Integrating SEA and Ramsar guidelines to conceptualise a framework of ecosystem services inclusive SEA for the sustainable future of Sewri wetlands in India

Deshpande Paritosh[1a], Uttam Kedar[a], Balfors Berit[a], and Asolekar Shyam[b]

[a] *Division of Land and Water Resources Engineering, KTH Royal Institute of Technology Stockholm, Sweden*

[b] *Centre for Environmental Sciences and Engineering, Indian Institute of Technology Bombay, India*

Abstract:

Diverse ecosystems around the world are exposed to cumulative and indirect impacts resulting from drivers of changes including, change in land use, infrastructural changes, urbanization and industrialization. Previous studies reveal that, wetlands are among the least understood, neglected and hence severely damaged ecosystem service (ES) in the global context. Cumulative and indirect effects on biodiversity are well anticipated at a strategic level by applying the principles of the ecosystem approach and hence recent guidance issued by *Convention for Biodiversity* (CBD) in 2006 encourages use of SEA to provide more emphasis on biodiversity and ESs.

This study focuses on the conceptualisation of a framework of ecosystem services inclusive SEA and integrating it with the guidelines regarding biodiversity-led SEA proposed in Ramsar convention and its application in Indian context for the Sewri coastal wetlands located in the west coast of India. Sewri wetland is a valuable ecosystem that shelters thousands of near threatened water bird species and mangrove forests. However, this biodiversity-rich area is facing severe threats from a proposed major infrastructural sea-link project and the pollution from existing industries and slums around Sewri.

The ES inclusive SEA framework for Sewri should integrate components such as biodiversity framework and identify and value the ESs with the aid of stakeholder engagement at the earliest stage in SEA. This will be useful in addressing the cumulative and indirect effects on ecosystem. Moreover, it would also facilitate in identifying sustainable strategic options for the wise use of wetlands according to the guidelines issued in Ramsar convention.

Keywords: *Coastal wetlands, SEA, Ramsar Convention, Ecosystem, Biodiversity, Migratory Birds*

1. Introduction

Wetlands are among the world's most important environmental resources yet remain some of the least understood and most seriously abused assets. Studies and trends in the past prove that, of all ecosystems, degradation rate of wetlands is posing an alarming level of concerns for the society, (Ramsar Convention 2004). Finlayson *et al.* (2005) reported that more than 50% of the wetlands in the world have been destroyed since 1900 due to changes in land use and various socio-economical factors. In developing countries, the issues related to conservation and valuation of ESs provided by such wetlands continue to remain neglected and seen to be dependent more on trends in socio-economic, political development and on the outcome of litigation, legislative and administrative debate rather than the natural processes in the ecosystem (Turner *et al.* 2000). The existence of such wetlands become even more crucial for the developing countries, where the majority of population is directly or indirectly dependent on the ESs provided by them (Maltby, 1991).

[1] *Corresponding author: Tel: +46 767159074, E-mail: pcde@kth.se*

This pressing need to conserve and protect the remaining threatened and near threatened wetlands around the world called for the establishment of First International Convention focusing on protecting wetlands and promoting sustainable and wise use of wetlands. The Ramsar Convention on Wetlands (Ramsar, Iran, 1971) is an intergovernmental treaty whose mission statement is "conservation and wise use of all wetlands through local, regional and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world (Ramsar COP 2013)". Ramsar convention has found worldwide acceptance even among the developing countries and India became a contracting party to the Ramsar Convention in 1981. However, so far only 25 wetlands in India have been internationally designated as Ramsar sites. This is in spite of the richness of aquatic ecosystem types in the country and hence the existing Ramsar sites do not represent even fraction of the diversity of wetlands habitats existing in India (Rahmani and Islam 2010). The current study focuses on the conceptualisation of an integrated framework for the assessment, protection, preservation and sustainable use of one of such neglected and potential Ramsar sites, Sewri coastal wetlands, located on the west coast of India.

