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Swiss Agency for Development and Cooperation SDC

Regional Seminar

Managing Disaster Risks and Water under Climate Change in Central Asia and the Caucasus

Khorog (Tajikistan), 17-23 September 2018



Background Information Paper (BIP)

Concepts, approaches and methods used in tackling sustainable water management and disaster risk reduction under climate change

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August 2018

Climate Change & Environment Network (CC&E)
Disaster Risk Reduction Network (DRR)
Water Network (RésEAU)

Preliminary remarks

At the Earth Summit in Rio de Janeiro in 1992, over 159 countries signed the United Nations Framework Convention on Climate Change to stabilize greenhouse gas concentrations in the atmosphere.

Three years later, in 1995, countries launched negotiations to strengthen the global **response to climate change**, and adopted the Kyoto Protocol in 1997. The Kyoto Protocol legally binds developed country parties to emission reduction targets.

The Paris Agreement, adopted in 2015, builds upon the Climate Convention and its central aim is to keep a global temperature rise this century well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5°C.

Nowadays **water** scarcity and excess of water affect more than 40 percent of people around the world, an alarming figure that is projected to increase with the rise of global temperatures as a result of climate change. Although 2.1 billion people have gained access to improved water sanitation since 1990, dwindling supplies of safe drinking water are a major problem impacting every continent. The Sustainable Development Goals (SDGs), as successors of the Millennium Development Goals, are a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity. The 17 Goals came into effect in 2016 and include new areas such as climate change, innovation and sustainable consumption among other priorities. SDG 6 shall ensure availability and sustainable management of water and sanitation for all.

Excess of water can be a consequence of meteorological events such as storms and trigger flooding and disasters. To reduce the natural disaster risks, the concept of **disaster risk reduction** (DRR) has evolved to a widely adapted framework in the last decades:

The UN International Decade for Natural Disaster (1990-1999), the Yokohama Strategy & Action Plan for a Safer World (1994) and the Hyogo Framework for Action 2005-2015 (Building the Resilience of Nations and Communities to Disasters) have contributed to comprehensive understanding of hazard, vulnerability and risk and towards the development of a forward looking strategy for managing risk.

The Sendai Framework for Disaster Risk Reduction 2015-2030 as the successor of the Hyogo Framework for Action 2005-2015 has its main priorities on risk assessment, risk governance, resilience building and preparedness, preventing new and reducing existing risks. It represents the non-binding framework for nations, national and international institutions as well as for international cooperation.

The following chapters shall provide basic background information of the relevant concepts and approaches applied by the Swiss Agency for Development and Cooperation as well as project partners to address the challenges of climate change, sustainable water management and disaster risk reduction.



1. Climate Change Adaptation and Mitigation

The IPCC **Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX; <http://www.ipcc.ch/report/srex/>)** addresses how to reduce and manage the risks of such events and disasters in a changing climate.

A changing climate leads to changes in the frequency, intensity, spatial extent and duration of extreme weather and climate events, and can result in unprecedented extremes. Such events affect vulnerability to future extreme events by modifying resilience, coping capacity, and adaptive capacity. The cumulative effects of disasters can substantially affect livelihood options and resources as well as the capacity of societies and communities to prepare for future disasters.

There is evidence that some extremes have changed as a result of anthropogenic influences, including increases in atmospheric concentrations of greenhouse gases.

Trends in extreme events:	Trends in disaster losses
<ul style="list-style-type: none"> – Since 1950, extraordinary hot days and heavy precipitation have become more common. – Climate models project more frequent hot days throughout the 21st century. – Climate models project there will be more heavy rain events throughout the 21st century. 	<ul style="list-style-type: none"> – Economic disaster losses from weather- and climate-related disasters have increased, but with large spatial and interannual variability. They are higher in developed countries. – Fatalities are higher in developing countries (from 1970-2008, over 95% occurred in developing countries). – Increasing exposure of people and assets has been the major cause of changes in disaster losses.

➤ Increasing vulnerability, exposure, or severity and frequency of climate events increase disaster risk.

