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“Wetlands: home and destination”

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Wetlands and health: taking an ecosystem approach

1. RECALLING Resolution X.3, *The Changwon Declaration on Human Well-being and Wetlands*, Resolution X.23, *Wetlands and human health and well-being*, and Resolution X.21, *Guidance on responding to the continued spread of highly pathogenic avian influenza*, each of which called for an integrated approach to addressing health issues in wetlands, and ALSO RECALLING that Resolution IX.1 Annex A defined the “wise use” of wetlands as “the maintenance of their ecological character, achieved through the implementation of ecosystem approaches, within the context of sustainable development”;
2. AWARE of relevant recent initiatives and developments, including the United Nations General Assembly’s 2010 ~~assertion of a global right to water and sanitation~~ recognition of the right to safe and clean water and sanitation as a human right; the Libreville Declaration on Health and Environment in Africa in 2008; the Convention for Biological Diversity (CBD) Decision X/20 calling for collaboration with the World Health Organization (WHO) on biodiversity and health; the work agenda of the Protocol on Water and Health to the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes; the tripartite strategic alignment between Food and Agriculture Organisation of the United Nations, World Organisation for Animal Health (OIE), and WHO to address health risks at the human-animal-ecosystems interface; -and the continuing relevance to wetland management of the Health Synthesis report of the Millennium Ecosystem Assessment (MA);
3. ALSO AWARE that Resolution 9.8 of the Convention on Migratory Species (CMS) called for fully integrated approaches, at both national and international levels, to addressing diseases of domestic livestock and wildlife, recognizing the direct and indirect benefits to human, wildlife and domesticated livestock health from such activities;
4. ACKNOWLEDGING that a “~~One World~~—One Health” movement recognizes the inextricable connections between humans, pet animals, livestock and wildlife (both plants and animals) and their social and ecological environment; NOTING that the “Ecohealth” movement involves researchers, human and animal health practitioners, and communities motivated by the inherent interdependence of human health, biodiversity, and ecosystems; AWARE that both of these movements place disease dynamics in the broader contexts of sustainable agriculture, socio-economic development, environment protection and

- sustainability, and the complex patterns of global change (*inter alia* the increasing interface between humans, domestic and wild animals with resultant disease transference); and ALSO AWARE that both of these health movements have been promoted and supported by many international, government, and non-government organizations;
5. RECOGNIZING the relevance of wetland management and wise use in supporting governments' efforts to achieve the 2000 Millennium Development Goals (MDGs) and their targets for 2015, and the significant contributions that Contracting Parties can make to their achievement through wetland conservation and management; and AWARE that world leaders reaffirmed their commitment to the MDGs and called for intensified collective action and the expansion of successful approaches at the 2010 High-level Plenary Meeting of the General Assembly on the Millennium Development Goals,
 6. ALSO RECOGNIZING that health for humans is a complete state of physical, mental and social well-being and not merely the absence of disease and infirmity; ~~and~~ RECALLING the World Health Declaration's principle of the highest attainable standard of health as one of the fundamental rights of every human being; and ALSO RECALLING the recognition by the Rio +20 Conference (Brazil, 2012) that "the goals of sustainable development can only be achieved in the absence of a high prevalence of debilitating communicable and non-communicable diseases and where populations can reach a state of physical, mental and social well-being", and that such needs equally apply to the goal of wetland wise -use;
 7. AWARE that human health and well-being are dependent upon ecosystems, the effective management of which needs holistic and collaborative approaches and an understanding of complex relationships among humans and other biodiversity; and WELCOMING the recognition by the Rio+20 Conference "that the livelihoods of farmers including pastoralists and the health of livestock are intertwined" and that sustainable livestock production systems include, inter alia, enhanced sustainable water management systems and efforts to eradicate and prevent the spread of animal diseases;
 8. RECOGNIZING that ecosystem approaches to the health of humans, livestock and wildlife are essentially preventive and participatory, with long-term savings for medical and veterinary costs, and with benefits through the involvement in preventive care of those most likely to be affected by specific health issues; and ALSO RECOGNIZING that pursuing an ecosystem approach to human and animal health involves the genuine cooperation and mutual understanding of quite different organizational sectors and disciplines;
 9. CONFIRMING that ecosystem approaches are consistent with the 'healthy settings' approach as outlined in the Ottawa Charter for Health Promotion, whereby health is created and experienced by people within the settings of their everyday life, and where people actively use and shape the environment, thus creating or solving problems relating to health; and AWARE that wetlands are one of the key settings for human health and provide a context for health policies, particularly relevant for urban and rural areas;
 10. STRESSING the key role of wetlands in determining human health and well-being, since they are the source of hydration, safe water, and/or nutrition; the sites of exposure to pollution, toxicants, infectious diseases, and/or physical hazards; the settings for mental

