighted that 24.5% of women staff reported having been exposed to sexual harassment such as suggestive gestures or looks, unwelcome comments and inadvertent touching or brushing, in a Swedish university in 2019.

The results also found that gendered work-family conflicts exist due to differentiated gender roles. Gender roles often limit women's mobility and interfere with their careers (Caprile & Valles, 2010; Yousaf & Schmiede, 2017; Wandahi & Njoroge, 2021). Here, most women seemed to take full responsibility at work and home, which often led to delayed career progression. Our findings showed that most male participants claimed or perceived work and family responsibilities as normal and manageable. However, when we dig deeper to assess how they are helping with the children or housework, most said 'they are with their mother'. Most women participants confessed that balancing work and family is difficult as they all require time and full attention, and some had to pay for house help to assist with home responsibilities. Work-family conflict has been defined as a form of inter-role conflict in which the role pressure from work and family domain are mutually

incompatible in some respect, that is participation in work role is made more difficult by participation in the family and vice versa (Flippo, 2005; Akintayo, 2010). In other words, it represents the extent to which an individual's perception of the involvement in one role interferes with their ability to meet the demand/responsibilities of another role (Bethge & Borngräber, 2015; Arshad & Gill, 2018). Adebayo (2016) also defined work-life balance as the maintenance of stability in one's personal and professional life, which is fundamental welfare resulting in employee productivity and job satisfaction.

Ojwala et al., (2022) undertook a gender policy analysis that revealed that Kenyan universities had no policy on flexible working hours, parental leave and child care support or facilities, which are fundamental to working parents and can help them achieve work-family balance. In most cases, working mothers have to cope with the problem of combining work and family responsibilities in their daily life due to rigid work schedules in universities, thus rendering this job increasingly difficult (Tammelin et al., 2017). Our findings have shown that the non-flexible working hours are more limiting for women, as they influence their time allocation to teach, conduct research and care for the children. Regarding the evidence provided by the women participants with family responsibilities such as having younger children, it is indisputable that a considerable proportion of women employees struggle to balance work and family responsibilities. Voydanoff (2005) also added that significant differences between employees exist based on the characteristics of an individual, including gender, education, class, family status and the work performed. Having responsibility for children potentially increases time demands and strain, particularly for young children (Hill et al., 2004). To increase female participation in the workforce, there is an urgent need to pay attention to the policies that tackle unconscious and conscious biases and barriers and ensure that work-family policies are developed and implemented effectively (Tammelin et al., 2017). Additionally, we can achieve work-family balance through the presence of job satisfaction, part-time work, flexible working hours and adequate spousal support (Bruck et al., 2002; Annik & Den Dulk, 2012). FPE emphasizes the need to incorporate gender equality in management and governance of natural resources such as oceans, because knowledge is gendered and it important to have diverse skills and ideas to find concrete solutions to enhance ocean sustainability (Nightinagle, 2011; Arora-Jonsson, 2011; Sundberg, 2015).

In conclusion, this paper investigated the roles and experiences of women academic staff in ocean science education in public universities using the feminist political ecology lens and found out that women play a crucial role in teaching, supervising students and conducting research. In addition, the findings showed that a large portion of women staff experienced slower career progression due to their gender and ethnic biases that resulted to lack of promotion opportunities and support. Apart from lack of promotion, women staff were also found to be faced by numerous challenges including unfriendly working environment and work-family conflicts

that hindered their full participation in workplaces. Furthermore, the institutional good practices identified in this study were found to be ineffective in terms of promoting gender equality in ocean science. For instance, gender policies were not well-known to the participants and they were also poorly implemented.

We recommend the establishment of gender-sensitive promotion guidelines and practices, effective awareness creation about gender issues and women's right to opportunities, development of gender-transformative and effective policies to tackle unrealistic parental leave days and childcare services or facilities, provision of adequate support in both financial and mentorship programmes to empower the young staff.

Declaration of Competing Interest

None.

Data availability

Data cannot be shared publicly due to the privacy of the participants in this study.

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