Interrelationship of Traditional livelihoods & Riparian landscape of Narmada basin

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Abstract

Technological advances and modernization have posed a serious threat to the resilience and survival capacity of fragile ecosystems which include, inter other, Riparian landscapes. Simultaneously, it is also seen that the traditional livelihoods are losing out to newer livelihoods due to many reasons but mainly due to modernization.

While there are many types of research finding out the relationship between the landscape and the traditional livelihoods that these supported, this research investigates whether changes in the landscape zones in a particular context have affected the traditional livelihoods that it supported through its ecological services.

For this purpose, the Riparian zone of Narmada basin in India has been analyzed by study of two districts within the basin. In these study districts, changes in landscapes have been documented using geospatial analysis and field survey and changes in traditional livelihoods and the causes have been mapped and identified through historical documents, household survey and focus group discussions. It was found that many of the traditional livelihoods that existed a century back are lost forever. Results also indicate that the 'flora dependent' traditional livelihoods have been impacted greatly as compared to other livelihoods. Complete loss of as many as 12 livelihoods which were entirely dependent upon flora was observed. Modern intensive agriculture along with other activities have greatly impacted the biodiversity of the landscape and the traditional livelihoods of the region. As the region has many residents belonging to a people group categorized as 'tribal' (comparable to aboriginal people concept) by the government of India, it was further observed that it is these people whose traditional livelihoods were most affected. It is further seen that both female and male members in traditional livelihoods were occupied in occupational activities.

Keywords: Indigenous livelihoods, Cultural landscape, Narmada River, Riparian landscape.

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Introduction

In the context of riparian landscape, symposiums, and bodies such as Symposium on Urbanization and Stream Ecology (SUSE), Asian Cultural Landscape Architecture Association (ACLA) and Indian Society of Landscape Architects (ISOLA) have identified the need to evaluate the socio-cultural systems of a place with their landscape. Symposium of Urban Stream Ecology (SUSE III, 2014) among its other conclusions, stressed the need to address socio-cultural impacts on river basins, while also stating that there is no 'one size fits all' approach to riparian landscape management.

Dilip Kumar (2017) has enumerated socio cultural and socio-economic attributes of the Ganges basin. Relationship of women and Ganges River in the Garhwal Region indicated that as men migrated to towns the women were engaged in household and livelihood activities in the regions and greater understanding of the region (Lutkewitte 2015). Contradictory demands for food and water are aggravated by an increasing population and environmental damage in major river systems (Cook, 2009). Continuously shifting river flows are essential for livelihoods dependent on flood recession agriculture, floodplain cattle grazing and pisciculture (Mul, 2014).

Amrita Baviskar in her seminal work In the Belly of the River (1995) has pointed out the woes of the native communities caused by large dams leading to displacement and migration of native communities of Narmada River. P. Sainath, has written much about the sugar factories and the damage done in Vidarbha riparian landscape and the role of riparian agriculture of sugarcane on ground water depletion. Ramchandra Guha (2011) calls anti-dam movements of riparian landscape as significant environmental conservation events, the first one being protests for Mulshi region in Maharashtra in 1920s and later *Narmada Bachao Andolan* in 1990s. Activism on riparian landscape and people movements such as *Narmada Bachao Andolan* has pointed to the urgency to understand riparian landscapes in context of native communities and their needs.

Overall, it may be said that river basin changes in landscapes have been studied earlier by numerous researchers and so also the changes in livelihoods. But both aspects have been studied mostly in singular domain specific perspectives. This study brings these two aspects together in a context to understand the unique interlinkages between the two.

Taking a cue from the aforesaid questions related to future management of landscapes and one of the focus areas identified by SUSE III, this study sets the following questions for further exploration.

What are the patterns of relationship between the traditional livelihoods and riparian landscape?

How do traditional livelihoods and the riparian landscape shape and influence each other?

There are debates in landscape ecology over the choice of nomothetic and idiographic approaches. Nomothetic approach is based on a tendency to generalize, and Idiographic approach is based on a tendency to specify assuming that the landscape has had a unique life history. This study adopts the idiographic approach from the perspective of regional landscape to answer these aforesaid questions taking the case of Narmada River basin to explore the unique socio-cultural impacts on a river basin and vice versa.

