United Nations Educational, Scientific and Cultural Organization · World Water Assessment Programme

WWDR 2020 "Water and Climate Change" (working title)

Annotated Table of Contents

Final Draft – December 2018

Scope of the Report[1]

This is to be a fact-based, unbiased and technically sound report highlighting the critical role that the world's water resources and the essential services they provide play in the broader context of sustainable development in a changing climate. This report will focus on how water resources are managed and used, describing responses and approaches to overcome current and future development challenges related to climate change and maximize benefits and opportunities for all.

Although the theme of this next edition of the WWDR is 'Water and Climate Change', this report is *not* merely meant to be a technical report about the potential impacts of climate change on the hydrological cycle. Rather, the WWDR 2020 will seek to address the critical linkages between water and climate change in the context of the broader sustainable development agenda. The report will focus on the challenges, opportunities and potential responses to climate change – in terms of adaptation, mitigation and improved resilience – that can be addressed through improving how water resources are management and used, while providing water supply and sanitation services for all in a sustainable way. In doing so, the report will address two of the most critical crises the world will continue facing over the next several decades: Water (in)security and climate change.

Purpose of the Annotated Table of Contents

The Annotated Table of Contents (AToC) identifies the main content/points of discussion to be included in each particular chapter. The Lead Agencies and the authors are expected to respect the overall content of the AToC and to work closely with the WWDR production team (i.e. WWAP Secretariat) to ensure coherence across the report and avoid redundancy. It is important to note that, although the AToC informs on the principal content of the chapter, it does not necessarily dictate the chapter's detailed

[1] **OHCHR:** 'Human angle/focus' should be emphasized for all chapters.

structure – it is often only after the first full draft is produced that the best options for a clear and coherent narrative and structure emerges.

PART 1 – Context: Role of water management for climate change adaptation and mitigation in the context of sustainable development

PROLOGUE ('Chapter 0'): The state of water resources in the context of climate change

Length: 4,000 words

Lead Agencies: WMO, UNESCO-IHP and WWAP

Contributors: IAH, IAHS, ICHARM, IGRAC, IIASA, RAMSAR, UNDP, UNU-FLORES, UNU-INWEH[2]

Overview of the state of the world's water resources and potential impacts of climate change on the hydrological cycle, and the supply, use and quality of water resources, including ecosystems. The Prologue can be seen as a type of 'fact sheet' that sets out the state of knowledge that the rest of the report can refer back too and build upon.

- Short summary[3] of current empirical evidence of the general trends in climate change (e.g., GHG emissions and atmospheric concentrations, connection carbon cycle and energy, temperature, radiative fluxes, …), including what we know now compared to 15-25 years ago (e.g., anthropogenic impacts, CC effects have been more rapid than expected, possible 'hothouse pathways' …).
- General status of knowledge about CC and water, including climate projections and their impacts on 'trends' in terms of[4]:
    - Water availability
    - Water demand
    - Water quality[5]

[2] **UNU-INWEH** would like to contribute particularly to subsection on general status of knowledge

[3] Much of this can be based on the October 2018 '1.5 C temperature increase report' (http://www.ipcc.ch/report/sr15/) and the annual 'State of the climate report for COP'

[4] **WHO:** This information is described in detail in WHO's water safety plan climate change document. See chapter 2 which includes climate impacts on water resources, both quantity and quality aspects, with a summary table http://www.who.int/water_sanitation_health/publications/climate-resilient-water-safety-plans/en/

[5] **UNESCO-IHP** has proposed to allocate a separate chapter for water quality and to contribute the following: Changes in ambient water quality due to climate change (water temperature rise ; depletion of dissolved oxygen, eutrophication, algal blooms, pathogens, nutrients, salinity); higher nutrient content in water bodies due to rainfall and runoff changes, as well as irrigation; impacts of changes in precipitation patterns and of water-related disasters (floods and droughts) on ambient water quality (pollution surges during floods and water quality

- Water-related disasters and extreme events
- Water-related ecosystems
- Risk-sensitive areas – SIDS, semi-arid regions, coastal hinterlands, mountains

These would each be complimented, when appropriate, with material describing unknowns and uncertainties[6], including shortcomings of current models, likelihoods, tipping points, and other matters pertaining to the range of possible futures.

