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## Economic Commission for Europe

Meeting of the Parties to the Convention on  
the Protection and Use of Transboundary  
Watercourses and International Lakes

### Working Group on Integrated Water Resources Management

#### Tenth meeting

Geneva, 24 and 25 June 2015

Item 8 of the provisional agenda

**Thematic assessment of the water-food-energy-ecosystems nexus**

## Chapters on selected aspects of the water-food-energy- ecosystems nexus

**Prepared by the secretariat with input from experts**

### *Summary*

At its sixth session (Rome, 28–30 November 2012), the Meeting of the Parties to the Convention on the Protection and Use of Transboundary Watercourses and International Lakes requested the Task Force on the Water-Food-Energy-Ecosystems Nexus, in cooperation with the Working Group on Integrated Water Resources Management, to prepare a thematic assessment focusing on the water-food-energy-ecosystems nexus with a view to its publication prior to the seventh session of the Meeting of the Parties (see ECE/MP.WAT/37, para. 38 (i)).

The present document contains two chapters on selected aspects of the water-food-energy-ecosystems nexus, namely: the application of a nexus approach in transboundary basins; and governance and the nexus in a transboundary context. The contents of the two chapters were discussed by the Task Force on the Water-Food-Energy-Ecosystems Nexus at its third meeting (Geneva, 28–29 April 2015).

These chapters, revised in accordance with any comments from the Working Group, will become a part of the final publication on the nexus assessment to be submitted to the Meeting of the Parties at its seventh session (Budapest, 17–19 November 2015) for endorsement.

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## **I. Background and proposed action by the Working Group on Integrated Water Resources Management**

1. An assessment of the water-food-energy-ecosystems nexus in a selected number of transboundary river basins is being carried out as part of the programme of work for 2013–2015 under the United Nations Economic Commission for Europe (ECE) Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Water Convention) (ECE/MP.WAT/37 Add.1, programme area 5). The nexus assessment aims at supporting transboundary cooperation by:

- (a) Identifying intersectoral synergies that could be further explored and utilized;
- (b) Determining policy measures and actions that could alleviate tensions or conflicts related to the multiple uses of and needs for common resources.

The nexus assessment also aims at helping to optimize the use of available resources and to move towards increased efficiency, greater policy coherence and co-management, as well as to build capacity in the countries studied to assess and address intersectoral impacts.

2. The Task Force on the Water-Food-Energy-Ecosystem Nexus, established by the Meeting of the Parties to overview and guide the preparation of the nexus assessment and chaired by Finland, agreed on the main features of the assessment at its first meeting (Geneva, 8–9 April 2013). The present document underlines the need for an intersectoral approach to policymaking, the value added of a nexus approach to integrated water resources management (IWRM) and the importance of the governance context, as relevant to the nexus assessment.

3. The Working Group on Integrated Water Resources Management may wish:

(a) To review and endorse the draft chapters contained in the present document, while inviting the Parties, non-Parties and other stakeholders to provide any necessary revisions to them by 13 July 2015;

(b) To express its appreciation to the experts from the Royal Institute of Technology (KTH, Stockholm), the University of Geneva, the Central European University, the Kazakh-German University, the Aalto University, the University of Leeds Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), the Food and Agriculture Organization of the United Nations (FAO) and the Water Convention secretariat for the substantive work done;

(c) To entrust the secretariat in cooperation with the Bureau and the Chair of the Task Force to address the comments received, if any, and to integrate the different chapters and finalize the thematic assessment for publication, including by performing the needed editing and shortening to meet editorial requirements, and subsequently to design, publish and print the assessment for the seventh session of the Meeting of the Parties. The thematic assessment will be presented as an official printed publication and not an official document to the Meeting of the Parties in order to facilitate and accelerate improvement of intersectoral coordination and related transboundary cooperation in basins around the world. The English original will be presented to the Meeting of the Parties, with French and Russian translations to follow.

4. The methodology for assessing the water-food-energy-ecosystems nexus in transboundary basins (ECE/MP.WAT/WG.1/2015/8) and the major findings of the basin-level assessments of the water-food-energy-ecosystems nexus in transboundary basins (ECE/MP.WAT/WG.1/2015/7) are set out in separate documents.

## II. The application of a nexus approach in transboundary basins<sup>1</sup>

### A. Background

5. The water, energy and food sectors are so strongly interlinked that actions in one area commonly have impacts in one or both of the others; yet these sectors too often operate in isolation, and seeking security in one sector may compromise others. The international conference on “The Water, Energy and Food Security Nexus — Solutions for the Green Economy” (Bonn, November 2011) brought wider attention to these interlinkages and presented initial evidence for how a nexus approach can enhance water, energy and food security by increasing efficiency, reducing trade-offs, building synergies and improving governance across sectors.

6. Since the Bonn conference, the nexus of particular sectors or components has been defined variably depending on the scope and focus of each study and project, deviating from the classic nexus of the three sectors referred to above.<sup>2</sup> Some definitions, for example, include climate as a part of the nexus.

7. The nexus needs to be tackled in practice in diverse physical and political settings, including in the context of transboundary river basins, in which very little has been done so far. At its sixth session (Rome, 28–30 November 2012), the Meeting of the Parties to the ECE Water Convention decided that an assessment of the water-food-energy-ecosystems nexus of a representative set of transboundary would be carried out as a part of the programme of work under the Convention for 2013–2015.

8. When the Parties to the Water Convention decided that a nexus assessment should be carried out, ecosystems were included in the scope of the nexus. It was felt that environmental aspects had not received sufficient attention in earlier nexus work.

9. Water is used in variable intensity in different industries, as well as for energy production, not only in hydropower plants but also as a cooling media in other types of power plants. Conversely, energy is needed for extracting, transporting, distributing and treating water.<sup>3</sup> In the ECE region, as well as globally, agriculture is the largest consumptive water user. The predicted agricultural production increase necessary in the future to meet growing population demands, and the current push for increasing the use of renewable energies (especially hydropower and biofuels), affect water and land resources. The possibilities for agriculture and food production are constrained by limited suitable land resources, which in some areas are threatened by land degradation. The development perspectives depend substantially on functioning ecosystems and the services they provide specifically to these three sectors — water, energy and food — as well as to maintain biodiversity, and the many services derived from it, such as tourism, local economies, climate change adaptation and mitigation. The pressures from population growth,

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<sup>1</sup> In developing this chapter, the ECE secretariat has benefited from inputs from the following experts from the Royal Institute of Technology, Stockholm: Mark Howells, Lucia de Strasser, Dimitris Mentis, Manuel Welsch and Sebastian Hermann.

<sup>2</sup> The methodology for the nexus assessment under the Water Convention identifies the water, energy and agricultural sectors as forming the core group of key sectors. Others may include, for example, a particular industry, tourism or navigation (see ECE/MP.WAT/WG.1/2015/8).

<sup>3</sup> United Nations World Water Assessment Programme, *The United Nations World Water Development Report 2014*, vol. 1, *Water and Energy* (Paris, United Nations Educational, Scientific and Cultural Organization (UNESCO), 2014). Available from <http://www.unesco.org/new/en/natural-sciences/environment/water/wwap/wwdr/2014-water-and-energy/>.

urbanization, industrialization, economic development and climate variability and change add to the challenge of ensuring the availability of water in sufficient quantity and quality for its various uses. Accommodating the different sectors and promoting synergies between them supports the transition to a green economy, which aims (among others) at efficiency in resource use and greater policy coherence.

10. At the national level, coordination between the water, energy and food sectors is fraught with difficulties, but the complexity increases substantially in transboundary basins, where the impacts spread from one country to another. Across the ECE region and globally, there is great spatial variation both in resource availability (or scarcity) and in the means in place to develop and sustainably manage those resources.

11. Where competition between different resource domains is likely to increase, trade-offs need to be made deliberately, requiring management and containment, preferably through collaboration and in a coordinated manner. Conflicting uses and trade-offs call for concerted efforts to accommodate the different sectoral needs and to promote synergies.<sup>4</sup>

## **B. Towards greater policy coherence, and the obstacles on the way**

12. Shortcomings in intersectoral coordination are a major challenge both on the national and transboundary levels for all countries — developing countries and countries with economies in transition, as well as developed countries.

13. The Issue Brief of the United Nations High-level Political Forum on Sustainable Development, “From silos to integrated policy making”,<sup>5</sup> underlines the importance for effective policy integration of taking into account interlinkages among different areas of policy at the formulation stage:

Achieving effective integration of the three dimensions of sustainable development goes beyond merely “aggregating” independently formulated policies across the different domains. It entails taking into account interlinkages among different areas of policy at the formulation stage. Integration implies that policymaking in any one area takes into account the effects of (and on) policies and outcomes in other sectors and areas. This will help ensure that policy is mutually coherent across the full range of dimensions, and that the effects of policy in one area do not contradict or undermine desired outcomes in others. This also enables to incorporate in sectoral policymaking cross-cutting dimensions that are crucial to achieving sustainable development, such as sustainable consumption and production.

14. At the national level, policy fragmentation remains a challenge, as Governments are often organized along sectoral lines and effective intersectoral structures and coordination arrangements are commonly lacking. Furthermore, in many cases human, funding, infrastructure and other capacities may not be in place to facilitate efficient coordination and cooperation. With a shortage of human capacity, the priority will often be to focus on core responsibilities. Cross-cutting efforts may suffer as a consequence. Better governance will require better coordination, facilitated by improved relationships between different branches and levels of government.

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<sup>4</sup> Ibid.

<sup>5</sup> United Nations Department of Economic and Social Affairs, Issue Brief No. 5 (2014), available from <https://sustainabledevelopment.un.org/index.php?page=view&type=400&nr=1322&menu=35>. This Issue Brief makes reference to the nexus assessments of the Alazani/Ganykh and the Sava Basins, carried out under the Water Convention.

