Research Article

Status of Riparian Zone of River Narmada in the Central Zone using QBR index

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Abstract Riparian zone is a transit zone between Aquatic and terrestrial ecosystem. It is an integral part which plays an important role in the present study. Riparian zone assessment was carried out in the reach of river Narmada from Umardha to Joga village to assess its condition. The status of riparian zone assessment was carried out in the central zone of River Narmada and this reach of river is located from Umardha village (Junction of Dudhi with Narmada) to Joga village (Backwater of Indra sagar reservoir). The riparian zone of any river is an integral part from the ecological point of view and keeping this in mind survey of riparian zone for this reach was done. During the survey of riparian zone QBR index was used to assess its condition. According to the values which was given in QBR index for each parameter of sampling station it was observed that riparian zone of the above said river stretch is in very poor condition with extreme or moderate degradation. Very few locations were found under fair or good condition with minimum or least degradation. Human activities such as construction, sand mining, soil mining, and conversion of forest land for agriculture (deforestation) are noticed under the stretch of river which are being damaged the riparian area. Sand mining the major activity in this area was observed on the largest scale. Livelihood dependence is more responsible for vanishing riparian zone condition on the river banks which are posing adverse impact on the riverine ecosystem.

Keywords *Central zone; QBR index; Riparian zone; River Narmada*

1. Introduction

Riparian zone provides ecosystem services for riverene ecosystem; also plays an important role for balancing abiotic and biotic components. It provides shelter and food for fauna living nearby the river and helps in water filtration and aquifer recharge. Riparian zone helps in maintaining water quality, control sediment erosion, flooding & temperature control, decreasing hydrological risk and construct stable river banks (Fu et al., 2017).

Assessment of riparian zone using protocols and indices are in globally practice. During the present study, QBR index was chosen among them. The QBR index ("qualitat del bosc de ribera" or riparian forest quality) is an easy-to-use field method for assessing the habitat quality of riparian forests. This was designed and developed for use in Mediterranean streams in Spain (Díaz-Pascacio et al., 2018).

It is a score-based index divided into four main aspects of the riparian zone which are total riparian cover, cover structure, cover quality and channel alteration. It is used to contrast sites, to compare sites, to ideal conditions and to assess the success of restoration of riparian zone/riparian forest.

2. Materials and Methods

Study area

Present study was carried out on the central zone of Narmada River which is located in the central part of the country and known as lifeline of the state of Madhya Pradesh. The study area starts from Umardha village (confluence point of Dudhi with Narmada) to Joga village (upstream or back water of Indira Sagar reservoir) and shown in Figure 1. The reach of Narmada River lies in two districts of Madhya Pradesh i.e. Hoshangabad and Harda (Figure 2).
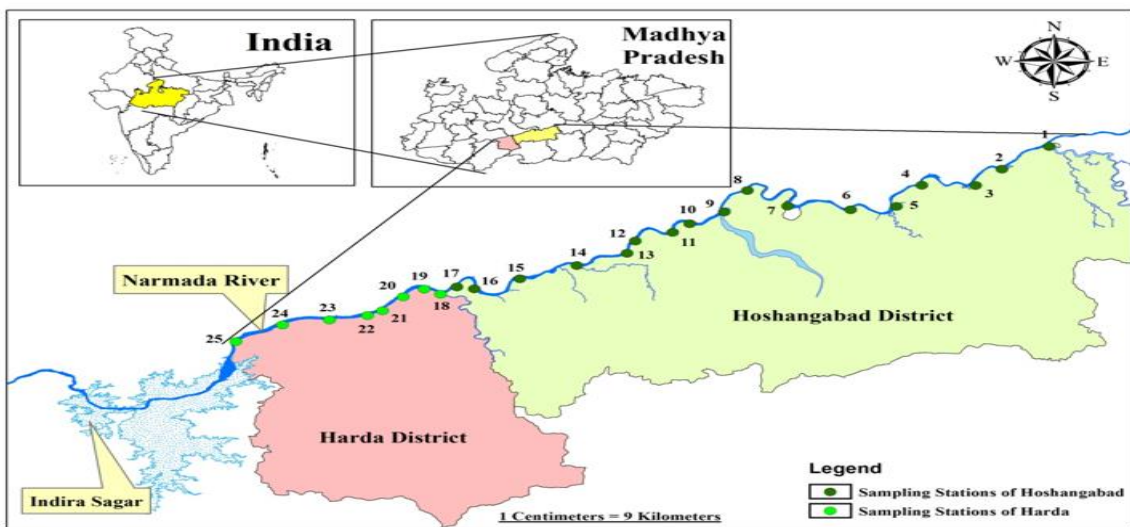