CHAPTER 1: Climate change, water and sustainable development[7]

Length: 3,000 words

Lead Agencies: WWAP, UNESCO-IHP and WMO

Contributors: AGWA, IAHS, ILO[8], OHCHR, RAMSAR, UNDP, UNHCR (most vulnerable), UNIDO, UNU-FLORES, UNU-INWEH[9], WaterLex (most vulnerable), Water.org, World Youth Parliament for Water

What the report is about (scope and objectives of the report), for whom it has been prepared, why it is important (whom will it help), and where it adds value as part of the global efforts to address the issue of climate change.

- **Objectives and scope**
  Objectives and scope of this report. Societies worldwide are being affected through the hydrological changes induced by CC. There is an urgent need for adaptation and opportunities for mitigation in water management. Defining 'adaptation', 'mitigation' and 'resilience' (including time scales). What this report is not about (or not trying to fix). Broad linkages between water, CC, sustainable development and security.
- **A cross-sectoral challenge and the need for integrated assessments**
  CC impacts sustainable development through water, both across various sectors (agriculture, energy, industry, cities, livelihoods, ecosystems and the environment) but also through sector interlinkages (e.g. water-energy-food-environment nexus). Adapting to CC may require additional trade-offs, but also create opportunities (possible socio-economic and environmental benefits).

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impairment during droughts); emerging pollutants and antibacterial resistant bacteria (more favorable conditions of bacterial growth in water bodies and certain emerging pollutants transport and pathways in the aquatic environment due to temperature and precipitation changes); impact of water quality impairment on ecosystems and their services and functions; impact on water quality from permafrost melting (in cold climates).

[6] SIWI: The limited usefulness of climate models at the decision-making scale should be acknowledged along with a greater emphasis on solutions that work for a range of possible futures.

[7] **FIRST DRAFT TO BE DEVELOPED AND SHARED WITH LEAD AGENCIES IN LATE DECEMBER 2018**

[8] **ILO** would like to contribute on cross-sectoral challenges

[9] **UNU-INWEH** would like to contribute to the part on 'who and where the most vulnerable are'

The role of water in mitigation but also the negative feedback of mitigation on water (Interlinkages water-energy-carbon cycle).

- **Who (and where) are the most vulnerable**
  Certain groups are particularly vulnerable to the effects of CC through water. Linking water and CC in the geopolitical context: population growth, consumption patterns, economic crises, conflict and security, migration, … Potential economic impacts[10] (costs and possible benefits) of CC in terms of GDP. Particular needs of developing countries (introduce attribution problems and 'climate justice').

CHAPTER 2: The International Policy Frameworks

Length: 2,500 words

Lead Agencies: SIWI and WWAP

Contributors: FAO, ICHARM[11], ILO, OHCHR, UNDP, UNECE[12], UNESCO-IHP, WaterLex, WHO[13], WMO

Where this report 'fits' in terms of the international political frameworks and the sustainable development agenda.

- **Overview of the main agreements**
  Paris Agreement/UNFCCC (including NDCs and NAPs), Sendai Agreement, Agenda 2030 and SDGs, and International Water Conventions[14] – specifically relating to adaptation and mitigation through water, and where this reports fits.
- Are these agreements[15] addressing water and sufficiently enabling 'water solutions' (if not, why and what is missing?). How can water support (as a 'connector') implementation of the Paris and other agreements (e.g., are water issues are a main

[10] See **ECLAC** research on the economics of climate change: https://www.cepal.org/en/topics/climate-change

[11] **ICHARM** can contribute on major policy frameworks, such as High Level Panel on Water (HLPW) and High-level Experts and Leaders Panel on Water and Disasters (HELP).

[12] **UNECE** would like to contribute concerning the Water Convention

[13] **WHO** can contribute as they are co-leading some of the relevant water related targets under SDG 6 as well as involved in some of the other SDGs

[14] **SIWI** proposed including other multilateral environmental conventions, (Biodiversity, desertification's), Ramsar, Habitat III…
Reply from WWAP: OK, as long as these are directly related to water and CC (adaptation and mitigation). But we want to avoid a very long exposé on various international frameworks and focus on how the WWDR can contribute to these processes.