2. Methods:

A qualitative research approach was adopted. The study is primarily based on literature review, which included scientific studies, regional and national legislations to understand the interconnection between Ramsar convention and the applicability of SEA as a tool in assessing wetlands as per Ramsar guidance. In addition, a site visit was conducted and certain local stakeholders were interviewed to understand direct and indirect drivers of change, various ESs offered by wetlands to investigate the baseline situation of Sewri wetlands ecosystem.

2.1. Study Area:

Sewri is a small town located on the western coast of Mumbai in the state of Maharashtra, India and is characterized by the presence of mudflats and coastal wetlands. Sewri is dominated by mangrove forest and known to shelter around 20,000 to 30,000 greater and lesser flamingos during the winter season. The mudflat spans an area of around five-acres and is bordered by a dilapidated old port that is of archaeological importance, ship breaking yards, two oil refineries, a fertilizer plant, and an extensive slum. The geographical location of Sewri can be seen in **Figure 1a & Figure 1 b**.

2.2. Ecological significance of Sewri

The southern part around Sewri predominately comprises of mudflats with rich biodiversity, where about 53 species of vascular plants and 150 bird species have been recorded by Bombay Natural History Society (BNHS). According to Woodward (2007), this mudflat has several industries operating along the coast and pollution contributed by them resulted in increased algal growth in mudflats and developed correlated ecosystem. Flamingos and other migratory birds started periodic migration for food to these mudflats from 1992 and have become integral part of its ecology which attracts visitors especially for birding while local fishermen use Sewri wetlands for fishing, boating, wood cutting etc making this ecosystem vital in terms of provisioning and cultural ES. Considering all the facts, Sewri is significant from environmental standpoint and needs to be protected given the rapid pace of urbanization (Islam and Rahmani, 2008).

Figure 1a: Map showing the flamingo habitat zone (marked in pink) at Sewri, Mumbai

Figure 1 b: Flock of Lesser Flamingoes feeding at Sewri wetlands and mangrove forest.

3. Findings of the study:

Reviewing the previous scientific studies on Sewri wetlands ecosystem; along with field visits and interviewing stakeholders revealed that, Sewri wetland aids valuable and diverse ecosystem. However, there are several factors leading towards polluting the wetlands ecosystem and in a way destructing the habitats of migratory birds. Manmade activities leading to biophysical changes are known as Direct *Drivers* whereas *Indirect Drivers* can be futuristic trends which might affect the characteristics of existing ES, (*e.g*. climate change, land occupation, etc) Ramswar COP (2013). Some of the direct drivers of changes identified in Sewri include

- Sewri wetland is surrounded by coal storage facility, lorry parking area, illegal slums, ship repairing yards, fertilizers plants, *etc*. Periodic polluted effluent discharge from this industrial sector and local sewage loading resulting in polluting the wetland ecosystem and causing an alarming level of toxic and persistent pollutants in the vicinity of wetlands ecosystem.
- Lack of appropriate management practices for mudflats due to conflicts of ownerships among the state government and private industrial sector.
- Destruction of mangrove forest covers due to polluted sediments and illegal wood cutting from local fishermen.
- Shutting down of local small scale industries resulted in increased rate of unemployment putting excessive stress on wetland ecosystem.
- Proposed infrastructural changes including the major proposal to build 6-lane causeway from Sewri to Navha-Sheva named, Mumbai Trans Harbour Link (MTHL) which will cut the Sewri wetlands in two pieces causing the fragmentation of wetlands ecosystem.

While some of the indirect drivers include, projected population growth, elevated rate of unemployment, rate of urbanization which will pose excessive stress on the several elements of wetlands ES. Indirect drivers like climate change can result in sea level rise and in a way threatening the existence of coastal wetland habitat. These direct and indirect drivers along with their potential cumulative effects are leading towards the destruction of wetlands ecosystem. Hence, there is a need to develop an integrated and comprehensive assessment framework that will help in developing a set of strategies for the wise-use of Sewri wetlands.

