Chapter 4
The Water-Migration Nexus: An Analysis of Causalities and Response Mechanisms with a Focus on the Global South

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4.1 Introduction

Migration has long served as a coping strategy to respond to environmental disturbances, including issues about water availability and access. Parry et al. (2007) argue that human migration triggered by climate crises is a new and emerging challenge that may destabilize sustainable future world prospects and human development, noting that Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) has integrated this narrative in their synthesis. Also, the World Economic Forum (2015) Global Risk Report underlines how water crises and water-based shocks, including resultant human migration, offer new risks and vulnerability scenarios for the sustainability and human development agenda. Currently, perceptions and measures in the migration discourse often focus on the 'response' context (IOM 2015; UNDESA 2017). Additionally, there is increasing evidence that migration patterns can trigger political conflicts and should be investigated using an integrated approach focusing on drivers and response mechanisms. The need for current and concrete empirical evidence that supports the 'causality' dimension of human migration related to water and climatic variability [referred to as environmental migration (EM)] remains pertinent for migration studies.

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Causality, defined as the relationship between cause and effect in the water-migration nexus, the phenomena that embed the water- and climate crisis triggered migration to possibly inform strategies to cope with this migration. Gaps in the current understanding of the water-migration nexus can best be handled if data, information, and knowledge on multiple settings of water and climate crises are explored with a contextual, scale-based approach. These settings include pollution, resource degradation, resource-related conflicts, and their resulting instability, droughts, floods, and extreme events. The need for a regional or global overview that can facilitate interpretations of various facets of human migration is a continuing challenge.

In recent years, the gradient and intensity of water quality, water quantity, and extreme water events have been high. Given the fact that 1.2 billion people currently live in areas of physical water scarcity—a figure that is predicted to increase to 1.8 billion by 2025—a continually growing population will be living in countries or regions with absolute water scarcity. This means that two-thirds of the world's population could be living under water stressed conditions (WWDR 2012).

The International Organization for Migration (IOM) and Paris Institute of Political Studies (Ionesco et al. 2017) published a review of major environmental migration case studies from 2010 to 2017. It indicates that between 2008 and 2016, more than 195 million people were internally displaced by floods and tropical cyclones (climate events with a large water footprint). In summary, environmental migration, and more specifically, water-driven migration is one of the critical challenges facing the global community today as more people's identity, habitat assets and livelihoods are impacted due to forced migration. This is particularly true for populations living in the Global South [an emerging term steered by the World Bank for countries seen as low and middle income in Asia, Africa, Latin America and the Caribbean] due to theses regions' high vulnerability to natural hazards, multiple impacts of climate change, and a range of direct and indirect environmental drivers that influence human development.

A recent FAO (2017) report predicts that by 2050, more than 50% of the world's population, some 4.8 billion people, and an equal percentage of food-related agriculture production, will be at risk due to water stress. This interlinkage is described in the water quantity scenario, i.e., increased variability in rainfall and droughts. Critical factors influencing this situation are a surge in fragility or vulnerability caused by a scarcity of specific vital natural resources, such as water, and by the climate crisis and related conflicts. Table 4.1 presents examples to support this argument.

The lack of commonly agreed definitions and explanations of migration that is driven by the water and climate crisis presents difficulties in defining and measuring new and emerging migration trends—both within and across national borders. Gaps in data and up-to-date information on water and migration, linked to forced or seasonal displacement, adds to the lack of understanding of these issues. In this light, two points are of concern: firstly, the water context in human migration is generally reflected in the climate or environmental migration; and secondly, water-

Table 4.1 Selected examples of the water-migration nexus from the Global South that demonstrate links between water quality, quantity and extreme scenarios (aggregated from various sources, mainly Ionesco et al. 2017)

Country/ region	Year	Global South Region	Migration and the link to water crisis scenarios	Number of people displaced
Pakistan	2010	Asia	Water Quantity/Extreme—Floods—Heavy monsoon rainfall caused Indus River to crest. Floodwater impacts water quality in supply water storage and supply systems.	11,000,000
China	2010	Asia	Water Quantity/Extreme—Floods—28 provinces, autonomous regions, and municipalities in the West of China. Floodwater intrusion impacts water quality of supply systems.	15,200,000
India	2009	Asia	Extreme Event—Cyclone Aila hit west region of the country.	2,300,000
India	2012	Asia	Water Quantity/Extreme—Floods—monsoon flooded Assam State (north east India).	6,900,000
Indonesia	2008	Asia	Water-Related Extreme Event (landslide—heavy rainfall in the northern coast of Java).	30,000
Papua New Guinea	2012	Pacific Islands	Water-Related Extreme Event (Heavy rainfall and large landslide (2 km long, 500 m wide) occurred in the Como areas after heavy rainfall).	10,000
Guatemala	2010	Central America	Water-Related Extreme Event (Flood and landslide—after heavy rains in Guatemala's highlands).	50,640
Papua New Guinea	2006	Pacific Islands	Sea level rise and salinization—inhabitants of Han islet initiative a relocation plan to adapt to sea level rise, salinization, and food insecurity.	2000
Vanuatu	2004	Pacific Islands	Sea level rise and floods—after significant floods and sea level rise the Lataw village on Torres Island relocated inland.	N/A
Solomon Islands	Long term	Pacific Islands	Sea level rise—Choiseul (township located 2 meters above sea level) threatened by sea level rise. As a result, authorities are planning to relocate inhabitants.	1000 (potential)
Tuvalu	Long term	Pacific Islands	Sea level rise and salinization—Funafuti island is located 2 m above sea level and is facing sea level rise, salinization, and coastal erosion. Migration as the adaptation strategy.	4500 (potential)
Mexico	Long term	Central America	Water Quantity (mostly scarcity)-Drought—Reduction in crop yield due to droughts is linked to increasing international migration to the USA from Mexico.	N/A

(continued)

Table 4.1 (continued)

Country/ region	Year	Global South Region	Migration and the link to water crisis scenarios	Number of people displaced
Burkina Faso	Long term/ annual	Africa	Water Quantity (mostly scarcity)-Drought—Drought—increase rainfall deficit has led to increased migration from dry, rural areas to areas with more favorable weather conditions.	N/A
Ghana	Long term/ annual	Africa	Water Quantity (mostly scarcity)-Drought—Drought—farmers are relying on rain-fed agriculture are engaging in seasonal migration during the dry periods as a coping strategy.	N/A
Republic of Tanzania	Long term/ annual	Africa	Water Quantity (mostly scarcity)-Drought—Drought and water shortage—increased drought frequency and water shortages have made people migration to cities or rural areas with better weather conditions.	N/A
Bangladesh	Long term/ annual	Asia	Water Quantity (mostly scarcity)-Drought—Drought—Rice growing is affected by rainless periods in the northwest of Bangladesh. The rural, poor are engaging in seasonal migration in search of agricultural employment as a coping strategy.	N/A

and climate crisis is not often identified as a direct influencer (push factor) for migration.

The dimensions of 'causality'—in this case, water and climate crisis scenarios causing human migration—is complex, often bearing a connection to water quality, accessibility, and availability. Availability pertains to basic provision needs, livelihood, and income generation contexts. In other instances, it relates to extreme events, disasters, and situations stemming from competing and conflicting use of water resources, such as the construction of dams, or economic interventions like water transfer projects. The water-migration nexus operates in specific situational and contextual aspects of water and climate crises scenarios. To explain this, lets us consider the example of communities living near polluted water systems which report health issues and decide to move from their current dwelling to a new destination. Behind this scenario is a complex web of linked factors. This means that reliable data and information are required to have a clear picture of the how water- and climate crisis is influencing the emerging and evolving migration pathways.