➤ Information on vulnerability, exposure, and changing climate can inform adaptation and DRM; an iterative process involving monitoring, research, evaluation, learning, and innovation can reduce disaster risk in the context of climate extremes; the Figure 1 shows that disaster risk management and climate change adaptation can influence the degree to which extreme events translate into impacts and disasters. The importance of climate change, climate change scenarios and adaptation is also reflected in the Hyogo Framework for Action 2005-2015 and consequently in the SFDRR 2015-2030.

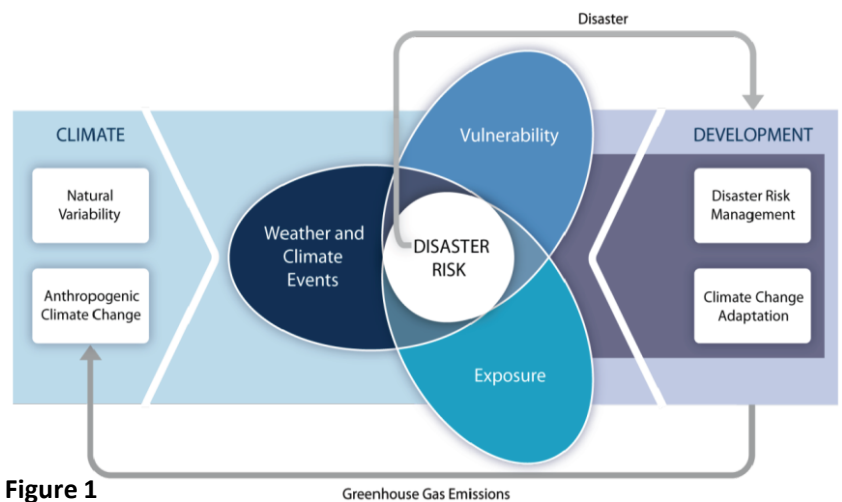


Figure 1

Adaptation and mitigation are fundamental responses to climate change. The idea that less mitigation means greater climatic change, and consequently requires more adaptation is the basis for the urgency surrounding reductions in greenhouse gases. Climate mitigation and adaptation should not be seen as alternatives to each other, as they are not discrete activities but rather a combined set of actions in an overall strategy to reduce the worst impacts of climate change.

CC Adaptation: Adaptation methods are those based on strategies that enable the individual or the community to cope with or adjust to the impacts of the climate locally. They include efficient environmental resource management practices such as the planting of early maturing crops, adoption of hardy varieties of crops and selective keeping of livestock

37 in areas where rainfall declined. They also include the use of technological products that enable the individual to function in
38 the “new” conditions. However, beyond a certain threshold, the possibilities to adapt are also limited.

39 **CC Mitigation:** Mitigation strategies are procedures or activities that help prevent or minimize the process of climate
40 change. Mitigation strategies can be grouped into two categories: some represent mainly technological solutions; others
41 involve changes in economic structure, societal organization, or individual behavior.

42 The International Panel on Climate Change (IPCC) defines mitigation as: “An anthropogenic intervention to reduce the
43 sources or enhance the sinks of greenhouse gases.” Strategies aimed at reducing GHG emission emphasize cutbacks in the
44 burning of fossil fuel through improved energy-efficiency, use of clean energy sources particularly solar and discontinuation
45 of gas flaring. Carbon sink enhancement generally involves forestry programmes that protect the forest and encourage
46 afforestation in marginal areas including range lands [*The value of indigenous knowledge in climate change mitigation and*
47 *adaptation strategies in the African Sahel; A. Nyong et al. 2007*].

48 Innovations and technological progress have led to a paradigm shift regarding the economics of clean
49 energy generation. Today, much lower costs and the move away from centralized to decentralized energy
50 systems provide a unique opportunity to decarbonize economic growth, increase resilience, and exploit
51 the co-benefits of climate-smart development. Together, these innovations and improvements contribute
52 to the achievement of the Sustainable Development Goals of the 2030 Agenda for Sustainable
53 Development. SDC’s Global Programme Climate Change and environment (GPCCE) is well positioned to
54 provide policy solutions and innovation to deliver on this transformational process. [*SDC Global Programme*
55 *on Climate Change*].

