



11th Meeting of the Conference of the Parties to the Convention on Wetlands (Ramsar, Iran, 1971)

“Wetlands: home and destination”

Bucharest, Romania, 6-13 July 2012

Resolution XI.10

Wetlands and energy issues

1. RECALLING that in the Convention’s Strategic Plan 2009-2015 (Resolution X.1, 2008), Strategy 1.4 (“Cross-sectoral recognition of wetland services”) is aimed at increasing recognition of and attention in decision-making to the significance of wetlands for reasons of 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. ALSO RECALLING that the Changwon Declaration (Resolution X.3) emphasized the need to harmonize policies in different sectors, so that initiatives aimed at achieving human and economic development did not inadvertently lead to the degradation of wetlands, thus “undermining the ability of wetlands to provide vital services”, as well as the relevance to wetlands and energy issues of Resolutions VIII.2 on *The Report of the World Commission on Dams*, X.19 on *Wetlands and river basin management*, and X.1 *The Ramsar Strategic Plan 2009-2015*, particularly its Goal 1 concerning the Wise Use of Wetlands;
3. CONSCIOUS of the need, in pursuing policies for the wise use of wetlands and sustainable development, to avoid, mitigate, or compensate for negative impacts on the ecological character of wetlands (Resolution XI.9);
4. RECALLING the Outcome of the Rio +20 Conference (Brazil, 2012) which recognized that energy plays a critical role “in the development process, as access to sustainable modern energy services contributes to poverty eradication, saves lives, improves health and helps provide for basic human needs”, and which emphasized the need to take further action to provide these services in a “reliable, affordable, economically viable and socially and environmentally acceptable manner in developing countries”;
5. RECOGNIZING that demands for energy can be met from a variety of renewable and non-renewable sources as described in the annex to this Resolution, and CONCERNED that the increasing but differentiated demand for both renewable and non-renewable energy, when not addressed using sustainable measures and actions which take into account the need to protect wetland ecosystems, is likely to lead to a continued loss of wetland biodiversity and ecosystem services;

6. CONCERNED about the potential for certain activities related to the extraction of non-renewable energy resources, the production or harvesting of renewable energy resources including biofuels (outlined in Resolution X.25 on *Wetlands and "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 adverse impacts on the ecological character of wetlands, including Ramsar Sites¹; and CONCERNED about the particular vulnerability of wetlands to the impacts of extraction of non-renewable energy resources, as described in Resolution X.26 on *Wetlands and extractive industries*;
7. ALSO CONCERNED about the vulnerability of wetlands to the consequences of failures in the energy sector, 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 and in coastal and marine areas;
8. CONCERNED IN PARTICULAR about the globally increasing number of energy development plans that, by changing water fluxes and sediment transport, interrupting connectivity, and creating barriers for species migration, could have adverse effects on the ecological character of wetlands, including on wetland species and ecosystems, on the potential for wetlands to produce a wide range of ecosystem services, on their biodiversity, and on the status of water quantity and quality;
9. AWARE of the particularly close inter-relationships between energy, water and wetlands, where some energy options are wholly or partly dependent on water; ALSO AWARE that water availability can impose limitations on energy production; RECALLING that Resolution VIII.1 contained guidelines for the allocation and management of water for maintaining the ecological functions of wetlands; and STRESSING the need for integrated planning in order to maintain sustainable water and energy supplies while also protecting the ecological character of wetlands;
10. AWARE that Resolution XI.11 on *Principles for the planning and management of urban and peri-urban wetlands* highlights the continuing trends of rapid urbanization of human populations, CONCERNED that the increasing demands for infrastructure and services, including energy services, for growing urban populations will pose significant challenges for the wise use of wetlands in the future, and ALSO RECOGNIZING the important role of local governments in planning and managing energy service delivery to urban populations;
11. NOTING that Resolution XI.14 on *Climate change and wetlands* 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”;

¹ Whilst Contracting Parties recognize the importance of continuing efforts to better assess such indirect impacts, at present there is no scientific consensus regarding their quantification and measurement. Further work is required to improve understanding of, and the ability to measure, such indirect impacts.

