CONVENTION ON WETLANDS (Ramsar, Iran, 1971)
43rd Meeting of the Standing Committee
Gland, Switzerland, 31 October – 4 November 2011

**DOC. SC43-20**

# Wetlands and energy issues

**Action requested.** The Standing Committee is invited to consider the attached Draft Resolution and annexed key messages on "Wetlands and energy issues" and approve them for consideration by the 11th meeting of the Conference of the Contracting Parties.

*Background note prepared by the Chair of the Scientific and Technical Review Panel:*

## A) Scientific and technical work supporting this Draft Resolution

1. In their 2009-2012 work plan (Resolution X.10), the Scientific and Technical Review Panel was requested to "conduct a scoping review of the implications for wetlands of energy generation and distribution activities, covering both the conventional and renewable energy sectors, having regard to issues concerning climate change and wetlands, linking as appropriate to work done in relation to the task on extractive industries . . . and taking account of up-to-date evolving policy perspectives in these sectors and on issues of energy security in general."

2. That scoping review has been prepared by the STRP during 2010-2011, with financial support from the government of the United Kingdom's Department of Environment, Food and Rural Affairs, to whom the STRP is very grateful, and it will be published prior to COP11 as a Ramsar Technical Report (with a working title of "*Wetlands and energy issues: a review of the possible implications of policies, plans and activities in the energy sector for the wise use of wetlands*"), subject to completion of a peer review process in 2011.

3. The information contained in the draft scoping review has provided the key source material for the preparation of this Draft Resolution on "Wetlands and energy issues". The annex provides the "Key messages for policy makers and wetland managers" arising from the scoping review, and the executive summary of that review will be provided as a supporting Information Paper for the 11th meeting of the Conference of the Contracting Parties.

## B) Recognizing wetlands in other sectoral policies, plans and initiatives

4. It is noted in the Changwon Declaration that "development sectors, including mining, other extractive industries, infrastructure development, water and sanitation, energy, agriculture, transport and others can have direct or indirect effects on wetlands. These lead to negative impacts on wetland ecosystem services, including those that support human health and well-being. Managers and decision-makers in such development sectors need to be more aware of this and take all possible measures to avoid these negative impacts" (Resolution X.3, *The Changwon Declaration on human well-being and wetlands,* 2008).

5. The Declaration emphasizes the need to harmonize policies in different sectors, so that initiatives aimed at achieving human and economic development do not inadvertently lead to the degradation of wetlands, thus "undermining the ability of wetlands to provide vital services".

6. Similarly, the Ramsar Strategic Plan 2009-2015 notes that "to achieve wetland conservation and wise use, a broader and multisectoral approach to wetland conservation and sustainable development is needed" (Resolution X.1). In Strategy 1.4 ('Cross-sectoral recognition of wetland services'), Contracting Parties have agreed to "increase recognition of and attention in decision-making to the significance of wetlands for reasons of [their value for] biodiversity conservation, water supply, coastal protection, integrated coastal zone management, flood defense, climate change mitigation and/or adaptation, food security, poverty eradication, tourism, cultural heritage, and scientific research".

7. In recent years, the Convention has adopted various Resolutions that speak to the influence and potential impacts of specific sectors on wetlands and wetland ecosystem services. These have been adopted by the Conference of the Parties with the objectives of promoting cross-sectoral collaboration and ensuring that the role, importance and values of wetlands, and their ability to support human and economic development goals, are sufficiently recognized in other sectoral policies, plans and projects. Examples of such sectoral Resolutions already adopted by the COP include Resolution X.19 (on river basin management), Resolution X.26 (extractive industries), Resolution X.25 (biofuels), and Resolution X.31 (rice paddies).

8. The present Draft Resolution represents another in the package of Ramsar guidance related to other sectors whose polices and plans can have significant impacts upon wetlands. Other Draft Resolutions for consideration at COP11 that fulfil a similar purpose include those on poverty eradication (DOC. SC43-22), urban wetlands (DOC. SC43-24), and wetlands and health (DOC. SC43-25).