15. Integrated management approaches, such as IWRM, integrated energy planning and integrated land-use assessment, have been developed to study, plan and develop policy for resource management, seeking to integrate different uses of the resource in question.

16. Examples of integrated management approaches demonstrate limitations in cases where resources are tightly interwoven.<sup>6</sup> Each approach examines future development scenarios for one sector, yet no consistent and concurrent scenarios for other sectors are normally made. Integrated management processes make intersectoral linkages explicit. However, they do not necessarily look beyond such linkages, which is why a non-water consuming activity in one country may impact water use in another. While this is clearly beyond sectoral management, it might not be apparent even in a (conventional) integrated management approach.

#### Box 1

##### **The need to extend intersectoral planning: examples in agriculture**

The interrelation of energy, irrigation and food security has become a serious issue in South Africa. Electricity tariffs increased by an average of 22 per cent between 2008 and 2013. That represents a cumulative increase of 330 per cent.<sup>7</sup> One of the areas that could be most affected by energy price increases is the agricultural sector, due to its energy demand for irrigation. Some 25 per cent of South Africa's staple food is grown on irrigated land, and the area of irrigated land is planned to be increased.<sup>8</sup> However, decreasing irrigation and shifting towards rain-fed agriculture could endanger national food security, especially during drought periods. South Africa was a net food exporter from 1985 to 2008 but, due to population growth and a declining increase in agricultural productivity in recent years, has become a net food importer.

As another example, the Punjab represents only 1.5 per cent of the territory of India, but its output of rice and wheat accounts for 50 per cent of the grain the Government purchases and distributes to feed more than 400 million Indians. A significant problem is that farmers are pumping ("mining") aquifers faster than they can be replenished (as electricity is subsidized, this is partially due to inadequate price signals) and, as water levels drop, increased pumping is sapping an already fragile and overtaxed electricity grid. Overall, irrigation accounts for about 15 to 20 per cent of India's total electricity use.<sup>9</sup>

<sup>6</sup> M. Howells and others, Integrated analysis of climate change, land-use, energy and water strategies, *Nature Climate Change*, Vol. 3 (2013), pp. 621-626.

<sup>7</sup> Eskom, Tariff History, available from [http://www.eskom.co.za/CustomerCare/TariffsAndCharges/Pages/Tariff\\_History.aspx](http://www.eskom.co.za/CustomerCare/TariffsAndCharges/Pages/Tariff_History.aspx) (last accessed on 18 June 2015).

<sup>8</sup> T. von Bormann and M. Gulati, *The Food Energy Water Nexus: Understanding South Africa's most urgent sustainability challenge* (Cape Town, World Wide Fund for Nature South Africa, 2014). Available from [http://www.wwf.org.za/what\\_we\\_do/food\\_energy\\_water\\_nexus/?11141/WED-food-energy-water/](http://www.wwf.org.za/what_we_do/food_energy_water_nexus/?11141/WED-food-energy-water/).

<sup>9</sup> International Atomic Energy Agency (IAEA), "Seeking Sustainable Climate, Land, Energy and Water (CLEW) Strategies", in *Nuclear Technology Review 2009* (Vienna, 2009). Available from <https://www.iaea.org/publications/reports>.

17. Given the interconnectedness between economic sectors, a paper for the Bonn Nexus Conference<sup>10</sup> concluded that a reduction of negative economic, social and environmental externalities can increase overall resource use efficiency, provide additional benefits and secure the human rights to water and food. Conventional policymaking and decision-making in silos therefore needs to give way to an approach that reduces trade-offs and builds synergies across sectors — a nexus approach. As an early proponent of the nexus concept, the World Economic Forum<sup>11</sup> viewed securing water resources as dependent on consideration of multiple sectors, namely energy, trade, national security, cities, people, business, finance, climate and economic frameworks.

18. Since then, a wealth of integrated analytical initiatives have been launched to promote intersectoral or concurrent multisectoral approaches under a “nexus” umbrella, variably covering complex interlinkages between energy, water and food or agriculture, or at least some of these. The *United Nations World Water Development Report 2014* volume on *Water and Energy*<sup>12</sup> lays out a wealth of evidence about the impacts of the management of each of these resources on the others, but also points to various possible actions that can be taken in response.

19. In a 2011 study,<sup>13</sup> based on integrated modelling carried out at the International Atomic Energy Agency (IAEA),<sup>14</sup> the authors conclude that treating the three areas of the water-energy-food nexus holistically would lead to a more optimal allocation of resources, improved economic efficiency, lower environmental and health impacts and improve economic development conditions. In short, overall optimization of welfare. So significant are the simulated impacts, taking into account climate change,<sup>15</sup> that Governments and the global community are increasingly looking to improve nexus (or concurrent multisectoral) planning.

### C. Expanding integrated water resources management: water uses in the nexus

20. While the integration of water resources management at the river basin scale has been practiced for decades,<sup>16</sup> the paradigm has changed. Also, international recognition and support for IWRM has evolved.

21. An often-quoted definition of IWRM is that of the Global Water Partnership (GWP): “a process which promotes the coordinated development and management of water, land and related resources in order to maximize economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems”.<sup>17</sup> The concept also

<sup>10</sup> Holger Hoff, *Understanding the Nexus*, Background Paper for the Bonn 2011 Conference: The Water, Energy and Food Security Nexus (Stockholm, Stockholm Environment Institute, 2011). Available from [http://www.water-energy-food.org/en/news/view\\_\\_255/understanding-the-nexus.html](http://www.water-energy-food.org/en/news/view__255/understanding-the-nexus.html).

<sup>11</sup> World Economic Forum Water Initiative, *Water Security: The Water-Food-Energy-Climate Nexus* (Washington, D. C., Island Press, 2011).

<sup>12</sup> United Nations World Water Assessment Programme (Paris, UNESCO, 2014).

<sup>13</sup> Morgan Bazilian and others, “Considering the energy, water and food nexus: Towards an integrated modelling approach”, *Energy Policy*, vol. 39, No. 12 (December 2011), pp. 7896–7906.

<sup>14</sup> IAEA, *Seeking Sustainable Climate, Land, Energy and Water (CLEW) Strategies*.

<sup>15</sup> Mark Howells and others, “Integrated analysis of climate change, land-use, energy and water strategies”, *Nature Climate Change*, vol. 3 (2013), pp. 621–626.

<sup>16</sup> François Molle, “River-basin planning and management: The social life of a concept”, *Geoforum*, vol. 40 (2009), pp. 484–494.

<sup>17</sup> Global Water Partnership, *Integrated Water Resources Management*, Technical Advisory Committee (TAC) Background Papers No. 4 (Stockholm, 2000).

involves the integration of the demand and supply of water, and of natural and human systems.

22. Chapter 18 of Agenda 21 of the United Nations Conference on Environment and Development in 1992 provides for “the application of integrated approaches to the development, management and use of water resources”.<sup>18</sup> UNCED recognized the challenges of managing water resources for a multiplicity of uses and threats that are set within the much broader contexts of changes in the economic, social and political landscapes. An important global affirmation of the IWRM approach and political support for putting it into practice came when the Johannesburg Plan of Implementation was adopted by Governments at the 2002 World Summit on Sustainable Development in Johannesburg, South Africa. The Johannesburg Plan of Implementation calls for the development of integrated water resources management and water efficiency plans by 2005.<sup>19</sup> This target turned out to be ambitious, since a review led by the United Nations Environment Programme (UNEP) in 2012 concluded that, worldwide, 64 per cent of countries had developed IWRM plans and 34 per cent reported an advanced stage of implementation.<sup>20</sup>

23. While the IWRM concept already underlines the importance of integration between water resources policy, economic policy and sectoral policies,<sup>21</sup> a nexus approach extends further into integrated, intersectoral planning, lending itself to different scales, and river basins — the basic unit for water management in IWRM — do not have the same preference or priority. The table below highlights in rough and simple terms the main differences between IWRM and nexus approaches.

24. The concept and scientific underpinnings of a “nexus” in the context of resource management are currently the subject of dynamic research. Capturing the richness of that research is beyond the scope of this chapter. Evidence of the practical value and influence of a nexus approach is still accumulating and remains to be evaluated.<sup>22</sup> However, there is at least one characteristic of the nexus approach that makes it interesting to promote cross-sectoral coordination. Because of its broad perspective and the absence of a single-resource focus — such as water in the case of IWRM — the nexus approach can allow for a more egalitarian dialogue across sectors. For example, in the case of a river basin, it can encourage the greater involvement of important economic sectors such as agriculture and energy production in the dialogue on water management.

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<sup>18</sup> *Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3–14 June 1992*, vol. I, *Resolutions Adopted by the Conference* (United Nations publication, Sales No. E.93.I.8 and corrigendum), resolution 1, annex II.

<sup>19</sup> *Report of the World Summit on Sustainable Development, Johannesburg, South Africa, 26 August–4 September 2002* (United Nations publication, Sales No. E.03.II.A.1 and corrigendum), chap. I, resolution 2, annex, para. 26.

<sup>20</sup> United Nations Environment Programme, *The UN-Water Status Report on the Application of Integrated Approaches to Water Resources Management* (Nairobi, 2012). Available from <http://www.un.org/waterforlifedecade/iwrm.shtml>.

<sup>21</sup> For example, GWP, *Integrated Water Resources Management* (2000).

<sup>22</sup> See, for example, David Benson, Animesh K. Gain and Josselin J. Rouillard, “Water Governance in a Comparative Perspective: From IWRM to a ‘Nexus’ Approach?”, *Water Alternatives*, vol. 8 (2015), pp. 756–773.