1.1. Environmental assessment methods

Environmental assessment methods are critical in assessing the impacts from various activities on the wetland ecosystem and are listed as one of the key criteria in order to assign the status of

Ramsar protected wetlands in the partner country. Studies in the past showed that both Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA) were proven useful and are recognized assessment methods under the United Nations Convention on Biodiversity (CBD) and other conventions related to the biodiversity protection and ES conservations (CBD, 2006; Ramsar Convention on Wetlands, 2002; Ramsar Convention Secretariat, 2013).

Therivel (2007) and Partidario and Gomes (2013) have indicated that EIA has several limitations over SEA in determining the effective assessment of impacts on biodiversity because of its limited scope and geographic time frame. Whereas, Fischer (2002) and Therivel (2004) have reported the effectiveness of SEA in addressing cumulative and indirect impacts in the assessment unlike project EIAs. It has been observed that, although, SEA has become more accepted and practised as an environmental assessment tool in the developed countries especially in Europe after the formulation of EU directive on SEA (2001/42/EC), its use in developing world has been limited (Andersson and Azcárate, 2005). India has signed an International treaty to protect the wetlands such as Ramsar convention in 1981 but the uses of SEA remain restricted. Studies conducted by Dalal-Clayton and Sadler (1998); Sadler and Verheem (1996); Hirji and Davis, (2009), Mathur and Rajvanshi (2005), Rajvanshi (2005) have discussed that the use of SEA in assessing policies and plans in Indian context is minimal and is not strictly governed by its many global definitions, and India has not transposed its SEA requirements into national legislation though it has introduced EIA through its Environmental Protection Act.

However, in case of Sewri wetlands, it is of utmost priority that stakeholders should understand the importance of functions and values of ES in order to preserve the ecosystem by establishing the strategies for wise-use of wetlands under Ramsar convention. This calls for the development of tailor-made framework, particularly for the cases that involve critically endangered and biodiversity rich ecosystems, so as to address socio-economic, environmental and ecological issues.

1.2. Conceptual Framework for ecosystem services and biodiversity inclusive SEA for Sewri wetlands:

Several studies have explored the integration of biodiversity and ES in the vital decision making of SEA process. For example, Slootweg *et al.* (2006, 2010), Partidario and Gomes, (2013), Geneletti *et al.* (2011), Ramsar COP (2010) have focused on integrating SEA with ES and biodiversity with case studies. The insights from these studies aided the conceptualisation of a site specific ES and biodiversity inclusive SEA framework for Sewri wetlands area. **Figure 2** shows the framework proposed for the assessment of Sewri wetlands and further to develop a wetland management plan according to Ramsar convention for the wise-use of wetlands. The conceptualised framework integrates three assessment methods namely, ES Assessment [as proposed in MEA (2005) and CBD (2006)], biodiversity framework [as formulated in Ramsar COP (2013)] and strategic based model for SEA developed by Partidario (2012).

In the first leg, ES Assessment is aimed at identifying the critical elements of ecosystem and further performing the qualitative/quantitative valuation based on the data available. Qualitative valuation with the engagement of local stakeholders could be the most preferred method for Sewri wetlands. These findings from the ES assessment could further be used as an input while developing the “strategic options” and “decision factors” (Partidario, 2012) that set the strategic focus for the SEA. The second leg includes the biodiversity framework, which is the assessment method extensively used for the wetlands assessment under the Ramsar convention. To be able to make a judgement whether a policy, plan or programme has potential biodiversity impacts, two elements are of utmost importance: (i) affected area and stakeholders related to this area, and (ii)

types of planned activities that can act as driver of change in ES along with the in-depth understanding of how these drivers, direct and indirect, are affecting the various species so that precautionary measures can be developed and probable damage to the biodiversity could be avoided, minimized or compensated (Ramsar COP, 2013). These two elements are envisaged to provide comprehensive understanding about the wetlands and the various cumulative, direct, indirect and negative impacts on an ecosystem, their causes in the form of direct and indirect drivers of change.