56 Climate change is likely to further increase the exposure to risks affecting the magnitude, frequency
57 and spatial distribution of disasters (IPCC, 2014; SREX, 2015). It influences slow onset disasters such
58 as environmental degradation and droughts as well as more rapid onset disasters such as debris
59 flows and floods. Climate Change will not only influence the availability of water but also other
60 natural resources. As a consequence, SDC has developed a Climate, Environment and Disaster Risk
61 Reduction Integration Guidance (CEDRIG) to systematically integrate climate, environment and
62 disaster risk reduction into development cooperation and humanitarian aid in order to enhance the
63 overall resilience of systems and communities.

64

65 **2. Natural Resource Management (NRM)**

66 A **natural resource** is an asset that we can obtain from our environment: water, soil, plants, wind,
67 animals, minerals, the energy of the sun and many others. Natural resources are often seen in terms of
68 economic value, because so many of them are crucial for people’s livelihoods. Natural resources typically
69 share a number of key features, which often include exhaustibility, uneven distribution across countries,
70 negative externalities consequences in other areas, dominance within national economies and price
71 volatility. A distinction is often made between renewable and non-renewable natural resources:

- 72 ➤ A renewable natural resource can regrow, or its supplies can be replenished through natural
73 processes. Some examples of renewable resource include plants, animals, insects, or wind. If the
74 renewable resources in a particular area are overexploited for a long period of time, it is possible
75 that they may become endangered or even disappear altogether.
- 76 ➤ A non-renewable natural resource will not replenish itself. Examples of these include oil, coal,
77 minerals, or rocks. The use of these resources should be carefully monitored and managed according
78 to their availability.

79 The challenge of managing limited resources in a context of growing demand generates tension when
80 natural limits are confronted with human behaviours. Hence natural resources management is a field of
81 research, in which many disciplines meet.

82 Natural resource management involves efforts by different institutions to formulate and implement laws,
83 policies and legislation to ensure viable use of natural resources. Natural resources, mainly found in rural
84 areas, are not only important as a source of food and other domestic products but also form the basis for
85 social and cultural functions.

86 The implementation of a natural resource management plan typically involves the following steps
87 [USAID/CRS/MEAS. 2015. Managing natural resources: a smart skills manual]: **a)** understanding of the community
88 context; get familiar with livelihood, socioeconomic and policy context; **b)** Identifying and engaging
89 stakeholders; **c)** Mapping natural resource challenges and opportunities – support stakeholders to identify
90 and map their resources by using participatory methods; **d)** elaborate a natural resources management
91 plan to identify and implement interventions and achieve the desired objectives; **e)** Managing natural
92 resources projects – e.g. creation of demonstration plots, pilots or on-farm trials in order to define the
93 interventions that work best; **f)** Developing a monitoring and evaluation system: this system will facilitate
94 measuring the progress and assessing the impact of the activities.

95 A specific and often applied method of managing natural resources is Community Based Natural Resource
96 Management (CBNRM). CBNRM can be defined as collective use and management of natural resources in
97 rural areas by a group of people with a self-defined, distinct identity, using communally owned facilities.
98 The focus of CBNRM is not merely wise management of natural resources. As important is the need for
99 community development, local self-government, and the creation of local institutions for managing
100 common property resources [Community-Based Natural Resource Management, C. Fabricius, Rhodes University, South
101 Africa].

102

103 **3. Integrated Water Resource Management (IWRM)**

104 IWRM has emerged over the past decades as a globally recognised guiding concept for managing water
105 resources. It is promoted by all major organisations dealing with water and is increasingly shaping
106 national legislations and regional cooperation arrangements. In 2015, the United Nations have explicitly
107 adopted the global implementation of IWRM as Sustainable Development Goal 6.5.