### A comparison of integrated water resources management and a nexus (intersectoral) approach

	<i>IWRM</i>	<i>Nexus (Water-Food-Energy-Ecosystems)</i>
Origin of the concept	Agenda 21, Rio de Janeiro, 1992	First Nexus Conference, Bonn, 2011
Trigger	Sectoral strategies and plans need more integration to meet key water supply goals.	Sectoral strategies and plans need more integration and dynamic and dependent development scenarios to be considered.
Objective	Improve efficiency and sustainability in the use of water. <sup>a</sup>	Address externalities across sectors and achieve overall resource use efficiency. <sup>b</sup>
Entry point	Water use; water resources management.	Externalities between sectors; management of natural resources.  The entry point can be different (e.g., water or energy) depending on the perspective of the policymaker and the priorities. <sup>b</sup> Seeks to engage different sectors in coordination on a more equal footing.
Main challenges	Securing appropriate water for people, food production, aquatic and terrestrial ecosystems. Dealing with variability of water in time and space, with risks related to water flows, groundwater recharge and water quality. Creation of awareness and forging political will to act, promoting collaboration across sectors and boundaries. <sup>c</sup>	Defining actions, trade-offs and synergies in the provision of water, food and energy from resource to use, taking into account environmental needs. Harmonizing often diverging policy directions, targets and goals of different sectors.
Boundaries of a typical IWRM or nexus analysis	Basin or sub-basin.	Depending on the focus, could be local, national, basin level, regional or global, <sup>a</sup> with a particular emphasis on basins.
Sectors and resources	Water resources are at the centre and outlooks for different users and different needs are considered.	There is no universal methodology. Depending on the focus of the analysis, water, energy or land use can be at the centre. However, outlooks for other sectors are dynamic, responding to the same drivers as well as to feedbacks between sectors.

	<i>IWRM</i>	<i>Nexus (Water-Food-Energy-Ecosystems)</i>
International dimension	Explicitly reflected where water bodies are shared, calling for transboundary cooperation.	Explicitly reflected where resources or linkages between sectors are shared. This would include for example, transboundary water bodies, but also regional power pools, etc. Also, prices are influenced by global markets.

<sup>a</sup> Global Water Partnership, *Integrated Water Resources Management*, Technical Advisory Committee (TAC) Background Papers No. 4 (Stockholm, 2000).

<sup>b</sup> Holger Hoff, *Understanding the Nexus*, Background Paper for the Bonn 2011 Conference: The Water, Energy and Food Security Nexus (Stockholm, Stockholm Environment Institute, 2011).

<sup>c</sup> Morgan Bazilian and others, "Considering the energy, water and food nexus: Towards an integrated modelling approach", *Energy Policy*, vol. 39, No. 12 (December 2011), pp. 7896–7906

#### D. Transboundary settings: use of the nexus approach to support implementation of the Water Convention

25. The key obligations under the Water Convention are the prevention, control and reduction of adverse transboundary impacts on, as well as equitable and reasonable use of, shared water resources. The definition of a "transboundary impact" in the sense of the Water Convention is broad,<sup>23</sup> and the Convention covers different water uses. To promote these objectives, effective interventions commonly need to be made outside "the water box",<sup>24</sup> for example where decisions regarding agricultural policy are made, in order to reduce excessive water use or pollution. So, , water management authorities need to work much more closely and in better coordination with the different sectors of the economy.

26. In transboundary basins the impacts from development potentially propagate beyond State borders, therefore requiring cooperation between riparian countries in the management and use of shared water resources, including water infrastructure. In such settings, trade-offs and externalities may cause friction between the riparian countries and different interests. To avoid significant negative impacts from unilateral action, it is necessary to coordinate plans and management measures between the riparian countries. Including representatives from different sectors in a discussion on initiating or strengthening transboundary water cooperation will ensure that benefits<sup>25</sup> that may otherwise go unidentified are uncovered. Coordination, cooperation and exchange of information can help to identify synergies for mutual benefits and reveal ways to address

<sup>23</sup> The Convention specifies that significant adverse effects on the environment include effects on human health and safety, flora, fauna, soil, air, water, climate, landscape and historical monuments or other physical structures or the interaction among these factors; they also include effects on the cultural heritage or socioeconomic conditions resulting from alterations to those factors.

<sup>24</sup> The "water box" refers to the water sector and its decision-making, i.e., in areas of water supply and sanitation, hydropower, irrigation and flood control; outside the water box is other decision-making affecting water. See World Water Assessment Programme, *United Nations World Water Development Report*, vol. 3, *Water in a Changing World* (Paris, UNESCO and London, Earthscan, 2009).

<sup>25</sup> See the draft policy guidance note on identifying, assessing and communicating the benefits of transboundary water cooperation (ECE/MP.WAT/WG.1/2015/4), which highlights the importance of involving different sectors in a discussion on transboundary water cooperation; the involvement of different sectors will help identify new opportunities for mutually beneficial cooperation and generate many significant benefits, ranging from accelerated economic growth, to increased human well-being, to enhanced environmental sustainability and increased political stability.

the trade-offs. As it is also necessary to ensure the long-term sustainability of the water resource, a balance needs to be found between various uses and protection of the resource.

27. Obtaining the necessary information basis and forming a holistic picture of the situation is more complicated in transboundary basins, where harmonized data would be needed from all the riparian parties with a significant share of the basin. However, there is also potentially more opportunity for benefits, only achievable through joint action, through looking at the basin as a whole and identifying the most suitable locations for developments.

28. The development of an approach to assess the water-food-energy-ecosystems nexus in order to enhance intersectoral coordination and transboundary cooperation can therefore be helpful. Hence the nexus approach is a way to help meet obligations under the Water Convention, moving towards a more equitable and reasonable use of water resources, limiting transboundary impacts and promoting cooperation.

29. While all sectors are important, in the context of transboundary basins, water provides a useful point of entry to a nexus analysis. The physical link it creates between countries calls for transboundary cooperation. It is increasingly obvious that different sectoral policies and development plans that significantly impact on the status of water resources is outside the domain and influence of water management, underlining a need to cooperate closely with different economic sectors. As such, the nexus approach can be seen as a subsequent (or even parallel) step to IWRM. The nexus approach strengthens transboundary cooperation by actively involving all sectors whose action can improve synergies.<sup>26</sup>

## **E. The future: changing pressures and intersectoral relations with climate**

30. Competition — and in some cases even conflicts — between different water uses, often in different riparian countries, is a common challenge. Climate change impacts are expected to further aggravate such competition. In many basins, the potential impacts of climate change on water resources have not been specifically assessed: more comprehensive and collaborative research into the impacts of climate change at the subregional and basin level is needed.<sup>27</sup>

31. Future resource scarcity, ecosystems degradation and the risks associated with climate change are the most evident reason to consider climate in the context of the nexus.

32. Lower run-offs, decreased rainfall, desertification, natural erosion and the increased frequency and intensity of extreme weather episodes of droughts and floods are all examples of climate-related factors that will test the resilience of all sectors, which means their capability to respond and adapt to climatic changes. To “climate proof” the practices and operation of the various sectors, will mean, from a nexus perspective, finding ways to

<sup>26</sup> Annukka Lipponen and Mark Howells, “Promoting cross-border policy responses on the water and energy nexus”, *Water Monographies*, vol. 2, *Water and Energy* (2014), pp. 44–55 Available from <http://wcece.biz/index.php/issues/water/scow/188-water-monographies-ii-water-energy>.

<sup>27</sup> Under the Water Convention such collaborative work is promoted through the Global Network on Adaptation to Climate Change in Transboundary Basins, led by ECE and the International Network of Basin Organizations. Good practice examples on adaptation in transboundary basins and lessons learned have been gathered in this framework (see *Water and Climate Change Adaptation in Transboundary Basins: Lessons Learned and Good Practices*, United Nations Sales publication, No. E.15.II.E.1, available from <http://www.unece.org/index.php?id=39417&L=0>).

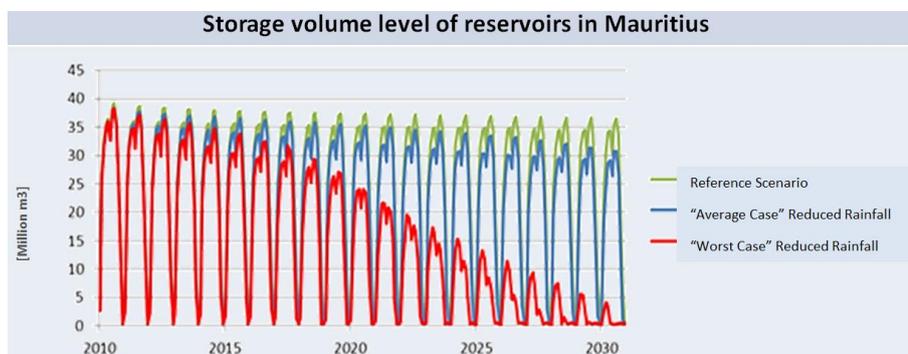
use resources more efficiently, elaborating more coherent strategies for development across sectors and assigning clear responsibilities and mandates to take action.

33. Several aspects of a nexus approach resonate well with efforts to adapt to a changing and variable climate: for example improving water use efficiency — advocated as a nexus measure — also reduces exposure to climate-induced physical water scarcity. Shifting to more appropriate crops according to climatic conditions, land type and water availability is another example of an adaptation measure that has intersectoral benefits — with less agricultural inputs needed and a reduction in the impact on ecosystems and shared water resources — and it can therefore be considered a nexus solution.