## C) Scope and purpose of this Draft Resolution

9. The chief purpose of this Resolution is to highlight specific issues in which there are connections between the energy and the wetlands sectors, in order to:

   i) draw the attention of decision makers in both sectors to some of the potential negative impacts upon wetlands of energy sector activities;

   ii) emphasize the importance of both energy provision and wetland ecosystem services to human and economic development and highlight the need to harmonize policy objectives in both sectors;

   iii) encourage the application of Ramsar's suite of existing guidance to support the integration of wetland conservation and wise use into policies, plans and initiatives in the energy sector; and

   iv) assist Contracting Parties in strengthening integrated planning and policy making to achieve sustainable human and economic development trajectories that are consistent with the wise use of wetlands.

10. The Draft Resolution does not contain any technical detail relating to management of the impacts of specific energy extraction, processing, generation and distribution technologies. Rather it focuses on the need for balanced planning and decision-making processes related to energy development, which take into account the value and importance of wetland ecosystem services for supporting human and economic development.

## Draft Resolution XI.xx

## Wetlands and energy issues

*Prepared by the Scientific and Technical Review Panel, submitted by the Standing Committee*

*The context for this Resolution*

1. RECALLING that in the Ramsar Convention's Strategic Plan 2009-2015 (Resolution X.1), Strategy 1.4 ('Cross-sectoral recognition of wetland services') is aimed at "increas[ing] recognition of and attention in decision-making to the significance of wetlands for reasons of [their value for] biodiversity conservation, water supply, coastal protection, integrated coastal zone management, flood defense, climate change mitigation and/or adaptation, food security, poverty eradication, tourism, cultural heritage, and scientific research";

2. CONSCIOUS of the need, in implementing policies for the wise use of all wetlands and in a context of objectives for sustainable development, to avoid, minimize or mitigate the negative impacts of economic development on the ecological character of wetlands, [as is reiterated in COP11 DR XI.xx on "An integrated framework for avoiding, mitigating and compensation for wetland losses"];

3. RECALLING that the Changwon Declaration (Resolution X.3) emphasizes the need to harmonize policies in different sectors, so that initiatives aimed at achieving human and economic development do not inadvertently lead to the degradation of wetlands, thus "undermining the ability of wetlands to provide vital services";

4. RECOGNIZING that secure access to reliable and sustainable energy supplies for various purposes, including electricity generation, transport, heating and lighting, is an essential factor in promoting and supporting human and economic development;

5. ALSO RECOGNIZING that demands for energy can be met from a variety of sources, including non-renewable (coal, crude oil, natural gas, peat, "unconventional" sources of oil and gas such as oil shale and tar sands, metallic fuels for nuclear power such as uranium, plutonium and thorium); renewable (wind, solar, hydropower, ocean energy including tidal and wave energy, and bioenergy including energy from purpose-grown energy crops or byproducts from agriculture, forestry or algal culture); and other sources such as geothermal energy and emerging/future technologies;

*Concerns and issues related to potential impacts of energy sector activities on wetlands*

6. RECOGNIZING that the global demand for energy is likely to continue growing, with an associated increase in activities associated with extraction, development and exploitation of both renewable and non-renewable energy sources;

7. AWARE of the potential for certain activities related to the extraction of non-renewable energy resources, the production or harvesting of renewable energy resources such as biofuels, and the processing, distribution and utilization of energy resources and generation of electricity, if they are not appropriately managed and regulated, to have direct and indirect negative impacts on the ecological character of wetlands, including Ramsar Sites and CONCERNED about the particular vulnerability of wetlands to the impacts of extraction of non-renewable energy resources, as is addressed in Ramsar Resolution X.26, *Wetlands and extractive industries* (2008);