108 The Global Water Partnership (GWP), a global champion of the promotion of IWRM, defines it as “a
109 process which promotes the coordinated development and management of water, land and related
110 resources in order to maximise economic and social welfare in an equitable manner without
111 compromising the sustainability of vital ecosystems and the environment.”

112 The basis of IWRM is that the many different uses of finite water resources are interdependent. High
113 irrigation demands and polluted drainage flows from agriculture mean less freshwater for drinking or
114 industrial use; contaminated municipal and industrial wastewater pollutes rivers and threatens
115 ecosystems; if water has to be left in a river to protect fisheries and ecosystems, less can be diverted to
116 grow crops; etc.

117 IWRM is a cross-sectoral policy approach, designed to replace the traditional, fragmented sectoral
118 approach to water resources and management that has led to poor services and unsustainable resource
119 use. IWRM is based on the understanding that water resources are an integral component of the
120 ecosystem, a natural resource, and a social and economic good. The Human Rights to Water and
121 Sanitation are complementary concepts emphasising the government’s responsibility to fulfilling the
122 access to sufficient, safe and affordable water for all people.

123 Management of water resources in natural units (river basins and watersheds, groundwater bodies)
124 rather than in administrative units, as well as cross-sectoral integration, coordination or cooperation are

125 two key approaches in IWRM addressing the natural interdependencies in water resources management.
126 In practice, this may be done through dedicated institutions and tools (e.g. river basin organisations,
127 responsible for river basin planning), but may also done through extensive cooperation between the
128 relevant administrative levels (e.g. federal states like Switzerland rarely have dedicated institutions on
129 river basin level but rather implement IRWM through adequate cooperation between the federal
130 administrations). For large river basins covering several countries, IWRM principles call for transboundary
131 cooperation.

132 IWRM also requires participation of all water users in the process of defining priorities and resources
133 allocation; in practice often implemented through coordination and participation mechanisms such as
134 river basin councils or committees.

135 IWRM is not a blueprint approach: it requires individual, tailored application for each national or local
136 context. In Switzerland, for example, the application of IWRM is quite diverse, reflecting the complex
137 institutional landscape of its federal system. The Swiss Federal Office for the Environment FOEN provides
138 guidance for the implementation of IWRM under the heading of "[watershed management](#)".

139 The European Union's Water Framework Directive (WFD) is the world's most complete and ambitious
140 legal framework on water resources management; it reflects most but not all elements of IWRM. As it is
141 designed for the situation and needs of EU countries, it is not necessarily suitable as blueprint for other
142 regions. That said, the EU-WFD is frequently used as a guiding concept in water sector reforms in
143 countries in the EU neighbourhood, including in the Southern Caucasus. In Central Asia, several countries
144 are also undertaking water sector reforms based on the IWRM principles. More details on this in the
145 Thematic Input Paper 2.

146

147 **4. Disaster Risk Reduction: Natural hazards, vulnerability, disaster risks and resilience**

148 Every day, populations face a wide variety of risks arising from geopolitical, economic and natural hazards;
149 the latter are also influenced by Climate Change. Disaster risk reduction (DRR) deals with the effects of
150 natural hazards which often threaten human life, health, livelihoods and safety. Moreover, they can
151 heavily impact the environment, put communities at further risk, displace populations and destroy
152 development achievements. Reducing disaster risks is not just necessary in order to save lives and
153 livelihoods, but also to contribute to poverty alleviation, to sustainable development and therefore to
154 resilience building [SDC Guidelines on DRR; April 2018].

155 With the Hyogo Framework for Action 2005-2015 and with the Sendai Framework for Disaster Risk
156 Reduction 2015-2030 as its successor the focus was shifted towards mainstreaming and resilience
157 building. The today used concept of DRR was developed giving particular emphasis on proactive measures
158 (prevention, preparedness and resilience) aiming at preventing new and reducing existing risks instead of
159 being reactive to disasters.

160 The United Nations International Strategy for Disaster Reduction (UNISDR) Terminology promotes a
161 common understanding and common usage of disaster risk reduction concepts and assists the disaster
162 risk reduction efforts of authorities, practitioners and the public. The following terms are consequently
163 defined according to the UNISDR terminology [<https://www.unisdr.org/we/inform/terminology>].