Figure 1: *Location map of the study*

Figure 2: *Sampling stations of the study area*

Sampling Station

A total of 25 sampling stations were selected for assessment of riparian zone in the study and among them, 17 are located at Hoshangabad district and 8 are located at Harda district (Figure 3).
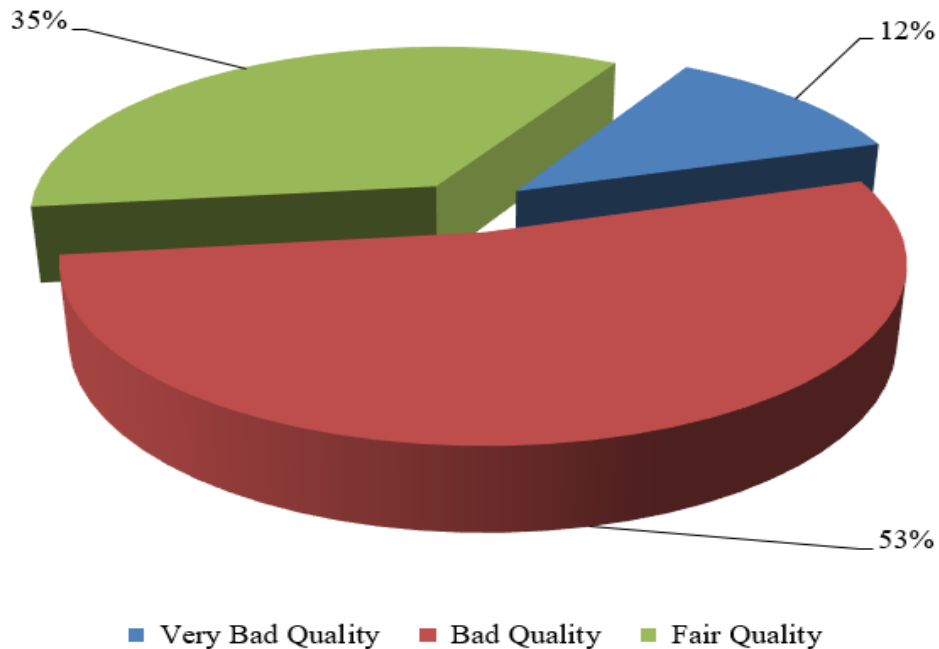

Figure 3: *Status of Riparian zone in Hoshangabad district*

QBR (Qualitat del Bosc de Ribera) Index

Table 1: *Field data sheet of QBR index*

Riparian Habitat Quality Level	QBR
Riparian habitat in natural condition	≥95
Some disturbance, good quality	75-90
Disturbance important, fair quality	55-70
Strong alteration, bad quality	30-50
Extreme degradation, very bad quality	≤ 25

The QBR index for assessment of riparian forest quality is a protocol which was developed by F.E.M. (Freshwater Ecology and Management) research group of Universitat De Barcelona (Díaz-Pascacio et al., 2018). In this protocol there are four riparian habitat quality levels and for each there is a given score. The protocol field data sheet is given in Table 1.

3. Results and Discussion

According to categorization of protocol in which values are categorized under different conditions, extreme degradation or very bad quality of riparian zone was observed at 2 stations of Hoshangabad and Harda districts, while 9 stations of Hoshangabad district and 4 stations of Harda district were found strongly altered and bad quality riparian habitat, whereas fair quality of riparian zone was noticed at 6 stations of Hoshangabad and 1 station of Harda district with some disturbance while good quality of riparian zone with minimum disturbance was found only 1 station of Harda district in the

entire stretch of the studied river (Table 2). It was observed on an overall status that in Hoshangabad district 53% area of the riparian zone was in the bad quality with strong alteration, followed by 35 % of fair quality, 12% area of riparian zone was in very bad quality with extreme degradation (Figure 3).

In Harda district 50% area of the riparian zone was in the bad quality with strong alteration where as 25 % area was noticed in very bad quality and extreme degradation, while 12% area was found under fair quality and 13 % of area was in good condition with minimum or some disturbed condition (Figure 4).
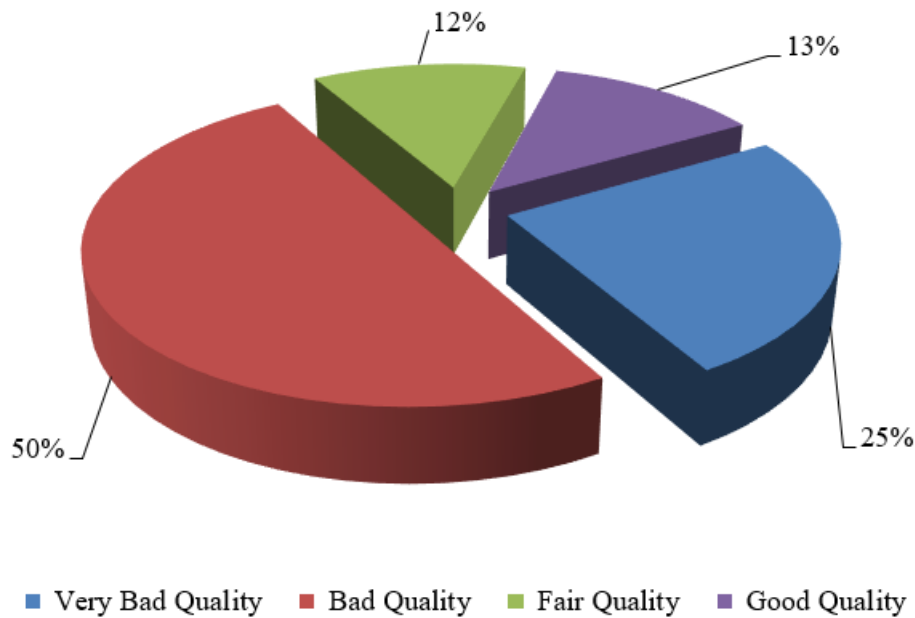