8. ALSO CONCERNED about the vulnerability of wetlands to the consequences of failures in the energy sector, including catastrophic failures due to natural disasters (such as the Fukushima earthquake and tsunami) and to human-induced disasters (such as the Macondo well failure in the Gulf of Mexico), as well as chronic failures of governance and management over longer periods (such as the ongoing oil pollution in the Niger Delta), given not only the role of wetlands as sources of key ecosystem services including water provision and storage, but also the potential for impacts to be transferred both upstream and downstream within a river basin;

9. RECALLING that Resolution X.24 on *Climate change and wetlands* (2008) stresses the need to ensure that climate change policy responses do not lead to further degradation and loss of wetlands, as well as the need for integrated coordination in developing and implementing national policies related to water management, agriculture, energy production, poverty reduction, and human health in order to ensure that sectoral objectives are mutually supportive in addressing the likely negative impacts of climate change;

10. RECOGNIZING that attempting to increase energy security and economic development as well as reduce greenhouse gas (GHG) emissions is an urgent global priority (Resolution X.25, *Wetlands and "biofuels",* 2008), and AWARE of the increasing global attention to the use of low-emission and renewable sources of energy, including *inter alia* biofuel production, but CONCERNED that in some cases the implementation of measures to mitigate climate change can potentially compromise the ability of wetlands to provide options for climate change adaptation measures;

11. ALSO RECOGNIZING the potential contribution of the sustainable production and use of biofuels for the promotion of sustainable development and the achievement of Millennium Development Goals (MDGs), but AWARE of the potential negative environmental impacts of biofuels whose production is water-intensive and/or land-intensive, and the potential socio-economic impacts of production of certain feedstocks for biofuels which are also food crops (Resolution X.25);

12. FURTHE RECOGNIZING the particularly close interdependence between energy, water and wetlands, in which some energy options are wholly or partly dependent on water,

AWARE that water availability can impose limitations on energy production objectives, and STRESSING the need for integrated planning in order to be able to provide and maintain sustainable water and energy supplies while also protecting the ecological character of wetlands;

13. AWARE that energy sector projects are often planned and implemented at regional and global scales through bilateral or multilateral international collaboration, and that the potential impacts of such projects can be manifested over correspondingly large geographic scales and across political or administrative boundaries, affecting both individual wetlands and networks of wetlands;

*Relevance of other Ramsar decisions and other international processes to wetlands and the energy sector*

14. RECOGNIZING that Resolution X.26, *Wetlands and extractive industries*, also applies to the extraction of non-renewable energy resources, and that in that Resolution Contracting Parties:

    i) recognized the importance of adequate wetland inventory and baseline information in supporting decision-making and permitting procedures and in strengthening and supporting Strategic Environmental Assessment (SEA) and EIA processes related to extractive industries;

    ii) emphasized the importance of early notification of proposed exploration and extraction activities; and

    iii) further emphasized the need to ensure that the boundaries of all Ramsar Sites within their territories are accurately delineated and mapped; and

15. ALSO RECOGNIZING that those provisions of Resolution X.26 are relevant to other energy sector activities, including those activities related to renewable energy such as the production or harvesting of energy feedstock for biofuels and the processing, distribution and utilization of energy resources and generation of electricity;

16. RECOGNIZING the value of SEA approaches in supporting decision making that reflects the wise use of wetlands, in line with Resolution X.17 on *Environmental Impact Assessment and Strategic Environmental Assessment: updated scientific and technical guidance* (2008);

17. RECALLING Resolution VII.16, *The Ramsar Convention and Impact Assessment: strategic, environmental and social* (1999), which calls upon Parties "to reinforce and strengthen their efforts to ensure that any project, plans, programmes and policies with the potential to alter the ecological character of wetlands in the Ramsar List, or impact negatively on other wetlands in their territories, are subjected to rigorous impact assessment procedures and to formalize such procedures under policy, legal, institutional and organizational arrangements";