[15] **WHO** suggests to refer to article 4.1.f of the UNFCCC which refers to commitments from countries and the need to consider public health impacts for any adaptation or mitigation policy or programme to be implemented by them. This includes health impacts via WASH.
Reply from WWAP: The wording of the article is vague and the implications for water and WASH are not explicit.

priority for countries in their NDCs?). Reflection on latest trends and developments in Katowice, Poland, COP (focus on implementation of Paris Agreement)

*PART 2 – Challenges and opportunities for adaptation, mitigation and resilience in water management**

What can be done through improved water management to better adapt to CC, to increase the efficiency, effectiveness and robustness of water management infrastructure (including O&M), and to contribute to CC mitigation. Different water use sectors/stakeholders also face different challenges with respect to water and CC – there are opportunities to improve CC adaptation and contribute to CC mitigation (i.e., sectoral 'responses').

*** WWAP** will prepared a short introduction (400 words) on why the structure of Part 2 follows an approach focused on different stakeholder groups (not a 'silo' approach), while recognizing critical interlinkages between these groups (cross-benefits and potential trade-offs). The issue of 'integration' will be further elaborated in Chapter 8.

CHAPTER 3 Water availability/supply, infrastructure, ecosystems

Length: 4,000 words

Lead Agency: UNU-INWEH, UNESCO-IHP

Contributors: FAO, IAH, IAHS, IGRAC, IHE, IWMI, RAMSAR, UNU-FLORES, WHO[16], WWC

Establish linkages between CC and various aspects of water management through adaptation, mitigation and resilience. Note that the main 'impacts' on water resources will be covered in the Prologue.[17]

- **Supply management – enhancing resource availability**
  Storage (surface and groundwater, snow and ice, soil moisture); supply augmentation (e.g., rainwater and fog harvesting); energy requirements for pumping, inter-basin transfers and desalination; water recycling/reuse (incl. energy savings) for irrigation, urban/domestic, industrial, recreational and environmental uses; demand management (concept of 'soft measures' presented in very general terms).

[16] **WHO** would also like to contribute or at least review this section given their work on water supply

[17] **GIZ**: Chapter 1 points out that climate projections are constrained by uncertainties. This means water management needs to remain flexible and be able to adapt to various risks. It would be crucial to include the need for climate risks assessments and analysis to any water management planning. See for instance: Climate Risk Informed Decision Analysis (CRIDA)http://unesdoc.unesco.org/images/0026/002658/265895e.pdf

- **Water supply and sanitation infrastructure**[18] [19]
  Water purification and wastewater treatment – energy requirements and GHG footprint of various treatment methods and opportunities for adaptation, mitigation and building resilience[20] (e.g., turbines in water pipes as a source of clean energy).
  Aging infrastructure and non-revenue water; multipurpose infrastructure (technical optimization); improved use of climate information in the water sector.

- **Ecosystem services, landuse planning and managing ambient water quality**[21]
  Land use planning and other nature-based solutions (NBS) for adaptation, mitigation (GHG emission related to land management) and resilience.

Chapter 4 Water related extreme events and risk management (floods, droughts, disaster risk reduction)[22] [23]

Length: 2,500 words

Lead Agency: UNU-INWEH

Contributors: GWP, ICHARM[24]**, IAH** (for drought scenarios), **IWMI, UNDP, UNECE**[25]**, UNESCO-IHP, UNISDR, WMO**

Establish linkages between CC adaptation and DRR[26]

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[18] **WHO** suggests to separate Water supply from Sanitation infrastructure since there are useful specificities we can speak to for each in terms of climate vulnerability and emission profile of technologies - since knowledge on sanitation is behind water supply it is at risk of being lost if not mentioned separately.

[19] **UNESCO-IHP** has proposed to contribute the following:
Impact of climate change on wastewater treatment (both in tropical and cold climates) with negative consequences on ambient water quality; higher costs of water purification and treatment due to changes in water quality and climate episodes.

[20] See **WHO**'s WSP climate change document

[21] Note that the main 'impacts' of CC on ambient water quality and ecosystems will be covered in the Prologue.

[22] Note that the main 'impacts' of CC on extreme events will be covered in the Prologue.

