6th World Water Forum Synthesis Report on the Priority for Action 2.3

Harmonize Energy and Water

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International WaterAssociation

Outline

I. Introduction

There is an intrinsic link between the challenge we face to ensure water security and to manage the world's rapidly growing demand for energy.

The need for a better integration of policies on those essential and scarce resources has been illustrated extensively at the 5th World Water Forum (WWF5), and is now well recognized. However, the communities of specialists and policy-makers in water and in energy still have few opportunities to share views, and many tradeoffs are not yet properly addressed.

The purpose of Key Priority 2.3 was to link decision-makers and stakeholders from the water sector with their counterparts in the energy sector in order to address the water-energy nexus. The 6th World Water Forum aimed at promoting a dialogue and building coalitions between the energy and water communities, involving specialists, policy-makers and citizens, around concrete solutions on the two sides of the nexus. The challenge is to meet water and energy demand through efficiency improvements and shifts in supply, without impacting the other resource. The World Water Forum presents a unique opportunity to bring key actors together and to bring issues out of silos to discuss them on an international, regional and intersectoral level.

Key Priority 2.3 considered both sides of the water-energy nexus: Energy requirements for water (Target 1, 2 and 3) and Water requirements for energy (Targets 4, 5, 6 and 7). Key Priority 2.3 culminated with Target 8, aiming to create a 'Policy network for energy and water'. For each of these targets, a taskforce has been established to propose pragmatic responses to the water-energy nexus.

It was the aim of the 6th World Water Forum to focus on solutions that will be carried forward after the event. Key Priority 2.3 has therefore worked through expert networks to implement its associated targets, to establish solutions, to obtain commitments, to share best practices and develop and implement guidance and assessment tools to promote sustainable practices.

This synthesis report summarises the work that has been carried out over the past year within the eight taskforces associated with the Key Priority 2.3. Taking stock of the outcomes and key messages of previous World Water Fora, it enshrines the issue of water and energy in the current political agenda and provides preliminary guidance on how to properly address the necessary trade-offs.

The report also presents the eleven sessions which were organized under the Key Priority 2.3 "Harmonize Water and Energy" during the 6th WWF. Three of these sessions were directly organised under the overall Key Priority 2.3: Opening Session, Synthesis Session and Multi-Stakeholder Session. Further to this, each of the eight target groups that had been established under KP 2.3 organised a session on its particular topic.

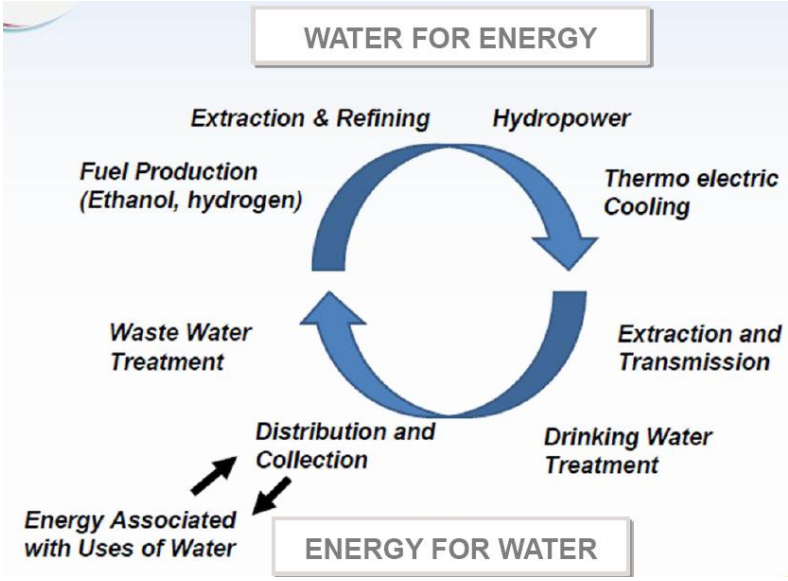
II. Background and rationale of the Priority for Action 2.3

The global demand for energy and water is intensifying as a consequence of a growing world population, better standards of living in developing countries and significant industrial growth in

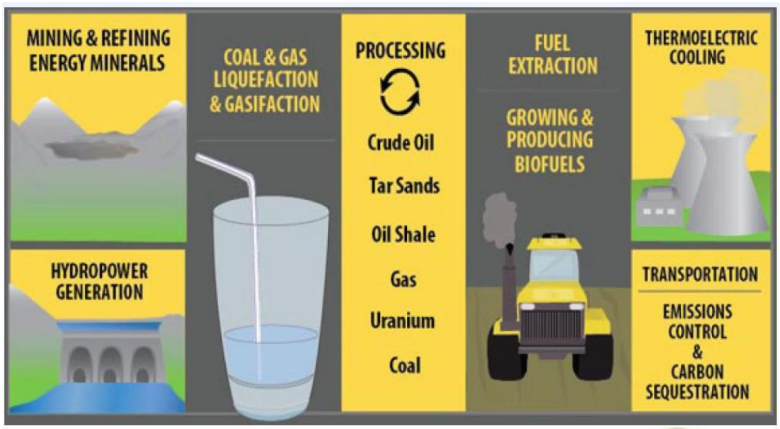
countries such as China and India. Water is used in energy production and supply, and, in turn, energy is used for extracting, distributing and treating water. As a result, in a context of Climate Change, as the linkages between both energy and water systems have grown more complex and interdependent, water must be viewed as a complex vulnerability of the energy system (including extraction and refining) — and vice versa.