18. AWARE of the guidance provided to Contracting Parties in [COP11 DR XI.xx, "An Integrated Framework for avoiding, mitigating and compensating for wetland losses"];

19. ALSO AWARE that [COP11 DR XI.xx, "Principles for the planning and management of urban wetlands", highlights the continuing trends of rapid urbanization of human populations, and RECOGNIZING that the increasing demands for infrastructure and services, including energy services, for urban populations will pose significant challenges for the wise use of wetlands in the future;

20. NOTING that the *Framework for assessing the vulnerability of wetlands to climate change* (Ramsar Technical Report no. 5, 2011)provides approaches for developing and implementing responses that will help to reduce a wetland's vulnerability to various pressures and potential threats, and ALSO NOTING that Resolution VII.10, *Wetland Risk Assessment Framework* (1999), outlines how to approach the prediction and assessment of change in ecological character with a particular emphasis on the application of early warning techniques;

21. FURTHER NOTING that [COP11 DR XI.xx, "Climate change and wetlands: implications for the Ramsar Convention"] stresses that "integrative policies and planning measures for the wise use of wetlands need to be encouraged in order to address the influence of global climate change on the interdependencies between wetlands, water management, agriculture, energy production, poverty reduction and human health";

22. RECOGNIZING the importance in decision-making of valuing of the full range of ecosystem services provided by wetlands, and RECALLING that the guidance on valuation of wetland ecosystem services, provided in Ramsar Technical Report no. 3 (2006), should be applied in a manner consistent and in harmony with the Convention, internationally agreed development goals, and other relevant international obligations;

23. NOTING recent decisions of the Contracting Parties to the Convention on Biodiversity (CBD), including:

    i) Decision X/28 (sec 10e), which encouraged Parties to "[enhance] efforts to address the drivers of inland water biodiversity degradation and loss by integrating biodiversity considerations, where appropriate, into decision-making by other sectors, for example, energy production, transport, agriculture, fisheries, industry, mining and tourism, and into regional development plans"; and

    ii) Decision X/37 (sec 9) which "[encouraged] Parties, other Governments and relevant organizations to address impacts of the production and use of biofuels on biodiversity and the services it provides, and impacts on biodiversity that affect related socio-economic conditions, in developing and implementing land-use and water policies and other relevant policies and/or strategies, in particular by addressing direct and indirect land use and water use changes affecting, amongst others, areas of high value for biodiversity and areas of cultural, religious and heritage interest and indigenous and local communities";

[24. ALSO NOTING that in Resolution 10.xx on *Conflict between migratory birds and electricity power grids* adopted by the Conference of Contracting Parties to the Convention on Migratory Species at its tenth meeting, in 2011, the Parties to the CMS emphasize *inter alia* the importance of identifying critical sites of significance for migratory birds where a risk of conflict with energy infrastructure may exist, and the use of Environmental Impact

Assessment and Strategic Environmental Assessment to support informed decision-making for the avoidance, minimization or mitigation of negative impacts as appropriate;] {**Note.** *This paragraph may need to be reviewed following CMS COP10 in November 2011.*}]

[25. FURTHER NOTING the outcomes of the 6th World Water Forum in March 2012 related to its "Key Priority 2.3: Harmonize Water and Energy", and {**Note.** *This paragraph may need to be reviewed following the WWF in March 2012*}.]

[26. NOTING the outcomes of the United Nations Conference on Sustainable Development (Rio+20) meeting in June 2012 in relation to its theme on Green Economy and issues of renewable and/or clean energy development, and energy conservation, and {**Note.** *This paragraph may need to be revised following Rio+20 in early June 2012*}.]