[23] The proposed contribution from **UNU-FLORES** is based on recent research on adaptation measures to climate change within insurance companies. Insurance companies' response to climate change has to take into consideration adaptation, dynamic capabilities and competitive advantage, differentiating between the dynamic capabilities climate knowledge absorption, climate-related operational flexibility and strategic climate integration. Risk is an inherent part of the dynamic capabilities.

[24] **ICHARM** can contribute on early warning, understanding of uncertainty of phenomena, planning of infrastructure and reconstruction, and improving capacity of communities.

[25] **UNECE** could contribute through their recently published 'Words into action on water and disasters' together with UNISDR

[26] Some information on links between DRR, IWRM and water safety planning (management approach for drinking-water) is included in **WHO**'s WSP climate change document

- Highlight opportunities to build resilience, disaster preparedness and prevention, and (water risk) management systems;
- Risk management options: 'climate-proofing' infrastructure; early-warning systems;
- Soft measures (insurance, land use planning and other NBS, etc.)

CHAPTER 5 Water, climate change and human health

Length: 2,500 words

Lead Agency: WHO

Contributors: IIASA, IHE, ILO, UNESCO IHP, IWMI, OHCHR, UNU-FLORES, UNU-INWEH, Water.org[27]

Establish linkages between CC and various water-related health issues[28].

- Trends in water-related diseases and other health issues linked to CC (e.g., vector-borne diseases, human health issues as a result of CC-related disasters)
- Response options for WaSH[29] (in healthcare centres, schools, the workplace[30], safe reuse in agriculture …) in terms of CC adaptation
- Demonstrate that the WaSH sector needs to adapt to climate change, but improving access to WaSH services also increases the resilience of people and communities to CC

CHAPTER 6 Agriculture and food security (incl. fisheries, livestock and forestry)

Length: 4,000 words

Lead Agency: FAO

Contributors: CDP-BAFWAC, IAH[31], IAHS, IIASA[32], ILO, IWMI, WMO

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[27] **Water.org** would like to contribute to the section on the need for WaSH sector to adapt to climate change. ***Reply from WWAP***: Depending on the type of contribution Water.org has in mind, it might be more appropriate to contribute to the section on water supply and sanitation infrastructure in Chapter 3.

[28] **WHO** suggest adding a text box on cholera.

[29] The use of WaSH here seems to imply health effects at the tap and toilet. For clarity **WHO** would cover health risk along each step of the water supply (catchment to consumer) and sanitation (toilet to end use/disposal) as well as mitigation measure and potential public health trade-offs off different mitigation and investment options.

[30] **WHO** propose to also include response options for wastewater operators, sanitation and water operators and safe use of wastewater for agriculture
Reply from WWAP: These are all relevant issues, provided the link to CC is explicit.

[31] **IAH** can contribute on the subject of groundwater use.

[32] **IIASA** can contribute on the subject of biofuels

Establish challenges and opportunities for CC adaptation, mitigation and resilience in agriculture (in both high and low-income countries) through improved water and land management.

- **Adaptation**
  Increasing irrigation efficiency[33] (in terms of both water and energy savings); improving rainfed crop productivity and drought resistant crops[34];
- **Mitigation**
  Agricultural (and forestry) land management (e.g., increasing carbon storage); sustainable livestock husbandry and freshwater fisheries, biofuels (trade-offs w.r.t. land use, water use and food security vs. GHG mitigation),
- **Resilience**
  Reducing food waste; reducing/recycling non-edible or non-revenue crop residues[35]

CHAPTER 7 Energy and industry

Length: 4,000 words

Lead Agency: UNIDO

Contributors: CDP-BAFWAC, FAO (t.b.c.), IAH (for geothermal energy), ILO, UNU-FLORES, WHO

Establish challenges[36] and opportunities[37] for CC adaptation, mitigation and resilience in the energy sector and throughout industry through improved water and land management.

- Options to improve water use efficiency (and water use reduction) in primary energy production and power generation (i.e., the 'water-energy-climate' nexus[38]). Renewables

[33] **ECLAC**: Measures designed to improve on-farm irrigation efficiency may actually, depending on the institutional framework, decrease water availability and increasingly stress water supplies.

[34] **UNIDO**: … and managing flooding and seasonal changes.