health and psychosocial well-being, including as places where people derive their livelihoods and have their lives enriched, so enabling them to cope and help others; and sites from which medicinal products can be derived; RECOGNIZING the close specific linkages between wetland ecosystems and human livelihoods and improved lifestyles (including potential for physical exercise, stress relief, improved mental health and resistance to illness), in particular for indigenous ~~peoples~~ [peoples](#) and local communities; and [ALSO RECOGNIZING that changes in wetland functions from anthropogenic activities can result in poor health outcomes](#)~~ALSO RECOGNIZING that anthropogenic modification of wetland functions can result in poor health outcomes;~~

11. AWARE that for wildlife, [natural cycles of disease](#) ~~are is~~ an integral part of ecosystems, with infectious organisms and other causes of disease serving an important role in the population dynamics of animals and plants; CONCERNED that threats affecting wetlands, including *inter alia* climate change, substantial habitat modification, pollution, invasive alien species, pathogen pollution, wildlife and domestic animal and plant trade, agricultural intensification and expansion, and increasing industrial and human population pressures, can act as drivers for disease emergence and re-emergence occurring beyond natural cycles; and ALSO CONCERNED that these epidemic disease emergences or re-emergences are negatively impacting wildlife populations and in some circumstances (such as the role of the fungal disease chytridiomycosis in global amphibian declines) are acting as important contributing factors in multiple extinctions of wetland species;
12. NOTING the similarities and parallels between the negative impacts of invasive alien species and novel pathogens and REAFFIRMING Resolution VIII.18 (*Invasive species and wetlands*) which recognized that prevention of the introduction of such species is preferable to attempting their subsequent control, and that wetland management practices aimed at prevention of either of these types of species can provide a level of protection from both;
13. UNDERSTANDING that biological diversity itself helps to provide resilience to ecosystems, including buffering against disease emergence, and AWARE that the loss of wetland diversity can have direct adverse health consequences affecting humans, agriculture and wildlife;
- [13bis. AWARE that altered hydrological conditions in wetlands can result in the exposure of humans and animals to biological, physical and chemical characteristics of wetland sediments with negative health outcomes, for example in arid and semi-arid climates where dried sediments can become mobilised in dust storms; and AWARE that in most instances the resolution to these problems will require regional and global cooperation;](#)
14. RECALLING the Ramsar Convention's attention to the role of wetlands in the prevention and mitigation of disaster impacts (Resolution IX.9, 2005), NOTING that the world has witnessed recent floods, earthquakes, and tsunamis where large numbers of human lives have been lost, and where there have been acute and long-lasting health consequences for affected populations, and AWARE that, in some circumstances, these consequences can be reduced with appropriate policies that recognize and implement ecosystem approaches to wetland management;
15. RECOGNIZING the work of the World Health Organization's Commission on Social Determinants of Health (2008) in highlighting the mediating role played by socio-

economic status in determining human health and the persisting unacceptable inequities in this regard, and ACKNOWLEDGING that similar disparities may also exist in wetlands and contribute to poor domestic animal health;