This increasing interaction has become obvious during recent years through significant events:

- ✓ power outages in Brazil caused by drought,
- ✓ need to shut down nuclear reactors in Europe during a heat wave because of the concerns on the temperature of the rivers used for cooling,
- ✓ dependency of water supply systems in arid countries from energy intensive desalination,
- ✓ economic equilibrium of water utilities threatened by electricity price hikes

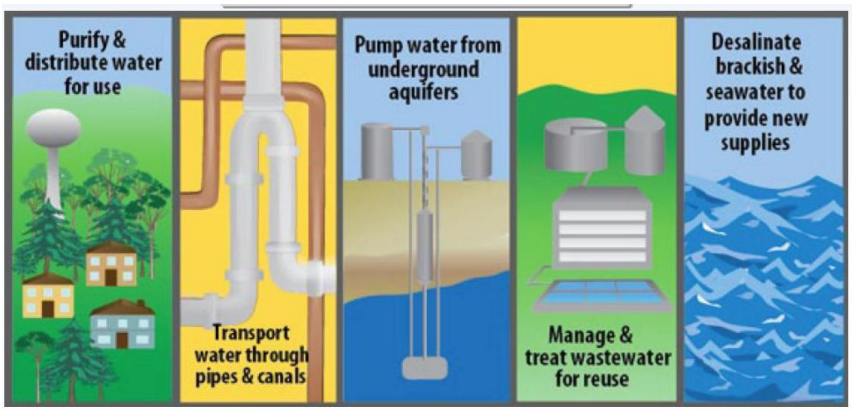


In the energy sector, water is used from sourcing to production, for example extraction of different fuels (oil, gas, biofuels, uranium, etc.), energy production and conversion, as well as in other processes (amongst others refining, storage, and transportation).



Water needs for energy (source : World Economic Forum)

Similarly energy is a central resource for water and wastewater systems, especially in the case of desalination, and energy prices can hinder access to water for the poorest.



Energy needs for water management (source : World Economic Forum)

Unfortunately, while individual sectors, companies, research centres and countries undertake research on parts of the complex issue, little comparative research currently exists that brings together stakeholders and allows for comparisons between technologies and regions. In many regions, water use planning and energy production policies are not fully integrated. Nevertheless, some steps are made in that direction. The Flagship Initiative on for a Resource-Efficient Europe[1] is one such example. Research and collaborations must be furthered that will allow optimisation of current practices to make water provision as energy efficient as possible and to keep energy impacts on water at a minimum.

Water and energy at previous World Water Fora

Water and Energy has been a growing topic throughout subsequent World Water Fora. While the awareness of the energy impacts on water and vice-versa was minimally touched upon in the first Forum, the issue has since been increasingly treated during the thematic sessions and throughout the political processes. However, it is not until very recently that the energy impacts of all energy types on water and the requirement of energy for all water services is broadly recognized and taken into account at the successive Fora.

A brief history of Water and Energy at the 4th and 5th World Water Fora highlights this growing importance.

[1] http://ec.europa.eu/resource-efficient-europe/

4th World Water Forum 2006, Mexico

The Thematic Programme of the 4th World Water Forum included a session on "Water and Energy" which presented case studies of the linkages between water and energy. These included: Renewable energy and Water (IHA), Optimisation of Water consumption of thermal power plants (Mexico), Use of Treated Urban Wastewater for cooling (Mexico), and Diversification of Power Sources through the Construction of Hydroelectric Power Plants (Mexico).

The Ministerial Declaration of the 4th World Water Forum makes no reference to energy services and their impacts on water. The only reference to energy services is the recognition of the need to ensure water provision for and development of hydropower.

5th World Water Forum 2009, Istanbul, Turkey

The 5th World Water Forum saw the organisation of a Topic "Water For Energy, Energy for Water". The discussions in the topic were organised in three sessions, and addressed the following questions: Technology, Sustainability, and Policy. While the approach taken in Istanbul focused on the means and expertise required to achieve sustainable water and energy resources management, it did not yet look at all the aspects of energy requirements for water services and energy impacts on water resources.

The sessions concluded with the following 7 recommendations:

1. Reduce demand for water and energy through increased water-energy efficiency
2. Invest in research and development into water and energy technologies
3. Develop and implement practical sustainability tools and standards
4. Take an integrated approach to policy-making, planning and management in the water and energy sectors
5. Policies promoting efficient use of resources and sustainable practice need to be complemented by integrated incentive and regulatory structures
6. Hydropower has significant potential to contribute to water and energy needs as well as to mitigating climate change

During the political process of the 5th World Water Forum for the first time a Ministerial Roundtable "Water for Energy, Energy for Water" was held. The Roundtable was co-chaired by France and Turkey and coordinated by Norway. Box 1 summarizes the central conclusions, tools and recommendations of this Ministerial Roundtable.

Box 1: Conclusions, Tools, Policy Goals and Recommendations of the Ministerial Roundtable "Water for Energy, Energy for Water" at the 5th World Water Forum, 2009.

Main Conclusions:

- Water and energy issues are closely interlinked. This requires coordinated action and improved integration of policies between the two sectors in order to streamline such action.
- Water resources should be managed at the basin level (IWRM), and take into consideration multiple uses in different sectors and areas, such as irrigation, drinking water, hydropower, energy, ecosystems, etc.
- To achieve sustainability in the development of infrastructure projects by adopting a scientific approach.
- Enhancing institutional mechanisms and cross-sectoral coordination at the national level so as to maximise efficiency is also critical. The involvement of stakeholders in the coordination processes is important.
- The promotion of intergovernmental and transboundary cooperation is required to maximise the benefits of the water-energy nexus.

Tools identified as necessary to achieve policy goals

- Sustainability assessment tools and guidelines including environmental and social safeguards, environmental impact assessments are useful tools for planning and policy formulations;
- Development of infrastructure and investment in renewable energy projects are needed;
- Renewable energy resources should be improved by taking into consideration climate change and fighting poverty;
- The scientific research on the water footprint of energy needs to be developed;
- Since water is a scarce and limited resource, its efficient use should be promoted;
- Energy efficiency should be promoted;
- Mechanisms should be developed in order to include civil society in decision-making processes
- Financial models for the maintenance, rehabilitation and upgrading of infrastructure should be improved;
- Cross-sectoral cooperation at national level is needed.

Recommendations and Proposals for Follow-up towards the 6th World Water Forum

- Agree on mechanism(s) to develop better understanding of the water and energy nexus, and to select priorities to improve the coherence of water and energy policies;
- Call for a specific program on the interactions between water and energy;
- Call for closer interaction between World Water Fora and world energy fora;
- Call for a widely recognized tool for assessing the sustainability of hydropower as well as multipurpose water infrastructure projects;
- Propose actions to increase water security in case of volatile energy prices;
- Strengthen the links with existing international processes. Feed results from World Water Forum into other relevant processes.