A 3Scenario (3S) framework is proposed in this chapter to enhance the understanding of the water-migration nexus (Fig. 4.1). This thinking builds on critical water crises scenarios explained by Guppy and Anderson (2017). The three scenarios are migration triggered by *water quality, water quantity, and water extremes*, and they are outlined to cluster various situations observed and noted in the water-

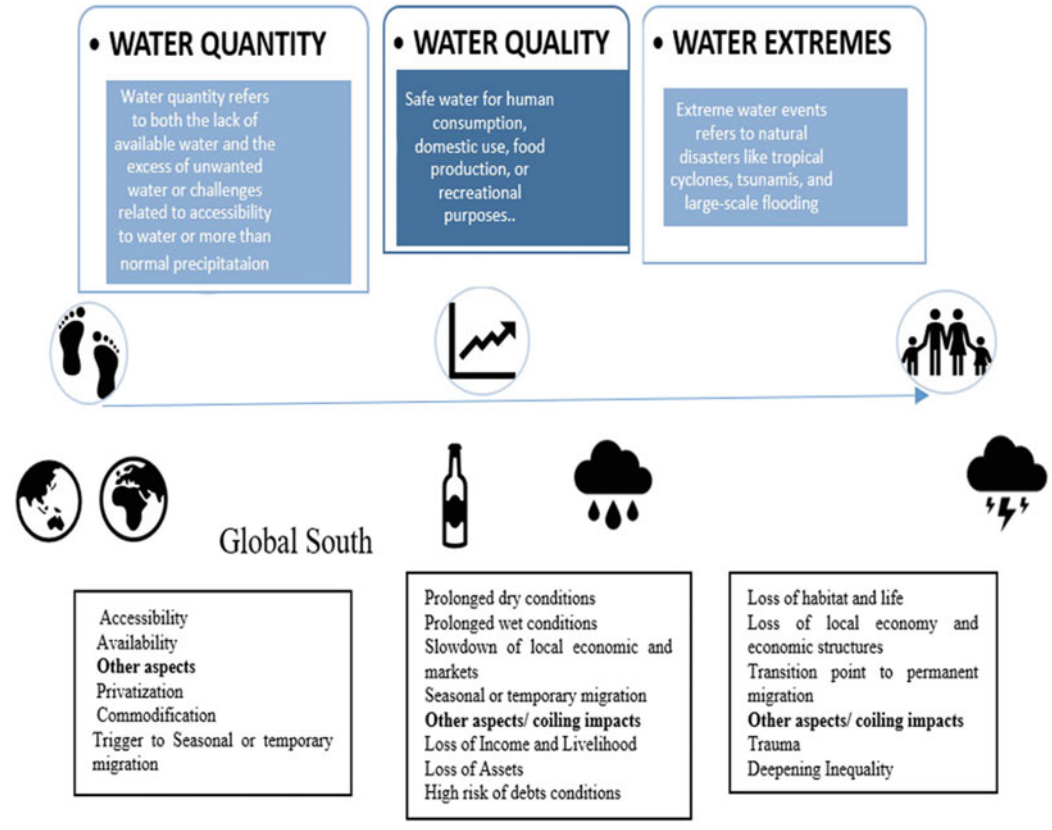

Fig. 4.1 Visual representation of the 3Scenario (3S) framework in the context of the water footprint in migration in the Global South

migration nexus. This framework will help decision-makers to generate a clearer understanding of the water context that will benefit research and development programs on human migration. It will benefit planning and policy decisions in the Global South, where these three scenarios apply in many contexts. The 3S approach will address human migration, nationally, regionally, and globally, in areas such as causalities in migration management, planning, and policy decisions. It frames temporary, seasonal, or permanent issues, water-crisis scenarios that cause migration.

On the issue of how water quality adds to the vulnerability of populations and communities, the World Health Organization estimates that two billion people use drinking water from a contaminated source containing excreta and that half a million die each year due to water quality-related adverse health outcomes such as diarrhea (WHO 2017). A significant number of these people live in vulnerable situations, including migrants. Water pollution and the consumption of contaminated water are two of the leading causes of illnesses and death (WWAP 2019—Chap. 2 and Nagabhatla et al. 2020).

Water quantity scenarios address availability and accessibility of potable water. Estimations point that four billion people live in severe water scarcity conditions [1 month/year], 1.8–2.9 billion people live in extreme water scarcity [4–6 months/year], and 500 million people live in continual water scarcity [12 months/year] (Mekonnen and Hoekstra 2016). Lack of water clubbed with diminished water quality. However, that is not always the case, noting that complexity, the water-migration nexus is explained using the 3Scenario framework (Fig. 4.1).

An excess of unwanted water is caused by periods of high rainfall resulting in flooding. Or in small island states, scenarios of sea-level rise. Strauss and Kulp (2014) estimate that as many as 650 million people may be exposed to sea-level rise, with most of the affected people living in China (41–63 million). Water-extreme scenarios are illustrated by disasters with a high-water footprint (severe floods, cyclones, and storms) or chronic water shortage conditions such as persistent droughts. This is supported by case studies from the Global South, to present the multiple dimensions of water crises and management and its likely influence for local and cross-boundary migration patterns, mostly for vulnerable communities and people. A set of arguments is provided to explain the pluralistic facets of the water-migration nexus. They couple the known aspects—quality, scarcity, extreme events, and transboundary—with lesser known ones—conflicts, peace, and security. Based on these observations, a case for re-positioning migration as a central factor to this set of challenges in the globalization and sustainable development goals and targets is argued, along with the need to analyze the gaps in migration-related institutional reforms and policy agenda. These three main sections of the chapter will help develop an up-to-date understanding of the water-migration nexus by presenting a set of narratives, a tool and multiple levels of information on direct and indirect drivers of migration, stemming from water- and climate crisis scenarios. As such kind of information is limited or mostly lacking in the available migration literature and all is deficient on the causality context, the synthesis presented in this chapter

bears relevance to the ongoing and planned discussion for safe and orderly migration.

4.2 Water-Migration Nexus: Overview of Multiple Narratives from the Global South

This section presents a set of narratives, describing the links between water and human migration using the nexus concept explained by Galaitsi et al. (2018), with an enhanced explanation of the 3S framework outlined in the introduction. The concept identifies the multifaceted interdependencies between sectors and the need to analyze these connections to provide the basis for effective decisions on resource sustainability and effective governance. For the sake of integrating with the existing explanations on human migration linked with environmental and climate parameters, water-triggered migration is considered as a subset of environmental/climate migration.

The view of the International Office for Migration (IOM) is that "environmental migrants are persons or groups of persons who, predominantly for reasons of sudden or progressive change in the environment that adversely affect their lives or living conditions, are obliged to leave their habitual homes or choose to do so, either temporarily or permanently, and who move either within their country or abroad" (*The* Atlas of Environmental Migration, Ionesco et al. 2017, p. 124). In this context, the 3S approach outlined above—that applies the lens of water quality, water quantity, water extreme—provides an organized explanation for better understanding of the water-migration nexus. This approach offers insights on a working concept of the water-migration nexus. It helps assess consistency and demonstrates the framework's potential to be transferred as a tool to manage environmental migration issues. The primary motivation for providing empirical arguments to illustrate the role of water-crisis scenarios is that they possibly influence stability, security, and sustainability of populations and communities in various socio-ecological, socio-cultural, and socio-political realms. In the Global South (mainly Asia and Africa and most recently in Latin America) people opt for migration due to environmental destruction and climate extremes (e.g. flooding, disasters that lead to loss of economic opportunity, etc.) (Nagabhatla et al. 2014).

Gemenne and Blocher (2017) have written on how floods, storms, and tsunamis influence human migration, using case studies in their work. However, many of these case studies, and indeed much of the quantitative environmental migration literature, focus on internal migration. The reason for this may be because tracking the exact cause of environmental migration, unless it is mass migration, can be difficult, as migrants may not recognize environmental factors as the primary cause of their move. Further clarification is brought by specific case studies that blend the aspects of water quality, quantity, and cross-boundary water cooperation. This water context exists alongside socioecological variabilities and socioeconomic realities.

The selected case studies outline a regional approach and attempt to embrace the 3S framework thinking towards analytical explanations of the region-specific migration trends.