Again, one finds a dichotomy of reductionist as well as holistic approach dealing with such a study. This study adopts a reductionist approach and has taken sample areas along the river basin to explore the topic. GIS based studies significantly reduce the time consumed in large regional studies and get accurate results and hence GIS based spatial analysis is conducted. Anthropologists and ethnographers James Forsyth (1871), Verrier Elwin (1920), have discussed the rich cultural arboreal civilization of forests of Narmada River basin and unique nature culture relationships. Modernization activities have greatly modified the river landscape and hence the site is selected to study livelihood landscape relationships.

Methodology

The methodology comprises four major steps, namely: 1. Study area identification and delineation of landscape zones, 2. Assess landscape changes in selected study areas, 3. Assess livelihood changes in study areas, 4. Compare the two kinds of changes and make conjectures, 5. Confirm the conjectures with the opinion of the residents through 'focus group discussions.

Study area identification and delineation of landscape zones

The first step was delineating and mapping the riparian landscape using the technique of overlay analysis in the GIS platform. To delineate the Narmada River riparian landscape, two perspectives were considered, namely the natural element (stream order and flood map) and socio-cultural element (pilgrimage route and administrative boundary or village map). Processed images of land use land cover of Narmada basin for the year 2004, 2008 and 2014 were obtained from Central Water Commission. GIS shape files of landscape zones and land use & land cover of this area from 2004 to 2015 were acquired from 'Food and Agriculture Organization' and Central Water Commission of India respectively. The overlay maps led to delineation of the riparian landscape of Narmada river. A land use study of the riparian landscape was further done through geospatial analysis.

The second step was to select case study districts, for which four criteria were selected namely; (1) districts with maximum traditional livelihood diversity, (2) presence of long term hydrological observation stations, (3) proximity to major dams, (4) zones with significant land cover changes. Based on above criteria, Hoshangabad district from upper basin and Barwani district from lower basin were selected. The third step was delineation of landscape zones of case districts. The landscape zones are identified by overlay of physical layers of geological formations, soil type, elevation and hydrology. Three landscape zones namely Riparian, Plain and Hill zones were delineated in Hoshangabad and Barwani districts. Sample study villages were selected from each such zone using snowball survey techniques. Based on predefined criteria, 28 villages were selected from three landscape zones of Hoshangabad district, and 24 villages were selected from Barwani district. Research tools were focused to assess landscape changes and livelihood changes. Multiple field visits for making observations, questionnaire surveys and FGDs were made in between May 2015 to 2019.

Assess landscape changes in selected study areas:

Landscape changes of both districts are studied through LULC analysis, long term changes in water quality, assessing changes in socio ecological patches and conditional mapping of riparian landscapes using RARC tool. For rapid landscape change assessment research methods adopted were visual observation of activities (transect walks), interviews, focus group discussions and RLA (Rapid Landscape Assessment). Along with it rapid visual landscape survey using the technique of transect walk was conducted in the same villages. Since agriculture is identified as a major traditional livelihood, traditional crops and seasonality of crops grown were also documented.

Livelihood change assessment:

The research strategy followed was historiography for documenting the past, FGD (Focused Group Discussion) for documenting the present in case study areas and opinion survey for documenting latest changes and perspectives for exploring the reasons of the same happening.