THE CONFERENCE OF THE CONTRACTING PARTIES

27. EXPRESSES APPRECIATION to the Scientific and Technical Review Panel for its preparation of Ramsar Technical Report No. xx on *Wetlands and energy issues* and the executive summary of that report provided to Contracting Parties in COP11 DOC xx, THANKS the government of the United Kingdom (Department of Environment, Food and Rural Affairs – defra) for its financial support for this work, and ACKNOWLEDGES the Key Messages from that report as annexed to this Resolution;

*Policy-level interventions*

28. ENCOURAGES Contracting Parties to promote integrated planning approaches in:

    i) developing and implementing national policies related to wetlands, water management, agriculture, energy production, poverty reduction, urban planning, and human health and climate change; and

    ii) identifying energy options for implementation which can contribute to achievement of mutually supportive objectives in these sectors;

29. Recognizing that the cost of retrofitting existing energy infrastructure can be very high, but that improvements in energy efficiency can significantly reduce overall energy demands and thus help to reduce impacts on wetlands, ENCOURAGES Parties to consider prioritizing the use of more efficient energy options or technologies in new energy infrastructure development which avoid or minimize direct and indirect impacts on wetlands;

30. Recognizing that the speed at which new energy technologies emerge and are implemented is not always matched by knowledge of the impacts of these technologies on wetlands, ENCOURAGES Parties to adopt a precautionary approach for the introduction and regulation of new energy technologies until there is an adequate understanding of the full implications and potential impacts on wetlands, both short- and long-term;

31. ENCOURAGES Contracting Parties to undertake appropriate Communication, Education, Participation and Awareness (CEPA) activities in order to ensure that all relevant public and private sector bodies associated with energy sector activities are aware

of commitments under the Ramsar Convention regarding the wise use of wetlands and the maintenance of their ecological character;

*Integrated/coordinated sectoral planning*

32. URGES Contracting Parties to pay particular attention to ensuring that water and energy planning are fully integrated in order to minimize impacts on wetland ecosystems through the water demands and water-related impacts of energy sector projects, and in their planning to recognize the vital role of wetlands as natural water infrastructure;

33. ALSO URGES Contracting Parties, when developing and evaluating options to meet future energy demands, to evaluate the economic, social and environmental benefits and impacts of efficiency and demand management options (particularly in the industrial, building, and transport sectors) against the associated benefits and impacts of supply side options;

*Strategic Environmental Assessment (SEA)*

34. ENCOURAGES Contracting Parties to establish transparent and inclusive processes for planning and decision making which ensure the integration of wetland conservation and wise use into energy policies and plans, and to facilitate the participation of wetland policy makers, wetland managers and other stakeholders in these processes by, *inter alia*:

    i) applying the guidance adopted in Resolution X.17 on *Environmental Impact Assessment and Strategic Environmental Assessment: updated scientific and technical guidance*, adapting that guidance as appropriate in order to address specific issues associated with the direct and indirect impacts of energy sector policies, plans and projects on wetlands and, in applying the guidance, to take account of traditional collective knowledge;

    ii) ensuring that, in SEA and environmental impact assessment (EIA) studies related to the energy sector, potential upstream and downstream impacts in river basins are fully considered through ecosystem approaches (including *inter alia* that of the Convention on Biological Diversity), and in doing so to apply the guidance available in Resolution IX.1, Annex Cii (groundwater guidance) and Resolution X.19 on *Wetlands and river basin management: consolidated scientific and technical guidance*;

    iii) making adequate information available on current and future energy policies and plans so as to facilitate SEA and integrated spatial planning at national, regional and global scales;

    iv) ensuring that local and indigenous communities have appropriate opportunities to participate in decision making, applying as needed the guidance adopted in Resolution VII.8, *Guidelines for establishing and strengthening local communities' and indigenous peoples' participation in the management of wetlands* (1999), and Resolution VIII.36, on *Participatory Environmental Management (PEM) as a tool for management and wise use of wetlands* (2002); and

    v) considering valuation at an early stage in SEA and EIA, using appropriate techniques, including those that Contracting Parties may have developed, and in a

manner consistent and in harmony with the Convention, internationally agreed development goals, and other relevant international obligations, in order to ensure that the full range of ecosystem services is considered, both quantitatively and qualitatively, in cost-benefit analyses related to all relevant phases of energy sector activities;