6th World Water Forum 2012 and its Priority for Action 2.3 "Harmonize water and Energy"

In the spirit of the conclusions and recommendations of the Ministerial Roundtable on Water and Energy in Istanbul, the 6th World Water Forum (WWF6) included the water-energy nexus as a key topic, which was dealt with in the WWF6 Thematic Process, but also in the Regional Process (Americas, Europe) and Political Process (High Level Ministerial Roundtable on water-food-energy nexus, WWF6 Ministerial Declaration). For the first time a Priority for Action "Harmonize Energy and Water" (KP 2.3) was established and aims, through its 8 associated Targets to develop both sides of the water-energy coin. Table 1 shows an overview of all the targets under KP2.3 and their respective coordinators. The following sections further develop the objectives, and milestones of each target. The thematic structure of the targets reveals the increasing evidence and awareness of the numerous interlinkages between water and energy. Perhaps for the first time in any international process, it can be claimed that most of the impacts of energy generation on water and water provision on energy have been taken into account.

Further to the attempt to work on a large scope of energy impacts on water and vice versa, the current World Water Forum has focused on solutions. Solutions could be existing or innovative, legal, technical, institutional, financial or communication-related. Above all, however, solutions were meant to address one or several of the work areas of KP 2.3 and to carry on the work that went into the 6th Forum beyond 2012. It was their intent to transform words into actions. Around 100 solutions were put forward on "Water and Energy" as of May 2012. These were individually evaluated by the target group and some of these are further mentioned in the section below. Moreover, each target group organised a session at the WWF6 in March 2012, where some of these solutions were presented and resulted in concrete commitments for action. The outcomes of the sessions are presented in the following section.

Table 1 KP 2.3, the Strategic Targets and their respective coordinators

ISSUE	TARGETS	COORDINATOR
Energy for Water	Target 1: Measures are implemented by public authorities and water utilities in cities totalling 500 million inhabitants, aiming at a minimal improvement of 20% of energy efficiency of municipal water and wastewater systems by 2020 compared to 1990 level.	**International Water Association (IWA)** Paul Reiter - Ger Bergkamp paul.reiter@iwahq.org Ger.Bergkamp@iwahq.org
	Target 2: Create an Energy Task Force, and develop a guide allowing to achieve a 20% energy reduction in desalination by 2015	**International Desalination Association (IDA)** Leon Awerbuch letleon@comcast.net
	Target 3: By 2015, build a 'collaborative task force' which will promote a multi stakeholder approach to enable a better access to energy & water	**Electriciens Sans Frontières (ESF)** Philippe Desroques p.desroques@laposte.net
Water for Energy	Target 4: By 2015, establish a conceptual and analytical framework for evaluation and reporting of the energy impacts on water.	**EDF** Laurent Bellet laurent.bellet@edf.fr
	Target 5: By 2015, with the aim to measure and guide sustainability performance in the preparation, implementation and operation of hydropower facilities in at least 20 countries covering the world's five major regions, utilize a hydropower sustainability assessment tool, developed through a multi-stakeholder process, and covering economic, social and environmental dimensions.	**International Hydropower Association (IHA)** Richard Taylor rmt@hydropower.org;
	Target 6: By 2015 a virtual collaboration platform between oil & gas professionals from International Oil Companies, National Oil Companies, Service Companies & International Trade Associations to drive responsible water management in oil & gas exploration and production is operational. This platform will address water use, impact, opportunities, assessing performance and communicating.	**Institut Français du pétrole (IFPEN)** Maurice Bouteca maurice.bouteca@ifpen.fr
	Target 7: By 2015, develop and implement a conceptual framework providing guidance on best water management practices for biofuel production, both on a project level (voluntary standards) and on a policy level (regulations).	**Round Table on Sustainable Biofuels (EPFL)** – Sebastien Haye Sebastien.haye@epfl.ch
Water/ Energy Nexus	Target 8: By 2015 establish a network of water and energy policy makers involving at least 10 developed and 10 developing countries to increase levels of dialogue and awareness of all aspects of the water-energy nexus.	**Ministry of Petroleum and Energy of Norway** Oivind.Johansen@oed.dep.no

III. TSG's progress: Target action plans, solutions and commitments

Target 1: ***Measures are implemented by public authorities and water utilities in cities totalling 500 million inhabitants, aiming at a minimal improvement of 20% of energy efficiency of municipal water and wastewater systems by 2020 compared to 1990 levels.***

Objective: Target 1 was intended to further amplify and accelerate the importance and feasibility of investment in utility efficiency. It also dealt with different incentive systems, voluntary agreements (decided either by local authorities and /or utilities), as well as the regulatory framework, since the ultimate objective is to promote commitments on the implementation and upscaling of relevant solutions.

Milestones (see TSG 1 report for detailed target action plan):

In line with IWA Water Climate and Energy Programme, the target aimed firstly at setting up water-energy efficiency roadmaps in 100 cities located in four different regions of the world. To achieve this, four focus areas were stressed:

- FOCUS AREA 1: Frameworks and baseline information
- FOCUS AREA 2: Demonstration sites of cities and water/waste-water utilities for energy and carbon neutrality
- FOCUS AREA 3: Transfer of technology, know-how and expertise
- FOCUS AREA 4: Business case and financing

Further to the session at WWF6, reporting on target progress will be made at the 7th World Water Forum in 2015 and work will be further carried out up to 2020 to achieve its objective.

Solutions collected

16 solutions have been collected.

- The big majority dealt with technical solutions to improve energy efficiency in water supply and sanitation, mainly through :
  - heat recovery from wastewater (Degrés Bleus)
  - biogas recovery from wastewater sludge (Dutch water boards "Energy Factory", Suzhou Industrial Park, A2O Process, EXRT Process)
  - use of renewable energy (As Samra wastewater treatment plant)
  - optimisation of energy consumption through IT and data management (smart network and smart metering: Schneider Electric)
- Other solutions described voluntary agreements, policy and contractual incentives taken to boost investments in energy efficiency:
  - an electricity saving campaign for the Danish utilities launched by DANVA (the Danish Water and Wastewater Association) with a goal of reducing electricity consumption in the sector by 25% over 5 years

- the contractual incentive system organised between local authorities and the operator of Jeddah City Business Unit, in Saudi Arabia, to boost performance improvements, notably in the field of energy efficiency, through performance oriented contracts, organized around key performance indicators rewarded by bonus or penalty fee.