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The historicity study led to enumeration of the traditional livelihoods of the study districts which existed 100 years back based on historical evidence and their present status based on primary survey. Secondly structured Questionnaires were prepared for household survey and rapid visual survey toolkit was then prepared for the study of villages in the landscape zone. These were based on literature derived indicators and the outcome of reconnaissance surveys. The household survey forms were shared in these villages comprising a majorly aboriginal population (called as scheduled tribe in India). Audio and video recordings along with notes from the interviewees were taken. The audio recordings were then transcribed, and the livelihood process was axially coded.
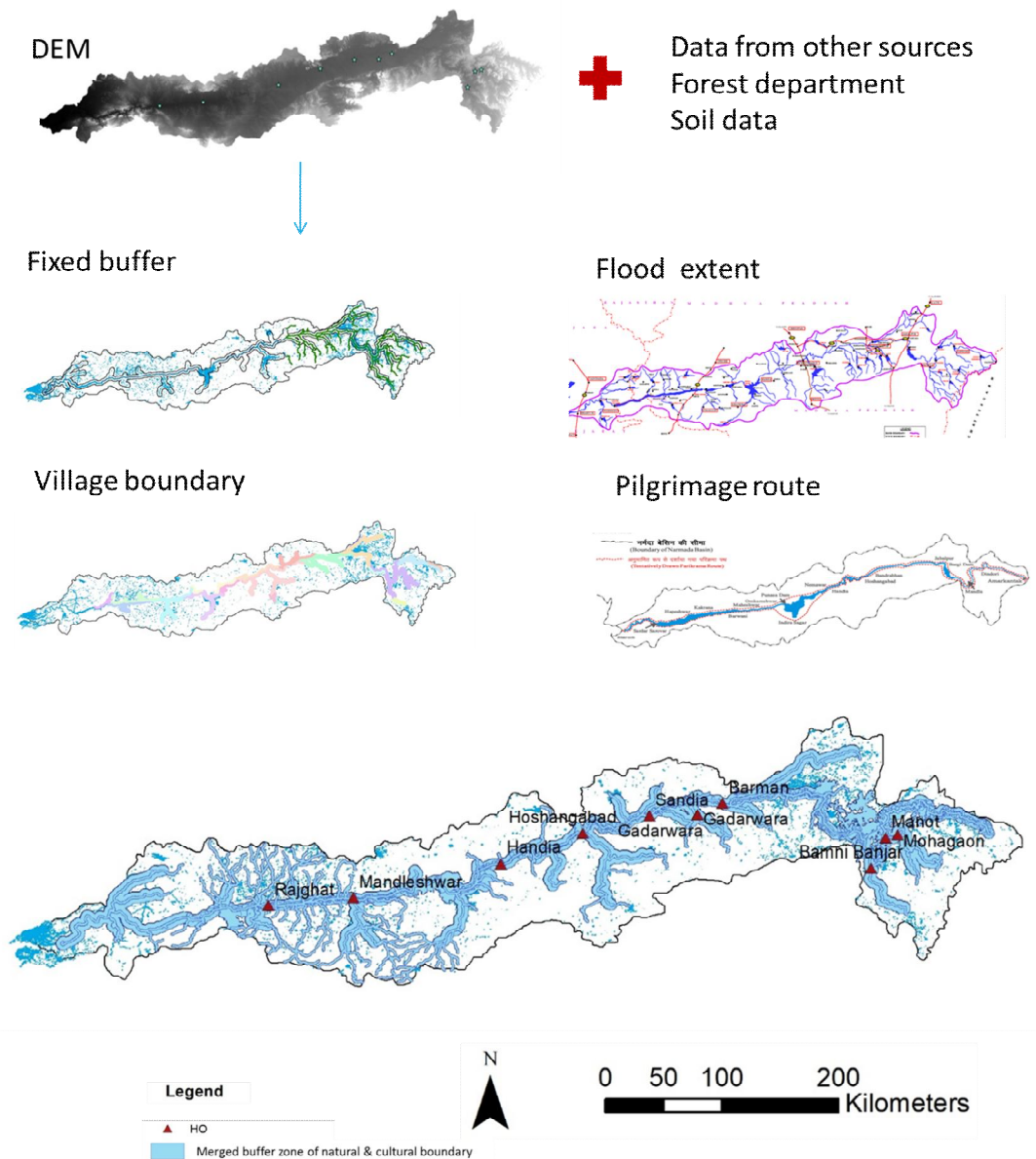

Fig.1. Mapping of riparian zone of Narmada basin in ARC GIS platform

Results and discussion

Landscape change assessment results
Land cover changes in study districts:

The built-up area was documented to have increased by 439.36 % in Hoshangabad and 23 percent in Barwani. Area with double triple cropping has increased by 468.36 % in case of Hoshangabad and 131 % in case of Barwani. Area under the forest cover has almost been reduced by 43.4 % in case of Hoshangabad and 93 % in case of Barwani of the original forest area in 1908. Absence of continuous and appropriate width riparian buffer has negatively impacted aquatic habitat and associated livelihoods. Results of rapid riparian assessment indicated fragmented and discontinuous vegetation in the riparian zone (In Hoshangabad 626.8 sqkm (26.6 %) and 20.3 (2.5%) in Barwani) which is theoretically inadequate to ensure water quality of the river and the aquatic habitat.

Changes in water quality:

Loss of vegetation buffer on both the edges of the river has led to change in DO, BOD, TDS and increased FC in the river water.