12. RECOGNIZING the importance in decision-making of valuing the full range of ecosystem services provided by wetlands, and RECALLING that the advice on valuation of wetland ecosystem services in Ramsar Technical Report no. 3 (2006) can be applied in a manner consistent with the Convention, internationally agreed development goals, and other relevant international obligations; and
13. NOTING the relevance of recent decisions of other multilateral environmental agreements (MEAs), notably Decisions X/28 on *Inland waters biodiversity*, X/37 on *Biofuels and biodiversity* and X/44 on *Incentive measures* adopted by the 10th meeting of the Conference of the Contracting Parties to the Convention on Biodiversity (CBD), Resolution 10.11 on *Power lines and migratory birds* adopted by the 10th meeting of the Conference of Contracting Parties to the Convention on Migratory Species (CMS) and CMS Resolution 7.5 on wind turbines and migratory species, Resolutions 5.11 on *Power lines and migratory waterbirds* and 5.16 on *Renewable energy and migratory waterbirds* of the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA), and *Bats and other migratory animals: guidelines for consideration of bats in windfarm projects* (EUROBATS publication no.3 2008);

THE CONFERENCE OF THE CONTRACTING PARTIES

14. WELCOMES the *Guidance for addressing the implications for wetlands of policies, plans and activities in the energy sector* annexed to this Resolution, and INVITES Contracting Parties to make use of this guidance, adapting it as necessary to suit national conditions and circumstances, within the frameworks of existing regional initiatives and commitments;
15. ENCOURAGES Contracting Parties to identify the capacity, expertise and technical information which are needed, particularly in relevant public sector and local government institutions, to address the specific issues and potential impacts of the energy sector on wetlands as described in this document; FURTHER ENCOURAGES Contracting Parties to implement, through the Ramsar Regional Wetland Centres and where necessary through partnerships with public, private and NGO sector organizations, appropriate training and capacity building programmes in order to strengthen if necessary regulatory oversight of energy sector activities and to enhance application of guidance for Strategic Environmental Assessment (SEA) and Environmental Impact Assessment (EIA) contained in Resolution X.17, as well as application of the guidelines in Resolution VIII.1 on allocation and management of water for maintaining the ecological functions of wetlands; and REQUESTS the Secretariat, in collaboration with the Scientific and Technical Review Panel (STRP), the CEPA Oversight Panel, the Regional Initiatives and Contracting Parties to support, resources permitting, Contracting Parties' training and capacity building efforts;
16. INVITES Contracting Parties, the International Organization Partners (IOPs), NGOs, relevant scientific and technical organizations and industry associations to share information, guidance and case studies for managing specific impacts of energy sector activities on wetlands (e.g., the Hydropower Sustainability Assessment Protocol, as agreed at the International Congress on Hydropower in Iguassu, Brazil, 2011), and studies on regional and transboundary collaboration for energy planning and development that are consistent with the wise use of wetlands and that reflect the differences in energy and environmental policies of each of the Parties and the transboundary energy services which wetlands produce, and REQUESTS the Secretariat to compile this information and make it widely available;

17. INVITES Contracting Parties to undertake, at national level, development of specific ecological impact criteria to be applied in selection of energy generation sites in relation to wetlands, ensuring that these criteria take into account the wide range of natural river and wetland characteristics such as hydromorphology, water quality and quantity, sediment transport and distribution, presence of rare or endemic species and habitats, biodiversity and other ecosystem functions;
18. INVITES Contracting Parties, as necessary and appropriate, to adopt and apply such ecological impact criteria for energy generation consistently, as part of SEA processes or water resources planning processes, to guide energy development planning in order to minimize impacts on the ecological character, functions and biodiversity of wetlands;
19. ALSO INVITES the Scientific and Technical Review Panel (STRP), with inputs from Contracting Parties that have already established and adopted such ecological impact criteria, and with support from other interested organizations and Ramsar's IOPs, to compile information on approaches and best practices for applying these impact criteria in selection of energy generation sites, to report to the Standing Committee on the progress of this work, and to submit this for consideration at COP12;
20. REQUESTS the STRP, funding permitting, to monitor the information and trends emerging from relevant global assessments, such as the Global Energy Outlook and Global Biodiversity Outlook, and to keep Contracting Parties informed of the trends in the context of wetlands and energy;
21. INVITES the STRP, in carrying out task 6.2 (wetlands and biofuels) of its work programme, to take into account the findings and conclusions contained in the documents UNEP/CBD/SBSTTA/16/14 and UNEP/CBD/SBSTTA/16/INF/32 related to gaps in tools and approaches and uncertainty surrounding the sustainability of biofuels compiled for discussion at the 16th meeting of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) of the CBD, as potential contributions for further refinement of the Guidance annexed to this Resolution as well as for addressing sustainable biofuels issues in relation to wetlands by Contracting Parties to the Ramsar Convention;
22. EXPRESSES APPRECIATION to the STRP for its preparation of the draft Ramsar Technical Report on *Wetlands and energy issues* and the executive summary of that report provided to Contracting Parties in COP11 DOC. 28, and to the government of the United Kingdom (Department of Environment, Food and Rural Affairs – defra) for its financial support for this work; and
23. INVITES the Secretary General of the Ramsar Convention to bring this Resolution to the attention of the Secretary General of the United Nations as well as the United Nations High Level Panel in charge of developing the “Sustainable Energy For All” Initiative.