16. ALSO RECOGNIZING the importance of the cross-sectoral mechanisms (including the Scientific Task Force on Avian Influenza and Wild Birds) developed in response to the threat of highly pathogenic avian influenza H5N1; WELCOMING the global momentum to build the capacity and understanding of wetland managers, biologists and human and animal health practitioners during the international response to this disease; ALSO WELCOMING the establishment of the multi-stakeholder CMS/FAO Scientific Task Force on Wildlife [and Ecosystem Health Diseases \(as retitled in CMS Resolution 10.22\)](#), of which the Ramsar Convention is a member; and DESIRING to further strengthen capacity and broaden communication and cooperation among those organizations involved in wetland health monitoring and management;
17. RECOGNIZING that prevention of disease emergence rather than its subsequent control brings multiple benefits, including cost effectiveness, and that this preventive ecosystem approach needs to be addressed at a landscape scale to ensure the maintenance of ecosystem services and reduce negative impacts to wetland sites, and APPRECIATING that land and wetland users represent key stakeholder groups with an important role in prevention of disease emergence;
18. ACKNOWLEDGING that enhanced capacity to take an ecosystem approach to health, including managing, mitigating, detecting and responding to, and learning from, health issues within wetlands, is needed across a broad range of stakeholders, particularly wetland managers and decision makers, but RECOGNIZING that there remains a need for greater awareness to support the provision of animal and human health services in wetlands;
19. APPRECIATING that communication, education, participation and awareness in a broad range of wetland users helps to promote health through wise use and through the engagement of local people whose health is affected, and RECOGNIZING that wetland users' understanding of the principles of disease risk reduction and actions to prevent disease emergence is key to an ecosystem approach to health;
20. WELCOMING the preparation by the Scientific and Technical Review Panel (STRP) of Ramsar Technical Report no. 6 on *Healthy wetlands, healthy people: A review of wetlands and human health interactions*, which provides a conceptual treatment of the relationship between wetland management and human health and shows that the wise use of wetlands [goes beyond enhances](#) the provision of ecosystem services and also results in specific and demonstrable health outcomes and benefits, and NOTING WITH APPRECIATION that it has been prepared and published jointly with the World Health Organization, so that its information and advice may reach health sector practitioners as well as wetland wise use and management practitioners;
21. ALSO WELCOMING the guidance that has been developed by international entities with relevant expertise to help policy-makers and wetland managers respond to animal diseases in wetlands, notably that prepared by the STRP and provided in the *Ramsar wetland disease manual: Guidelines for assessment, monitoring and management of animal disease in wetlands* (Ramsar Technical Report [\[no. xx\]no. 7](#), 2012), and THANKING the STRP, the UK Wildfowl &

Wetlands Trust, and those Contracting Parties and others who contributed experiences and input to that publication; and

~~22. NOTING the summaries of those two Ramsar Technical Reports provided for the use of Parties and others in [COP11 DOC. XX];~~

THE CONFERENCE OF THE CONTRACTING PARTIES

23. WELCOMES the assessment of the relevance of wetland management and wise use in supporting governments' efforts to achieve the 2000 Millennium Development Goals (MDGs) and their targets for 2015 (Annex 1 to this Resolution) and URGES Contracting Parties to draw to the attention of those bodies responsible nationally for working toward the MDGs the significant contributions that can be made by implementing wetland wise use and management under the Ramsar Convention;
24. ALSO WELCOMES the 'Key Messages' for policy-makers and wetland managers concerning wetlands, human health and wildlife diseases provided in Annexes 2 and 3 to this Resolution, derived from the Ramsar Technical Reports on *Healthy wetlands, healthy people* and the *Ramsar wetland disease manual*, for use by Parties and others in promoting and delivering an ecosystem approach to health in wetlands;
25. CALLS UPON the Secretariat and URGES Contracting Parties to communicate the *Ramsar wetland disease manual* to wetland managers and to help translate, publish, and disseminate it further;
26. STRONGLY URGES Contracting Parties to adopt an ecosystem approach to health in wetlands and their catchments with integrated methodologies and actions across relevant sectors (e.g., human health, wildlife management, and agriculture) in order to bring health benefits to all; to seek to ensure that all disease [prevention and](#) control actions are undertaken within wise use principles; and to facilitate dialogue between different health sectors, using National Ramsar Committees or other relevant mechanisms where other structures do not already exist;
27. ENCOURAGES relevant national and international organizations to continue to gather data and information on the specific health benefits for wetland users, livestock, agriculture and wildlife that may be gained by managing wetland ecosystem services effectively and on the consequent impacts on poverty reduction, sustainable livelihoods, and food security which bring specific health benefits;
28. RECOMMENDS that Contracting Parties adopt an appropriate use of 'healthy wetland' terminology (see Annex 2 to this Resolution), thereby acknowledging the need to understand the complex interactions within wetlands as the basis of good decision making regarding wetland and landscape management and the maintenance of ecological character;
29. REQUESTS the STRP, [resources permitting](#), to advise on appropriate strategic mechanisms to ensure that health costs and benefits are satisfactorily included in economic models that seek to value the contributions that wetland management makes to human health and well-being, and to identify and compile techniques to evaluate the outcomes of wetland management decision making in health terms, noting that such appropriate

strategic mechanisms will necessarily involve government sectors for whom such valuations are more commonly undertaken;

