# WFaS Initiative

## Terminology

The WFaS Initiative uses a ***Conceptual Framework*** to represent the Global Freshwater System encompassing relevant dimensions of Society, Economy, Nature and Well-being. It will also include ***Solutions*** embedded in those dimensions.

***Solutions*** refer to a variety of proposed measures and options, such as changing water allocation mechanisms and priorities and technological innovations, which are expected to assert a major influence on future water supply or use. Water supply oriented solutions may involve water storage options or increased groundwater exploitation, may consider wastewater treatment options and water cascading, explore desalination or other measures to increase the availability and resilience of water resources. On the water demand side there will be technological options to improve water use efficiency for water-dependent goods and services. Indirect measures may include adjustment of output levels in water-dependent sectors (such as agriculture) or substitution of water-intensive production through trade or alternative products. Finally, future water solutions will critically depend on governance mechanisms and institutions used to manage water systems and control water use.

The conceptual framework consists of systems ***dimensions*** and ***linkages*** between them. The term *dimension* is used in a broader sense representing certain aspects of the system – sets of attributes, processes, or components of human-environment systems. Overall system performance is determined by ***Critical Dimensions*** (for instance climate change, technology development or quality of governance) that are used to evaluate scenarios.

The framework represents the freshwater systems at different levels. At the highest level its elements are called ***dimensions***, at the lower levels, on sub-diagrams representing parts of the overall system, dimensions need to be operationalized as ***variables***. V***ariables*** are the ways in which different attributes of a *dimension* are specified for numerical (or ordinal such as 'low', 'middle', 'high') representation or data processing. Examples include GDP, fertility or food demand.

***Linkages*** indicate a dominant direction of influence. Linkages in the system can be circular and form feedback loops. *Dimensions* (and *variables*) when used for presenting systems relationships in the spheres of Nature, Society and Economy are often called ***drivers*** or ***driving forces***. *Dimensions* (or *variables*) representing water system perspective will be called ***water dimensions*** *(or* ***water variables)***. *Dimensions* (or *variables*) representing freshwater ecosystems health, human water security and other dimensions of human well-being will be called ***outcome dimensions*** *(or* ***outcome variables)***. The distinction between *drivers* and *outcomes* should not obscure the fact that *outcomes* may also affect *drivers* through a variety of feedback mechanisms.

***Indicators*** are selected variables or groups of variables that provide an indication of the condition or direction of the system or sub-system being studied. Indicators used for overall scenario evaluation are termed *critical dimensions*.

Economic activity level refers to actions that involve the production, distribution and consumption of goods and services at all levels within a society. Gross domestic product or GDP is an aggregate way of assessing economic activity; production, trade and consumption of wheat is a detailed example of the food and agriculture sector.

***Water Scenarios*** in the Initiative will be developed to describe and represent internally consistent and possible futures combining different socio-economic pathways, climate change projections and water-

specific elements as well as their combined impacts on human well-being and ecosystems health. The water scenarios will be consistent with IPCC shared socioeconomic pathways (SSPs) and will expand them to include water-specific elements. Climate change projections will be derived from representative concentration pathways (RCPs) of IPCC AR5 – the selection of a specific RCP will be consistent with greenhouse gas concentrations quantified for each scenario. The water scenarios will be first developed qualitatively (***qualitative water scenarios*** or *stylized scenarios*). Later they will be quantified using a multi-model approach (***quantitative water scenarios***). The water scenarios will combine both quantitative (future values of water system dimensions) and qualitative (narratives) parts in a consistent way.

Shared Socioeconomic Pathways (SSP): Based on the overall framework laid out in a publication in Nature (Moss et al., 2010), the Shared Socioeconomic Pathways (SSPs) process is an effort by the scientific community to develop the next generation of global socio-economic scenarios, to be used in both emission mitigation analyses and for impacts, adaptation and vulnerability studies.The SSPs define the state of human and natural societies at a macro scale and have two elements: a narrative storyline and a set of quantified measures that define the high-level state of society as it evolves over the 21st century under the assumption of no significant climate feedback on the pathway. This assumption allows the SSP to be formulated independently of a climate change projection. At this stage, the preliminary storylines about future changes and quantitative scenarios for key drivers (population, urbanization and GDP) have been described for five possible worlds based on different challenges for mitigation and adaptation and have been developed since 2010 during a series of workshops.

Moss, R. H., Edmonds, J. A., Hibbard, K. A., Manning, M. R., Rose, S. K., van Vuuren, D. P., Timothy, R., Carter, T. R., Emori, S., Kainuma, M., Kram, T., Meehl, G. A., Mitchell, J. F. B., Nakicenovic, N., Riahi, K., Smith, S. J., Stouffer, R. J., Thomson, A. M., Weyant, J. P., Wilbanks, T. W. 2010. The next generation of scenarios for climate change research and assessment. Nature, 463, 747-756.

Representative Concentration Pathways (RCP): Representative Concentration Pathways (RCPs) are a set of four greenhouse gas concentration (not emissions) trajectories developed for the climate modeling community as a basis for long-term and near-term modeling experiments adopted by the IPCC for its fifth Assessment Report (AR5). The four RCPs together span the range of year 2100 radiative forcing values found in the open literature, i.e. from 2.6 to 8.5 W/m2 (van Vuuren et al., 2011). The four RCPs – RCP2.6, RCP4.5, RCP6, and RCP8.5 – are named after a possible range of radiative forcing values in the year 2100 (2.6, 4.5, 6.0, and 8.5 W/m2, respectively).

van Vuuren, D. P., J.A. Edmonds, M. Kainuma, K. Riahi and J. Weyant. 2011. A special issue on the RCPs. Climatic Change 109, 1-4, DOI: 10.1007/s10584-011-0157-y.