*Environmental Impact Assessment (EIA) and project level issues*

35. ENCOURAGES Contracting Parties to strengthen EIA and regulatory processes related to energy sector activities, by *inter alia*:

    i) applying the guidance on Environmental Impact Assessment adopted by Resolution X.17, adapting it where appropriate in order to ensure that it adequately addresses direct and indirect impacts upon wetlands of the full spectrum of energy sector activities, including the impacts of distribution infrastructure such as transmission lines and pipelines, and transport infrastructure such as roads and railways, as well as the dredging of navigation channels to transport energy resources;

    ii) where necessary, reviewing and revising regulatory and permitting procedures related to energy sector activities, in order to ensure that impacts on wetland ecosystems and their ecosystem services are avoided or mitigated as far as possible, and that any unavoidable impacts are sufficiently compensated for in accordance with any applicable national legislation, [applying as appropriate the guidance adopted through COP11 DR XI.xx on "An Integrated Framework for avoiding, mitigating and compensating for wetland losses"];

    iii) ensuring that regulatory procedures allow sufficient time for the collection of wetland inventory and baseline information and for valuation studies to support effective Environmental Impact Assessment, permitting, and oversight of energy sector activities, especially with respect to enforcement of compliance with the conditions of authorizations and licenses; and

    iv) considering taking a precautionary approach when energy sector activities may directly or indirectly impact identified internationally important wetlands and Ramsar Wetlands of International Importance, or when the SEA or EIA predicts any substantial or irreversible loss of wetland ecosystem services;

36. URGES Contracting Parties to ensure that existing or new energy sector development projects address the need, as far as possible, to avoid or mitigate the impacts of these projects, and to compensate, in accordance with any applicable national legislation, for the loss of livelihoods that may result directly or indirectly from the impacts of these projects on wetland biodiversity and ecosystem services, in a manner consistent and in harmony with the Convention, internationally agreed development goals, and other relevant international obligations, and taking into account Resolution VII.24, *Compensation for lost wetland habitats and other functions* (1999), and Resolution VIII.20, *General guidance for interpreting "urgent national interest" under Article 2.5 of the Convention and considering compensation under Article 4"* (2002);

37. FURTHER URGES Parties to prioritize transport methods for energy production and resources which minimize direct impacts on wetlands and which do not require dredging in riverine or coastal wetlands;

*Risk, transparency and social responsibility issues*

38. ENCOURAGES Contracting Parties, in conducting EIA and cost-benefit analyses (CBA), to ensure that risks of failure in the energy sector are incorporated into the cost side of CBA and are weighed against the potential value of wetland ecosystem services lost or degraded in the case of catastrophic failure;

39. FURTHER ENCOURAGES Contracting Parties to ensure that risks of failure are minimized or avoided in those areas where wetlands, and the people who depend upon wetland ecosystem services, are especially vulnerable to the impacts of catastrophic failure, and to ensure that enforceable mechanisms are in place for the restoration of wetlands damaged as a result of catastrophic failures or for appropriate compensation in the event of wetland losses due to catastrophic failures;

40. URGES private and publicly-owned companies and utilities in the energy sector to openly report on investments, activities and impacts associated with their activities according to agreed international mechanisms such as the Global Reporting Initiative and the Extractive Industries Transparency Initiative, [and in line with the terms of COP11 DR XI.xx on "Promoting responsible investment by government and the private sector to ensure the maintenance of the benefits people and nature gain from wetlands",] and to include the full life cycle cost (including decommissioning) of new infrastructure in their economic assessments;

*International collaboration*

41. Recognizing that in many cases energy policy options and plans are developed at regional and global scales amongst several cooperating countries, ENCOURAGES Contracting Parties to collaborate further to ensure that wetland ecosystems and the full value of wetland ecosystem services are adequately considered in regional energy policy development, planning and implementation;