Annex

Guidance for addressing the implications for wetlands of policies, plans and activities in the energy sector

A. Context and definitions

1. The “energy sector” is broad and diverse and, for the purposes of these guidelines, it includes:
 - i) the generation of electricity in thermoelectric, tidal 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. Within the energy sector, 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 and from use of traditional biomass sources such as mangroves and other kinds of wood, as well as from byproducts of agriculture, forestry, municipal waste, and algal culture).
3. The “energy supply chain”, with regard to wetlands, has several distinct phases, each of which may have potential impacts on wetland ecosystems. For the purposes of these guidelines, the energy supply chain includes:
 - i) planning of energy development projects, including mitigation and compensation;
 - ii) exploration for, extraction and processing of, raw energy resources from non-renewable sources;
 - iii) development and construction of energy generation projects and facilities;
 - iv) monitoring and oversight of energy projects;
 - v) production or harvesting of energy from renewable sources;
 - vi) distribution of energy and the transport of fuels to points of use for electricity generation, transport, heating and other purposes; and
 - vii) decommissioning of energy plants and associated infrastructure.

B. Potential impacts of energy sector activities on wetlands

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

services² will continue to increase in the near 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.

5. Energy sector activities in all phases of the energy supply chain can potentially have negative impacts on the ecological character of wetlands³. Impacts are primarily expressed through (but not limited to) the following aspects:
 - i) changes in water quantity available for wetlands due to consumptive use of surface water or groundwater or to alterations of natural flow regimes or drainage;
 - ii) changes in water, soil, and air quality due to chemical, thermal, radioactive and organic pollutants resulting from energy sector activities;
 - iii) changes in natural coastal water level fluctuations due to the construction of {energy generation facilities such as} tidal power plants;
 - iv) direct impacts on wetland habitats arising from the conversion of wetlands for construction and operation of energy generation facilities and infrastructure and disruption in sediment flow and ecosystem connectivity of energy-related activities or infrastructure;
 - v) direct impacts on wetland fauna, especially birds and bats, due to collision and electrocution;
 - vi) indirect impacts of habitat fragmentation and connectivity between hydrographic basins, their wetlands and primary forest zones with a high biodiversity component;
 - vii) indirect impacts of atmospheric emissions, including water quality impacts from emissions (for example of particulate materials, sulphur or nitrogen compounds) and those due to climate change effects resulting from greenhouse gas emissions in the energy sector (GHG); and
 - viii) effects on local climate which can reduce the potential for carbon sequestration and storage in peatlands.

C. Inter-relationships between policies in energy, water, wetlands, climate change and other sectors

6. Many large-scale energy generation and supply projects are implemented in ways that require large geographic distances between activities associated with different phases of the energy supply 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, which can compromise the integrity of an entire network where those wetlands may be connected through hydrological processes (for

² “Energy services” include lighting, cooking and water heating, space heating, cooling, energy to support access to information and communication technologies, and energy for earning a living.

³ 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” (Resolution IX.1 Annex A). As defined by the 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 along migration routes).

7. There is an especially close inter-relationship among energy, water, and wetlands. Some energy options are particularly water-intensive in one or more phases of the energy supply chain. Some water supply options are energy intensive, for example in their needs for pumping or treatment. Hence there is potential for significant 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 other water uses (including human consumption) can be compromised if the ecological character of wetlands should become degraded.
8. Climate change policies also have significant influences on energy policies and demands. 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 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. In some cases the implementation of measures to mitigate climate change could potentially compromise the ability of wetlands to provide options for climate change adaptation measures.
9. Attempting to increase energy security and economic development as well as reduce greenhouse gas (GHG) emissions has been cited as an urgent global priority (Resolution X.25, *Wetlands and "biofuels"*, 2008), and there is increasing global attention to the use of low-emission and renewable sources of energy, including biofuel production. Whilst the Contracting Parties have recognized the potential contribution of the sustainable production and use of biofuels for the promotion of sustainable development and the achievement of Millennium Development Goals, they have also noted the potential negative environmental and socio-economic impacts of unsustainable production and use of biofuels (Resolution X.25).
10. In Resolution X.25, the Conference of the Parties i) called upon Parties to apply EIA and SEA to assess the potential impacts, benefits and risks, including drainage, of proposed biofuel crop production schemes affecting Ramsar Sites and other wetlands, and ii) strongly urged Parties to "consider the full range and value of ecosystem services and livelihoods provided by wetlands and the biodiversity they support, and to consider the trade-offs between these services alongside cost benefit analysis and make use of, as appropriate, the application of the precautionary approach as defined in Principle 15 of the 1992 Rio Declaration on Environment and Development".