4.2.1 Case Studies from Africa

A first example of the water-migration nexus is the Lake Chad water crisis, although in the available literature, this connection is not investigated explicitly. Lake Chad is the largest transboundary (Chad, Cameroon, Niger, and Nigeria) aquatic ecosystem in northern Africa (approximately 2,500,000 km^2 in size) and was once the sixth largest lake in the world. It is in a semi-arid [south] and arid [north] climate. More than 90% of the lake's water originates from the Chari/Logon river system. The lake is a closed system, meaning that there is no outflow (Birkett 2000). The lake was a vital source of water to more than 30 million people in the Sahel who relied on farming, fishing, and pastoral activities as livelihoods and means of income generation (Coe and Foley 2001; Tower 2017). Its surface water has been shrinking since the 1960s. By the 1980s, its size had reduced 22,000 km^2 to 300 km^2 due to persistent droughts and increased irrigation withdrawals (Gao et al. 2011). Consequently, the communities surrounding the basin area have suffered asset and income loss. The scenario also led to forced migration, the most noted of which was internal migration in Niger and Nigeria. This case study reflects the influence that climate variability and unsustainable human interventions have had on water quantity and availability. In the past four decades, Lake Chad has contracted by 95% largely due to climatic variability and the high demand for agricultural water. A logical conclusion is that this trend has led to internal and transboundary migration, and conflicts between different resource users (Taguem Fah 2007).

A recent survey by the Climate Refugee project says that among 150 respondents contacted to understand the correlation of migration with water crisis scenarios, many had experienced adverse environmental conditions. This included unpredictable weather patterns, droughts, flooding, shorter off-season, and, at times, severe rain spells, which were a trigger for them to move in search of more secure habitation and livelihood options (Tower 2017). Some reports also link social and political conflicts, including those connected to Boko Haram, either stemming from crisis-related triggers or exacerbating the existing situation of scarcity and security. For the north Nigerian region, IOM reports that more than 2.5 million people have been displaced in recent years, including more than 2.4 million internally displaced persons and 190,636 obtaining refugee status in another country (IOM 2016). While the Boko Haram insurgency has been labeled as the main driver of these trends, the report mentions that natural disasters, mainly heavy rains and succeeding flooding during the wet season, also have roles to play. The fraction attributed to the former and latter set of drivers varies significantly from a human

security perspective,[1] with violence marked as urgent and critical compared to slow or sudden impacts of nature-based disturbances. In most instances, those who migrated were in the transboundary region (i.e., more than 90% in Cameroon, almost 100% in Chad, and 92.81% in Nigeria). The report also suggests the militant group benefits from the existing food and water insecurity in the region. In that context, the argument from Felter (2018) that young men are likely to join the extremist groups not for religious motives, but rather because of frustration stemming from the social situation, seems fitting.

4.2.2 The Case of Small Island Developing States (SIDS)

Most of the SIDS are developing countries located in the Global South and quite often listed as highly vulnerable to climate and environmental variability and change. SIDS present a specific context of human migration, particularly as the impact of climate change has added an extra level of vulnerability to coastal communities. Reckoning that most of the migration episodes may not directly reflect the water context, the argument that the lack of available and accessible water provision in those instances indirectly influences migration pathways, in tandem with influences of social or political conflict situations, is a fair deduction. Some SIDS are beginning to plan for future mass migrations of their citizens due to ecological degradation, water crises, and extreme climate events (Gheuens et al. 2019).

A study by UNU EHS (2015) employed a survey-based method to analyze inhabitants' experiences and attitudes on migration in Kiribati (2799 individuals or around 2.72% of the total population), Nauru (1246 individuals or about 11% of the total population), and Tuvalu (2807 people or about 25% of the total population). Milan and Ruano (2014), Campbell and Warrick (2014), and Oakes et al. (2016) reported that the outcome of the survey presented a revealing 97% of households having been affected by natural hazards, water quantity, and extreme water scenarios (including drought and irregular rains, sea level rise, cyclones, saltwater intrusion, floods, and storm surges) between 2005 and 2015. Of the recorded 4000 migration cases, environmental reasons are acknowledged as a driver for internal movements and international migration. Noting that direct and indirect drivers are closely linked (e.g., livelihood opportunities and income generation for communities are related to agriculture production or tourism sectors), people are in turn crucially dependent on water availability.

Most SIDS show a negative net migration rate, with more people emigrating than immigrating (Fig. 4.2). In the Pacific, an unusually high emigration rate is seen in the case of Micronesia and Tonga (around −20/1000 population), the lowest in the

[1]Cameroon noted little more than 8%, and Nigeria only around 1%, of the total migration occurring because of natural disasters (IOM 2016).

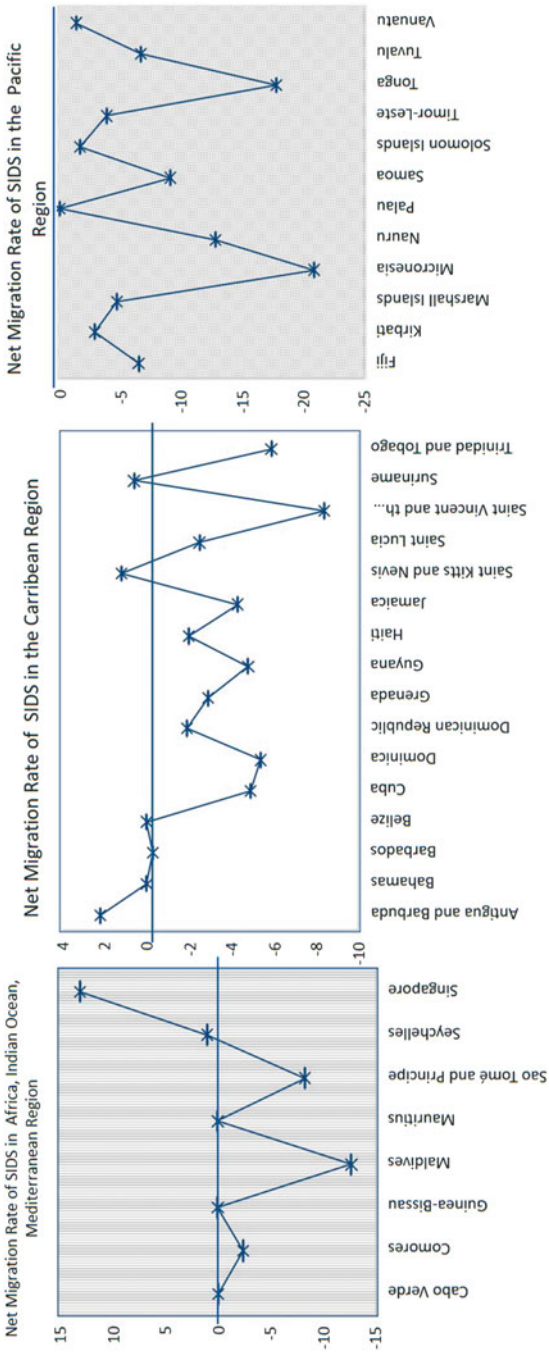

Fig. 4.2 Migration trend and pattern expressed as net migration rate in SIDS: (**a**) Africa, Indian Ocean and Mediterranean region, (**b**) Caribbean Islands and (**c**) Pacific Islands. Data Source for both: The World Factbook – Central Intelligence Agency (2018)

world. In the Caribbean, the net migration rate varies at a lower range between −2 and −6/1000 population (The World Factbook – Central Intelligence Agency 2018). Note that another closely related aspect of analyzing net migration is the remittance statistics of SIDS. For these small islands, remittances remain an essential part of the GDP, especially in Caribbean SIDS, where migration has three key characteristics: more than 50% of emigrants are women, most out-migrants are in a highly productive age group, and higher educated individuals are most likely to migrate (Gheuens et al. 2019). The financial flow attributed to out-migration has positively influenced poverty alleviation. In Haiti, for example, remittances account for 21% of the GDP. High economic and environmental vulnerability are increasingly reported as the 'push-factors' stimulating this trend. It is expected that climate change, chiefly the intensity and frequency of extreme weather events, will exacerbate the situation impacting the habitable possibilities, thereby influencing migration patterns (IOM 2017).