164 **Hazard:** A process, phenomenon or human activity that may cause loss of life, injury or other health impacts,
165 property damage, social and economic disruption or environmental degradation.

166 **Exposure:** The situation of people, infrastructure, housing, production capacities and other tangible human assets
167 located in hazard-prone areas.

168 **Vulnerability:** The conditions determined by physical, social, economic and environmental factors or processes which
 169 increase the susceptibility of an individual, a community, assets or systems to the impacts of hazards.

170 **Capacity:** The combination of all the strengths, attributes and resources available within an organization, community
 171 or society to manage and reduce disaster risks and strengthen resilience.

172 **Disaster Risk:** The potential loss of life, injury, or destroyed or damaged assets which could occur to a system, society
 173 or a community in a specific period of time determined probabilistically as a function of hazard, exposure,
 174 vulnerability and capacity.

175 **Disaster Risk Reduction:** Disaster risk reduction is aimed at preventing new and reducing existing disaster risk and
 176 managing residual risk, all of which contribute to strengthening resilience and therefore to the achievement of
 177 sustainable development. *Disaster risk reduction is the policy objective of disaster risk management, and its goals and*
 178 *objectives are defined in disaster risk reduction strategies and plans.*

179 **Resilience:** The ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt
 180 to, transform and recover from the effects of a hazard in a timely and efficient manner, including through the
 181 preservation and restoration of its essential basic structures and functions through risk management.

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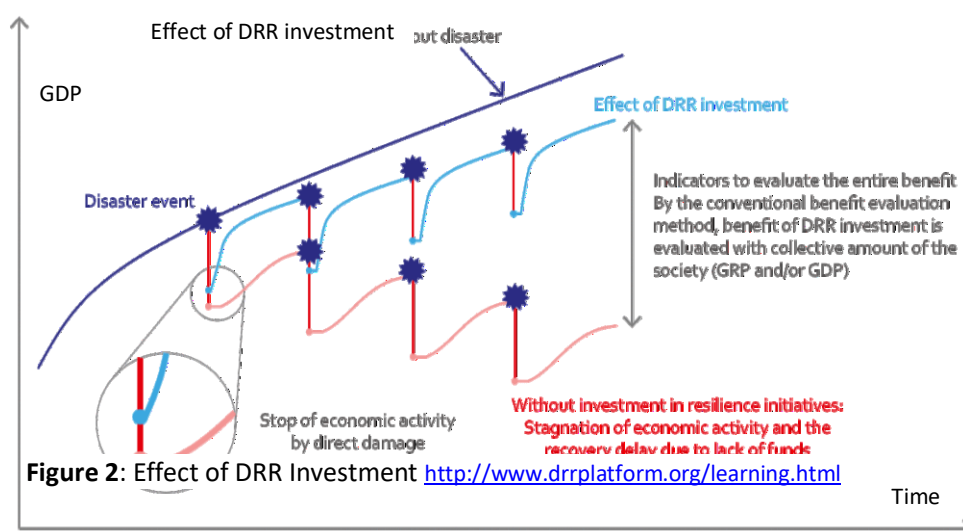


Figure 2: Resilience aims to ensure that shocks, stresses and hazardous event do not lead to a long-term downturn in development progress, economic growth and other means. Investment in DRR for resilience is also priority No. 3 of the SFDRR 2015-2030.

198

199 5. Integrated Risk Management (IRM)

200 SDC is strongly advocating for integrated (disaster) risk management (IRM). IRM refers to an overall risk
 201 assessment process and its components (risk identification, risk analysis and risk evaluation) as well as risk
 202 treatment (prevention, preparedness, response, recovery). Natural disasters are the manifestation of risks
 203 resulting from the combination of an exposure to hazard, the conditions of vulnerability and insufficient
 204 capacity or measures to reduce or cope with the potential negative consequences. Even if disasters
 205 cannot be completely avoided, their root causes can be addressed and their impacts mitigated. The goal is
 206 sustainable development and human welfare that is not compromised by natural hazards.