[35] **UNIDO**: These actions sound more like adaptation measures. Resilience implies flexibility and ability to recover.

[36] **UNIDO**: These should be outlined. While they are similar in general for energy and industry as for other sectors or people - uncertainty, unpredictability, extremes, disasters - the effects and responses are likely to be different.

[37] **UNIDO**: The options listed below are not necessarily opportunities, they are largely responses. To some extent, industry, business and the private sector will balance the efforts of government but from a different perspective. In this respect, there will be changes in orientation, such as becoming more a part of civil society, and business cases to be made that hopefully benefit society as well as shareholders. There is a need to go beyond corporate philanthropy.

[38] **WHO:** There is a clear linkage to health as a reduction in carbon intensive practices will imply important health co-benefits (through a decrease in mortality and morbidity linked to air pollution). WHO can provide references to this

(solar and wind[39]) are both low-carbon and low-water (mitigation), whereas the use of fossil fuels impacts both the climate and water security.

- Options to improve water use efficiency (and water use reduction) for different industrial sectors (incl. mining, but also other business sectors such as tourism); value chains, water footprints, CSR and the need of long-term commitments, business models, role of industry 4.0 …

CHAPTER 8 Human settlements (incl. water/climate-induced migration)

Length: 3,000 words

Lead Agency: UN-Habitat

Establish challenges and opportunities for CC adaptation, mitigation and resilience through integrated water management and land use planning in urban, peri-urban and rural settlements.[40]

Contributors: CDP-BAFWAC, IWMI, UNESCO-IHP, UNU-FLORES, UNU-INWEH[41], World Youth Parliament for Water, Water.org[42]

- Building 'resilient' cities[43] (climate smart, water sensitive etc.); 'green cities' provide adaptation, climate change mitigation, and improved water management;…
- Settlements in rural areas: challenges and sustainable pathways in light of climate change
- Climate-induced migration[44] and its effects on rural, peri-urban and urban settlements

CHAPTER 9 Integration/NEXUS section[45]

Length: 2,000 words

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[39] **WWAP**: Biofuels will probably be covered in Chapter 5 and Chapter 8 (as an example of nexus trade-offs). If addressed here we'll need to ensure complementarity and avoid redundancy.

[40] **WWAP**: Note that water supply and sanitation will be covered in Chapter 3. This chapter focuses on the development of sustainable human settlement 'systems'.

[41] **UNU-INWEH** focal point is Nidhi Nagabhatla - Water and migration and other relevant inputs

[42] **Water.org**: Managed water and sanitation leads to stronger cities (as opposed to slums with little/no WaSH access and the increased vulnerability to communicable diseases such as cholera, etc.) Water.org could contribute on this point.

[43] **UNIDO**: This is a large part of what is currently happening with climate adaptation. Many major cities have plans. Perhaps it deserves more attention. Moreover, the recent example of Cape Town is a good example of a crisis situation.

[44] **UNU-INWEH** proposed that the issues of Small Island stats shall come explicitly

[45] It is possible that this will be covered in the introductory text of Part 2, in which case this chapter would be dropped.

Lead Agency: WWAP

Contributors: FAO, GWP, IAH (groundwater role in nexus; groundwater dependent ecosystems), IAHS, IWMI, UNECE[46], UNESCO-IHP, UNIDO, UNU-FLORES, WHO

Highlight that several topics/sectors covered above are interlinked through water and climate, and establish the need to 'work together' to address the challenges and identify opportunities for collective responses. Progress will require concerted action (beyond the 'silo' approach) along several different fronts.

- Multiple opportunities through interlinkages[47] – various 'nexus' (including ecosystems); potential for a matrix of sectors vs. water impacts and response options to demonstrate interlinkages (e.g., how adaptation/mitigation affect water quantity and quality)
- Trade-offs: when mitigation/adaptation measures in one sector can be detrimental to mitigation/adaptation measures in another (e.g., biofuels, other renewables).
- IWRM for CC[48]; impacts of *not* addressing water-related CC impacts on energy, industry, etc.