Session outcomes and commitments

This session has been an important milestone in the implementation of the action plan. The action plan and target have been fully incorporated in IWA Water Climate and Energy Programme, which will enable to ensure effective implementation and monitoring.

Target 2: ***Create an Energy Task Force, and develop a guide to achieving a 20% energy reduction in desalination by 2015***

Objective: The objective, through this taskforce was to establish a network of professionals (IDA Technical Programs Committee, R&D Institutions, Desalination Companies and Desalination plant operators…), to share best practices for energy efficiency for desalination. Many of the desalination utilities and companies were already committed to significant reduction in energy. Through this target and the ongoing efforts related to it, IDA will support and build on the existing initiatives, through the production of a guide to achieving a 20% reduction of energy consumption in all desalination major processes by 2015.

Milestones (see TSG 2 report for detailed target action plan):

- Establish Background of Energy Consumption in Desalination: establishing existing energy requirements for desalination processes and outline specific targets for each process thermal, membrane and hybrid.
- Produce draft guidelines based on agreed targets.
- Together with suppliers and utilities select on voluntary basis projects and plants for pilot and demonstration for significant energy reduction of different processes.
- Produce guidelines to achieve a 20% reduction of energy consumption in all desalination major processes by 2015 and established methodology to collect and report data.
- Establish IDA Desalination Academy to educate inter alia water and energy nexus. The IDA Academy will be the premier coordinating school for specialized training in Desalination and a higher school for special study in the field. The mission of the IDA Desalination Academy is to provide the highest level of training, education and instruction to individuals, utilities, companies, institutions, universities and other organizations interested in desalination in all its aspects. The Faculty members of the Academy are the leading experts in their fields, distinguished by their combination of theoretical and practical knowledge and experience.
- The final objective is to implement those solutions in all desalination projects, using the best available technologies applicable to the location of the plants, and that the

technology and the pilot and demonstration work will be adopted by water and power utilities and Independent Water Projects and Independent Water and Power Projects

Solutions collected

Of the 13 targets which have been uploaded on the Platform of Solutions, only half deal with the core focus of the target, which is the energy consumption of desalination plants. These solutions, which are existing and innovative technological solutions, are centred on:

- use of renewable energy for desalination: coupling with wind farm (Perth), Solar desalination (Qatar, Pakistan, Mauritania, Congo Brazzaville)
- innovative design for energy efficiency (closed circuit desalination, advanced desalination projects in Israel-Soreq, Hadera and Ashkelon..)

Session outcomes and commitments

This session has gathered many stakeholders interested in supporting and joining IDA in its strong commitment to achieve a 20% reduction of energy consumption in all desalination major processes by 2015.

Target 3: *By* 2015, build a 'collaborative task force' which will promote a multi stakeholder approach to enable a better access to energy & water

Objective: This target addressed one of the social aspects of the water-energy nexus, which is the link between access to water and access to energy. Among the 1 billion people without access to an improved source of drinking water, many are also deprived of access to electricity. The target group's core question was: how can access to safe water for off-grid communities be facilitated when water access is considered as one of the ripple effects of energy poverty.

Milestones (see TSG 3 report for detailed target action plan):

- Action Plan Kick off during the 6th World Water Forum: thanks to the target session and multi-stakeholder session, increase audience awareness on energy poverty as a key influencing factor in access to safe water.
- Advocacy campaigns: According to stakeholder's commitments and suggestions, TGS will determine a set of key messages to be delivered to International Agencies and decision makers in order to increase their support toward water access project implementation through appropriate energy sources.
- Set up a collaborative platform to bring together a diversified set of stakeholders working on access to water and energy in order to build up federated actions on the field and strive for integrated development.
- Monitor issues evolution: promote the development a monitoring program which will follow development needs toward water access through affordable energy sources.

Solutions collected

Around 15 technical and organisational solutions were gathered from both NGOs and companies, aiming at providing safe water access to off-grid communities. These solutions cover a good range of energy sources: wind (GRET), solar (mainly solar pumping i.e Grundfos, Secours Islamique France, Soltrad), gravitational (Aquassistance, Electriciens Sans Frontieres, AIDFI), manual (manual well drilling i.e IDE, ATPESFORC, Relief International and manual pumping i.e AFD, Vergnet).

Session outcomes and commitments

This session has produced the following conclusions

>Local/national authorities and NGOs shall take over the governance part,

>Beneficiaries have to be one of the main stakeholders,

>Initiatives will be supported by assessment tools in order to check the efficiency of the task force

>From 2015, scale up the task force to a multi regional network.

Target 4: ***By 2015, establish a conceptual and analytical framework for evaluation and reporting of the energy impacts on water***

Objective: The objective of this target was to establish a conceptual and analytical framework for evaluation and reporting of the energy impacts on water. It aimed at widely agreed definitions for the terminologies commonly used (use, withdrawal, consumption, evaporation, waterfootprint, etc) as well as evaluating impacts of energy on water (water for energy) and to result in a framework.

Milestones (see TSG 4 report for detailed target action plan):

- Organisation of a Scoping Workshop in September 2011
- Launch of the Framework at the 6th World Water Forum
- Between 2012 and 2015 a network of scientists and practitioners convenes regularly to develop a framework and test this
- By 2015, the conceptual and analytical framework will be presented at the 7th World Water Forum

Solutions collected

A number of solutions have been uploaded to the platform, these include:

- Conceptual Framework for Assessing Water Use in Hydropower Generation (IHA)
- Scoping Workshop on Energy Impacts on Water (EDF)
- The Global Water Tool Including 2 industrial sector customizations (power utilities and oil & gas companies) (WBCSD)

Session outcomes and commitments

EDF has committed to coordinate an initiative to produce by 2015 an Evaluation Framework on Energy Impacts on Water. This framework will work through a number of expert groups on the individual energy types and draw on the advice of a scientific reference group. The World Water Council and the World Energy Council have agreed to jointly act as an advisory body to the initiative.