207 Interventions to reduce risks should be based on the risk concept: all risks and the corresponding hazards
 208 – including impact of climate change on magnitude or frequency of hazards - , vulnerabilities and coping
 209 capacities are assessed and evaluated ('know your risks'). An in-depth assessment of all prevailing risks
 210 and their complex interconnectedness provides the basis on which to decide which risks to address

211 [SDC Guidelines on DRR; April 2018].

212 The approach of **IRM** addresses the guiding question how to handle DRR in a systematic manner (see
 213 Figure 3 below):

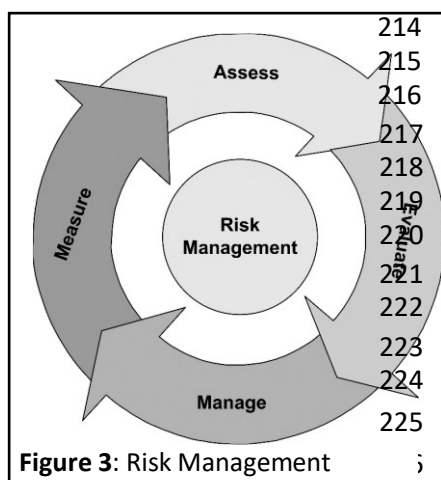


Figure 3: Risk Management

Assess: What can happen? Identification and assessment of hazards, exposure, vulnerability and coping capacity (qualitative vs. quantitative assessments).

Evaluate: what is allowed to happen? What do we accept and where do we want to reduce the risks. How much safety at what price (drawing a line between ‘acceptable’, ‘tolerable’ and ‘intolerable’ risk is one of the most controversial tasks in the risk governance process).

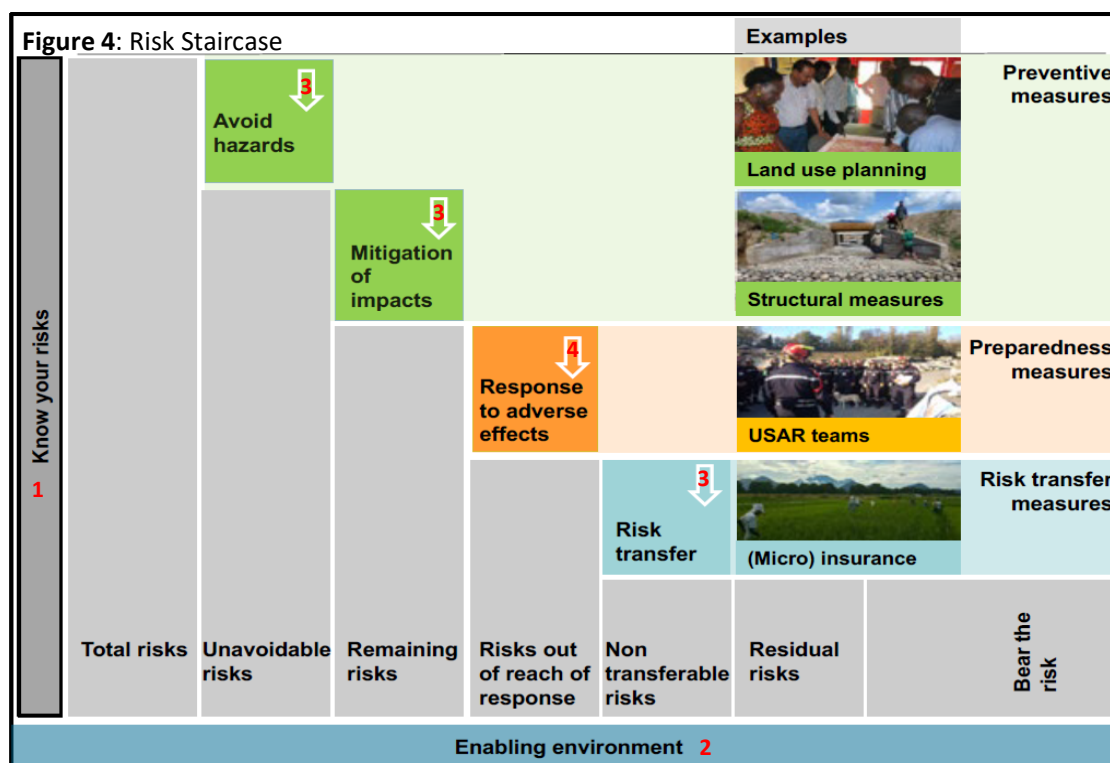
Manage: what has to be done about? Plan for risk reduction measures: prevention, mitigation, preparedness; use cost-benefit analysis (CBA).