30. REQUESTS the STRP, resources permitting, and working with the WHO, the UN Food and Agriculture Organization (FAO), the CBD, the World Organization for Animal Health (OIE), the Biodiversity Indicators Partnership, IUCN, Contracting Parties and others, to identify and compile from expert sources:
 - i) indicators of the relationship between wetland ecosystem services and health, with a particular emphasis on identifying early warning indicators for the emergence or re-emergence of diseases and persistent and endemic diseases of people, livestock or wildlife associated with wetlands;
 - ii) guidance on the health implications of disruptions to ecosystem services so that the health sector can more effectively participate in planning and decision making related to wetlands and their catchments;
 - iii) guidance for wetland managers on the conduct of human and animal health impact assessments in wetlands (identifying the impact assessment protocols that examine health in particular, for elements that are currently insufficiently dealt with in wetland management procedures, including the importance of invasive species and pathogens; prevention of disease emergence or re-emergence; attending to livelihoods, reducing poverty and improving health outcomes; and the possible trade-offs between ecosystem services and health); and
 - iv) human health guidance for wetland managers so they can provide wetland-related inputs to a) burden-of-disease assessments (i.e., comparative measurements of the gap between a given health status for a population and an ideal health situation where the entire population lives to an advanced age, free of disease and disability); b) community health assessments (where communities themselves conduct assessments of the health matters that they perceive to warrant greater attention); and c) community and stakeholder engagement concerning health matters;
31. REQUESTS the STRP, [resources permitting](#), to seek the views of wetland managers and other relevant stakeholders on the utility of the content of the *Ramsar wetland disease manual: Guidelines for assessment, monitoring and management of animal disease in wetlands* and whether expanding its coverage, such as to include plant diseases and human diseases associated with wetlands, would be desirable;
32. ENCOURAGES relevant national and international organizations to help to build the capacity of wetland managers, as a key stakeholder group, to take an ecosystem approach to health, including by using the *Ramsar wetland disease manual* to assist promotion of health in domestic and wild animals, and ALSO ENCOURAGES wetland managers to enhance disease prevention by building disease consideration and management into wetland management planning and plans;
33. URGES Contracting Parties, working with relevant national and international organizations, to address current gaps in understanding of wetland wildlife health and impacts of disease on biodiversity, including by creating national or regional integrated wildlife health strategies which recognize disease as a threat to the conservation status of species as well as its impact on human and domestic animal health; and

34. REQUESTS the Ramsar Secretariat and the STRP, within available resources, to work with the other relevant institutional stakeholders concerned with health (such as WHO, FAO, OIE, UNEP, IUCN and the Convention on Migratory Species) to encourage an ecosystem approach to relevant health issues in wetlands and their surrounding catchments.

Annex 1

The contributions of wise use and wetland management to achieving the Millennium Development Goals (MDGs)