Figure 4: *Status of Riparian zone in Harda district*

Agriculture was the predominant activity noticed in the riparian area during the study. Different varieties of crops were cultivated on both the banks of the river which is responsible for degradation of riparian cover in the study area. Human activities like construction, sand mining, soil mining, conversion of forest land for agriculture and deforestation in the riparian zone are playing key role for the degradation of riparian area of River Narmada. Sand mining is the major activity which was generally observed in the study area is also responsible for destruction of riparian zone.

After the survey of the study area it was observed that riparian zone was being encroached through construction work on the bank of river and especially expansion of agriculture land on the bank of river for livelihood of local people. Similar observation was reported at three catchments area of Sabinal River, Mexico here RQI (Riparian Quality Index was used to assess the riparian quality, among 15 reaches in which 6 are in bad condition, 5 are in poor condition, 2 are in moderate condition because of human intervention, while only two reaches are in good condition (Horn and Richards, 2006). In Songhua River which is the fifth longest river of china, where 60% of the riparian zone was disturbed by human activities like build-up and farm land contraction Bolin (Munné et al., 2003). Pandey et al. (2015) Reported degradation in riparian zone of Kaliyadeh stream which is a tributary of River Narmada in the central zone. The same was reported for Chandni Nalla by Chaurasia et al. (2015) and Bhahner River by Bahsir et al. (2015). Dominance of agriculture practices on both banks of Chandni Nalla was also reported by War et al. (2014) which are more responsible for soil erosion and ecological degradation of a stream/River. Sirombra and Mesa (2012) reported poor riparian quality near population centers because of livelihood dependence and good quality of riparian zone near area adjacent to protected region in subtropical Andean stream of the northwest Argentina

including within Yungas Biomes. Vyas et al. (2012) also reported poor status of riparian zone and floodplain areas in the selected reach of River Narmada because most of the area near river bank and floodplains were dominated by agricultural practices. Worldwide most of the riparian zone or area of any river ecosystem is being exploited through different types of human activities due to which the loss of habitat and source of pollution introduced in the system. In most of the riparian area agriculture is the most common practice done, which directly affects the flora and fauna of rivers. Chatzinikolaou et al. (2011) studied the riparian quality of five freshwater ecoregions of mainland Greece was assessed for 35 independent river basins where 222 stations were chosen for the study. QBR index was used for the assessment of these sites and according to the index 78 sites (35%) were found under high or good status, while 144 sites (65%) were observed under below good condition because of human interference in the ecoregions. QBR index was also used to assess the status of riparian forest of three watersheds i.e. Big Darby Creek, The Little Darby Creek and The Walnut Creek of Central Ohio river in which 60 sampling stations were chosen from forest area, which provides habitat for wide range of species including fish, macroinvertebrates, amphibians, mammals and birds. According to values of QBR index for these stations none are found in very poor conditions but some are observed under poor condition because of agriculture practice, while rest stations were categorized under fair, good and excellent habitat class because of minimum or undisturbed condition of riparian quality (Colwell and Hix, 2008). Riparian quality of Kizilirmak river of Turkey was assessed using QBR index and results revealed that among three stations two were in extremely degraded condition, while one station was in fair condition. Such status of riparian zone of the river was observed because of excess human disturbance on the bank in the form of settlement, agriculture and effluent discharge from oil refinery (Tüzün and Albayrak, 2015).

4. Conclusion

According to the QBR index protocol for riparian quality assessment the present study concludes that the quality of riparian area in the selected reach of river Narmada was mostly categorized under poor condition. As per visual observation of the study area most of the sampling station was found degraded due to human interference because people of this area were largely dependent on the riparian zone of the river for their livelihood. Therefore, proper attention should be given for restoration & management of riparian area of the studied river, so that it can be saved for the future of human and ecology of the river.

Acknowledgement

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