Measure: what is the effect of DRR? Establish monitoring and evaluation system to demonstrate effectiveness of DRR.

The Sendai Framework for Disaster Risk Reduction 2015-2030 (SFDRR) with the overall goal to “prevent new and reduce existing disaster risk... and thus strengthen resilience” defines four priorities for actions: **1) Understanding disaster risk, 2) Strengthening disaster risk governance to manage disaster risk, 3) Investing in disaster risk reduction for resilience, 4) Enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation and reconstruction.** The relevance of climate change regarding natural disaster risks is mentioned several times.

The SFDRR focuses on risk assessment, risk governance, resilience building and preparedness. The SFDRR is mainly a tool for nations, national and international institutions and for international cooperation. The SFDRR is a bit less developed for work on local / project level; adapted risk management frameworks are necessary to also address the issue of evaluation (especially on project level).

The risk staircase, as a risk management model, illustrates the set of possible measures to reduce and prevent risks. Based on a risk analysis, the total risk is consecutively reduced by prevention/mitigation and preparedness measures and transferred or shared. The residual risk of disaster has to be borne [SDC Guidelines on DRR; April 2018]. The risk staircase also reflects the 4 priorities for action of the SFDRR 2015-2030 (see red numbers in Figure 4 and the four SFDRR priorities above).



254 6. Integrated Watershed Management (IWSM)

255 Integrated Watershed Management (IWSM) can be viewed as part of a Disaster Risk Management
256 approach. But it also provides a framework to integrate natural resource management with community
257 livelihoods in a sustainable way. IWSM addresses the issues of degradation of natural resources, soil
258 erosion, landslides, floods, frequent droughts and desertification, low agricultural productivity, poor
259 water quantity and quality and poor access to land. The approach also considers the relevance of Climate
260 Change and Climate Change adaptation.

261 As a consequence it shares a common perspective with the NRM/IWRM approach. But with the aim to
262 improve livelihoods (resilience building) the IWSM approach has an important additional scope.

263 IWSM includes improvement of governance, especially in land and water management to improve
264 livelihoods, to optimize productivity and sociocultural benefits, as well as to sustain the resource base and
265 ecological functions or services. It is important to adapt technical solutions to the socio-economic and
266 cultural conditions of the resource users. Impacts of upstream use on downstream use and the different
267 interests of neighbouring land users in the upper and lower-lying parts of a watershed must be taken into
268 account. It must be ensured that costs and benefits are balanced.

269 The following table describes exemplarily the key topics of effectively integrated watershed management
270 [Wolfgang B., IWSM policy brief No2. University of Bern, CDE, 2015].