1. Through the adoption by the United Nations in 2000 of the *Millennium Declaration*, the world's governments established the Millennium Development Goals to improve the lives of people around the world, particularly those most vulnerable and disadvantaged, with specific targets to be reached by 2015.
2. The MDGs are designed to lift people out of poverty, save lives, ensure adequate childhood education, reduce maternal deaths, and expand opportunities for women and girls through empowerment. Of direct relevance to wetlands and water resource management, they seek to ensure access to clean water and alleviate the burden of deadly and debilitating diseases that many people face. They seek to promote sustainable development and protect the most vulnerable from the devastating effects of multiple crises, whether they be conflicts, natural disasters, or volatility in prices for food and energy (United Nations 2011).
3. Global attempts to achieve these goals and targets are increasing: "At the 2010 High-level Plenary Meeting of the General Assembly on the Millennium Development Goals, world leaders reaffirmed their commitment to the MDGs and called for intensified collective action and the expansion of successful approaches" (United Nations 2011, p.5).
4. Wetland policy-makers and managers can make a contribution towards the MDGs wherever the close relationships between wetland management and food production, hunger and poverty, climate change, water extraction and use, and waterborne and aquatic vector-borne diseases are present.
5. Contributions through implementation of the Ramsar Convention can be foreseen along two axes. The first is intervening in the ongoing disruption to wetland ecosystem services so as to help to improve human, domestic- and wildlife health and thereby address the MDGs; this axis is shown in column two of the following table.
6. The second axis is shown in column three of Table 1. Methods for seeking to achieve the MDGs, improve human health, and enhance wetland ecosystem services may not necessarily be mutually beneficial – indeed, systemic effects like cross-scale interactions and feedback consequences may prove to undermine the originally intended objectives. The activities to address MDGs by the international community, national actions, and actions by sectors other than wetland management need to be more cognisant of the systemic nature of the relationship between these objectives and wetland ecosystem health. Where potential negative consequences are foreseeable, this is no reason to avoid actions that seek to achieve these MDGs; rather, those consequences need to be understood and considered in decision making.
7. An understanding of the trade-offs among different wetland ecosystem services and the need for cooperation across sectors is critical in designing further actions in support of the MDGs. For example, it is not uncommon for strategies intended to increase food

production and reduce poverty to propose the conversion of marshes to agriculture, conversion of mangroves to aquaculture, and significant increases in the use of fertilizers to increase crop production. This approach, however, will reduce habitat area (and hence the magnitude of services provided by the original habitat), increase the input of water pollutants, remove the natural water filtering service provided by wetlands, and remove ecosystem services provided by mangroves, such as storm surge protection, timber and charcoal supply, and fish habitat, on which local residents in particular rely. This will make the development goal of improved water and sanitation more difficult to achieve and may in fact increase poverty for some groups. In contrast, a development strategy that safeguards the full range of benefits provided by wetlands might better achieve the set of development goals while minimizing future harm to the wetlands.

Table: Ways in which wise use and wetland management can contribute towards the achievement of the Millennium Development Goals (modified from Horwitz *et al.* (Ramsar Technical Report No. 6, 2012), which was compiled using material presented in Molden (2007), UNEP (2007), UN WWDR (2006) and as otherwise indicated.)

Millennium Development Goals (MDGs)	How will intervening in disruption to wetland ecosystem services improve human health & help address the MDGs?	Systemic consequences: where will addressing MDGs need to be aware of the relationship between human health & wetland health?
1. Eradicate extreme poverty & hunger	Food security of the poor often depends on healthy ecosystems & the diversity of goods & ecological services they provide. Diverse wetland ecosystems are self-sustaining & provide the essential genetic material for aquaculture & horticulture. Sustainable livelihoods by definition seek to ensure that the core requirements of food & water are provided to those dependent on the provisioning of wetland ecosystems.	The challenge for irrigated agriculture is to improve equity, reduce environmental damage, increase ecosystem services, & enhance water & land productivity in existing & new irrigated systems (Molden, 2007). Improving productivity should not be at the expense of other ecosystem services. If it is, the human, animal & plant health consequences of ecosystem disruption will occur in full or in part due to a range of both direct & indirect impacts, the latter as a result of altered health status of livestock & wildlife.
2. Achieve universal primary education	Wetland management needs to address the disruptions to ecosystem services that result in water-related diseases. Water-related diseases such as diarrheal infections cost about 443 million school days each year, diminish learning potential & reduce the coping capacity of local populations for current predicaments & future ecosystem changes.	Primary education should include knowledge of health, water & energy issues at least (a fundamental necessity for urban dwellers who have become more alienated from their surroundings than at any stage in history). Education services can have tendencies to resist increases in attention to such environmental issues at the expense of other subjects.
3. Promote gender equality & empower women	Addressing degradation in wetlands, such as water contamination & deforestation, will contribute to the health of women & girls. Women & girls bear the brunt of collecting water & fuelwood & are more vulnerable members of populations to water-borne diseases.	Improved wetland management should involve women & girls in a meaningful way, perhaps by recognizing that women can play greater roles in wetland management than they currently do. "Wetland managers", as professions, tend to be dominated by men. Decision-