PART 3 – Regional Perspectives

CHAPTER 10 – Regional Perspectives

Length: 8,000 words

Lead Agencies: GWP, in close cooperation with the RECs (ECE, ECLAC, ESCAP, ESCWA and ECA), WWAP and other regional offices/agencies

Contributors: ICHARM, IHE, UNESCO Field Offices

The five different regions (as defined under the UN Regional Economic Commissions) have different challenges regarding water and climate change and unique responses. However, effective solutions might also (with some adaptations) work elsewhere. These will be highlighted in this chapter, which will focus on a limited number of specific examples (i.e., 'case studies') that will showcase 'learning examples' and inspire transfer and action. Ideally, the description of the case will be more detailed than the references and boxes that will populate the other chapters of the report. They could cover key aspects linking a main water management objective related to climate change, co-benefits (e.g. job creation, carbon sequestration, sustainable livelihoods), lessons learned etc. Could feature case studies beyond specific countries, e.g., Lake Chad which combines a series of water & CC related issues.[49]

[46] **UNECE** can contribute with their work on the water-food-energy ecosystems nexus and the basin assessments

[47] **WHO** would like to add reference to the Health in All Policies approach (HiAPs).

[48] **UNIDO**: This might be better in Chap 10 perhaps as a potential response in the discussion about the attribution problem.

[49] **ECLAC:** This does NOT seem to be a good option: the cases provided by the regional commissions are unlikely to cover all relevant climate change adaptation and mitigation issues and maybe not even regional priorities, and

PART 4 – An enabling environment for change and progress

The call for adaptation to CC in water management has been happening for over 15 years. Why has progress been so slow? The mitigation (GHG) opportunities through improved water management are less well known. Relevant and inspiring cases will be introduced throughout.

CHAPTER 11 Governance (incl. awareness raising, participation, cross-sectoral coordination and political will)

Length: 5,000 words

Lead Agency: UNDP

Contributors: Aquafed, IHE, ILO, UNECE[50], UNESCO IHP, ICHARM, IWMI, OHCHR, RAMSAR, SIWI, UNU-FLORES, WaterLex, Water.org, WHO, World Youth Parliament for Water, WMO, WB (t.b.c.)

This chapter describes the legal, institutional and political mechanisms to support CC adaptation, mitigation and resilience[51] in water management, as well as opportunities to raise the profile/importance of improved water management in climate change policy.[52]

- CC adaptation and mitigation as part of national water policies[53], and vice-versa (via National Determined Contributions (NDC) and National Adaptation Plans (NAPs)
- Roles of legal and regulatory frameworks for water and land use management; transboundary issues; roles of different levels of government (global, regional, national, local) and the importance of bottom-up approaches[54]; importance of accountability and transparency[55]

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aggregating them is a common chapter could be confusing and not well balanced. It would be much better to use this material to illustrate, and incorporate regional perspectives, in the other chapters. Say if someone presents a case in urban water supply, than put it under "Human settlements", a case on irrigation in Chapter 5, on energy in Chapter 6, and so on.

[50] **ECE** would like to contribute to the part on roles of regulatory frameworks based on work in the framework of ECE intergovernmental Task Force on Water and Climate and ECE pilot projects on climate change adaptation in transboundary basins

[51] **ECLAC**: It will be better to clearly separate mitigation and adaptation throughout the text.

[52] **SIWI**: The limited usefulness of climate models at the decision-making scale should be acknowledged along with a greater emphasis on solutions that work for a range of possible futures.

[53] **ECLAC:** It will be difficult to separate this from "The International Policy Frameworks".

[54] **SIWI**: Risk assessment yes but also decision making under risk approach. Need to have a no regret vision

[55] **UNESCO-IHP** has proposed to contribute the following: Youth as a priority group and engaging with Indigenous Peoples

- Human Rights Based Approach; OECD water governance framework[56];
- Roles and responsibility of different actors (everybody's problem) and International Agreements (Agenda 2030, Paris[57], Sendai, water conventions, etc) implementation gaps and challenges[58] [directly linked to Chapter 2]
- Attribution problem[59] (what part of the problem is water management, and what part is CC); public (stakeholder) participation; address conflicting interests; consumer awareness and collective action, strengthen political will and follow-up actions.

CHAPTER 12 Financial and economic instruments

Length: 4,000 words

Lead Agency: World Bank

Contributors: AGWA, Aquafed, CDP-BAFWAC, GWP, OHCHR, UNDP, UNECE[60], Water.org, WMO, WWC

Water resources management and WaSH are notoriously under-financed. This chapter explores opportunities to improve the situation in the context of CC adaptation, mitigation and resilience.