Target 5: ***By 2015, with the aim to measure and guide sustainability performance in the preparation, implementation and operation of hydropower facilities in at least 20 countries covering the world's five major regions, utilize a hydropower sustainability assessment tool, developed through a multi-stakeholder process, and covering economic, social and environmental dimensions.***

Objective: In order to advance the implementation of sustainable hydropower as well as the optimisation of existing and planned projects, sustainability assessments, applying an internationally recognized tool, are to be undertaken as widely as possible.

Milestones (see TSG 5 report for detailed target action plan):

- Launch of widely endorsed assessment tool on hydropower sustainability in June 2011
- Organise a high-level panel on hydropower sustainability at the 6th World Water Forum in March 2012, where the commitments for sustainability assessments are presented
- By 2015, in at least 20 countries covering the five major regions, the Protocol is used to assess hydropower sustainability at the project level.

Solutions collected

More than 20 existing and innovative solutions were uploaded onto the online platform. These included:

- 9 Sustainability Partnerships with IHA to apply the Hydropower Sustainability Assessment Protocol at a minimum of 9 projects
- Various sustainability initiatives at Hydropower Projects in Asia, Europe and South America
- Three hydropower projects in Asia that have previously been assessed using the Hydropower Sustainability Assessment Protocol

Session outcomes and commitments

In the process of preparing this target and as a means of achieving it by 2015, IHA has worked with partners to obtain commitments to measure and improve sustainability performance of hydropower projects through utilisation of the Hydropower Sustainability Assessment Protocol. Ten commitments were referenced:

- EDF Sustainability Partnership
- E.On Sustainability Partnership
- HEA Sustainability Partnership
- Hydro Tasmania Sustainability Partnership

- Itaipu Sustainability Partnership
- Landsvirkjun Sustainability Partnership
- Manitoba Hydro Sustainability Partnership
- Odebrecht Sustainability Partnership
- Sarawak Energy Berhad Sustainability Partnership
- Statkraft Sustainability Partnership

Target 6: ***By 2015, establish a virtual collaboration platform between oil & gas professionals from International Oil Companies, National Oil Companies, Service Companies & International Trade Associations to drive responsible water management in oil & gas exploration and production. This platform will address water use, impact, opportunities, assessing performance and communication.***

Objective: As a first step to address the uncertainty of the oil & gas impacts on water, an overview of the sector specific tools and best practices will be prepared in cooperation with existing networks of oil & gas professionals from International Oil Companies, National Oil Companies, Service Companies & International Association, some of which could be presented at the 7th World Water Forum. The next step will be to define such a collaboration platform in order to facilitate continuous improvement. This system will also be used to report on progress made in future World Water Fora.

Milestones (see TSG 6 report for detailed target action plan):

- Establishment of a coherent target and Action Plan, recruitment of TSG members
- Prepare and conduct the session at the 6th World Water forum
- Establish and Launch the Virtual collaboration Platform

Solutions collected

A number of solutions have been uploaded on the platform. These include the WBCSD Global Water Tool for water use in the oil & gas sector, a programme for recycling of cooking oil from Brazil, produced water cleaning at an oil platform in Norway and an enhance environmental monitoring methodology for oil & gas produces from Biota Guard and GDF Suez E & P Norge AS.

Session outcomes and commitments

This session gathered many actors from both the water and energy (including oil and gas) sectors, also including companies, NGOs, and research centres who are supporting the objective of building a platform to share and facilitate the debate

Target 7: **By** ***2015, develop and implement a conceptual framework providing guidance on best water management practices for biofuel production, both on a project level (voluntary standards) and on a policy level (regulations).***

Objective: The objective was to consider and develop mechanisms that will allow for the incorporation of water concerns and issues into existing and developing sustainability

assessment protocols and and to develop a methodology that recognizes the specific implications, limitations, opportunities and ramifications of biofuel systems. The aim is to develop a conceptual framework on water management practices in the bioenergy sector by 2015.

Milestones (see TSG 7 report for detailed target action plan):

- Establishment of a coherent and efficient target action plan, recruitment of TSG members, fundraising actions
- State-of-the-art for water management practices in bioenergy production and knowledge of water issues
- Draft conceptual framework
- Final conceptual framework and WWF 6

Solutions collected

The collected solutions were categorized in Analytical (AS), Technological (TS) and Policy (PS) by recognizing that no single solution can address the target in its entirety but that a mix is required. Solutions on the platform included:

- AS1): Conduct comprehensive integrated water impact assessments at the river basin level and use the principle of multiple water use services planning
- AS2): Comprehensive Water Life Cycle Assessment for decision analysis
- TS1): Introduce bioenergy feedstock production systems that mitigate water impacts of existing land use practices (Innovative)
- TS2): Identify opportunities to optimize output (including products and co-products) per unit input of water, i.e., maximize overall system water efficiency
- TS3): Implement water efficiency measures in industrial processes including feedstock processing and biofuel production; potential measures such as use of waste and wastewater is to be encouraged
- TS4): A Program for Collecting and Recycling Cooking Oil.
- PS1): Develop and/or adapt policy and policy instruments to regulate usage and ensure efficient water use
- PS2: Promote and upscale voluntary standards and certification schemes to demonstrate compliance with sustainable water management requirements.
- PS3): For any water policy, increasing stakeholder engagement from the planning through the implementation phases and intensifying (scientific) dialogue on the topic and on capacity building.
- PS 4): Global Bioenergy Partnership (GBEP) water indicators and methodology for water use and water quality.

Session outcomes and commitments

This session enabled to learn about current state of knowledge on water-related issues, good practices and future improvements in minimizing biofuel water footprints. Efforts to establish an evaluation framework for water impacts of the biofuel industry will be carried forward to 2015 to be presented at WWF7.

Target 8: ***By 2015 establish a network of water and energy policy makers involving at least 10 developed and 10 developing countries to increase levels of dialogue and awareness of all aspects of the water-energy nexus.***

Objective: The main objective of this target was to bring together policy-makers from developed and developing countries from the water and energy sectors in order to exchange experiences. In the follow up to WWF6, this will involve drawing on existing expertise from practitioners and researchers. It will also entail engaging with the other target groups under KP 2.3. The aim will be to develop a better understanding of the impacts of policy-making in one sector on the functioning of the other. In the period up to 2015, mechanisms and best practices for integrated policy-making will be reviewed and presented.