		making structures for water resource management, wetland management, & agriculture are also gendered in many parts of the world. These may operate as barriers to achieve this Goal.
4. Reduce child mortality	Wetland management will become an essential operational requirement to reduce exposures to waterborne diseases, such as diarrhoea & cholera. Prevalence of these diseases is a result of disruption of regulatory services (as a result of over-extraction & inappropriate practices).	Interventions such as water treatment facilities (often through aid provision) will usually be technological & infrastructural in the short term to address immediate needs. However the medium- to long-term goal should be the management of wetland ecosystems to ensure that they can provide suitable water purification & pathogen removal services.
5. Improve maternal health	Addressing disruptions to wetland ecosystem services will always include an examination of water quality. Provision of clean water reduces the incidence of diseases that undermine maternal health & contribute to maternal morbidity & mortality.	Improving the quality of source water from catchments, reservoirs & wetlands in general, & distribution infrastructure, may reduce disinfection loads & the likelihood of maternal exposures to these loads.
6. Combat major diseases	Up to 20% of the burden of disease in developing countries may be associated with environmental risk factors. Preventive environmental health measures are as important & at times more cost-effective than health treatment. Managing wetlands to enhance ecosystem services with the aim of reducing the likelihood of human exposures to pollutants & infectious diseases is preventive, attending to upstream environmental determinants of health. New biodiversity-derived medicines hold promises for fighting major diseases.	Increasing human population sizes as a consequence of successful disease prevention measures may also increase pressure on local water & wetland resources. Wetland management needs to act in concert with water resource management to deal with these foreseeable consequences, for instance by increasing awareness & thus changing behaviour, & by incorporating the concept of ecosystem services in prevention strategies. This management needs to be integrated with regional population policies, domestic livestock & wildlife policies (to reduce risk of emerging zoonoses), education & awareness.
7. Ensure environmental sustainability	Current trends in environmental degradation need to be reversed in order to sustain the health & productivity of the world's ecosystems. Wetlands, & the biodiversity they support, encompass many of the key ecosystems of the world & many of the most productive ones. Wetland management applies directly to this Goal.	Development strategies that aim to safeguard the full range of benefits provided by wetlands might better achieve the Goal while minimizing harm to wetlands. This requires recognizing the trade-offs that exist when managing for some ecosystem services like those concerned with production, while trading-off supporting & regulating services.
8. Develop a global partnership for development	Poor countries are forced to exploit their natural resources, like wetland ecosystems, to generate revenue & make huge debt repayments. Unfair	Trade, tourism & migrations of species are often transcontinental. Meaningful wetland management acknowledges that pests & pathogens capable of decreasing

	globalization practices export their harmful side effects to countries that often do not have effective governance regimes.	ecosystem services & having consequences for the health of local human, domestic & wildlife communities can be distributed by inappropriately planned & controlled human activities. This needs appropriate recognition in global partnerships for development.
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References

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Annex 2

Healthy wetlands, healthy people: A review of wetlands and human health interactions

(Ramsar Technical Report no. 6/World Health Organization Report, 2012)

Key messages for policy-makers and wetland managers

1. **Wetland ecosystems**, including rivers, lakes, marshes, rice fields, and coastal areas, **provide a well-defined set of ecosystem services that contribute to human well-being and poverty alleviation**, and this relationship has changed over time. It is impossible to imagine human life without water and wetlands.
2. **Ecosystems are implicitly recognized within considerations of public health** in nearly all of its endeavours, **yet managing ecosystems is mostly given low priority** against the medical imperatives of attending to curing disease.
3. While the Ramsar Convention uses text and language that centres around wise use and ecological character, **the phraseology of ‘healthy wetlands’** (and healthy rivers, healthy ecosystems, healthy parks, healthy landscapes, etc.) **persists in common and professional use, including by the Convention itself**. A claim to ‘healthy ecosystems’ comes from judgments on the desirability of an ecological character. It is also explicit about the health of components of the ecosystem (including humans) and about whether organizations responsible for managing ecosystems are adaptive and responsive to changes in those ecosystems.
4. **The benefits of wetland ecosystems for human health can be approached in at least three inter-related ways**: by recognizing the human needs that are met by water in its setting; by recognizing the health products that come from wetland ecosystems; and by valuing wetlands in a full sense, in a way that allows individuals within wetland ecosystems to sustainably improve their socio-economic conditions.
5. **Wetland ecosystems provide a sophisticated water treatment service** involving depositional environments, aerobic water columns, anaerobic sediments, microbial suites, and wetland vegetation, all contributing to the assimilation and extraction of pollutants, parasites and pathogens.
6. **Wetlands**, through the services they provide, **contribute to human health through the provision of food security**: ensuring food availability, buying power, or social capital to access food with cash or through barter, sufficient nutrients from the available food, and a resource of genetic material contained within wetland organisms.
7. **Addressing wetland management as if people’s lives, and their livelihoods, depended upon it will undoubtedly contribute to human health**.
8. **Humans can be exposed to health risks in wetland ecosystems**: toxic materials, water-borne or vector borne diseases. While steps can be taken to ameliorate these risks,