D. Guidelines for integrated sectoral policy and planning

11. At national, regional or global levels, the energy sector deploys a mix of 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.

12. Regardless of the mix of energy options deployed in policy and implementation, and recognizing that the costs of retrofitting existing energy infrastructure to achieve increased efficiency can be very high, 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 wetlands.
13. In this regard, the following recommendations can be made:
 - i) Promote integrated planning approaches in developing and implementing national policies related to wetlands, water management, agriculture, energy production, poverty reduction, urban planning, and human health and climate change.
 - ii) Identify energy options for implementation which can contribute to achievement of mutually supportive objectives in these sectors.
 - iii) Prioritize the use of more efficient options or technologies in new energy infrastructure development which avoid or minimize direct and indirect impacts on wetlands.
 - iv) 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.
 - v) Consider the potential cumulative effects of all energy projects, both planned and already implemented, on wetland ecosystems at river basin and flyway scale.
 - vi) In national planning, recognize the vital role of wetlands and wetland biodiversity in providing natural water infrastructure.
 - vii) When developing options to meet future energy demands, 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.
 - viii) Undertake appropriate Communication, Education, Participation and Awareness (CEPA) activities 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.
 - ix) Develop integrated knowledge platforms which support identification of threats to wetland ecological character, potential policy tradeoffs and opportunities for maximizing synergies and minimizing impacts.

E. Guidelines for Strategic Environmental Assessment (SEA)

14. Several provisions in Resolution X.26, *Wetlands and extractive industries*, are also relevant to the extraction of non-renewable energy resources and should be applied in managing the

impacts of energy sector activities on wetlands, while respecting national sovereignty in relation to natural resources and taking into account varying national circumstances and priorities. In particular, Resolution X.26:

- 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 Environmental Impact Assessment (EIA) processes related to extractive industries;
 - ii) emphasized the importance of early notification of proposed exploration and extraction activities, in respect of national sovereignty over natural resource and also in the light of national priorities; and
 - iii) further emphasized the need to ensure that the boundaries of all Ramsar Sites within their territories are accurately delineated and mapped.
15. Those provisions of Resolution X.26 are also relevant to other energy sector activities, including those activities related to renewable energy and the processing, distribution and use of energy resources and generation of electricity.
16. Transparent processes and systematic approaches for planning and decision making involving all relevant sectors can help to ensure the integration of wetland conservation and wise use into energy policies and plans, and can facilitate the participation of wetland policy makers, wetland managers, and other stakeholders in these processes. Contracting Parties have recognized the value of SEA approaches in supporting decision making that reflects the wise use of wetlands (Resolution X.17, *Environmental Impact Assessment and Strategic Environmental Assessment: updated scientific and technical guidance*, 2008).
17. The following recommendations should be taken into consideration:
- i) Apply the guidance adopted in Resolution X.17, adapting it 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, take account of traditional collective knowledge.
 - ii) Ensure that, in SEA and EIA studies related to the energy sector, potential impacts in whole river basins are fully considered through ecosystem approaches (including *inter alia* those of the Convention on Biological Diversity), and in doing so, apply the guidance in Resolutions IX.1 *Additional scientific and technical guidance for implementing the Ramsar wise use concept*, Annex Cii (groundwater) and X.19 on *Wetlands and river basin management*.
 - iii) Make 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, while respecting national sovereignty with respect to natural resources.
 - iv) Ensure that the boundaries of all Ramsar Sites within their territories are accurately delineated and mapped, especially in areas where the extraction of raw material for biofuels is proposed.

- v) Ensure that indigenous peoples and local communities, especially those within the project area, have appropriate opportunities to participate in decision making, applying as needed the guidance adopted by the Parties 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
- vi) Undertake valuation studies at an early stage in SEA and EIA, using appropriate techniques, including those that Contracting Parties may have developed, and in a manner consistent 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 whenever possible, in cost-benefit analyses related to all relevant phases of energy sector activities.