Riparian condition:

The riparian edges in both the cases are below reference levels indicating severe degradation and excessive human interference. Anthropogenic activities like grazing, discharge of polluted water, deforestation, water drawing from the river, loss of essential riparian buffer, mining etc. are seen in the riparian zone. As a result, riparian edges have heavily degraded and eroded.

Livelihood change assessment results

Livelihoods common in Hoshangabad and Barwani historically present were agricultural landlords and tenants, tribal agriculture; farm labourers, grass and fodder sellers, fuel wood sellers, charcoal makers, sellers of plant beads jewellery, oil pressers, floriculturists, fishermen boatmen, *Shivling* sellers, shoe makers, leather workers (*Charmkar*), cotton and silk weavers, jaggery makers, gatherers, potters, lacquer bangle makers, cattle rearers, rope makers, iron smiths, bell metal craft workers, sericulturists, cotton ginning workers, leaf plate makers, tobacco pipe makers, broom makers, wheel makers. The common livelihoods which were not found in the survey (2018) in Hoshangabad and Barwani were tobacco pipe makers, brassware makers, sellers of plant beads jewellery, sericulturists, grass rope makers, wheel makers, iron smiths, sellers of plant beads jewellery, oil pressers and lacquer bangle maker. 40 percent of the total respondents (both Barwani and Hoshangabad) recorded decrease in income they are mainly leaf plate makers, bamboo basket makers, potters, gatherers, fishermen, 45 percent informed the income is usual (cultivators, carpenters), while 15 percent of the respondents informed increase in household income (weavers and block printers). From the lost livelihoods or negatively impacted livelihoods it can be deduced that ST, SC and OBC representing aboriginal population were engaged in diverse traditional livelihood activities and have been impacted more than other communities by livelihood changes. In the riparian landscape out of 25 livelihood types only 15 are present while 10 other livelihoods are concluded to be lost. Plains historically had 26 different livelihoods out of which only 8 types of

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livelihoods were found in the survey. In hills there were 21 livelihoods present traditionally, in the survey 10 livelihoods were found.

Respondents in ST (100 percent) and SC (65%) were traditionally involved in gathering, rope making, (30*) bamboo basket making, traditional agriculture, (27*) sericulture, leaf plate making, bamboo basket makers, gatherers. In 97 percent of the traditional livelihood activity women male households had separate role and they were engaged in the livelihood process. In case of upscaled livelihoods it was observed that men folk are more involved as compared to the women counterparts.

Reduction in tertiary income from collection of fruits, leaves etc. due to reduction of forest cover was recorded from the respondents.