the risks can increase (sometimes dramatically) if disruption occurs to ecosystems and the services they provide.

9. ~~Wetlands can be the source of psychological stress as well.~~ **Wetlands, in their myriad forms, become embedded in the human psyche in formulations of “sense of place”.** Changes to wetlands, to their products, to their ability to deliver a livelihood, or becoming a source of toxic exposure or disease can influence people’s mental health by causing psychological stress. These potentialities are increasingly recognized as being part of the wetland manager’s and public health practitioner’s spheres of prevention and intervention.
10. **Attitudinal shifts and reorientation of perspectives within and outside the field of wetland management will ensure that human health and wetland ecosystems are managed to benefit one another.**
11. **To embrace the breadth and richness of the relationship between wetland ecosystems and human health and well-being will need policy interventions promoted by, but extending well-beyond, the wetland sector.**
12. **Instruments and approaches likely to be used by the health sector to respond to health effects and health outcomes of disruption to ecosystem services should be understood and used by wetland managers.**

Annex 3

Ramsar wetland disease manual: Guidelines for assessment, monitoring and management of animal disease in wetlands.

(Ramsar Technical Report no. XX, 2012)

Key messages for policy-makers and wetland managers

General

1. The term ‘disease’ is used to define any impairment to health resulting in dysfunction.
2. Disease is often viewed as a matter of survival or death, but the effects are often far more subtle.
3. Stress is often an integral aspect of disease capable of exacerbating existing disease conditions and increasing susceptibility to infection.
4. Disease is an integral part of ecosystems with infectious organisms and other causes of disease serving an important role in population dynamics.
5. The emergence and re-emergence of diseases has become a wildlife conservation issue both in terms of the impact of the diseases themselves and of the actions taken to control them.
6. The wetland manager may be responsible for biodiversity and its conservation, including parasites and parasite-hosts relationships and the ways in which they contribute to ecological functions.

An ecosystem approach to health

7. The concept of ‘One World One Health’ has arisen due to the appreciation of the fundamental connectivity in health of humans, domestic livestock, and wildlife.
8. Embracing an ecosystem approach to health in wetlands involves recognizing the dependence of health and well-being on ‘healthy wetlands’ which can only be achieved through wise use, most often at a landscape and/or catchment scale.
9. The concept of ‘prevention is better than cure’ and an ecosystem approach to health, particularly when focused at a landscape or catchment scale to ensure maintenance of ecosystem services and reduce negative impacts to wetland sites, maximize benefits and minimize costs for wetland stakeholders.

Basic principles of disease management

10. Diseases are integral components of ecosystems and often do not need management intervention.
11. The greatest power to prevent disease emergence in animals is not **only** in the hands of animal health experts but in those of the land users and managers. Although they cannot

be expected to be disease experts, these groups need to be empowered to play a central role in disease prevention.

12. If wetland stakeholders understand both the impacts of diseases and how to prevent and control them, they will feel motivated and empowered to take action.
13. An understanding of disease in its broadest terms and its overt and subtle effects on individuals and populations precedes a better appreciation of how to manage those effects successfully.
14. The drivers of disease emergence are often under-recognized in wetland management plans and actions.
15. Effective management of any disease is dependent on a good understanding of its epidemiology and the ecology of host populations.
16. Invasive alien species and novel pathogens and parasites have many parallels in their biology, in the risks they pose, and in the measures needed to prevent their establishment and control.
17. A broad range of proactive and reactive strategies and practices are available to the wetland manager and other wetland stakeholders to achieve or maintain the health of the ecosystem.