While environmental and water stressors are on the rise, few studies make a direct correlation between migration and nature-based drivers. The previously mentioned study explains what communities in SIDS perceive as direct influencers on the decision to migrate. For example, in Tuvalu, people chose to migrate (move to) to Funafuti (nation's capital) and Fiji, Vaitupu (the largest atoll in Tuvalu) and New Zealand. Campbell and Olivia (2014) clarify the gradient of drought and irregular rains (61%), sea level rise (34%), saltwater intrusion (17%), storm surge (6%), floods (3%), and cyclones (2%) impacted nearly 75% of households in Nauru between 2005 and 2015. A staggering total of 95% of Kiribati households were affected by natural hazards between 2005 and 2015, as shown by Oakes et al. (2016). An interesting aspect of this analysis is that it mapped people's attitudes to future migration. Noting that 40% of households interviewed in Nauru felt that the primary cause for potential migration could be sea-level rise or flooding, while 70% of households interviewed in I-Kiribati and Tuvalu labeled sea-level rise, flooding, drought, and saltwater intrusion as the leading environmental reasons they would flee in the future. The numbers reflect the incidences of household impacted by the events bearing the water quantity and water extreme connection. Future studies expanding investigation on such interconnection can potentially adopt the 3S framework for classification of human mobility scenarios in the water-migration nexus.

Haiti, an under-developed, low income, and resource-limited SIDS in the Western hemisphere, and the Dominican Republic, a middle-income state, have both suffered various extreme environmental events and disasters (e.g., heavy rainfall, flooding, coastal and topsoil erosion, and cyclones). These adversely impacted a large portion of their population (more than 40,000 people in Jimani, Dominican Republic and the Mapou and Fond Verettes regions of Haiti) triggering internal and international migration. Alscher's (2011) interviews and structured questionnaire research reflect on the link between environment and migration, more so the water crisis caused by heavy rainfall and floods as the leading cause of human migration. Although few respondents' noted migration as an option to expand on livelihood and income generation options, a large portion stated that extreme events causing loss of assets leave them with no other choice but to look for safer destinations.

Communities do feel that environmental (including water-related) problems could be a key driver for future migration, though they do not explicitly mention environmental issues as a trigger for their decision to relocate or possibly migrate. In terms of contextualization, the perspective to view migration as a response mechanism is deep-rooted, and the focus on understanding and addressing causalities remains a persistent gap.

4.2.3 Case Studies from Asia

To further understand the geographical and social context of the water-migration nexus, selected examples of water crises that potentially drive human migration from and within Asia are discussed. Bangladesh is cited frequently in the risk reports as highly vulnerable to climate variability and change. Most water-related natural hazards like cyclones, storm surges, droughts, and riverbank erosion are a frequent occurrence in the country, especially flooding of the low-lying basin and coastal zones. Approximately 20 million people living in these areas are subject to flooding, and around one-fifth of the country's territorial region is affected by annual floods (Nagabhatla et al. 2014). Each year the loss of life and assets is substantial; for example, in August 2014, several districts in north-western Bangladesh flooded because of the melting of the Himalayas and heavy monsoons. A total of 3.5 million people was affected, 34,000 homes were destroyed, and 200,000 homes were damaged. Migration is a common coping strategy in Bangladesh due to water access and extreme water events (e.g., massive floods, cyclones). The 2014 floods led to 325,000 internally displaced people (Walter 2015; Herrmann and Svarin 2009).

The Philippines also ranks high on the natural hazards risk ranking, adding to the existing development challenges such as high rates of poverty, child mortality, and lack of health services. In 2013, a Super Typhoon caused significant damage in 9 regions, 44 provinces, around 600 municipalities, and impacted more than 14 million individuals (Makhoul 2014). While the early warning systems helped manage the evacuation of about 800,000 people to safety, the aftermath in the following weeks internally displaced more than four million people, of which a significant number (1.7 million) were children and elderly (46,000 older than 60 years of age). A steady rise in internal migration in the few days after the extreme event triggered thousands to leave for other islands (and this number increased daily to tens of thousands). As the shelters around the impacted zones could accommodate only 2% (about 100,000), millions were left without shelter (Makhoul 2014).

The Indonesian capital city of Jakarta provides another example. The urban center is surrounded by a large bay and sits on subsiding lands and floodplains, making it extremely vulnerable to floods and extreme climate events. The rise in the frequency of events that lead to difficult access to clean water and, in some instances, extreme water situations, is an alarming call for the state to strengthen efforts for managing the resultant human migration. For example, flooding in 2007 subjected 340,000–590,000 people to forced migration (Lyons 2015). In 2014, floods

accounted for almost a third of more than 1500 natural disasters. Also, they were the most frequently occurring type of natural hazard over three decades. While showing a detailed account of the water footprint in temporary and seasonal mobility, the analysis also highlights how the gradient and frequency of torrential rain drive the migration. On 12 January 2014, several days of rain caused the surrounding rivers to outflow into Jakarta, and the government declared a 30-day emergency. The following week (19 January 2014) more than 30,000 residents were forced to evacuate the city due to continuing or worsening floods. Two days later, another 33,000 people moving into shelters, and a month then, while thousands began to return home, another 18,500 were re-evacuated due to prolonged flooding on 3–4 February 2014. More flooding continued in the following months.

Beyond the straightforward narrative that water has a significant footprint in migration in the context of causality, water facets apply in the post-migration scenarios. For example, the fast movement of migrants in substantial numbers can have many repercussions in economic, financial, and social terms, both for the destination (host) region and place of origin.

It may translate to an over-burdening of water resources, issues related to water, sanitation, and hygiene (WASH), and incidents of conflicts linked to resource ownership, use, access, and rights. Take the case of Syrian refugees' migration during and after 2014 to the neighboring regions such as Turkey and Jordan (MercyCorps 2014). A study by Oxfam shows how more than 3000 m^3 of water is delivered to the Zaatari camp for drinking, cooking, and cleaning per day (Gluck 2013). The water and sanitation facilities installed for refugees in water-scarce regions like Jordan also triggered civil and social outcry/conflicts, as well as a great deal of financial burden for the host country. To better address the water-climate crisis triggered migration, the focus on states and communities reporting scenarios stated in the 3S framework can serve as a starting point for clear and up-to-date assessments.

4.3 Multifaceted Aspects of the Water-Migration Nexus

4.3.1 Focus on Gender

Human migration driven by climate crises is a new and emerging challenge that may destabilize future sustainable world prospects and human development (Parry et al. 2007). Unpacking the causality aspects in water-triggered human migration requires accurate and up-to-date data and information to serve as evidence for bringing attention to newer trends and emerging migration pathways. Various other socio-economic and sociocultural aspects may apply to the water-migration nexus both in Global North and South. In instances, when water is denied to those who cannot afford it in Detroit (CBC News 2014), First Nations communities in Canada (Human Rights Watch 2016), or bottled on expired permits in Ontario (CBC News 2014), or in forced national privatization by large international organizations in Bolivia

(Balanyá et al. 2005), water inequalities lead to migration or can seed practices that contribute to water-driven strife and migration in the future.

These episodes described above ask key questions: Is stability and peace present in communities and states that value human rights to water? Can the state privatize and commodify water and other natural resources? Can access to water be denied to communities stating inability to supply as a reason? It follows then that mismanaging people's access to resources or unsustainable management of resources (for instance polluting water bodies that serve as a source of drinking water, livelihood management and income generation for communities) may be a driver of conflict and strife; and may lead to migration. This shows that water and climate crises are a 'push' factor for migration in a variety of contexts. The spillover effects may include increased migration.

The role gender plays in this nexus is expanded to provide a detailed understanding of one crucial aspect. Migration affects men and women differently. Men mostly decide to migrate for economic opportunities (a common trend in seasonal migration), women migrate in search of livelihood and income. Movement in situations of water- and climate crisis (floods and droughts) show an increase in the trend of women migrating for livelihood and income prospects—women account for nearly half of all global migrants by 2017 (IOM 2017). This pattern is a collective reflection on voluntary and involuntary migration. Effectively addressing migration scenarios requires access to gender-disaggregated data to manage how many causalities operate while deploying response mechanisms. Some specifics of the Global South help to examine multifaceted aspects of the water-migration interlinkages, including the gender dimension.