The maximum number of traditional livelihoods are dependent upon socio ecological patches of forests, followed by grasslands, rivers, homesteads and farms. Change of livelihood in 6 out of 14 and change in practice of livelihood was observed in 8 livelihoods. The causes of livelihood loss apart from change in flora resource identified from the focus group discussions which have affected the 12 livelihoods in order of their significance are (1) Lack of natural raw materials; (2) lack of knowledge and interest to pursue to traditional livelihoods in new generation; (3) competition from mechanised alternatives; (4) attitudinal shift
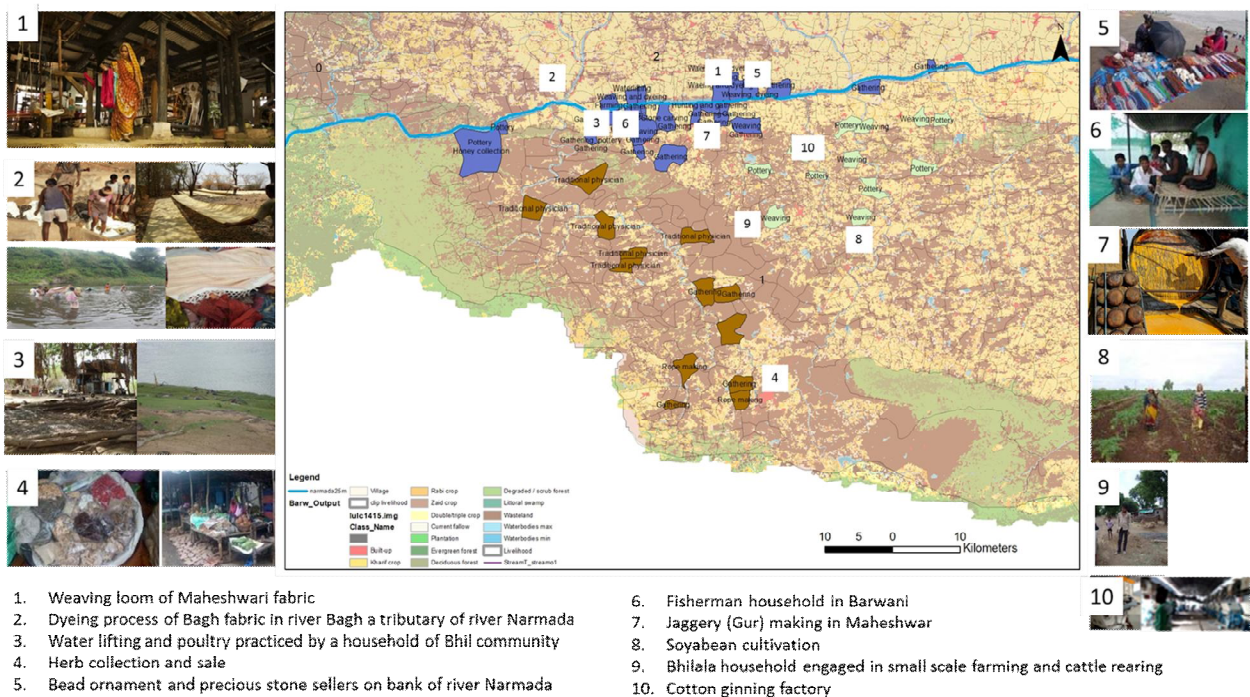
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1. Weaving loom of Maheshwari fabric
2. Dyeing process of Bagh fabric in river Bagh a tributary of river Narmada
3. Water lifting and poultry practiced by a household of Bhil community
4. Herb collection and sale
5. Bead ornament and precious stone sellers on bank of river Narmada
6. Fisherman household in Barwani
7. Jaggery (Gur) making in Maheshwar
8. Soyabean cultivation
9. Bhilala household engaged in small scale farming and cattle rearing
10. Cotton ginning factory

Fig.2. Traditional livelihoods of Hoshangabad district and Barwani district.

1. Lacquer toy cluster in Budni in Hoshangabad
2. Rope making in Itarasi
3. Bamboo craft in Pachmarhi
4. Wheel making
5. Walking stick making in Pachmarhi

6. Tobacco clay pipe in Sohagpur
7. Brassware manufacture in Sohagpur
8. Iron plough making, 9. Weaver Clusters
10. Mint if silver and gold coin
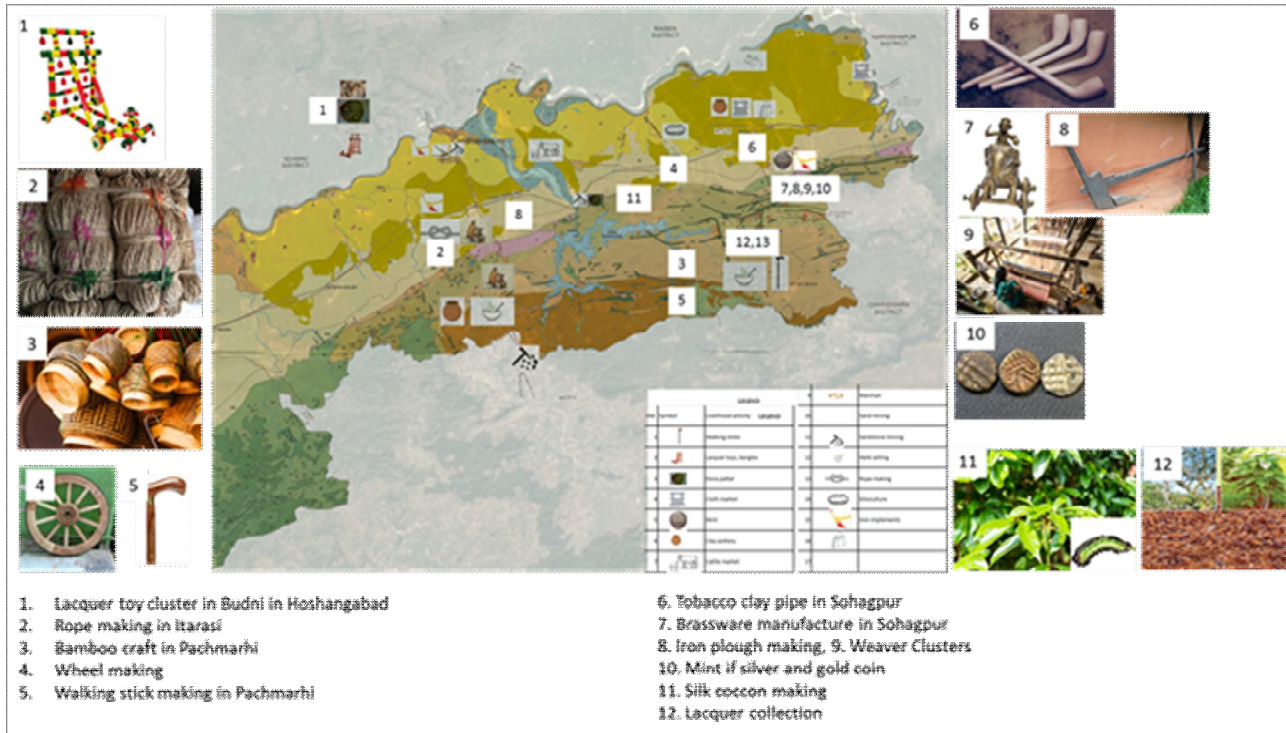11. Silk coccon making
12. Lacquer collection