<p>Watershed management is the integrated use of land, vegetation and water in a geographically discrete catchment or drainage area for the benefit of its residents, with the objective of maintaining the hydrological services that the watershed provides and of reducing or avoiding negative downstream or groundwater impacts (adapted from World Bank 2008).</p>	<p>Co-management describes «partnership arrangements in which government, the community of local resource users, external agents (NGOs, academic and research institutions), and other resource stakeholders share the responsibility and authority for decision making over the management of a natural resource; it covers various partnership arrangements and degrees of power sharing and integration of local (informal, traditional, customary) and centralized government management systems» (Pomeroy in Meinzen-Dick, Knox, Di Gregorio, 2000)</p>	<p>Land governance concerns the rules, processes and structures through which decisions are made about access to land and its use, the manner in which the decisions are implemented and enforced, the way that competing interests in land are managed. (FAO, UN-HABITAT 2009)</p>	<p>Tenure systems define and regulate how people, communities and others gain access to natural resources, whether through formal law or informal arrangements. The rules of tenure determine who can use which resources, for how long, and under what conditions. They may be based on written policies and laws, as well as on unwritten customs and practices. (FAO 2012)</p>
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271 Best practices (acquired e.g. in the IWSM-project in Muminabad, funded by SDC and implemented by
272 Caritas) on how to achieve co-management of the natural resources and inclusive land governance at
273 watershed level, recommend the involvement of all stakeholders through establishment of steering
274 committees (discussing matters of strategic importance regarding project-steering and ownership), civil
275 society committees (discussing matters of interest at local level) or pasture user unions (planning and
276 thereby improving the use of pasture land).

277 The establishment of such committees and unions allows evidence based decision making, e.g. with the
278 support of watershed action plans that describe the state of the watershed and define activities in
279 thematic fields such as:

- 280 - pasture management (to improve pasture land and organize users),
- 281 - conservation agriculture (to improve soil fertility and increase availability of fodder),
- 282 - agroforestry (to improve tree coverage and provide livelihood opportunities),
- 283 - energy efficiency (to reduce wood consumption and improve health conditions) and
- 284 - mitigation infrastructure (to improve protection).

285 **7. Useful links (selection)**

286 **Natural Resource Management**

287 <http://www.ucentralasia.org/Resources/Item/1148>

288 http://www.sanudurabilitas.ch/uploads/downloads/5/Understanding_Natural_Resource_Management_2015.pdf

289 **Integrated Water Resource Management**

290 <http://www.un.org/waterforlifedecade/iwrm.shtml>

291 <http://www.unece.org/index.php?id=35306>

292 <https://www.gwp.org/>

293 <https://www.eda.admin.ch/deza/en/home/themes-sdc/water/water-food.html>

294 https://www.shareweb.ch/site/Water/Documents/Water%202015_EN.pdf

295 <https://www.bafu.admin.ch/bafu/de/home/themen/wasser/publikationen-studien/publikationen-wasser/einzugsgebietsmanagement-anleitung.htm>

296 <https://www.bafu.admin.ch/bafu/de/home/themen/wasser/publikationen-studien/publikationen-wasser/einzugsgebietsmanagement-anleitung.htm>

297 http://ec.europa.eu/environment/water/water-framework/info/intro_en.htm

298 **Integrated Watershed Management**

299 http://www.cde.unibe.ch/research/projects/watershed_management_and_disaster_risk_reduction/index_eng.html

300 https://www.caritas.ch/fileadmin/user_upload/Caritas_Schweiz/data/site/was-wir-tun/engagement-weltweit/country-programme/tadschikistan/2014_IWSM_Experiences.pdf

302 <https://link.springer.com/content/pdf/10.1007%2Fs11676-016-0293-3.pdf>

303 <https://www.wocat.net/en/>

304 <http://www.icimod.org/?q=310>

305 **DRR and IRM links**

306 <https://www.shareweb.ch/site/DRR>

307 <http://www.planat.ch/en/home/>

308 <http://www.babs.admin.ch/en/home.html>

309 <http://drm.cenn.org/index.php/en/>

310 <https://www.preventionweb.net>

311 <https://www.unisdr.org>

312 www.gfdr.org

313 **Climate Change Mitigation and Adaptation links**

314 <https://www.eda.admin.ch/deza/en/home/themes-sdc/climate-change.html>

315 <https://www.shareweb.ch/site/Climate-Change-and-Environment/Pages/%C2%B0.aspx>

316 <https://www.cedrig.org/>

317 <http://www.ipcc.ch/>

318 <https://unfccc.int/process>

319 <https://public.wmo.int/en>

320 <https://www.greenclimate.fund/home>

321 <https://www.munichre.com/topics-online/en/2017/topics-geo/resilience-overcoming-natural-disasters>