General management practices

A. Assessing risk and planning for the future

18. To ensure that consideration for disease prevention and control is at the heart of wetland management, activities need to be integrated into wetland management plans.
19. Risk assessments are valuable tools for animal health planning and serve to identify problems/hazards and their likely impact, thus guiding wetland management practices.
20. Multidisciplinary advisory groups provide a broad range of benefits for disease prevention and control.
21. Contingency planning helps to model possible emergency disease management scenarios and to integrate rapid cost effective response actions that allow the disease to be prevented and/or controlled.

B. Reducing risk of disease emergence

22. An understanding by the wetland manager of the uses of a wetland and its catchment by people, industry, agriculture including livestock, and wildlife, coupled with an appreciation of the risk factors for disease emergence, can provide a sound foundation for disease risk reduction.
23. It is important that wetland managers identify stressor risks within their site and the broader catchment/landscape, and understand that these may change over time.

24. Disease zoning can help control some infectious diseases through the delineation of infected and uninfected zones defined by sub-populations with different disease status.
25. The movement of infected animals to new areas and populations represents [one of the most obvious potential routes](#) for the introduction of new/novel infections.
26. Where possible, biosecurity measures should be implemented routinely as standard practice whether or not an outbreak has been detected.
27. If wetland stakeholders understand the principles and value of biosecurity and what measures to take, it will encourage the development of an everyday ‘culture’ of biosecurity which can help disease prevention and control.
28. Implementing biosecurity measures in the natural environment can be extremely challenging, particularly in aquatic systems, and although eliminating risk will be impossible, a substantial reduction in risk can be achievable.

C. Detecting, assessing and responding to new disease

29. Timely and accurate diagnoses and early warning systems for disease emergence, [and rapid reporting of suspected disease outbreaks to competent authorities](#) are [all](#) critical for swift responses, achieving effective disease control, and minimising losses and costs.
30. The detection of new, emerging disease, robust risk assessments, and effective disease control in and around wetlands all rely on effective disease surveillance and monitoring.
31. Identifying when a disease presents a ‘problem’ is complex and needs thorough disease investigation and existing good long-term surveillance information.
32. In the event of a suspected outbreak of disease, wetland managers are not expected to be the final disease diagnostician. However, they should play a key role in an outbreak investigation team.

D. Managing existing disease

33. The appropriate approach to disease management will depend on the characteristics of the problem and, when dealing with an infectious disease, on the correct identification of reservoirs, hosts and vectors of infection.
34. Disinfection and sanitation procedures target pathogens and can be very effective at controlling spread of infection, but they should be used with caution in wetland situations to avoid negative impacts on biodiversity.
35. Animal carcasses represent a significant potential source of infection and should be rapidly and appropriately collected and disposed of.
36. Targeting vectors in integrated disease control strategies can be effective and usually takes the form of environmental management, biological and/or chemical controls, or actions to reduce the contact between susceptible hosts and vectors.

37. Vaccination programmes, often supplemented by other disease control measures, can help to control and even eliminate diseases affecting livestock and/or wildlife.
38. Habitat modification in wetlands can eliminate or reduce the risk of disease.
39. Movement restrictions of animals and people, usually imposed by government authorities, can be an effective tool in preventing and controlling disease transmission.
40. Complete eradication of a disease needs a thorough understanding of its epidemiology, sufficient political and stakeholder support, and thorough resourcing. ~~and it is thus rarely achieved!~~ Elimination of disease from a limited area is a more likely outcome.

E. Training and education

41. Well planned, targeted and resourced education and training programmes for wetland stakeholders are essential for raising awareness and appreciation of wetland diseases and the measures that can be taken to successfully prevent, detect, control and mitigate disease outbreaks.
42. Programmes should aim to inform wetland stakeholders of the basic principles of healthy habitat management, thus reducing the risk of a disease outbreak.
43. A ‘culture’ of proactive disease management can be developed only if a broad range of wetland stakeholders are involved in these programmes.
44. Simulation exercises and testing of contingency plans are a valuable method for training.

F. Communication

45. Communication strategies should aim to make stakeholders aware of the nature and potential consequence of animal disease and of the benefits gained from prevention and control measures.
46. Selection of the appropriate message, the messenger, and the method of delivery is critical for successful communication.
47. A strategy, written in ‘peacetime’, for dealing with the media can increase likelihood of successful outcomes.