Table 1: Overall changes in traditional livelihoods in various landscape zones of study districts of Hoshangabad and Barwani

	Case study villages in Hoshangabad district	Case study villages in Barwani district
Outcomes of historicity study Total number of livelihoods found in Gazetteers (1900-1906)	28	24
Total number of livelihoods found through survey 2018	11 (40.74% of overall livelihoods found in gazetteer)	12 (50% of overall livelihoods found in gazetteer)
Riparian (number of livelihoods found in Gazetteers)	26	20
Plain (number of livelihoods found in Gazetteers)	11	11
Hills (number of livelihoods found in Gazetteers)	11	11
Of the livelihoods identified from gazetteers how many are found in each zone		
Riparian zone	11	11
Plains zone	4	3
Hills zone	11	7

Of the livelihoods identified from gazetteers how many are lost in each zone		
Riparian zone	16	13
Plains zone	21	12
Hills zone	8	4
Livelihoods on the verge of being lost in each zone	5	5
Total livelihoods lost in each district	15	11

Compare the two kinds of changes and make conjectures

1. Household survey revealed that 80 Percent respondents practiced agriculture presently. Spatial analysis indicated approximately 400 Percent increase in agriculture zone in both the study districts. From these two observations it can be conjectured that modern agriculture has become the dominant livelihood activity in the study region.

2. From the household survey it was found that the maximum number of traditional livelihoods (20) are dependent upon socio ecological patches of forests (13), followed by grasslands (4), rivers (4), homesteads (4) and farms (2). Landscape changes in terms of biodiversity loss, changes in landform, depletion of groundwater was recorded from household survey and rapid visual survey. From these observations it can be conjectured that loss of biodiversity and detail of socio ecological patches has affected the traditional livelihoods.

3. The household study indicated that among all the livelihoods (32) in both study districts 21 are flora dependent, 6 are fauna dependent, 4 are water dependent, 7 are soil dependent. Of the lost livelihoods 6 are flora dependent and 3 are soil dependent indicating maximum loss in flora dependent livelihoods followed by soil. The landscape changes indicated reduction in forest cover as compared to 1905 in study districts, increase in agriculture area and increase in area of wastelands. The micro landscape also indicated overall reduction of flora coverage and diversity. Maximum changes in biodiversity were observed in plains leading to maximum loss of livelihoods, followed by riparian and least in hills. Maximum number of households and livelihoods (16 from historicity study and 12 from focus group discussion were found to be dependent upon specific flora species) had been impacted due to changes in forest cover and local biodiversity; it can be concluded that biodiversity degradation has impacted traditional livelihoods. As observed in opinion surveys, overall landscape change and rapid landscape surveys revealed changes in the biodiversity of traditional socio ecological patches in riparian landscape has impacted maximum traditional livelihoods. Thus, it can be concluded that changes in micro landscape elements indicate changes in biodiversity and landform leading to overall changes in biodiversity and landform. From these two inferences it can be conjectured that the changes of socio ecological patches could have negatively impacted livelihoods.