Milestones (see TSG 8 report for detailed target action plan):

- Successful initiation of policy-network and preparation of activities at World Water Forum 2012
- Successful delivery of target session at the 6th World Water Forum
- Successful meetings of Water-Energy Policy Network post 6th World Water Forum at key policy fora (e.g. Rio+20) with the aim to increase awareness of impacts between sectors and to share best practices of integrated decision-making

Solutions collected

A number of solutions were submitted to the online platform of solutions. Out of these, the following has been selected as particularly relevant for achieving the target: Establish a Platform for Policy-Makers to Facilitate Exchange on Water and Energy Practices by the Norwegian Ministry for Petroleum and Energy. This was initiated in Marseille 2012 and will work through to 2015.

Session outcomes and commitments

Under the leadership of the Norwegian Ministry for Petroleum and Energy, a network of policy-makers has been initiated, which met for the first time in Marseille where 14 governments were represented. This network will work to include further governments and to achieve the above-mentioned milestones by 2015. It will be supported by a number of high-level partnering institutions with expertise on this topic, some of which attended the first meeting.

IV. Outline of the limits of the approach and areas to be further investigated

For each target identified, in line with the spirit of the 6th World Water Forum, a number of solutions were proposed and initiated and work on these is progressing. Moreover, concrete commitments encourage partnership and measureable action over the coming years.

One of the keys to making this Strategic Priority for Action a success will be to continue this momentum to work on the solutions and associated commitments beyond March 2012. To enable the successful implementation of the solutions, continued engagement needs to be encouraged and monitored. This follow up mechanism will require financial resources.

While previous World Water Fora and recent major conferences have shown an increased awareness of the strong linkages between water and energy, the understanding of the different components of the nexus is very unevenly.

While some aspects, such as hydropower and energy efficiency of water services have been quite well addressed in the past decade, and the 6th Forum has built on programmes and platforms that are already set, for others such as the water management in biofuels and oil & gas sectors few initiatives have been launched so far .

Therefore, the targets and session outcomes have different levels of maturity, which are reflected in the ambition of their action plans and commitments. Several targets propose the creation of platforms for collaborative research and best practice sharing. These platforms are an important first step, in order to develop a common language and understanding between actors from the water and energy sectors, but will need, in the future, to materialize into concrete solutions and proposals of actions.

As has been shown, the current scope of the targets attempts to cover a wide range of aspects relating to the complex inter-linkages of water and energy. However, as awareness grows we will always identify areas that are not covered within the current scope of targets. The following critical elements of the water-energy nexus have yet not been able to be treated sufficiently in the targets and merit inclusion in future work on this topic:

- Energy for irrigation and the dilemma of the trade off between water efficiency and energy efficiency, e.g. drip irrigation saves water but uses more energy than traditional irrigation methods
- Important role of water in energy storage (pumped storage in hydropower schemes, use of aquifers as storage of heating or cooling source for buildings, etc.)

V. Recommendations for follow-up post 2012

To successfully implement the Targets and follow up on the solutions and commitments that have been presented at the 6th World Water Forum, this report identifies a number of conditions for success of the target groups of the Strategic Priority for Action 2.3:

- Establish a common understanding and collaboration between actors from the water and energy sectors ; develop a common scientific language, performance indicators and reporting frameworks for considering water and energy issues
- Share best practice tested through dissemination of case studies, promote best available technologies
- Develop the right incentives for economic actors through appropriate regulations, right energy and water tariffs, and performance-based contracts,
- Cooperate with civil society organisations like consumer associations, so as to promote responsible water and energy use in the general public

Further to this, this report recommends that collaboration between the water and energy sectors increases. To start this, the World Water Council and the World Energy Council have vowed to increasingly link relevant items of their work programmes and those of their members. This resulted in a joint statement in Marseille where Pierre Gadonneix, Chairman of the World Energy Council (WEC), and Loïc Fauchon, Chairman of the World Water Council, announced their commitment to join forces and cooperate in the long-term to promote greater energy efficiency in the management of water, recognise and improve energy usage in the water sector, and facilitate cross-sector dialogue.

Finally, this report proposes that the messages from the Strategic Priority for Action 2.3 will be carried into the political process of the 6th World Water Forum itself as well as into other related international processes and fora. Examples include the upcoming United Nations Conference on Sustainable Development (Rio+20) and the ongoing UNFCCC process and the associated climate change negotiations.

As an input to the international processes, this Strategic Priority for Action has formulated the following policy recommendations:

- Water supply and sanitation services, as well as agricultural and industrial water use, should contribute to greenhouse gas reduction targets, notably by improving energy efficiency in water services (pumping, treatment, end use).
- Thus, the requirement to supply drinking water at affordable cost, and better protect water bodies from pollution, should not conflict with the need to cut greenhouse gas emissions.
- Appropriate regulations and incentives should be developed which allow the energy potential of waste water to be harvested as an energy source.
- A conceptual and analytical framework should be developed to allow for comparative evaluation of the impacts on water of alternative energy sources (e.g. thermal, hydro, fossil and biofuels).
- A widely recognized tool for assessing the sustainability of hydropower as well as multipurpose water storage projects has been developed and now needs to be widely tested.
- A regulatory framework should be developed to encourage
    - the primary energy providers, the energy conversion players (e.g. the power and refining sector) to systematically account for water use, assess performance and communicate remedial action
    - the water sector to account for energy use and efficiency performance
- Appropriate measures, policies and mechanisms by policy makers (at all levels) –such as fiscal and tariff instruments- are needed to promote best practices, implement sustainable technologies and foster behavioural changes.
- A governmental platform should be established to help harmonize water and energy policies, through a multi-sectoral process, involving researchers, practitioners and policy-makers.

VI. Conclusion

It is the realisation of the growing importance of the water-energy nexus that has driven this group in working to achieve this Strategic Priority for Action. The success and consistency of the Key Priority 2.3 'Hamonize Water and Energy' at the 6th World Water Forum has demonstrated that water and energy inter-linkages are now increasingly recognized as central to economic and sustainable development. The Forum has achieved very encouraging outcomes by enabling a successful and constructive dialogue between the water and energy communities and

encouraging new commitment, a promising example being the commitment to collaborate between the World Energy Council and the World Water Council.

This is a promising result, which needs to be carried forward to the 7th World Water Forum in Korea and beyond. Timely engagement with the organisers of the next Forum will be essential for the success of this initiative.