In Africa, water scarcity (quantity/availability/access) and increasing episodes of drought have aggravated the gender dynamics. For example, in Ethiopia, drought-hit families and communities employ cultural norms such as early marriage, that do not favor females in the household (Miletto et al. 2017). In Bangladesh, the insecurity in land tenure, crop failure, hydro-climatic variabilities and extreme events such as flooding, influence internal displacement, often leading people to migrate in the subcontinent. Limited land ownership and tenure rights for women make them more vulnerable to limited coping strategies, and perhaps more likely to migrate. People in the Mexican state of Sonora depend on producing canned and candied vegetable and fruit products, but due to drought and forecasted declines in water availability, their water-dependent livelihood has suffered (Hunter and David 2009). As a result, men find themselves migrating to the US, and many women are dependent on the remittances, with limited options available for the less educated. This has negatively impacted the recent progress in women's empowerment gained through the expansion of the fruit industry (Hunter and David 2009). In Nigeria, men temporarily or seasonally migrate to urban centers, if income generation activities are influenced by floods or droughts, while women are caretakers of the household that usually engage in "petty trading to supplement the income from the men" (Goh 2012, p. 13).

Such pluralistic facets bolster not only the current migration discourse but also migration management in general. For instance, forced migration due to natural disasters may differ in the pattern and gender distribution when compared with

regular migration pathways. Emerging data show that women are more likely to evacuate in such scenarios, especially if children are involved (Chindarkar 2012). However, biophysical, economic, and cultural contexts largely determine whether men or women migrate. In settings and regions with a high level of gender equality, women and men migrate for similar reasons, such as security, better livelihood, and education (O'Neil et al. 2016). Mapping the competencies of actors and agencies that are assigned to design migration policies on gender-sensitive decision-making remains crucial. Also, in the crisis scenarios that lead to migration, the concerns of safety and sanitation apply differently to men and women and are most likely high for women due to reported observations on incidents of physical and sexual assaults (Chindarkar 2012).

Generating a better understanding of the multiple aspects of the water footprint (i.e., the role of hazards, climate and environmental variability and change) as drivers of human migration remains vital for policy and decision makers at global/regional and national scales. In this context, inter- and transdisciplinary approaches can help capture the complexity of the water-migration nexus, serving as a fitting approach to investigate water crisis impacts and the reform policies and agreements that govern migration challenges. Participatory development, a bottom-up, grassroots form of development that engages with the community, can help steer a holistic and inclusive development agenda leading to resilient communities and informed populations.

It is pertinent to explicitly identify the role of water as a driver of migration, capturing the consequences of economics growth-oriented interventions like commodification and privatization, the shift of resource governance from the public realms to the private domains. Inequitable decisions around natural resources, including water, can trigger unintended consequences such as forced human displacement. For example, private actors can deny water to those who cannot afford it or deny them access due to other reasons. Several models exist wherein water pricing structures, and water stress scenarios that may include denial of water to individuals and communities has driven strife, stress, and conflicts (Soto Rios et al. 2018). Also, an assessment of the (positive or negative) spillovers in new and emerging pathways of the water-migration nexus are openly investigated in discussions with hosting states/communities and states of origin of migration.

The global community can get a good grasp of the pre-emptive strategies to tackle the emerging trends in human migration by analyzing data, research, and policy outcomes with a balanced focus on direct and indirect drivers. Also, the development of practical tools like real-time monitoring systems and living dataset, aggregated and freely available information, and knowledge on the various facets of migration (pre and post event scenarios) can assist in pre-emptive strategies. For example, gender sensitive planning is essential as a part of this management approach, and the pattern of seasonal movements commonly observed in migration that is triggered by the water and climate crisis involves relatively overlooked aspects. These include increased burdens on women who stay behind. Women are often left to assume responsibilities that would otherwise have been done by men. It can be particularly challenging for societies that do not allow women to have equal access to "financial, technical and social resources that men may have" (Skinner 2011, p. 33).

4.3.2 Institutional and Policy Assessment

Chellaney's (2011) monograph "Water: Asia's New Battleground" makes an argument as to how fragility or vulnerability caused by natural resource systems including water is deepening, and how the related social, economic, and political conflicts are intensifying in tandem. The narratives are rooted in the Asian context; however, it may generally apply to many scenarios in the Global South, including Sub-Saharan Africa and politically turbulent regions of Latin America. Globally, the response mechanism towards managed migration is strengthening. International experts and UN agencies, and state and non-state actors are trying to broaden the migration discourse to integrate aspects that were either overlooked or relatively under-investigated, such as water- and climate crisis scenarios. It is well argued that implementing solutions with an enhanced understanding of direct and indirect drivers of migration can assist towards a firm response to United Nations Declaration A/RES/68/4 (Declaration of the High-level Dialogue on International Migration and Development 2014).

Some of the existing guidelines and strategies offer a platform to integrate the multi-faceted complexity of human migration-related challenges. For instance, the New York Declaration for Refugees and Migrants (A/RES/71/12016) instigated a global debate on issues of migration and refugees. On September 19 2016, 193 Heads of State jointly discussed and acknowledged human migration as a significant challenge for the international development agenda and flagged a need for a comprehensive approach and enhanced cooperation at the global level in the UN General Assembly. These discourses also tend to steer the plan to holistically address the water-migration nexus, setting out a range of actionable commitments, means of implementation, and a framework for follow-up and review between Member States regarding international migration in all its dimensions.[2]

This process has resulted in the creation of the Global Compact on Refugees (A/73/12) and the Global Compact for Safe, Orderly, and Regular Migration. The item lists of the resolution are reflective and insightful. For example, items 13 and 118 of the provisional agenda (A/RES/71/L.1) reflect on climate-related scenarios, most of which embed a water footprint, although an explicit mention of water crises or similar conflicts is missing. Item 43 of the declaration captures some views on drivers of water displacement. The specific mention of water contexts in the statement is limited to two items, both related to post-migration WASH (water, sanitation, and hygiene); see Table 4.2 for more details.

Noting that water is a human right, collective ownership thinking aligns with the vision outlined in the United Nations General Assembly Resolution [(A/RES/64/292), adopted on 28 July 2010]. The resolve of international and UN agencies as well as state and non-state actors to find and implement solutions to understand and address multiple causalities/divers/triggers in addition to "strengthening response mechanisms" is growing. The Global Compact for Safe, Orderly, and Regular

[2]Available at https://www.iom.int/sites/default/files/our_work/ODG/GCM/NY_Declaration.pdf

Table 4.2 Items from the New York Declaration for Refugees and Migrants reflecting on water-migration nexus (Data Source: https://refugeesmigrants.un.org/declaration) and the alignment with SDG's