F. Guidelines for Environmental Impact Assessment (EIA) and project level issues

- 18. Resolution VII.16, *The Ramsar Convention and Impact Assessment: strategic, environmental and social* (1999), 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”.
- 19. The following recommendations should be considered:
 - i) Apply the guidance on Environmental Impact Assessment contained in Resolution X.17 on *Environmental Impact Assessment and Strategic Environmental Assessment*, adapting it where appropriate in order to ensure that it adequately addresses the 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, review and revise 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, as suggested in Resolution XI.9, *An Integrated Framework for avoiding, mitigating and compensating for wetland losses*.
 - iii) Ensure that regulatory procedures allow sufficient time for the collection of wetland inventory and baseline information and for valuation studies to support effective EIA, permitting, and oversight of energy sector activities, especially with respect to enforcement of compliance with the conditions of authorizations and licenses.
 - iv) Adopt a precautionary approach when energy sector activities may seriously or irreversibly impact Ramsar Wetlands of International Importance or other

internationally important wetlands, or when the SEA or EIA predicts any substantial or irreversible loss of wetland ecosystem services. The decommissioning of energy generation plants and associated infrastructure as well as the management of wastes from energy generation should also be considered.

- vi) Prioritize transport methods for resources used in energy generation which minimize direct impacts on wetlands and which do not require dredging in riverine or coastal wetlands.
- vii) Ensure that existing or new energy sector development projects address, as far as possible, the need to avoid or mitigate the impacts of those projects, as well as the need to compensate for the loss of livelihoods that may result from their impacts on wetland biodiversity and ecosystem services. Such compensation should be in accordance with any applicable national legislation, in a manner consistent with the Convention, internationally agreed development goals, and other international obligations, taking into account Resolution VII.24, *Compensation for lost wetland habitats and other functions* (1999), Resolution VIII.20, *General guidance for interpreting "urgent national interest" under Article 2.5 of the Convention and considering compensation under Article 4.2*" (2002), and Resolution XI.9, *An Integrated Framework for avoiding, mitigating and compensating for wetland losses*.

G. Guidelines related to risk, transparency and social responsibility

- 20. Wetlands are especially vulnerable to the consequences of failures in the energy sector, including catastrophic failures. 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, prevented and minimized at the planning stage and are then managed carefully during implementation.
- 21. The *Framework for assessing the vulnerability of wetlands to climate change* (Ramsar Technical Report no. 5, 2011) provides approaches for developing responses that will help to reduce a wetland's vulnerability to various pressures and potential threats. 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.
- 22. In addition, while it is essential to seek and develop new technologies for extracting, processing, generating and using energy in order to meet growing demands, 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 adequate study should be undertaken prior to the introduction, application and regulation of new energy technologies in order to ensure that there is sufficient understanding of the full implications and potential impacts on wetlands, both short- and long-term.
- 23. The following recommendations should be noted:
 - i) Undertake adequate study prior to the introduction, application and regulation of new energy technologies in order to ensure that there is sufficient understanding of the full implications and potential impacts on wetlands, both short- and long-term.

- ii) In conducting EIA and cost-benefit analyses (CBA), ensure that risks of failure in the energy sector are incorporated into the cost side of CBA and weighed against the potential value of wetland ecosystem services lost or degraded in the case of failure.
- iii) 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 failure.
- iv) Ensure that enforceable mechanisms are in place for the restoration of wetlands damaged as a result of failures or for appropriate compensation in the event of wetland losses due to failures.
- v) Urge private and publicly-owned companies and utilities in the energy sector to report openly on investments and impacts associated with their activities according to agreed international mechanisms such as the Global Reporting Initiative and the Extractive Industries Transparency Initiative, in the spirit of Resolution XI.20 on *Promoting sustainable investment by the public and private sectors to ensure the maintenance of the benefits people and nature gain from wetlands.*
- vi) Urge private and publicly-owned companies and utilities in the energy sector to include the full life cycle costs (including decommissioning) of new infrastructure in their economic assessments.

H. Guidelines for international collaboration

- 24. In many cases, the raw resources needed for energy generation 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 or multilateral collaboration. 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. 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.
- 25. The following recommendations should be noted:
 - i) Collaborate with other Contracting Parties in the region to ensure that wetland ecosystems and the full value of wetland ecosystem services are adequately considered in regional energy policy development, planning and implementation.
 - ii) Collaborate in sharing information on wetland ecosystems and values to inform regional and global energy sector policies, plans and implementation.
 - iii) Collaborate in knowledge sharing on nature-friendly technological solutions to avoid, mitigate, or compensate for adverse impacts on wetland ecological character and values.