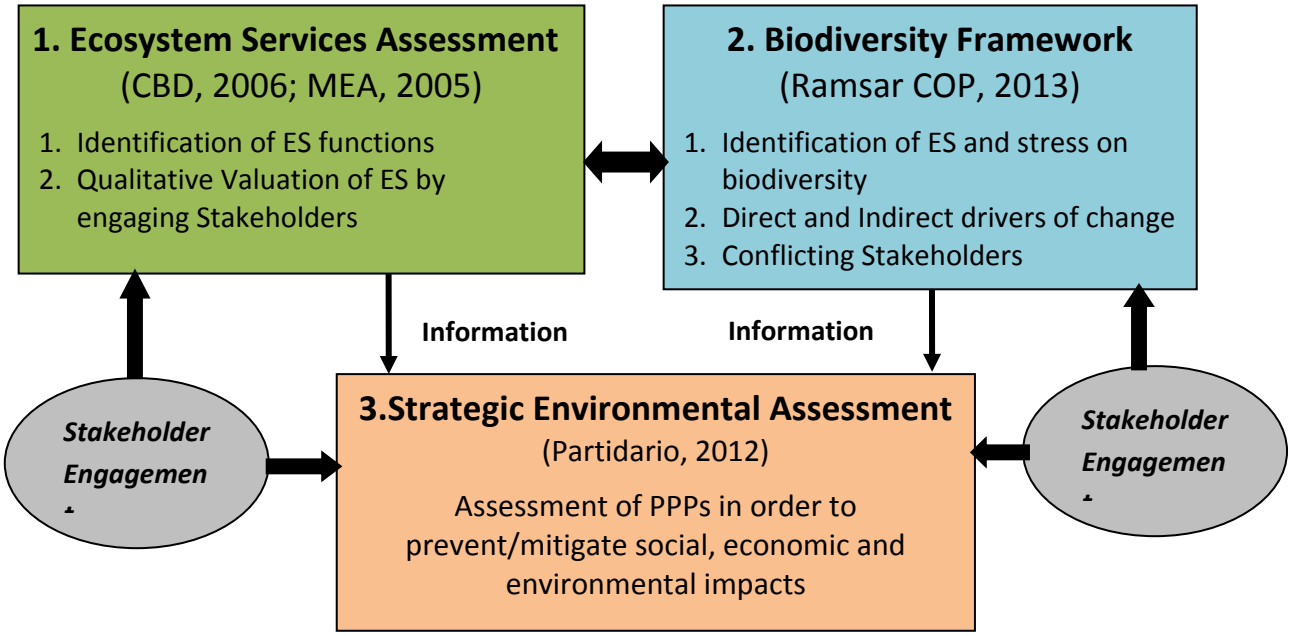

Figure 2*: Framework for ecosystem services and biodiversity guidelines inclusive SEA for Sewri wetlands*

The information obtained from ES assessment and biodiversity framework should be integrated at the various stages of strategic based SEA model which includes setting the context for SEA; studying baseline conditions of wetlands; engaging and interviewing stakeholders to map their interests; reviewing the regional and national legislations; developing strategic focus areas in the form of decision factors aiming at protecting wetlands ecosystems, and formulating the strategies for the "*Wise-use*" of wetlands as implied in Ramsar convention.

4. Conclusion

This study conceptualised a framework of ES and biodiversity inclusive SEA for the Indian context. The framework is envisaged to be useful for the engagement and participation of stakeholders, mapping their needs and disseminating the information among the local stakeholders regarding the importance of ES and various ways to preserve and protect the ecosystems throughout the strategic assessment. This conceptual framework is also expected to facilitate SEA in being more informative, flexible and comprehensive in addressing issues related to biodiversity and ecosystems. Including ES assessment and biodiversity framework would enable SEA to investigate the intricate factors and drivers responsible for the changes especially in threatened ecosystems while planning the strategies for the better future of such ecosystems. Moreover, findings from such framework should be tiered with other environmental assessment methods in order to ensure better implementation and management practices.