34. A more indirect impact of climate change on the nexus is related to greenhouse gas mitigation efforts. In different ways and with different levels of commitment, most countries are trying to reduce, stabilize or limit their contribution to global emissions. An international carbon market exists to provide economic incentives for emissions reduction. However, efforts to reduce greenhouse gas emissions require further coordination across sectors, because mitigation actions can lead to counterintuitive negative impacts, and their expected benefits need to be estimated with an accurate analysis of their impacts across sectors. The example from Mauritius, described below (figure 1 and para. 35), clearly illustrates these interdependencies. The integrated management approaches referred to earlier typically assume that the related sectors are static, or that their development is not fundamentally changed by the scenario drivers. This can result in important feedbacks being ignored or overlooked. For example, climate change may change the intersectoral relations and the level of use of some resources.<sup>28</sup>

Figure 1

**An example from Mauritius: intersectoral linkages and climate exerting pressure on water resources**



Source: M. Howells and others, Integrated analysis of climate change, land-use, energy and water strategies, *Nature Climate Change*, Vol. 3 (2013), pp. 621-626.

35. In Mauritius a national biofuel policy that made sense from a best practice energy, land and water planning point of view was shown to be strongly inconsistent. This was only discovered when the Government and international analysts modelled these systems in an

<sup>28</sup> For example, consider a climate change scenario where rainfall drops and temperatures rise. An Integrated Land Use Assessment might consider the impacts of lower rainfall on crops and determine water requirements to be met with irrigation, assuming an outlook on water availability. It may go on to calculate the increased energy demand required to pump crop irrigation requirements, assuming an outlook on irrigation and energy costs. However, it will not necessarily call on an Integrated Energy Planning Activity to assess — for the same climate change scenario — whether or not that extra energy can in fact be supplied, and if so, at what cost.

integrated manner, especially in response to climate change-induced reductions in precipitation. The change in rainfall patterns leads to an increase in water withdrawals that in turn leads to higher demand for energy to drive pumps to bring the water from its source to the fields and to power water desalination plants. A positive feedback loop means that this leads to increased demand for cooling of thermal power plants and thus additional withdrawals of water. Since electricity demand is met with coal-fired power generation, the greenhouse gas benefits of the biofuel policy are eroded by increased emissions from the power sector.<sup>29</sup>

## F. Assessing the nexus: how it can help in resource management

36. In their decision to pursue a nexus assessment, the Parties to the Water Convention called for the assessment to provide a picture of the interdependencies across water, ecosystems, energy, food and other areas — such as climate change and biodiversity — in terms of uses, needs, economic and social benefits and potential synergies, as well as conflicts and trade-offs, and also to identify possible policy responses. At the basin level, this implies the following aims:

- (a) Support for transboundary cooperation by:
  - (i) Identifying intersectoral synergies that could be further explored and utilized;
  - (ii) Determining policy measures and actions that could alleviate negative consequences of the nexus and help to optimize the use of available resources;
  - (iii) Helping to move towards increased efficiency in resource use, greater policy coherence and co-management;
- (b) The building of capacity in assessing and addressing intersectoral impacts.

37. In response to that decision, a methodology was developed to provide a framework for assessing transboundary basins (see ECE/MP.WAT/WG.1/2015/8). Several basins were subsequently assessed, namely the Alazani/Ganykh (the pilot basin), Sava and Syr Darya Basins, allowing valuable lessons to be learned.

38. From a substantive and analytical point of view, the nexus approach used builds on the Climate, Land-, Energy-, Water-use (CLEW) framework<sup>30</sup> and considers special characteristics associated with transboundary basins. In particular, it looks at the physical link that the water body forms between riparian countries and takes into consideration whether the basin area plays a special role within the country, as is often the case. The role of the basin area is part of a local-to-national dynamic as well as transboundary dynamics that add to the intersectoral linkages. Another key addition of the ECE nexus approach is the explicit recognition of ecosystems.

39. The approach seeks to combine a sound analysis of interlinkages (impacts, trade-offs, benefits) with a joint identification of actions that can improve the coherence of policies, intersectoral coordination and transboundary cooperation. An integral part of the process is an intersectoral, transboundary dialogue.

40. The aim is to carry out integrated assessments working across sectors that provide a strengthened knowledge base for the development of coherent policies that, in turn, support

<sup>29</sup> Mark Howells and others, *Integrated analysis* (2013)(see footnote 6).

<sup>30</sup> Mark Howells and others (2013) (see footnote 6).

co-optimization<sup>31</sup> and the taking into account of different needs in developing transboundary basins.

## **G. Need for a better and broader information base**

41. Data gaps and asymmetric access to information may also be an obstacle to more coherent governance. If information is missing or not available to all relevant departments or levels of government this can hamper productive dialogue and harmonized action.

42. By advancing knowledge, tool-kits, capacity-building and intersectoral transboundary dialogue, this nexus approach aims to help identify areas where coordinated planning, dialogue and governance holds new and effective paths to secure development that is sustainable. It is not the goal of this methodology to develop a detailed integrated master strategy, but rather to offer insights into where integrated management might provide additional benefits and lay the foundations for future joint actions.

43. Furthermore, given that increased intersectoral coordination implies greater complexity, the need arises to communicate effectively with representatives of different sectoral interests as well as with experts. Accessible, relevant and visual communication of information about intersectoral links helps to highlight the most relevant intersectoral linkages and therefore to prompt action.

## **H. The beginning of a dialogue**

44. The application of the methodology has demonstrated that it facilitates a dialogue across sectors and resources. The representatives of the countries of the basins assessed have appreciated the opportunity for intersectoral discussions, which are not common practice even at the national level. The general assessment framework was developed to assess diverse basins, but the methodology allows for flexibility to adjust to the characteristics of each basin.

45. The methodology has an important participatory dimension, employing an intersectoral nexus assessment workshop involving the sectors concerned, as well as a representative set of key stakeholders and interest groups. Moreover, reviews of the findings by the national administrations and other stakeholders and consultation meetings are among the key elements of the approach. The governance assessment component of the assessment methodology, discussed in the next chapter, informs and helps to verify who should ideally be involved in the process.

46. What can be achieved depends on the setting and the issues, the actors involved, the constructiveness of the dialogue and political will.

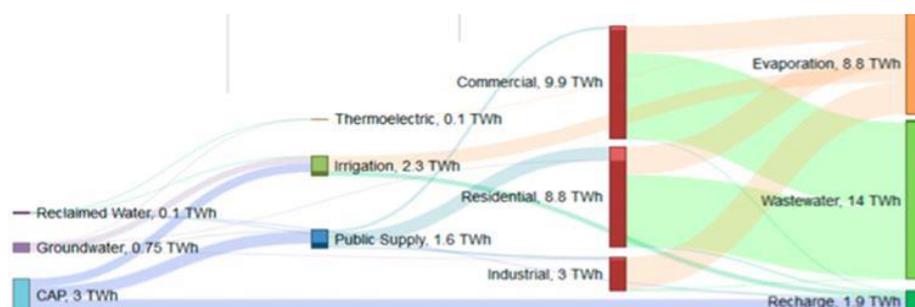
## **I. Tangible outputs: examples of intersectoral, transboundary solutions**

47. There is a growing body of evidence that intersectoral solutions provide important advances over single-sector responses. An exemplary case is that of the state of Arizona, in the United States of America, where energy efficiency goals are met by improving water efficiency (see figure 2).

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<sup>31</sup> Seeking to reach simultaneously more than one objective and incorporate several constraints; for example, instead of maximizing benefits from hydropower generation in flow regulation, a co-optimized solution could ensure adequate releases to sustain ecosystems.

Figure 2  
The embodied energy in the water cycle in Arizona



Source: M. D. Bartos and M. V. Chester, “The Conservation Nexus: Valuing Interdependent Water and Energy Savings in Arizona”, *Environmental Science and Technology*, vol. 48, No. 4 (February 2014), pp. 2139–2149.

Note: The breadth of each flow indicates the compounded quantity of energy that is used to manage or treat each flow. This implication is that as less water is used, so too is energy.

48. The best manner to demonstrate the utility of the ECE nexus approach is to point to the potential solutions that have surfaced during the basin assessment studies. These have been jointly discovered by national stakeholders and international partners involved in the development of three basin assessments. These include changing household energy use in one country to improve flood management in another; increasing the use of renewable energy to increase water releases and promote agriculture; and undertaking multipurpose water management to ensure energy security and the meeting of low carbon growth goals. More details on these nexus solutions are available in the chapter summarizing the findings from the basin assessments and the individual assessments.

49. Note that each of these solutions necessarily traverse sectors, sectoral planning and boundaries, yet have strong economic and other development drivers.

50. Further examples of how intersectoral impacts can be reduced and synergies built upon can be found in the chapter on nexus assessment tools.

## J. Conclusions

51. The exact definitions and scope of a nexus approach vary, and the concept and its value are still being debated. However, for a practitioner of resource management or a government official working in policy development in one of the nexus resource fields the following are some of the important considerations:

(a) The intersectoral impacts and the environmental implications of sectoral policies — potentially crossing borders in transboundary basins — may be significant;

(b) It makes a lot of sense to address these externalities, as there are concrete benefits to be had (for example, economic, environmental, resource security, welfare and public health-related benefits). Addressing these externalities is also consistent with the principles of customary international law and the ECE Water Convention to use transboundary waters in an equitable and reasonable way and to prevent, control and reduce significant transboundary impacts;

(c) The interlinkages between sectors are numerous and it is easy to lose a sense of which are most important. However, this should not be a reason to postpone action. Both a frank dialogue and information exchange between the relevant sectors and a sound integrated analysis help to reveal the most significant trade-offs to address as priority;

(d) A number of tools are available to Governments, joint bodies for transboundary cooperation and other actors to tackle the nexus, subject to selecting the most appropriate tools for a particular set of issues.

52. The nexus approach developed under the ECE Water Convention builds on IWRM and CLEW approaches in order to develop a workable set of tools to engage a multi-sector audience and communicate where and why more integrated planning is needed. It does so by simultaneously considering several sectors and the evolution of their interlinkages. Such a process can commonly be missed in integrated planning efforts. The ECE nexus approach may be used (together with other activities) as a basis for developing much needed local-to-national, cross-sectoral, transboundary cooperation. However, its objective is primarily to show that such cooperation is needed and do so in a non-prescriptive, inclusive and indicative manner, highlighting a broad range of potential opportunities.