Item as stated	Context and explanation
Item 1: "*in response to the adverse effects of climate change, natural disasters (some of which may be linked to climate change), or other environmental factors...*"	Water crisis, climate change, and natural disasters noted as a driver of migration. This aspect is researched and established within the current literature. The current information in the water-migration nexus do not present in-detail, the dimensions of the social and political system that apply- for example ownership structures, human rights, links with peacebuilding, etc.
Item 5: Part c states, "*...assess and meet the essential needs of refugees, including by providing access to adequate safe drinking water, sanitation, food, nutrition, shelter, psychosocial support, and health care...and assistance to host countries and communities in this regard, as required.*"	Access to adequate and safe drinking water is considered crucial to the well-being of migrant.
∗***Item 18***: "*...the Sendai Framework for Disaster Risk Reduction (2015–2030) and its recommendations concerning measures to mitigate risks associated with disasters...the Paris Agreement on climate change ...committed to its implementation. Addis Ababa Action Agenda of the Third International Conference on Financing for Development... including its provisions, applicable to refugees and migrants."* ∗*Sentence abbreviated to present key highlights*	Item 18 correctly, and relevantly, discusses issues of water-related to natural disasters. There is a deep normative component to the study of attaching economic value to water because, when studying this topic, one has an idea of *right and wrong* and how we *ought* to act leading to the discussions such as: Does our right to water mean that it must not be privatized? Does the right to water exclude selling water for profit? What are the corporate responsibilities attached to water, primarily when it is sold to private interest groups/corporations? These are questions that must be analyzed when thinking about water- and climate-driven migration. More arguments on this aspect presented in Soto Rios et al. (2018).
Item 43: "*addressing the drivers that create or exacerbate large movements. Analyze and respond to the factors, including in countries of origin, which lead or contribute to large movements. Cooperate to create conditions that allow communities and individuals to live in peace and prosperity in their homelands.*"	Item 43's proposals on promoting peaceful and inclusive societies based on international human rights and the rule of law, creating conditions for balanced, sustainable and inclusive economic growth and employment, combating environmental degradation- aligns with the spread of SDG 16 and 17 goals and targets.
Item 50: "*...assist, impartially and based on needs, migrants in countries...experiencing conflicts or natural disasters...in coordination with the relevant national authorities."*	This point recognizes the importance of coordination and cooperation between relevant states and authorities regarding human development challenges, that includes migration. Within such "needs" are the water and climate crisis context.

(continued)

Table 4.2 (continued)

Item as stated	Context and explanation
Item 80: *"committed to providing humanitarian assistance to refugees to ensure essential support in key life-saving sectors, such as health care, shelter, food, water, and sanitation. Support to host countries and communities. Use of locally available knowledge and capacities, while supporting community-based development programs for the benefit of all…"*	These points relate to a significant, pressing issue of water- and climate crisis (also reflected in SDG 6 and 13 goals and targets, WWDR 2019 on water quality, distribution, and access: The need for water to be available to all while Leaving no one Behind. The item reflects on a participatory and interdisciplinary approach that should embed local capacity, knowledge, and "community-based development programs for the benefit of all." It is crucial to note that it makes explicit mention on the point of water to be accessible to all, regardless of socio-economic standing.

Migration (GCM) is a concrete step in this direction. Within the context of globalization and interdependence, **UN General Assembly Report 71/296** summarizes the global migration patterns, highlighting the role of migration in population change, and presents the current state of ratification of relevant legal instruments as a response to General Assembly resolution 69/229 (UN General Assembly 2016a, b, c).

Speaking to the pervasiveness of human migration—of more people being on the move than ever before (p. 3)—the report offers a detailed breakdown of the migration statistics, covering questions such as: Who is migrating? From where, and to where, do they migrate? What systems and agreements have been instituted to deal with such migration? To address these questions, an improved explanation of causality/drivers/triggers (relating to natural disasters, more so the water context) is needed, along with an enhanced understanding of interlinkages between direct and indirect drivers of migration, as these aspects are somewhat overlooked in the current migration literature.

Following Report 71/296, a new inter-governmental negotiation agreement, Resolution 71/237, was created in April 2017 to address challenges linked with international migration and development. The agreement outlines a comprehensive approach to inform state and non-state actors on relevant migration-related issues and to recognize the influence of migrants and migration in sustainable development. Also, the plan calls for an open, transparent, and inclusive process of consultations and negotiations; noting stakeholder's participation clearly in the agenda. The GCM agenda also aligns with the guiding principles of the 'Modalities Resolution'—wherein Sect. 16 states, "*Addressing drivers of migration, including adverse effects of climate change, natural disasters, and human-made crises, through protection and assistance, sustainable development, poverty eradication, conflict prevention, and resolution*."

The UN General Assembly resolution 71/237 (UN General Assembly 2017) was created to address migration and development, although it does not explicitly cover the water-driven migration nexus from the viewpoint of causality. It does refer to the

Sendai Declaration and Sendai Framework for Disaster Risk Reduction 2015–2030 (Resolution 69/283, Annexes I and II, pg. 2- and UN world conference on disaster risk reduction, 2015 March 14–18, Sendai, Japan), as well as natural disasters connection with water, typhoons, droughts, floods, etc. (p. 5).

The Sendai Framework, however, does not address more profound challenges of the water crisis and water management, such as privatization, cordoning-off water for strictly private actors. Although it underlines extreme water events bearing on people and communities, the seven targets outlined by the framework in 2020–2030 include: (a) focus on reduction of mortality caused by disaster; (b) reduce the number of affected people globally by disasters (noting that communities employ migration as a coping strategy, the focus of this target is very fitting); (c) reduce direct economic loss caused by disasters; (d) reduce disaster damage to critical infrastructure and disruption of essential services; (e) increase the number of countries with national and local disaster risk reduction strategies; (f) enhance international cooperation to developing countries (focus on the Global South) towards their federal actions for implementation of this Framework; (g) increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments. Most aspects underlined in the set targets can assist with better attention to the spillover impact of water and climate extremes, wherein migration is acknowledged.

It is important to note that human migration is an evolutionary paradigm. Also, the benefits and repercussions are self-balancing if externalities, such as water- and climate crises, are not the main driving force. A key challenge in managing migration in an organized and sustainable manner is to increase understanding between countries on the role that the water and climate crisis has in driving migration and addressing the reasons for the low uptake of existing instruments and policies on migration by state agencies, in place of origin, transit locations, and destination countries. Global governance mechanisms have taken some note of this phenomenon in the existing tools that aim at sustainable human development, including the recent Sustainable Development Goals. Examples are shown in Fig. 4.3.

The current set of institutions and policies, primarily established in the 1950s, have directly or indirectly demonstrated immeasurable importance for migration-related challenges and affected populations. Post-2015, the global community's implementation of the 2030 Agenda and SDGs are focused on a variety of goals. The agenda cover various dimensions of human development such as eradicating extreme poverty and inequality, addressing gender facets through education, health and nutrition aspects (SDG 2, 3, 4 and 5). In addition, revitalizing the Global Partnership for Sustainable Development (SDG 17), promoting peaceful and inclusive societies (SDG 16) based on international human rights and the rule of law, creating conditions for balanced, sustainable and inclusive economic growth and employment, combating environmental (land and water) degradation and ensuring effective responses to natural disasters and the adverse impacts of climate change (SDG 6 and 11).

Most aspects of migration are embedded in the SDGs, even if not in an explicit manner, often integrated with the set of outlined goals and targets, for example, SDG

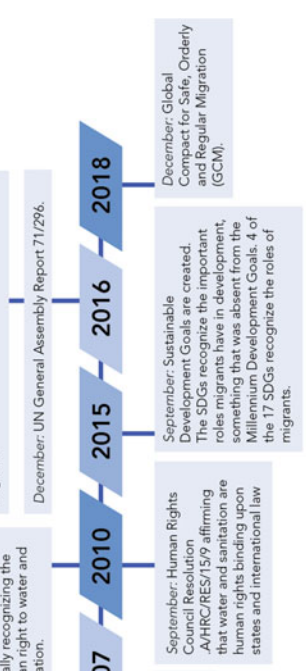

Fig. 4.3 A comprehensive overview of international management and governance tools and instruments that apply or relate to the water-migration nexus (includes only key events until 2018)

6.1 -by 2030, achieve universal and equitable access to safe and affordable drinking water for all. Or SDG 6.2 to achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying particular attention to the needs of women and girls and those in vulnerable situations—reflecting on accessibility and availability context. And, SDG 13.1—to strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries—that shows focus on drivers that influence socioeconomic stability, and, can include the case of migration. Seeing the interlinkages, one can anticipate that implementation planning of the SDG targets will set the pace for multi-stakeholder endeavors for likely instituting participatory mechanisms for inclusive migration planning. For instance, the IOM migration data portal (https://migrationdataportal.org/sdgs#0) includes a specific space to capture the SDG-Migration nexus. However, to date, concrete measures to address the water-migration are yet to be seen.