42. URGES Contracting Parties to collaborate in sharing information on wetland ecosystems and values to inform regional and global energy sector policies, plans and implementation;

*Future activities*

43. ENCOURAGES Contracting Parties to identify the capacity, expertise and technical information needed for addressing the specific issues and potential impacts of the energy sector on wetlands, particularly in relevant public sector institutions, and to implement, where necessary through partnerships with appropriate public, private and NGO sector groups or organizations, appropriate training and capacity building programmes to strengthen SEA, EIA, and regulatory oversight of energy sector activities;

44. REQUESTS the Secretariat, in collaboration with the STRP, the CEPA Oversight Panel, and Contracting Parties, to identify needs for future capacity building and technical

support to Parties in order to implement this Resolution, and to seek funding and partnerships to implement appropriate training, capacity building and implementation support programmes where the need is indicated;

45. REQUESTS Contracting Parties, NGOs, relevant scientific and technical organizations and industry associations to share available detailed technical information and guidance for managing specific impacts of energy sector activities on wetlands; and

46. INVITES Contracting Parties, the Convention's International Organization Partners (IOPs), and interested organizations to share information and case studies on regional and transboundary collaboration for energy planning and development that are consistent with wise use of wetlands, and REQUESTS the Secretariat to collate these and make them widely available.

## Annex

## Key messages for policy makers and wetland managers from Ramsar Technical Report no. xx "*Wetlands and Energy Issues*"

### 1. What is "the energy sector"?

The "energy sector" is broad and diverse and includes:

i) the generation of electricity in thermoelectric or other kinds of power plants;
ii) the production of liquid and gaseous fuels for the transport sector from various raw resources;
iii) the generation of heat and/or electricity through the use of various forms of biomass; and
iv) the direct use of liquid and gaseous fuels, solar energy and geothermal energy for heating water and/or built spaces.

### 2. Different energy sources and options

Demands for energy are currently met from a variety of sources, including:

i) non-renewable sources (coal, crude oil, natural gas, peat, "unconventional" sources of oil and gas such as oil shale and tar sands, and metallic fuels for nuclear power such as uranium, plutonium and thorium); and
ii) renewable sources (wind, solar, hydropower, ocean energy including tidal and wave energy, geothermal and bioenergy including energy from purpose-grown energy crops or byproducts from agriculture, forestry, municipal waste, and algal culture).

### 3. The energy value chain

The "energy value chain", which covers the generation, distribution and use of energy, has several distinct phases, each of which may have potential impacts on wetland ecosystems:

i) exploration for, and extraction and processing of, raw energy resources from non-renewable sources;

ii) production or harvesting of energy from renewable sources; and
iii) distribution of energy or fuels to points of use for electricity generation, transport, heating and other purposes.

## 4. The importance of energy development

Secure access to reliable and sustainable energy supplies is an essential factor in supporting human and economic development.

## 5. The demand for energy will continue to increase

Demand for energy and for associated energy services[1] will continue to increase in the future, particularly in developing countries. While significant expansion is expected in renewable sources of energy to meet this demand, many countries are likely to continue to rely upon non-renewable sources for the foreseeable future.

## 6. Potential impacts of energy sector activities on wetland ecological character

Energy sector activities in all phases of the energy value chain can potentially have negative impacts on the ecological character[2] of wetlands[3]. Impacts are primarily expressed through (but not limited to) the following aspects:

i) changes in water quantity due to consumptive use of surface water or groundwater or due to alterations of natural flow regimes;
ii) changes in water quality due to chemical, thermal and organic pollutants resulting from energy sector activities;
iii) direct impacts on wetland habitats and biota arising from the spatial "footprint" of energy-related activities or infrastructure; and
iv) indirect impacts of atmospheric emissions, including water quality impacts from emissions (for example of particulate materials, sulphur or nitrogen compounds), and due to climate change impacts resulting from greenhouse gas emissions in the energy sector (GHG).