### III. Governance and the nexus in a transboundary context<sup>32</sup>

53. This chapter examines what governance is and what implications it has for the nexus approach.

54. “Governance” can be defined as an inclusive system of institutions and norms that establishes responsibility and accountability in decision-making and builds trust and capacity to cooperate.<sup>33</sup>

55. By now, thanks to developments in the water management community — as well as the efforts of the international and scientific communities — it has become quite clear what good governance of water comprises and related principles have been elaborated.<sup>34</sup> At the same time, because the nexus approach seeks the involvement of and interaction with different sectors, notably agriculture and energy, on a more equal footing, what the approach implies for governance is still very much a subject of discussion. Governance of each of the other resources in the nexus has its own particular features. Land governance, including the rules, processes and structures that determine ownership, access, use and control of land,<sup>35</sup> is inextricably linked to the management of water and also other natural resources, such as mineral resources, including fossil fuels.

56. “Institutional silos” — discussed in the previous chapter — typical characterize the management of natural resources relevant to the nexus considered in this assessment. To address those silos and to develop the groundwork for resolving conflicts among competing uses, it is necessary to understand the needs, opportunities and challenges from a governance perspective.

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<sup>32</sup> In developing this chapter, the ECE secretariat has benefited from inputs of the following experts/governance analysts: Christian Bréthaut, Barbara Janusz-Pawletta, Marko Keskinen, Elena Lopez-Gunn, Lucie Pluschke, Susanne Schmeier and Stephen Stec.

<sup>33</sup> This definition was developed by Alexios Antypas and Stephen Stec of the Central European University (Budapest).

<sup>34</sup> See, for example, Peter Rogers and Alan W. Hall, *Effective Water Governance*, Technical Committee (TEC) Background Paper No. 7 (Stockholm, Global Water Partnership, 2013); and Organization for Economic Cooperation and Development (OECD), *OECD Principles on Water Governance* (brochure), 4 June 2015, available from <http://www.oecd.org/env/watergovernanceprogramme.htm>,

<sup>35</sup> Paul Munro-Faure and David Palmer, “An overview of the Voluntary Guidelines on the Governance of Tenure”, *Land Tenure Journal*, vol. 1 (2012).

## A. The multiple levels of governance

57. The extent to which a particular country has mechanisms for intersectoral coordination, as opposed to a continued silo approach, is an important measure of the country's preparedness for integrated decision-making. Intersectoral coordination bodies may already be established in connection with other processes, such as sustainable development planning.<sup>36</sup>

58. Integration of the water and parallel policy sectors is essential to both the nexus and IWRM approaches. A fundamental prerequisite for this integration is coordination between Government agencies and ministries.<sup>37</sup> Among the features commonly quoted as distinguishing the nexus approach from river-basin focused IWRM is the spanning of multiple scales and the call for integrated policy solutions and multi-tiered institutions.<sup>38</sup>

59. At the transboundary level, in addition to the integration referred to above, it becomes crucial how the riparian countries — which commonly have different sectoral and development priorities — can reconcile their different objectives and find common ground. Institutions for cooperation in the management of transboundary waters, which include river basin commissions but also, for example, bilateral commissions, could provide a good starting point for improving governance of the nexus. As many of those institutions have experience in bringing together different stakeholders across a basin, they lend themselves naturally to the implementation of nexus-based management approaches in shared basins.

60. Globally, river basin organizations have been established in more than 100 transboundary basins, including most major international basins. Joint institutions for transboundary cooperation around the world (with differing degrees of success) foster dialogue between different interests, provide support to harmonization and much more. How effectively institutions for transboundary cooperation can address or defuse intersectoral frictions depends on the institutional machinery in place, among others: well-defined and efficient decision-making mechanisms; mechanisms for data and information exchange, as well as for monitoring and compliance; procedures for notification of co-riparians on projects; mechanisms for ensuring a fair distribution of costs and benefits; and the quality of dispute-resolution mechanisms.<sup>39</sup>

61. Even though basin organizations and other institutions for transboundary cooperation can play a role in facilitating such intersectoral integration, it is clear that governance of the sectors in the nexus is not only about the river basin, but links strongly to both the national and regional levels.

62. In practice, what commonly stands in the way of more integrated planning and intersectoral coordination are the absence of agreements, limited mandates of institutions or problems with their organizational structure, shortcomings in decision-making processes

<sup>36</sup> Lucia de Strasser and others, "Draft report on the Water-Food-Energy-Ecosystems Nexus in the Sava River Basin" (8 April 2015), submitted to the Task Force on the Water-Food-Energy-Ecosystem Nexus at its third session (Geneva, 28–29 April 2015); available from [www.unece.org/index.php?id=38157#/](http://www.unece.org/index.php?id=38157#/).

<sup>37</sup> J. J. Rouillard and others, "Evaluating IWRM implementation success: Are water policies in Bangladesh enhancing adaptive capacity to climate change impacts?", *International Journal of Water Resource Development*, vol. 30, No. 3 (2014); and Benson, Gain and Rouillard, "Water governance in a comparative perspective" (2015) (see footnote 18).

<sup>38</sup> For example, Benson, Gain and Rouillard (2015).

<sup>39</sup> Susanne Schmeier, *Governing International Watercourses: River Basin Organizations and the sustainable governance of internationally shared rivers and lakes*, Earthscan Studies in Water Resource Management (New York, Routledge, 2013).

and a weak enforcement capacity. Political differences, power asymmetries and competition for resources between sectors can also present obstacles.

63. Water is the natural entry point to the nexus in this assessment, where the Convention provides a context for application of the nexus approach, and therefore significant emphasis is placed on the river basin scale. Water flows across State and administrative borders and the transboundary dimension is subject to special attention in this assessment. Intersectoral relations and related frictions in the nexus are affected by the quality and functioning of intersectoral coordination, including — and, perhaps, in particular — at the transboundary level.

64. Irrespective of the transboundary basin focus, national policies as well as regional developments far beyond the basin significantly influence how the intersectoral dynamics play out. Notably energy infrastructure and trade extend over large areas, so governance in the nexus context needs to be considered broadly and over different scales. Even land management, which is easily perceived as rather local, is influenced by regional and global development, as demonstrated by the recent food and economic crises — which sparked a wave of foreign investments in land,<sup>40</sup> whether for export food production, biofuel, or speculation. In the field of energy generation, transmission and distribution, the private sector commonly has a major role and private law agreements may become an important factor in governing the operation of this sector.

65. At the national level, the lack of a link between energy and water authorities, for example, might mean that long-term energy sector development plans do not accurately assess water availability, resulting in unnecessary risks or inefficiencies. Established consultation processes across sectors about plans and policies help to take into account other sectors' concerns and to avoid false assumptions about them, hence reducing frictions. Employment of sound, sufficiently broad technical and economic analyses to inform decision-making is also a valuable support. Ministries whose mandate covers more than one sector of relevance to the nexus could in principle better co-optimize the use of those resources. However, there is also a risk that, for example, water policy is optimized to support a particular economic sector while other users' might not be equally well accounted for.

66. Because of the wider geographical scale at which energy is transmitted and traded, organizations like regional power pools and customs unions, as well as trade agreements, are important players and factors in nexus governance.

67. The private sector has an important role to play in providing water services and access to energy. Both in countries where a market economy is predominant and in countries where State regulation is the main engine for change, legislation is important. Although its extent may differ, in the former case the application and relative significance of economic instruments is typically greater. The role of the market and economic instruments in the allocation of resources is more prominent in market economies. In the energy sector overall, the influence of private enterprises is greater and market mechanisms are generally more prominent than in the field of water services. The governance structures, laws and policies should ensure that sustainability considerations and the wider public interest are taken into account.

68. Regional integration supports harmonization of legislation and policies in various fields.

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<sup>40</sup> See, for example, Maria Cristina Rulli, Antonio Savioli and Paolo D'Odorico, "Global land and water grabbing", *Proceedings of the National Academy of Sciences of the United States of America*, vol. 110, No. 3. (January 2013), pp. 892–897.

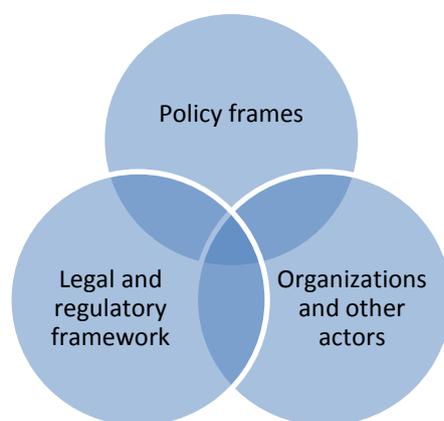
## B. Analysis of governance in this nexus assessment

69. In any specific context, an analysis of the governance setting may have to take into account the nature of institutions, their inclusiveness and flexibility, the underlying norms and procedures in legislation and policy, the availability of resources and capacities of various kinds. The role of the governance analysis in a nexus assessment is to evaluate the potential for the integration of policies, intersectoral coordination and integrated planning (applying the nexus approach) through multi-stakeholder dialogue.

70. The methodology used in analysing the governance aspects of the nexus for this assessment process was initially developed by the University of Geneva.<sup>41</sup> Subsequently, the governance analysis has evolved in the course of the assessment process, notably through the analyses of the Sava and the Syr Darya Basins carried out by the Central European University and the Kazakh-German University, respectively.<sup>42</sup> The resulting changes have been incorporated in the general methodology description. The different sectors of activity within the nexus involve a large number of actors, complex regulatory frameworks and many different types of legal provisions. However, because of the limited resources for the scoping level nexus assessments, the governance part has mainly focused on providing an overview of the legal basis, institutional framework and the main policies and regulations.