- Overview of financial risks for water associated with CC; cost of no action and potential savings (avoided costs) associated with preventive measures (e.g. up to 10 times or more in avoided costs[61])
- Opportunities for financing water though international CC funding mechanisms, for both adaptation and mitigation (e.g., CC adaptation fund, Green Climate Fund[62]).

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[56] **SIWI**: Climate justice

[57] **SIWI:** A big part of COP24 is going to be on enhancements of ambitions in NDC's and rule book to implement the Paris agreement. Even more with alarming IPCC report. Many governing and governance issues will be addressed. We can propose here a way forward with wise water management. Need to have a strong city angle here too since global issue but local solutions. Missing also the solutions with Source to Sea approaches, Shared Waters partnerships, Water-Forest nexus, …

[58] **UNIDO:** Tensions over water use within as well as between countries.

[59] **Water.org**: The attribution problem is a separate bullet from the others. There was basically one very vocal person who emphasized the attribution problem; it should not overshadow the other items in this grouping.

[60] **UNECE** is currently finalizing a publication on preparing bankable projects for climate change adaptation and transboundary cooperation together with the World Bank (Christina Leb). ECE would like to mention it in this chapter and include some text.

[61] See for example http://www.worldbank.org/en/results/2014/10/01/novel-approach-to-disaster-risk-management-mexico

[62] **SIWI**: GCF has an obligation to fund 50/50 adaptation and mitigation measures. They are having a hard time fulfilling that obligation even if gap is decreasing with more adaptation projects coming in; esp thanks to readiness projects.

- Most CC funding (at least at national levels) seems to be earmarked for mitigation – are there opportunities for water management to tap into these sources?; Examples(?) of national-level CC financing aimed specifically at water
- Alternative sources of financing: insurance (DRR etc.), PPPs, investment in climate-sensitive water projects, funding for preventive measures, private sector finance, blended finance (project specific utilisation of different funding source), importance of long-term sustainable business models (beyond of short-term CSR actions), what makes a project 'bankable', value water and savings (value of water beyond 'pricing'), no regret investments, …

CHAPTER 13 Technological innovation, knowledge (management) and capacity development, R&D

Length: 3,000 words

Lead Agency: UNESCO and UNU-INWEH[63] (TBC)

Contributors: Aquafed, IAHS, ICHARM, IHE, UNDP, UNU-FLORES[64], WMO

This chapter highlights challenges and opportunities in promoting research, innovation and science to support informed decision-making.

- Recognizing knowledge gaps and research needs; obstacles and solutions for flexible/adaptive design and methods
- Benefits of monitoring and evaluation (keeping track of the outputs and outcomes of strategies) for both decision-making and on-the-ground interventions; role of citizen science and other 'innovative' approaches to information gathering (e.g., ICT).
- Bringing the water and climate research communities closer
- Addressing human and institutional capacities to create more resilient societies[65]

CHAPTER 14 Concluding remarks

Length: 1,000 words

Lead Agency: WWAP

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[63] **UNU-INWEH** Focal point is Hamid Mehmood. INWEH can offer strong contribution to most of the Chapter bullets, particularly ICT and capacity development.

[64] The contribution of **UNU-FLORES** is based on extensive research on environmental management accounting defined as "the identification, collection, estimation, analysis, internal reporting, and use of physical flow information (i.e., materials, water, and energy flows), environmental cost information, and other monetary information for both conventional and environmental decision-making within an organization" (United Nations Division for Sustainable Development (UNDSD), 2001.

[65] **SIWI:** New perceptions of societies, circular economy paradigm, need a change and innovation in the paradigm.

Contributors: many...

A summary of the main policy messages, stressing the urgency for immediate action, managing risks, no regret options[66], and measures that support sustainable development in all its facets through water and climate interventions[67].

[66] UNIDO: This is essentially the Precautionary Principle of taking action based on incomplete evidence when risks are high to human health and the environment.

[67] ECLAC: What is lacking in adaptation in water management itself: what are the implications of the climate change for water rights regime, water allocation, priorities, groundwater management, water law, etc.