To support the international apparatus and optimize solutions for managing the migration challenges, enhanced understanding of the water and climate crisis as a driver remains relevant. Coordination apparatus of migration at national, regional, and global levels (more so, for human migration triggered by water- and climatic crisis), or of temporary, seasonal, or permanent migration should address causalities and responses mechanisms in tandem. Such an integrated approach to migration challenges can go a long way in designing smart strategies for effective migration planning. Overall, the synthesis calls for causalities to be suitably represented in the migration discourse.

The set of documents steering the international discourse on human migration-related issues do talk about protecting the rights of migrants. Access to water for migrants could be done through a participatory approach as well (Ecowatch 2015). The discussion (High-level Dialogues on International Migration and Development) report, as well as the resolution, is expected to improve the understanding of drivers of human migration, beyond the usual push-pull factors. The General Assembly planned an intergovernmental event in December 2018 and adopted the Global Compact. Emphasis on 'causalities' in the interventions discussed in this high-level gathering on migration is limited.

4.3.3 Collective Agenda and Co-Management

Water crisis scenarios and their impacts could be combatted by instituting a system of shared ownership and by making a distinction between territory and property. The promotion of peace as well as open, inclusive, and democratic societies that value and follow the rule of law operate best without water privatization and commodification aspects. A joint ownership model, like the elaborations of political philosopher Matthias Risse (2009a, b) or the commentary of Avery Kolers in 'Land, Conflict, and Justice' (2009), provides some food for thought to differentiate between property and territory, where territory implies stewardship of the earth and its resources (including water) whereas 'property' suggests something that can

be cordoned-off and privatized. The concept of territorial rights means that states cannot evict tenants and destroy the resources of the earth (Kolers 2009). Stewardship can be adopted in the water sector, meaning that the state takes care of water and natural resources of the land for not only the current generation but *future* generations (Kolers 2009).

The prevention of water-influenced migration due to lack of access to water can be tackled through shared ownership and co-management thinking. For example, ownership and tenure rights for water can be exercised through common and collective rights wherein water ought to be accessible and available to all. Commodification is contrary to shared ownership. Selling water for profit has roots both in the Global North and the Global South and might be regarded as an indirect driver of water-triggered migration. Privatization and commodification affect the poor most, and most existing water provisioning facilities and services are focused on the wealthy portion of the populations, of agriculture and industry, while the poor, or in some states rural, people are often neglected (Harvey 2018). This practice serves as an indirect driver to water triggered migration and, sometimes, forced displacement.

To tackle the spill-over impacts of water crises, joint ownership of water resources could offer a gainful and long-term solution. Privatization and other forms of resource ownership, especially in the water sector, can limit access and, therefore, potentially drive human migration. The agencies involved in the water dimension of migration planning could look into water matters both at "origin" (Is water or climate stress a key factor influencing the decision to migrate?; Does water crisis impact the food security of the communities?; Is it forced or voluntary migration?) and "destination" (water is distributed to migrants, do migrants receive clean water in the location that they flee to? Are corporations involved in the distribution of water to migrants? Do communities or states become beholden to—indebted to—corporations or other countries when distributing water?). These are pertinent aspects to investigate when researching the water-migration nexus.

4.4 Discussion

Linking human migration to environmental factors can be challenging. In the environmental (climate and water dimensions serving as a trigger) migration context—the cases of extreme water events (e.g., tsunamis, tropical cyclones, or large-scale flooding) is easy to quantify, as these events have an immediate effect on a population and require a direct response, so tracking the movement of people is part of the response mechanism. Additionally, government agencies and humanitarian organizations tend to be more involved in the mitigation of, and recovery from, natural disasters (i.e., forced evacuation and shelters), making it easier to assess the number of displaced or affected individuals. In cases of migration because of water quality (e.g., water pollution) or quantity (e.g., water shortages), the effects are often slow or gradual, meaning that there might not be a mass movement of people.

Instead, people might leave areas at different times, and these environmental drivers are often working in conjunction with economic factors.

This chapter makes a case to acknowledge and consider water among the drivers of human migration and examines how water crises trigger newer trends and patterns of mobility and migration. Also, as there is no universally recognized legal definition of, nor an established framework to capture and explain, environmental migration, the proposed 3S framework could help to make a strong case for the water footprint in human migration. It can also provide a clear framework to unpack the complexity of managing migration-related information (note important points in Table 4.3). Also, the set of narratives and references from case studies (mainly from Global South) outlined earlier in this chapter highlight crucial aspects that can contribute to

Table 4.3 Five key observations and assessment of 3S framework for enhanced understanding of the human-migration nexus

Key observations	3S Framework and the water-migration nexus
The water crisis scenarios around the ownership, rights, distribution, and privatization/commodification of water can influence the decision to migration or creates a scenario of conflict pertaining to water quality and availability (quantity).	Scenarios of strife and suffering, leading to possible conflict can be seen in states in the Middle East (e.g. Syria), Bolivia, Ecuador and many the Global South regions and communities.
The Global South is facing and tackling the interconnections between water and migration, which are not only complex but, also, multifaceted, sporadic, or sometimes ambiguous—water quality, quantity and extreme scenarios are central to the said interconnections.	States and communities in the Global South can better address the issue of water-driven migration through possible application of the 3S framework, complimented by participatory, bottom-up development that is inter- and transdisciplinary.
Human migration explorations need to embed gaps and needs assessments on gender and vulnerable groups. The emerging trends and patterns in human migration need to be carefully examined from a causality viewpoint.	Recent UN resolutions outlined in this chapter do not examine water causalities in any meaningful depth. The 3S framework offers a simple approach to classify and analyze the water-migration nexus, while providing flexibility to integrate scenarios that represent multifaceted aspects- quality and availability aspects apply in tandem, for example.
Enhanced understanding of spillover (positive or negative) impacts of the new and emerging pathways of water and climate crisis driven migration.	Case studies from the Global South explained with the context of the 3S framework (SIDS, The Philippines, etc.) address the need for an investigation that focuses on highlighting 'causalities' (i.e., direct and indirect driver).
The availability of quantitative data and information (national records) on water-driven migration are mainly on internal migration or at the country scale while creating a regional or a global quantitative overview remains challenging.	Acknowledging that data and information management of the water-migration nexus can be a challenging task. A clear and simple framework that embraces inter- and transdisciplinary thinking could lead to desired progress to schematically organize available data and information, and to outline gaps and needs for future work. The 3S framework shows promise in that direction.

the ongoing or proposed discourses on human migration. Furthermore, these recommendations could be used to better integrate the water-migration nexus in ongoing discussions on migration policies and planning. For example, recognition of water as a public natural resource, to one that is increasingly private, needs much study concerning how that interfaces with human migration.

4.4.1 Water-Migration Nexus: Summary Points

First, coordinating the involvement of all stakeholders in discussions that address the water-and climate-driven migration connection is crucial. Note that state actors on water issues are mostly restricted to ministries of water, wherein the migration context is not explicitly reflected in resource-related decision making; for example, water allocation decisions and climate adaptation planning reckoning migration as a coping strategy issue do not have specific positions in policy decision-making. Often, expected migrations are reflected in a piecemeal format in internal or state migration policies. The agencies/affairs for international migration in countries of origin, transit, and destinations are also missing 'causalities' aspects of water- and climate crisis, often calling for the better policy coherence on migration issues.

Second, improved focus on livelihood diversification (with less or optimized water footprint) options to ensure that migration is not the only adaptation strategy water- and climate crisis scenarios, particularly for groups and individuals living in vulnerable situations, and more importantly so for regions/communities facing climate extreme scenarios like floods and droughts.

Third**,** better emphasis needs to be placed on addressing 'causality' and 'response' in a balanced manner. Institutions and policies should emphasize community-level interventions aimed at groups and individuals living in vulnerable situations, as most often the impoverished people occupy the most sensitive areas are more exposed to like scenarios of floods etc., and these populations are mostly at the high risk of forced migration.