71. The assessment of the governance aspects has as its basis the main sectors of activity and the main intersectoral issues identified in the preceding steps of the nexus assessment. The governance analysis then looks at the legislative, institutional and policy framework of the basin, the countries and the region. These aspects are illustrated by figure 3.

Figure 3  
Aspects of governance



Source: Marko Keskinen.

<sup>41</sup> The original governance methodology document, “A draft methodology for assessing governance aspects of the water-food-energy-ecosystems nexus” by Christian Bréthaut of the University of Geneva, was submitted for consideration at the second meeting of the Task Force on the Water-Food-Energy-Ecosystem Nexus (Geneva, 8–9 September 2014), and is available from the meeting web page (<http://www.unece.org/index.php?id=34460#/>).

<sup>42</sup> The analytical work was led by Stephen Stec of Central European University and Barbara Janusz-Pawletta of Kazakh-German University.

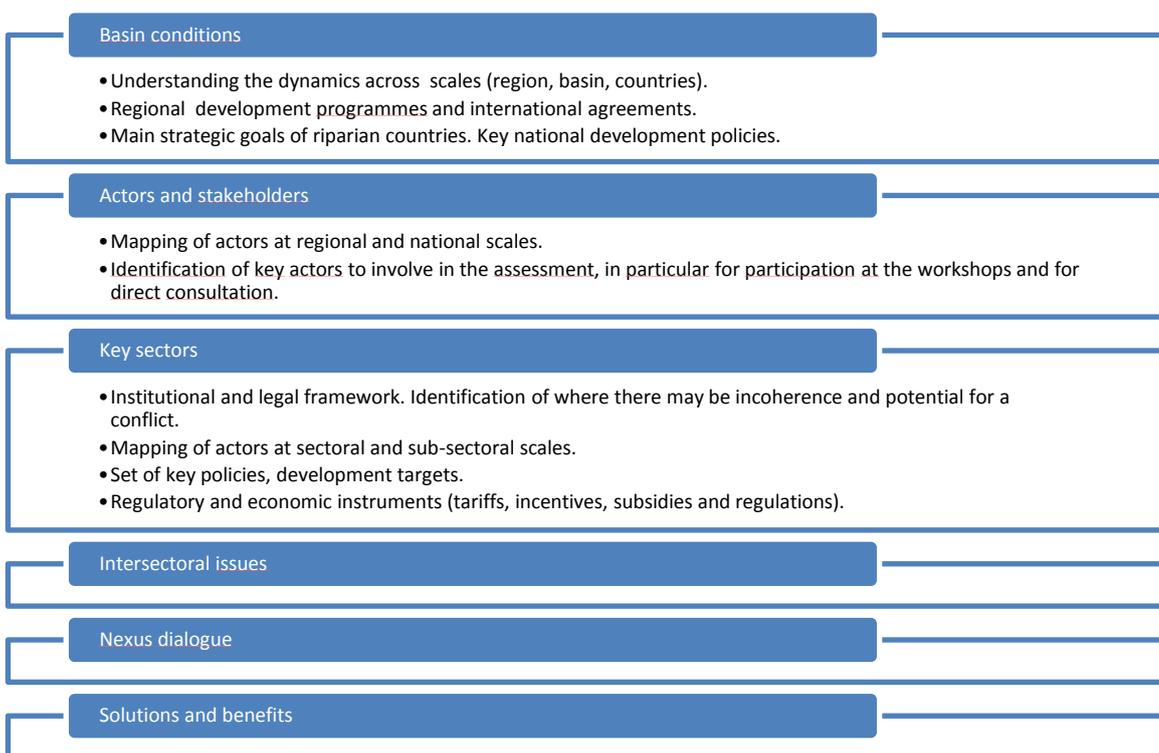
72. More specifically, the governance context in each of the basins is assessed by analysing:

- (a) The institutional structure of the water, energy and agriculture sectors, as well as environmental protection, at the local, national, basin, transboundary and regional levels;
- (b) The legislative framework;
- (c) Measures and policy instruments to implement sectoral strategies at the national level;
- (d) Economic instruments;
- (e) The level of coordination and coherence among sectors and countries.

73. In particular, attention was focused on uncovering areas where coherence might be lacking or where objectives might be conflicting and determining what the scope of cooperation was and what opportunities there were for achieving benefits through cooperation.

Figure 4

**Tasks of the governance analysis in relation to the six steps of the nexus assessment methodology<sup>43</sup>**



Source: The guide to the governance analysis contained in document ECE/MP.WAT/WG.1/2015/8 (annex IV) elaborates the analytical approach in more detail.

<sup>43</sup> The steps on intersectoral analysis, nexus dialogue as well as solutions and benefits are a joint effort with all the analysts, with the technical and governance parts integrated.

74. The application of the methodology allows the painting of a general picture of the governance setting, but has its limitations. The assessment of institutions, in general,<sup>44</sup> and organizations, in particular,<sup>45</sup> allows the mapping of tensions that may emerge between upstream and downstream countries based on uses between sectors within a country or between local and national authorities within a country. It also allows inference of where there might be gaps in the legal basis or limited coherence between policies.

75. It is easier to verify that more static elements of governance are in place, such as transboundary agreements and their scope, organizations and their official mandates and adherence to ECE instruments that are drivers of good governance. Unfortunately, more dynamic elements related to, for example, implementation of policies and actual power relationships between countries and institutions (tacit or explicit) would not necessarily be captured at this level of application.

76. As a further step, an identification of specific hotspots in the nexus was proposed, to analyse the main rivalries between actors in their use of resources and to understand how tensions are regulated. Resource use rivalries depend on resource scarcity, which can arise either from resource quantities being effectively limited (absolute rivalry) or when resources are sufficient and available but sharing arrangements deprive some users (relative rivalry). A rivalry over resources does not necessarily become a conflict over use. It tends to remain non-confrontational as long as a regulatory framework determines the distribution of uses in a coherent and balanced manner.<sup>46</sup> A further development of the governance analysis could study what kinds of governance solutions are needed to address nexus hotspots. This and other aspects of the methodology that could be developed further are discussed in more detail in the chapter on the nexus assessment methodology.

### C. Ways to facilitate nexus-relevant governance

77. Communication, assessment of impacts from plans and policies and consultations are among the key means to strengthen a nexus approach to improve integrated planning and intersectoral coordination. Such efforts can be made at various levels of governance: regional, subregional, macroregional, transboundary, basin, national and subnational. At each level the opportunities and challenges for action, and the capacities of the relevant actors — including authorities, experts, stakeholders and others — influence how intersectoral issues can be addressed.

78. Insights into how nexus-relevant governance can be supported are emerging from this nexus assessment, but also from other work of joint cooperation bodies in the framework of ECE and the Water Convention.<sup>47</sup> From this experience, it seems that an

<sup>44</sup> Institutions are defined in a very broad sense. In *Institutions, Institutional Change and Economic Performance*, Douglass North observes that they “provide the rules of the game for human interaction” (Political Economy of Institutions and Decisions series, Cambridge University Press, 1990). As a result, for example, GWP note in their 2000 IWRM report (see footnote 18 above) that “Institutional development is not simply about the creation of formally constituted organizations (e.g., service agencies, authorities or consultative committees). It also involves consideration of a whole range of formal rules and regulations, customs and practices, ideas and information, and interest or community group networks, which together provide the institutional framework or context within which water management actors and other decision-makers operate”.

<sup>45</sup> Organizations such as ministries or river basin organizations, on the other hand, are more rigid and visible than institutions: theoretically, they can be defined as structures performing recognized and accepted roles, created intentionally within the existing web of institutions to serve a certain purpose.

<sup>46</sup> See Christian Bréthaut, A draft methodology for assessing governance aspects.

<sup>47</sup> See *Strengthening Water Management and Transboundary Water Cooperation in Central Asia: the*

intersectoral or multisectoral approach can be promoted in practice in various ways, including, for example:

- (a) By establishing institutions with responsibilities covering multiple sectors;
- (b) Setting up interministerial structures, such as planning and coordination committees;
- (c) Through intersectoral planning and consultation processes.

79. Coherence needs to be sought not only between national ministries and agencies, but also between countries sharing the resource. Intersectoral issues at the national and subnational levels can be taken into account, and perhaps better accommodated, through a joint body for transboundary cooperation. Transboundary cooperation is commonly about reconciling different sectors' interests, most concretely water uses. These same frictions may be manifested to some degree at the national level.

80. Addressing the water-food-energy-ecosystems nexus at the transboundary level is about finding a balance between various uses and the protection of the resource — managing the trade-offs and increasing synergies. Cooperation and dialogue are key words if intersectoral conflicts are to be managed effectively at a transboundary scale. To avoid negative impacts from unilateral action, it is necessary to coordinate plans and management measures between the riparian countries. This is facilitated by existing structures for transboundary cooperation.

81. Joint bodies can support coordination of different water uses and accommodate them better in various ways, for example by providing a framework for engaging with different economic sectors, agreeing on water allocation, seeking synergistic actions and coherence and reducing negative impacts from developments. Practical actions to this end include assessments, guidelines, decision-support systems, working arrangements and the involvement of experts.

82. The ECE Water Convention recognizes that effective joint bodies are key to ensuring sustainable management of transboundary water resources. The conclusion of agreements between countries sharing transboundary waters and the establishment of joint bodies, such as river, lake or aquifer commissions, is a main obligation under the Convention, which supports their creation and reinforcement. Box 2 presents some factors supporting intersectoral coordination, identified among the “Principles of effective joint bodies” developed in the framework of the Water Convention.