5. Reference:

Finlayson, C.M., Bellio, M.G. & Lowry, J.B. 2005. A conceptual basis for the wise use of wetlands in northern Australia – linking information needs, integrated analyzes, drivers of change and human well-being. *Marine & Freshwater Research* 56: 269-277

Fischer T. 2002. Strategic Environmental Assessment in Transport and Land Use Planning. London: Earthscan.

Islam, M.Z., and Rahmani, A.R., 2008. *Potential and Existing Ramsar Sites in India*. Indian Bird Conservation Network: Bombay Natural History Society, BirdLife International and Royal Society for the Protection of Birds. Oxford University Press. Pp 592

Maltby, E. 1991. Wetland management goals: wise use and conservation. Landscape and Urban Planning, 20, 9-18

MEA — Millenium Ecosystem Assessment. Ecosystems and human well-being: synthesis report. Washington, DC: Island Press; 2005.

Partidario, M.R., Gomes, R.C. 2010. Ecosystem services inclusive strategic environmental assessment. Environmental Impact Assessment Review, 40, 36–46.

Partidario, M., R., 2012 Strategic environmental assessment good practice guidance—methodological guidance. Lisboa: Agência Portuguesa do Ambiente e Redes Elétricas Nacionais;

Rajvanshi, A. 2005. Strengthening Biodiversity Conservation through Community-Oriented Development Projects: Environmental Review of the India Ecodevelopment Project. Journal of Environmental Assessment Policy and Management, 7:2,pp. 299–325

R. Kerry Turner, R.K., van den Bergh, C.J.M., So¨derqvist, T., Barendregt, A., Straaten, J., Maltby, E., Ireland, E.C. 2000. Ecological-economic analysis of wetlands: scientific integration for management and policy, Ecological Economics, 35, 7–23

Ramsar Convention Secretariat 2013. Ramsar handbooks for the wise use of wetlands. 6th Edition. Ramsar Convention Secretariat, Gland, Switzerland.
http://www.ramsar.org/sites/default/files/documents/library/manual6-2013-e.pdf

Secretariat of the Convention on Biological Diversity (SCBD) 2006. *An exploration of tools and methodologies for valuation of biodiversity and biodiversity resources and functions.*

Slootweg R., Kolhoff A., Verheem R, Hoft R. 2006. Biodiversity in EIA and SEA — background document to CBD decision VIII/28: guidelines on biodiversity-inclusive impact assessment. The Netherlands: Commission for Environmental Assessment.

Slootweg R., Rajvanshi A., Mathur V.B., Kolhoff, A. 2010. Biodiversity in environmental assessment: enhancing ecosystem services for human well-being. Ecology, biodiversity & conservation series. U.K.: Cambridge University Press.

Therivel, R., Ross, B. 2007. Cumulative effects assessment: Does scale matter? Environmental Impact Assessment Review, 27, 365–385

Woodward, T., 2007: *Sewri bay-Thane creek-Mumbai*, Birding ASIA 7(OBC), p.61-64.

Andersson, K.and Azcárate, J. 2005: Strategic environmental assessment pre-study of Sonso Lagoon, Colombia. Minor Field Study.TRITA-LWR Master Thesis LWR-EX-05-11.

Dalal-Clayton, B. and Sadler, B. 1998. The Applications of Strategic Environmental Assessment in Developing Countries, draft report- London:IIED

Hirji, R. and Davis, R. 2009. Environmental flows in water resources policies, plans, and projects: findings and recommendations. Washington, D.C., World Bank.

Sadler, B. and Verheem, R. 1996. Strategic Environmental Assessment- Status, Challenges, and Future Directions. The Hague. The Ministry of Housing, Spatial Planning and the Environment of the Netherlands.

Mathur, V.B. and Rajvanshi, A. 2005. Integrating biodiversity considerations in SEA of an irrigation project in Central India. Paper presented at the IAIA SEA conference Prague.