Fourth, a participatory approach could be applied to migration research to generate required local-scale evidence for creating inclusive policies and multiple narratives to engage with various relevant agencies and actors. Participatory methods of evaluation and development bind communities and development professionals, allowing all stakeholders to be involved. For a technique to be participatory, it must be bottom-up and community-based as well, and it is with this method that empowerment and engagement become fostered. The significance of participatory development thinking in new international agreements (e.g., the Paris Agreement, where articles 7 and 11 support such methods) provides a useful reference for the adoption of this thinking for migration research.

Fifth, inter- and transdisciplinary thinking can be embraced in migration planning to unpack the complexity of the water-migration nexus skillfully. Agencies, policies, and agreements about water- and climate crisis triggered migration must weave their way through various areas of study—quantitative and qualitative assessments,

political science, ethics and justice within philosophy and the humanities broadly, climate sciences—within cross-disciplinary projects, programs, peacebuilding and development planning agendas, and activities.

To conclude, it is becoming evident that to address the water- and climate crisis triggers of migration, the focus must be given to countries and communities that are in the frontline of these crises and regions in Global South, specifically those already hosting large numbers of migrants. A migrant might attribute their decision to flee to an environmental driver and could serve value towards building a knowledge base for future discourse on this nexus. It remains challenging to pinpoint the proportion of the influence water-crises scenarios have on decision-making related to migration; however, is it more than clear that water- and climate crises are directly or indirectly reflected in human migration.

4.4.2 Limitations and Opportunities

The absence of standardized terms and definitions makes identifying new and emerging trends in human migration within and across the borders of sovereign territories challenging. Filling the gaps related to the broader nexus of resource dependence (land, water) and migration, mainly in the context of forced or seasonal displacement, remains crucial. It is important to note that water and climate crisis scenarios are not always directly driven by anthropogenic-influenced environmental degradation. There are also situational contexts regarding water quality, quantity and water and climate extreme events in case of natural hazards and disasters. These aspects are more complicated for communities in the Global South, due to the high exposure and vulnerability of many states and communities to water and climate crisis scenarios.

Aggregated quantitative information related to water and migration is limited to large-scale environmental disasters and local scale seasonal or temporary (internal) migration. For instance, migration data related to water exists if a drought is declared as a disaster. On the contrary, information on water quality-based migration is severely lacking. This synthesis' aim is not to establish clear boundaries in the context of one kind (quality, quantity, or extreme) of water crisis scenarios governing the migration patterns of populations, or to endorse specific views to limit the general conclusions in this understanding of the nexus; the goal is to aggregate evidence towards refining outcomes in migration management and planning. The arguments are meant to present a distinct approach to tackling water crises and resulting spillover effects to better understand the water-migration nexus from both causality and response viewpoints.

The global community could understand pre-emptive strategies in water-influenced human migration through the co-creation of data, research, and policy outcomes. Such outcomes require a balanced focus on direct and indirect drivers, development of practical tools like real-time monitoring systems and living datasets, aggregated and freely available information, and knowledge of the various facets of

the migration (pre- and post-event scenarios) nexus, with a clear focus on causality. For example, while examining water crises and climate change impacts, the risk assessment and management solutions could also reflect on additional dimensions such as human migration while providing scientifically rooted evidence to widen the understanding on causalities of human migration. Designing smart land and water governance measures—the application of the appropriate technologies/innovation and increased land, water, and human security—could serve as a foundation for outlining a 'preventative' outlook for new and emerging pathways of human displacement.

In addition, data sharing arrangements with agencies (e.g. IOM, UNHCR, Peace Building operation of the UN) that have a presence in migration hot spots (those areas and regions with high rates of emigration, e.g. after a disaster or a conflict situation) can help to organise an integrated database and knowledge system for better decision making on migration-related challenges. The argument here is that the proposed 3S framework, if adopted systematically to explain the increasing footprint of water and climate crises in the migration pathways, can serve to create a concrete set of evidence to feed the migration dialogue and related decision making. Moreover, this decision making could involve revision of international migration policy to better reflect the causal agents of migration, beyond the sole emphasis on geopolitical conflicts and related aspects. A better understanding of the water-migration nexus will help create solutions to effectively manage the broad and multifaceted challenges that apply in case of migration, especially in the Global South.

4.5 Conclusions

Having a clear understanding of the water-migration nexus and the effects of climate crises on migration flows is critical for decision makers in the Global South to do effective crisis management and scenario planning to protect their populations.

Water and climate shocks are not generally perceived to be the leading cause of people's decision to migrate. But the reality for many communities is that they are a primary trigger that pushes people to leave their homes. This is especially true for the causes of international migration.

The case studies from the Global South presented in this chapter highlight the need for countries to do in-depth investigations to identify the root causes of migration events; and build a body of evidence to help manage risks resulting from climate change impacts, such as water scarcity, socio-economic dynamics, socio-cultural and socio-political complexities.

These facets are typically managed from a 'vertical' sectoral viewpoint and lack the integrated view that is needed to develop effective solutions to a migration crisis. Other issues that influence the socio-economic dynamics of migration are the context of rights (customary vs legal), ownership, and allocation policies for natural resources.

Migration events attributed to water and climate crises often involve other, ignored facets such as gender, youth, identity, cultural and value aspects. It is important to understand how these aspects influence migration patterns as a direct or indirect influence. In policy analysis processes, the various causality and response dimensions of migration driven by water and climate crises also need to be unpacked.

Effective migration policies need to identify all the drivers of migration events and look closely at the effect that water and climate crises have on them. This chapter presents the 3S framework, a guide that helps decision makers develop a clear picture of their potential migration situation linked to water and climate issues. This tool promotes cross-sector and inter-regional dialogue to link the water footprint to human migration trajectories in migration policies. Using 3S, planners build a set of narratives that describe a specific situation. This promotes a better understanding of the water-migration nexus. 3S enriches existing data, complementing countries' existing planning and policy processes with its cross-sectoral analysis of different drivers of migration.

The integrated analysis from 3S feeds into Disaster Risk Planning programs such as the Sendai Framework, climate change and adaptation planning and water resource planning, connecting to the related SDG goals and targets. The tool can be applied to assess migration issues at local, national, regional or global scales. It integrates perspectives from a range of stakeholders to help decision makers better understand the multifaceted aspects of migration in their policy planning processes.

Water and climate crisis scenarios that influence migration operate in combination with socio-economic, socio-cultural and socio-political factors that trigger peoples' decision to migrate voluntarily, and in some cases in forced migration. Dialogue using the 3S framework looks at a range of related issues such as immigration and employment movements at state, region and international level, promoting better regional coordination between countries affected by migration events. Aggregating data across sectors helps pinpoint the causes of human migration and displacement in each specific case.

Current perceptions on human migration by leaders of host and transit countries are mixed, leaning towards problems and seeing migrants as threats to national and international security (Nagabhatla et al. 2014). It is critical that the voices of people in the countries of origin and destination locations—mainly in the Global South—are part of the migration discourse. This will help address inconsistent perceptions. Up-to-date data, information and knowledge that apply in the water and migration nexus will help analyze the spectrum of technical, human, capacity and financial interventions that is required to address different migration situations. This will help reveal current gaps and show what is needed to effectively manage pre- and post-event responses to migration situations. A focus on causalities will help countries of origin and destination identify and address water-related risks together in a shared migration agenda that includes causality and response dimensions.

A productive next-step can be a comprehensive assessment of the water-migration nexus across the migration hotspots in the Global South (including conflicts scenarios resulting in cross-border migration e.g. the case of Rohingya)

to inform migration policy reforms. This new view, that will include a careful examination of economies' reliance on water, will provide the data to guide effective channeling of funding, and support policy makers in their efforts to build resilient societies.

An assessment will help answer questions such as how migration triggered by water and climate-crises impact men, women, and children and what the levels of impact on societies are. Such insights will inform effective interventions to support 'at-risk' communities and socially vulnerable groups, especially women and girls. This new data will contribute to SDG 5 on gender goals and SDG 6 on water targets. It will also inform capacity development needs for technical and institutional teams to better address migration issues at point of origin, transit, and in recipient states. Improved capacities are specifically needed in regions susceptible to water-driven crises in Asia, Africa and South America.

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