Box 2

**Principles of effective joint bodies: factors supporting intersectoral coordination**

As institutional arrangements for transboundary water cooperation are very diverse and their practice has been established in specific contexts, making general conclusions or recommendations about their set-up or operation is challenging. Even against this backdrop, certain principles of organization and activities that generally increase the efficiency of joint bodies and contribute to reaching a mature level of cooperation between riparian States have been identified. Some of these “principles of effective joint bodies” touch directly upon the scope of

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*Role of UNECE Environmental Conventions* (ECE/MP.WAT/35). Available from <http://www.unece.org/index.php>.

cooperation and intersectoral coordination, notably the following:

- (a) The broad competence of a joint body, which allows for addressing in a complex way, on the basis of IWRM, the entire spectrum of issues related to the sustainable development, management, use (including infrastructure) and protection of transboundary waters;
- (b) A sufficiently broad and complete representation of national authorities in the joint body, implying participation beyond the water management authorities to include representatives from environment, fishery, agriculture, transport, health, energy, hydrometeorology authorities, economy and finance ministries, as appropriate;
- (c) A certain flexibility of the agreement establishing the joint body, enabling cooperation to develop progressively, in terms of scope, mandate and the riparian States involved;
- (d) A regular exchange of information and consultation mechanisms;
- (e) The facilitation of the assessment of impacts (transboundary and intersectoral) from developments, and the negotiation of an agreement about them between the riparians;
- (f) A framework for monitoring the long-term impacts (e.g., infrastructure);
- (f) Mechanisms for public participation and stakeholder involvement.

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*Source:* Draft principles for effective joint bodies on transboundary water cooperation (WG.1/2015/INF.2), informal document submitted to the tenth meeting of the Working Group on Integrated Water Resources Management. Available from <http://www.unece.org/index.php?id=38163#/>.

83. An appropriate representation of authorities and interests stems from the actual resource uses in the basin (or aquifer) and their relative importance. It is crucial to involve the concerned stakeholders in decision-making on resource management. Basin councils or other forums for different interest groups are helpful in engaging stakeholders. Such institutions for transboundary cooperation can also have an important role to play in the engagement of civil society. While some basin organizations have effective strategies for communication and outreach to civil society, generally there is room for improvement in this area.<sup>48</sup> It is important to guard against overrepresentation of particular interests and, to that end, it is helpful to review governance by employing appropriate methods and applying principles of good governance. Among others, a number of ECE instruments are drivers of good governance. Depending on the reason why stakeholders are being engaged — to identify, notify, inform or consult — the most appropriate means of public participation should be selected. The ECE Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters provides further guidance on this.

84. Various intersectoral processes can help to align policies at the national level better and to reduce conflict between sectoral objectives. Processes that help address the nexus

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<sup>48</sup> See Working Group on Basin Governance, OECD Initiative on Water Governance, “Key messages and principles on Basin Governance”(Draft 12 March 2015).

promote longer-term planning and proactive policy development involving a broad consideration of impacts and alternatives, while also consulting different interests and relevant stakeholders.

85. There are many potential benefits from better coordination and the search for synergies. Sustainable and integrated planning can help make future infrastructure less intensive in maintenance, less expensive and more efficient,<sup>49</sup> but also more widely accepted. With appropriate procedures in place and applied, environmental impacts can be reduced or benefits for multiple sectors secured from planned infrastructure investments. Some investors, like development banks, set requirements such as an environmental impact assessment (EIA) as conditions for the financing of projects.

86. Regional and global standardization can promote coherence, notably in the following areas: methodologies (standards of the International Organization for Standardization (ISO)); legislation (for which the European Union (EU) is influential); and policies (ECE and EU).

87. Some examples of processes that can be considered to advance nexus-relevant governance are described below. Even in the case of national instruments, it is usual to take into account international, transboundary and basin considerations.

## **1. Spatial planning**

88. The objectives of national spatial plans may be very broad, taking into account various sectors, so they can provide a good entry point for intersectoral governance. For example, the objectives can include balanced regional development and improved social cohesion, promotion of regional competitiveness and accessibility, sustainable use of natural resources and protected areas and protection and sustainable use of natural and cultural heritage and landscape.<sup>50</sup> Spatial plans may support the allocation of land for use where the necessary resource inputs are available and where the necessary infrastructure is in place, thereby enhancing synergies between economic activities. Spatial planning can also serve to site potentially hazardous activities in such a way that negative impacts are minimal.

## **2. Strategic environmental assessment**

89. The purpose of strategic environmental assessment (SEA) is to ensure that environmental considerations inform and are integrated into sectoral planning and strategic decision-making. It is a step-by-step procedure that implements a precautionary principle (Principle 15 of the Rio Declaration on Environment and Development) in the development of plans and programmes that set the framework for future development consent for projects that may have significant adverse impacts on the environment and human health. SEA contributes significantly to addressing, in a holistic manner and early in the decision-making procedure, environmental, including health, concerns in sectoral documents of a planning and programmatic nature that are adopted at the national, regional and local levels. To the extent possible, it can also be used in the development of policies and legislation.

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<sup>49</sup> The linkages between the water and energy sectors as well as related considerations on governance and private sector participation are discussed, for example, in the *World Water Development Report 2014*, vol. 1, *Water and Energy* (see footnote 3).

<sup>50</sup> These objectives, for example, are from the 2010 Spatial Plan of Serbia for the period 2010–2020 (see *Environmental Performance Reviews: Serbia — Third Review*, Environmental Performance Reviews Series No. 42, United Nations sales publication, No. E.15.II.E.3).

90. As a more recent tool of environmental impact assessment, SEA is still not sufficiently exploited in all countries of the pan-European region. Currently, SEAs are initiated most commonly in the field of land use or urban planning and also, but less commonly, in regional development, energy, water management, waste management and transport. An SEA for a national energy strategy, for instance, helps define key aspects related to the effects of energy installations, evaluates a wide range of likely impacts, compares alternatives and pros and cons, determines adaptation and mitigation measures and actions, and helps move towards increased efficiency of resources. Similarly, SEA for a river basin management plan would help to assess in a comprehensive manner the optimal use of available resources that could boost the economy, while properly integrating water and parallel policy sectors, including energy, regional development and transport. Concerning energy in particular, an SEA can reveal the cumulative environmental effects of any planned hydropower plants early in the process, while the environmental effects of the individual hydropower plants, as identified and addressed through the EIA procedure later at the project-level, may not be significant.

91. A key feature of the SEA procedure is that it facilitates communication and consultations among stakeholders (central and subnational governmental agencies, the business sector or the public) in streamlining their policies — not only at the national level, but also at the international level — by promoting transboundary cooperation.

92. SEA is therefore an important tool to support the intersectoral planning and consultation that the nexus approach also seeks to ensure.

93. In the pan-European region, EIA and SEA procedures are regulated by ECE treaties<sup>51</sup> as well as EU and national legislation. At the international level, SEA is supported by international financing institutions, including the World Bank<sup>52</sup> and the Asian Development Bank,<sup>53</sup> and other expert and advisory bodies, such as the Netherlands Commission for Environmental Assessment.<sup>54</sup>

### 3. National sustainable development strategies

94. The United Nations Department of Economic and Social Affairs has defined a national sustainable development strategy as a “coordinated, participatory and iterative process of thoughts and actions to achieve economic, environmental and social objectives in a balanced and integrated manner”.<sup>55</sup>

<sup>51</sup> I.e., the Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention) and its Protocol on Strategic Environmental Assessment.

<sup>52</sup> See the World Bank, “Strategic Environmental Assessment”, 10 September 2013. Available from <https://www.worldbank.org/en/topic/environment/brief/strategic-environmental-assessment> and specifically on water <http://water.worldbank.org/topics/environmental-services/strategic-environmental-assessment>.

<sup>53</sup> See, e.g., Asian Development Bank, *Strategic Environmental Assessment in the Greater Mekong Subregion* (brochure) (Bangkok, April 2015). Available from <http://www.adb.org/publications/strategic-environmental-assessment-gms>; and <http://www.mrcmekong.org/about-mrc/programmes/initiative-on-sustainable-hydropower/strategic-environmental-assessment-of-mainstream-dams/>.

<sup>54</sup> See Netherlands Commission for Environmental Assessment, “SEA” (accessed on 22 June 2015). Available from <http://www.eia.nl/en/environmental-assessment/sea>. There have been a number of recent capacity-building activities by the Netherlands Commission in Georgia (with ECE), Uganda, Mali and Zanzibar.

<sup>55</sup> United Nations Department of Economic and Social Affairs, “Guidance in preparing a national sustainable development strategy: managing sustainable development in the new millennium”, Background Paper No. 13 (DESA/DSD/PC2/BP13), submitted to the Commission on Sustainable

95. The guidance developed by the United Nations secretariat for developing national sustainable development strategies identifies policy integration as one of the main elements of such strategies or, more specifically, the integration of “economic, social and environmental objectives across sectors, territories and generations”. It also underlines the need to ensure a strong institution or group of institutions spearheading the process of developing such a national strategy (and monitoring its implementation).<sup>56</sup>

96. Effective intersectoral coordination will also be essential for progress towards the Sustainable Development Goals currently under negotiation for the post-2015 period.

#### **4. Adaptation plans on climate change**

97. The United Nations Framework Convention on Climate Change (UNFCCC) has emphasized the importance of involving various sectors in both the preparation and implementation of National Adaptation Plans (NAP). The NAP technical guidelines emphasize that “relevant sectors and other management units can respond and report to national governments on their plans and programmes to address adaptation to climate change, including efforts to cooperate across sectors and within specific areas such as regions and cities”.<sup>57</sup>

98. The ECE collection of lessons learned and good practices on climate change adaptation in transboundary basins<sup>58</sup> highlights the importance of ensuring synergies and linkages between adaptation actions at different government levels (local, national, regional and transboundary) and between different (economic) sectors. This could be facilitated through cross-references to strategies and plans at other levels, the regular exchange of information between representatives of the different levels and stakeholder engagement across the sectors. Institutions for transboundary cooperation such as river basin organizations can provide an overall framework and governance mechanism for linking sectors, institutions and interventions.