VII. Sessions organized on Water and Energy

Under the umbrella of the Key Priority 2.3 "Harmonize Water and Energy", eleven sessions were organized at the 6th WWF. Three of these sessions were organised Core Group of KP 2.3 (Opening Session, Synthesis Session and Multi-Stakeholder Session). Eight sessions were organised by each of the eight target groups on their respective topic.

2.3 INTRODUCTION - Understanding the Water-Energy Nexus and Turning Talk Into Action

Organized by IHA and IWA

This session aimed at promoting dialogue and building coalitions between the energy and water communities, involving specialists, policy makers and citizens. It built on Istanbul recommendations and guidance by presenting the fruits of effort to turn the talk into action

Facilitated by:

- Joppe CRAMWINCKEL - Water Director (World Business Council on Sustainable Development (WBCSD)

Speakers and Panelists:

- Leon AWERBUCH - IDA Programs Chairman (International Desalination Association (IDA)
- Laurent BELLET - Water and Energy Specialist (Electricté de France, EDF Group – Hydro Division)
- Ger BERGKAMP - Regional Group and Programmes Director (International Water Association)
- Maurice BOUTECA - Deputy director of the Results Centre (Institut Français du Pétrole et des Energies Nouvelles (IFPEN)
- Margaret CARTLEY-CARLSON - Patron (Global Water Partnership)
- Philippe DESROQUES , Deputy Electriciens sans frontieres
- Sébastien HAYE - Executive Secretary (Roundtable on Sustainable Biofuels EPFL)
- Oivind JOHANSEN - Assistant Director General (Ministry of Petroleum and Energy of Norway)
- Jacques LABRE. (International Water Association (IWA)
- Xavier URSAT, Deputy VP, EDF Hydro Gen.

2.3.1 Getting to Energy Positive – The Pathway to Heightened Energy Efficiency and Beyond in Municipal Water and Wastewater Systems

Organized by International Water Association (IWA)

Innovation is necessary and business as usual is not an option, since more stringent standards for waste water treatment would imply more energy consumption. Forerunners have proved that this trend can be reversed. The purpose of this session was to learn from their initiatives, and upscale the solutions that work.

Facilitated by:

- Ger BERGKAMP - Regional Group and Programmes Director (International Water Association)

Speakers and Panelists:

- Béatrice ARBELOT - Technical Director, Suez Environnement (Suez Environment)
- Alexander DANILENKO - Water and sanitation programme World Bank (WB)
- Bo N JACOBSEN - Project Manager - Water European Environment Agency (EEA)
- Steven KENWAY - Lecturer (University of Queensland)
- Noboru SAITO - Bureau of Waterworks Tokyo Metropolitan Government, Japan
- Moumouni SAWADOGO - Director of Operations Office National de l'Eau et de l'Assainissement (ONEA)
- Tim SKEEL - (Seattle Public Utilities)
- Albert VERMUE - General director (Dutch Association of Regional Water Authorities (Unie van Waterschappen)

2.3.2 Desalination: the Sustainable Solution and Hope for the Future Generations

Organized by International Desalination Association (IDA)

The session presented state-of-the-art desalination technology and future direction to reduce energy requirements of desalination process. It presented the programme of the International Desalination Association (IDA) Energy and Environment Task Force to provide guidelines in search for solutions to reduce energy and environmental impact.

Facilitated by:

- Leon AWERBUCH - IDA Programs Chairman (International Desalination Association (IDA)

Speakers and Panelists:

- Men Leong CHEW - Chief Executive (Public Utilities Board, Singapore)
- Avshalom FELBER - CEO (IDE Technologies Ltd)
- Dr. Masaru KURIHARA - Senior Scientific Director of "Mega-Ton Water System" (Fellow Toray Industries Inc.)
- Miguel Angel SANZ - Director Development & Innovation (DEGREMONT SA)
- Corrado SOMMARIVA - President of IDA and Managing Director Generation Middle East of ILF ConsultingEngineers (International Desalination Agency (IDA)

2.3.3 Powering Water: Access to Water Through Affordable Energy Sources for Off-Grid Communities

Organized by Electriciens Sans Frontières (ESF)

It is necessary to come up with new ideas and solutions propelled by affordable energy in order to increase water access among off-grid communities. In this session current best practices were highlighted to inspire new initiatives in developing countries and assist with achieving Millennium Development Goals' targets.

Chaired by:

- Philippe DESROQUES - (Electriciens Sans Frontières)

Facilitated by:

- Thibault Lesueur (ENEA Consulting)

Speakers and Panelists:

- Graham ALABASTER - Chief Section I Water, Sanitation and Infrastructure Branch (UN Habitat)
- Francoise GUICHARD - Sustainable Development Senior VP (GDF SUEZ)
- Herve GOUYET - President (Electriciens sans Frontieres (ESF))
- Jacques MONVOIS - Responsable du pôle accès aux services essentiels (GRET)
- Pierre NGOLSOU - President (ATPESFORC (Association Tchadienne pour la Promotion des Entreprises Spécialisées en Forages à faible Cout)
- Jean RANAIVONIRINA (Mayor of Ambohibary, Madagascar)

2.3.4 Paving the Way for the Development of a Conceptual Framework of Energy Impacts on Water

Organized by Electricite de France (EDF)

This session brought together energy sector practitioners and researchers to present the complexities around analyzing and reporting on the water resources impacts of the diverse energy types and services. The session culminated in the inception of a work group and programme aiming to establish a comprehensive conceptual framework for energy impacts on water by 2015.

Facilitated by:

- Laurent BELLET - Water and Energy Specialist (Electricité de France, EDF Group – Hydro Division)
- Guy PEGRAM - Managing Director (PEGASYS)

Speakers and Panelists:

- Maike BÖGGEMANN - . (Royal Dutch Shell)
- John BRISCOE - Gordon McKay Professor of Environmental Engineering (Harvard University)
- Robert GILL - . (International Hydropower Association)
- Bryan HANNEGAN - Vice President (Electric Power Research Institute)
- Sébastien HAYE - Executive Secretary (Roundtable on Sustainable Biofuels EPFL)
- Torkil JONCH-CLAUSEN - Managing Director and Stockholm International Water Institute (SIWI) (DHI)
- Jerson KELMAN - CEO (Light S.A.)
- Karl ROSE - Director of Policy and Scenarios (World Energy Council (WEC)

2.3.5 The Hydropower Sustainability Assessment Protocol: A global framework to promote best practice

Organised by International Hydropower Association (IHA)

This session presented the culmination of 10 years of collaborative work to establish an assessment tool for the evaluation of hydropower sustainability. The Hydropower Sustainability Assessment Protocol as well as three cases of existing Protocol implementation were presented. Moreover upcoming implementation plans were discussed, including the nine commitments gathered as of March 2012.