## 7. Potential impacts of energy sector activities on networks of wetlands

Many large-scale energy supply projects are implemented in ways that require large geographic distances between activities associated with different phases of the energy value chain such as extraction, generation, storage, distribution and use. This can lead to cumulative impacts not only on individual wetlands but also on networks of wetlands in the broader landscape, and that can compromise the integrity of an entire network of wetlands where those wetlands may be connected through hydrological processes (for

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1 "Energy services" includes lighting, cooking and water heating, space heating, cooling, energy to support access to information and communication technologies, and energy for earning a living.

2 The Ramsar Convention defines ecological character as "the combination of the ecosystem components, processes and services that characterize the wetland at a given point in time".

3 As defined by the Ramsar Convention, wetlands include a wide variety of habitats such as lakes and rivers, floodplains, swamps and marshes, wet grasslands and peatlands, oases, estuaries, deltas and tidal flats, near-shore marine areas, mangroves and coral reefs, and human-made sites such as fish ponds, rice paddies, reservoirs, and salt pans.

example, within a river basin) or through ecological processes (for example, as important breeding or feeding sites on a migratory waterbird route or flyway).

**8. The vulnerability of wetlands to catastrophic and chronic failures in the energy sector**

Wetlands are especially vulnerable to the effects of failures in the energy sector, including catastrophic failures such as massive spills as well as chronic failures where uncontrolled impacts of energy sector activities may occur over long periods without adequate oversight or remedy.

The potential costs of such failures in terms of lost or degraded wetland ecosystem services can be reduced if the risks of failure are identified and minimized at the planning stage, and then are managed carefully during implementation.

**9. The close interdependence among energy, water, and wetlands**

There is an especially close interdependence among energy, water, and wetlands. Some energy options are particularly water-intensive in one or more phases of the energy value chain. Some water supply options are energy intensive, for example in their needs for pumping or treatment. Hence there is a potential for significant combined or cumulative impacts on wetlands if energy and water planning are not coordinated and if insufficient water is available to maintain the ecological character of wetlands. Moreover, water supplies for energy and for other water uses (including human consumption) can be compromised if the ecological character of wetlands should become degraded.

**10. Designing an appropriate mix of energy options**

At national, regional or global levels, the energy sector deploys a mix of energy options to provide supply and meet demand. That mix of options is influenced by various drivers, including national, regional and global policies for economic development, energy security and climate change mitigation, but also by the introduction of new energy technologies. Undesirable impacts on wetlands and wetland ecosystem services can potentially be avoided, reduced or mitigated by adapting the mix of energy options where possible.

**11. Energy efficiency as a primary objective**

Regardless of the mix of energy options which is deployed in policy and implementation, striving for energy efficiency as a primary objective in both supply-side and demand-side options can significantly reduce overall energy consumption and help to reduce the overall impacts of energy sector activities on wetland ecological character.

**12. A precautionary approach for new energy technologies**

While it is essential to seek and develop new technologies for extraction, processing, generation and use of energy in order to meet growing demands in a sustainable manner, the speed at which new technologies emerge and begin to be implemented is not always matched by adequate knowledge of the impacts of those technologies on wetlands. Hence a precautionary approach is advised for the introduction and regulation of new energy

technologies until there is sufficient understanding of the full implications and potential impacts on wetlands, both short- and long-term.

## 13. International collaboration in SEA and integrated planning for energy and wetlands

In many cases, the raw resources needed for energy production are located far from where the energy will actually be used. Because of this, energy planning and energy policies are often developed and implemented at scales from regional to global, through bilateral and often multilateral collaboration in energy planning and delivery. International collaboration in strategic environmental assessment (SEA) and integrated resource planning can help to ensure that the potential impacts of energy plans and policies on wetlands and wetland ecosystem services are addressed in regional-scale and global-scale energy sector activities.