99. On the climate change mitigation side, climate change policy, including greenhouse gas targets and regulation, significantly influence the energy sector’s operating environment.

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Development acting as the preparatory committee for the World Summit on Sustainable Development, second preparatory session, 28 January–8 February 2002. Available from [https://sustainabledevelopment.un.org/content/documents/nsds\\_guidance.pdf](https://sustainabledevelopment.un.org/content/documents/nsds_guidance.pdf).

<sup>56</sup> Ibid.

<sup>57</sup> United Nations Framework Convention on Climate Change, *National Adaptation Plans: Technical guidelines for the national adaptation plan process*, Least Developed Countries Expert Group (December 2012). Available from [http://unfccc.int/adaptation/workstreams/national\\_adaptation\\_programmes\\_of\\_action/items/7279.php](http://unfccc.int/adaptation/workstreams/national_adaptation_programmes_of_action/items/7279.php),

<sup>58</sup> *Water and Adaptation to Climate Change in Transboundary Basins: Lessons Learned and Good Practices*, United Nations publication, Sales No. E.15.II.E.1. Available from <http://www.unece.org/index.php>.

## 5. Regional integration processes and policy coherence<sup>59</sup>

100. Examples of integration processes and policy coherence from the EU are especially relevant, given the richness of EU experience in regional integration and policy development covering various sectors. There is also a good availability of information. Over the past 15 years, in particular, a lot of effort has been put in the EU into assessing and improving the coherence of sectoral policies.<sup>60</sup>

101. The EU has a comprehensive legal framework that is the result of lengthy development and is applied by countries in very different conditions. It also influences legislation and policy well beyond the EU. Approximation to the EU *acquis communautaire* leads to gradual harmonization of legislation and policy frameworks, facilitating also transboundary cooperation. Both the improvements made to achieve a greater coherence between sectoral policies, and the remaining challenges, are instructive.

102. Achieving greater policy coherence within European water policy was a key reason for introducing the EU Water Framework Directive (WFD) in 2000.<sup>61</sup> It complemented and completed other EU water-related directives and regulations and helped to settle some earlier inconsistencies. It also introduced a strong emphasis on public participation in planning water resources management. A large number of other environmental policies are linked to the EU water policy framework, of which the Habitats Directive<sup>62</sup> from among the protected areas directives and the Integrated Pollution Prevention and Control Directive<sup>63</sup> can be mentioned as examples. A survey in support of “The Fitness Check of EU Freshwater Policy”<sup>64</sup> highlighted a need to improve further the integration of water policy with relevant environmental directives. Harmonization of reporting schedules for different water directives has been proposed as one means to that end.<sup>65</sup> Building on this “Fitness Check” and on an impact assessment of “A Blueprint to Safeguard Europe’s Water Resources”,<sup>66</sup> a set of policy options for action at EU level were identified and assessed.<sup>67</sup>

<sup>59</sup> This section builds on the findings of the publication by the Institute for European Environmental Policy and Deloitte Consulting, *Support to Fitness Check Water Policy*, which served as the report to the European Commission General Directorate for Environment on the project, “Request for services in the context of the framework contract on evaluation and evaluation-related services ABAC N°101934” (14 June 2011). Available from <https://www.yumpu.com/en/document/view/25782586/water-policy-fitness-check-institute-for-european-environmental->

<sup>60</sup> Andrew Jordan, Adriaan Schout and Martin Unfried, “Policy coordination”, in *Environmental Policy in the EU: Actors, Institutions and Processes*, third ed. (London and New York, Routledge, 2013).

<sup>61</sup> Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy.

<sup>62</sup> Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora.

<sup>63</sup> Directive 2008/1/EC of the European Parliament and of the Council of 15 January 2008 concerning integrated pollution prevention and control. This has since been replaced by Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control).

<sup>64</sup> European Commission, Staff Working Document, SWD (2012) 393 final (Brussels, 15 November 2012). Available from [http://ec.europa.eu/environment/water/blueprint/fitness\\_en.htm](http://ec.europa.eu/environment/water/blueprint/fitness_en.htm).

<sup>65</sup> For details of the survey and the findings, see Institute for European Environmental Policy and Deloitte Consulting, *Support to Fitness Check Water Policy*.

<sup>66</sup> Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, COM(2012) 673 final (Brussels, 14 November 2012).

<sup>67</sup> See EU, “Impact Assessment and support studies for the Blueprint to safeguard Europe’s water resources”, last updated 22 April 2015. Available from

103. Regarding agricultural policy, the Common Agricultural Policy (CAP) of the EU was found to have been a key driver of farming practices that in many cases enhanced water pollution and scarcity. Policy changes introduced through the reform of the CAP in the 2000s have increased the importance of environmental protection in the policy, underlining the value of this kind of review, as agriculture is commonly a major water user and impacts on water quality.<sup>68</sup> However, more remains to be done to improve the coherence of the CAP with water policy.

104. Harmonizing energy policy, with respect to some renewable energy sources and targets for biofuel production, with water policy objectives has been identified by the EU as an important area for future policy development. Unfortunately, the goals of green energy policy had not being fully aligned with the environment-related objectives of the WFD.

105. The above demonstrates that improving policy coherence is a long-term effort. The EU neighbourhood countries that approximate their legislation and policy to that of the EU benefit from the results of extensive experience of integration and increasing policy coherence across a region (and the same could be said about ECE instruments). On the other hand, each country has to adapt and apply regional instruments in their particular setting.

106. The approximation processes to the EU *acquis communautaire* result in potentially valuable reviews of legislation and, on occasion, in the establishment of national organizations with an intersectoral or interministerial mandate that can improve coordination and support checking for coherence.

## 6. Jointly developed guidelines

107. Balanced decision-making can be supported by jointly developed guidelines and strategic planning approaches that seek to define how, in practice, diverging interests can be weighed based on agreed relevant criteria.

108. One example is the Guiding Principles on Sustainable Hydropower Development in the Danube Basin,<sup>69</sup> which were elaborated by representatives from Danube countries and the relevant sectors, thus representing a shared understanding. The Guidelines outline an approach towards increasing the hydropower potential while at the same time meeting the obligations of water management and environmental legislation.

109. International organizations also provide guidelines that have been developed in close coordination with their member States for putting into practice principles of good governance. One relevant example is the FAO Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests (box 3).

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[http://ec.europa.eu/environment/water/blueprint/ia\\_en.htm](http://ec.europa.eu/environment/water/blueprint/ia_en.htm).

<sup>68</sup> European Environment Agency (EEA), "A Green CAP? Reform options from an environmental angle", EEA Green CAP project, Interim report first phase (Management Board meeting, 23 June 2011). Available from <http://www.eea.europa.eu/themes/agriculture/greening-agricultural-policy/> (see "Greening the CAP — first phase report).

<sup>69</sup> International Commission for the Protection of the Danube River (ICPDR), *Sustainable Hydropower Development in the Danube Basin: Guiding Principles* (Vienna, 2013). Available from <http://www.icpdr.org/main/activities-projects/hydropower>.

## Box 3

**Responsible practices in land tenure: guidelines of the Food and Agriculture Organization of the United Nations**

How people, communities and others gain access to resources is defined and regulated by societies through formal or customary systems of tenure. Insecure tenure and resource use rights can have negative impacts on investment and productivity. Land users are less likely to invest in their land and use it in a way that is sustainable and ensures its long-term productive potential if they cannot reap the benefits.

Frequently, access to land has favoured certain individuals and groups of people at the expense of others. Women often have fewer and weaker rights to land. As such, secure tenure rights can make a difference in the social and political standing of more vulnerable groups. Often existing land rights are poorly implemented, not recognized, or require clarification to ensure local food security and social justice.

In this context, FAO and its partners embarked on the development of guidelines on responsible tenure governance, the Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security. These guidelines set out principles and internationally agreed standards for responsible practices, providing a framework for countries to develop their own strategies, policies, legislation, programmes and activities, and to judge what acceptable practices are in regard to land tenure.

*Source:* Committee on World Food Security, *Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security* (FAO, Rome, 2012). Available from <http://www.fao.org/nr/tenure/voluntary-guidelines/en/>.

110. Regional and global standardization can also promote coherence by taking into account resource efficiency and environmental protection aspects, notably in the following areas: methodologies (ISO standards), legislation (EU influence) and policies (ECE and EU). Policies also drive technological development, and technology can have either beneficial or counterproductive effects on intersectoral dynamics. Consequently, governance as it extends to technology and innovation is also important to consider.

#### **D. Some concluding observations**

111. Irrespective of the intersectoral approach, be it IWRM or nexus, what is crucial is a functioning coordination between sectors and the necessary arrangements, policies, processes and analytical tools to support intersectoral governance.

112. A nexus approach facilitates intersectoral coordination and, at the same time, successful implementation of a nexus assessment requires policy coherence and intersectoral coordination.

113. The governance analysis methodology that has been developed under this project is transferable and replicable in diverse settings. It is general enough for wider application yet adaptable to specific conditions. The approach could be improved by addressing the points identified for further development.

114. Institutional capacity to address intersectoral frictions can be strengthened by building on existing structures, their further development and broadening the scope of work. Therefore, to advance intersectoral coordination, it is not necessary to develop specific nexus governance frameworks.

115. Many river basin organizations and other joint bodies already have a multisectoral scope. Therefore they can function as effective platforms for intersectoral dialogue and the negotiation of an agreement on actions, as well as the building of synergies or reduction of negative impacts across economic sectors or of economic and infrastructure development on the environment.

116. Formal structures and processes facilitate interaction between sectors and increase mutual understanding, but their existence does not guarantee coordination, consultation and planning. Political will is of key importance for ensuring intersectoral coordination and transboundary cooperation.

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