Facilitated by:

- Jörg Hartmann, Chair of Hydropower Sustainability Assessment Council

Speakers and Panelists:

- Rodolfo AZANZA, Country Representative Philippines, SN Power
- Antonio Guerreiro BRITO, President, ARH Norte
- Cameron IRONSIDE, Programme Director, International Hydropower Association
- David HARRISON, Senior Water Resource Consultant, The Nature Conservancy
- JIA Jinsheng, President, International Commission on Large Dams
- Jian-hua MENG, Water Security Lead, WWF International
- Gil Maranhão NETO, GDF Suez, IHA Vice President
- Daniel LOUDIÈRE, President, Société Hydrotechnique de France
- Donal O'LEARY, Senior Advisor, Transparency International, Water Integrity Network
- SHI Guoqing, Director, National Research Centre for Resettlement, China

2.3.6 Water in a Changing Oil and Gas World

Organized by IFP Energies nouvelles

This session explored how the oil and gas sector will increasingly depend on water as a resource and how that increased dependency will be managed

Facilitated by:

- Maurice BOUTECA - Deputy director of the Results Centre (Institut Français du Pétrole et des Energies Nouvelles (IFPEN)
- Joppe CRAMWINCKEL - Water Director (World Business Council on Sustainable Development (WBCSD)

Speakers and Panelists:

- Sophie BARTHE - TOTAL
- Antonio Claudio CORREA – PETROBRAS
- Jone HARESTAD - GDF SUEZ
- Didier LARGEAU - SCHLUMBERGER SWS
- Greg STRINGHAM - CAPP

2.3.7 Existing and Innovative Solutions for Better Water Management Practices in Biofuel Production Roundtable on Sustainable Biofuels

Organized by EPFL

This session enabled learning about current state of knowledge on water-related issues, good practices and future improvements in minimizing biofuel water footprints.

Facilitated by:

- Sébastien HAYE - Executive Secretary (Roundtable on Sustainable Biofuels EPFL)

Speakers and Panelists:

- Jean-François DALLEMAND - Senior Scientist, Institute for Energy (European Commission)
- Kevin FINGERMAN - Ph.D. Candidate (University of California, Berkeley)
- Punjanit LEAGNAVAR - Policy Consultant, Energy Branch (UNEP)
- Dan NEARY - Science Team Leader (Rocky Mountain Research Station)
- Martina OTTO - Head, Policy Unit – Energy Branch United Nations Environment Programme (UNEP)

2.3.8 Policy Network for Water and Energy

Organised by: Ministry for Petroleum and Energy, Norway

This session brought together high-level policy makers from developed and developing countries in order to explore current practices in the water and energy sectors of the various countries. Building on a successful Ministerial Roundtable on Water and Energy at the 5th World Water Forum, this session explored new challenges, technology developments and disparities between water and energy policy that have been explored in the last three years.

Facilitated by:

- Eli BLAKSTAD, Deputy Minister for Petroleum and Energy, Norway
- Haakon THAULOV, Senior Adviser, Norwegian Institute for Water Research, Norway

Speakers and Panelists:

- Ben BRAGA, President of the International Committee for 6th World Water Forum
- Clementine MARCOVICI, General Director of Climate and Energy, Ministry of Ecology, Sustainable Development, Transport and Housing, France
- Sultan RAHIMOV, Deputy Minister, Ministry of Labour and Social Protection, Tajikistan
- Karl ROSE, Director Policy & Scenarios, World Energy Council

2.3 Multi-stakeholder session - The Water and Energy Café

Organized by IWA and IHA

Thanks to an appropriate seating for interactive dialogue, the Water and Energy Café provided a unique opportunity for stakeholders to meet and talk , as a follow-up of the previous thematic sessions .

Facilitated by:

- Jacques LABRE - . (International Water Association (IWA)
- Caroline MAIRESSE (Suez Environnement)

2.3 Synthesis session - Water and Energy: on the Road to the 7th World Water Forum

Organized by IWA and IHA

This synthesis session has built on the target sessions on water and energy and paved the way to the 7th World Water Forum on the Water & Energy nexus. Target leaders presented the outcomes and commitments taken in their sessions. In addition, two high level witnesses presented their specific perspectives on the water-energy nexus:

• Harmonizing renewable energy and water

• Water energy nexus in the least developed countries

Facilitated by:

- Joppe CRAMWINCKEL - Water Director (World Business Council on Sustainable Development (WBCSD)

Speakers and Panelists:

- Dogan ALTINBILEK, Vice Chair of the Thematic Process Commission
- Leon AWERBUCH - IDA Programs Chairman (International Desalination Association (IDA)
- Laurent BELLET - Water and Energy Specialist (Electricté de France, EDF Group – Hydro Division)
- Julia BUCKNALL - Manager, central unit for Water (World Bank)
- Ger BERGKAMP - Regional Group and Programmes Director (International Water Association)
- Maurice BOUTECA - Deputy director of the Results Centre (Institut Français du Pétrole et des Energies Nouvelles (IFPEN)
- Margaret CATLEY-CARLSON, Honorary Chair (Global Water Partnership)
- Philippe DESROQUES - . (Electriciens Sans Frontières)
- Sébastien HAYE - Executive Secretary (Roundtable on Sustainable Biofuels EPFL)
- Oivind JOHANSEN - Assistant Director General (Ministry of Petroleum and Energy of Norway)
- Jacques LABRE, International Water Association
- Yves MUYANGE - Director General, (Energy Water and Sanitation Agency of Rwanda)
- Karl ROSE, World Energy Council,
- Richard TAYLOR - Executive Director (International Hydropower Association (IHA)