4. Reduction in tertiary income from collection of fruits leaves etc. due to reduction of forest cover indicate loss of native species and biodiversity in villages.

5. Livelihoods which have less adverse effect on the environment include tribal farming, plantations of banana and sugarcane, fruit sellers, tribal hunters, small tea stalls.

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6. Rapid landscape survey revealed an increased number of industries in the riparian zone. The historicity study had indicated traditional livelihoods in their original form depended entirely on natural raw materials. So, from these observations it can be concluded that the traditional livelihood process was more sustainable with biodegradable products however the modified processes might likely impact air, soil and water. Further it was found that traditional livelihoods were dependent on local resources and do not affect nearby environment adversely, however in large scale production the factories are likely to release toxic chemicals and utilise energy and water resources.

Table 2: Natural resource dependence of various livelihoods identified in study districts

Hoshangabad	Flora dependence	Fauna dependence	Soil Dependence	Water dependence
Livelihoods in Gazetteer	13	4	6	5
Livelihoods found in survey	7	2	0	4
Livelihoods lost and their dependence on resources	9			2
Livelihoods negatively impacted and found in survey	5	1	0	1
Barwani	**Flora dependence**	**Fauna dependence**	**Soil dependence**	**Water dependence**
Livelihoods in Gazetteer	13	4	6	23
Livelihoods found in survey	7	2	0	11
Livelihoods lost due to resource loss	9			2
Livelihoods negatively impacted and found in survey	5	1	0	1
Overall	**Flora dependence**	**Fauna dependence**	**Soil dependence**	**Water dependence**
Livelihoods in Gazetteer (27)	22	5	8	3
Livelihoods found in survey (15)	14	5	4	11
Livelihoods lost due to resource loss	10	3	6	2
Livelihoods negatively impacted and found in survey	5	1	0	1

Confirm the conjectures with the opinion of the residents through 'focus group discussions.

Focus points for focus group discussion (FGD) were decided. Views of people engaged in existing 31 livelihoods were recorded and transcribed for assessment out of which axial coding of 13 selected livelihoods was done.

The results indicated the preference of the young generation to practice other livelihoods from their traditional livelihoods. This was observed in 10 out of 13 livelihoods studied. The new livelihood in most of the cases (7 livelihoods) was found to be agriculture. From these observations it can be concluded that modern agriculture has led to loss of other traditional livelihoods and agricultural activity has negatively impacted other traditional livelihoods of the region, maximum in plains, followed by riparian zones and least in hill zones.

Loss of vegetation cover and biodiversity of the socio ecological patches in the study districts could has led to loss of necessary raw materials required to carry out traditional livelihoods such as leaf plate makers (Butea superba, bamboo), rope makers (grasses), wooden stick makers (hardwood varieties), lacquer bangle makers and sericulturists (Butea Monosperma and Schleichera oleosa), (10) lacquer toy makers (Wrightia Tinctoria and Schleichera oleosa), (31) walking stick makers and bullock cart wheel makers (Hardwickia binnata), Phoenix sylvestris (broom makers), weavers, dyers (Anogeisssus latifolia, Terminalia bellarica). It can be further inferred that amongst all dependent livelihoods the flora dependent livelihoods are maximum affected as compared to other livelihoods. that this population has been majorly affected by landscape changes especially the aboriginal population of the hilly landscapes of the study districts. Since maximum number of livelihoods were dependent upon flora and maximum loss of flora cover was observed it was conjectured that loss of flora cover and diversity has led to loss or negatively impacted traditional livelihoods. Since, this kind of studies contribute to future management of landscapes considering their unique requirement, it was also studied whether a scheme of the government related to large scale plantation along the river actually conformed to either the need of the dependent livelihoods or the need of recovery of plant species which are fast reducing. From the study it was found that current afforestation schemes of riparian landscape have not considered the need of flora requirement of various livelihood communities. The conjectures were confirmed with the findings of focus group discussions.

From the focus group discussions, it was found that out of 11 livelihoods surveyed in Hoshangabad and 12 in Barwani the traditional livelihood process 4 in Hoshangabad and 6 in Barwani has changed. Two types of changes were observed namely, 1. Upscaling, 2. Replacement of natural raw materials. Up-scaling of traditional livelihood in the form of textile industry, sugar factory, tile factory, brick making kilns, mono cropping is seen in the study areas which has led to landscape modification and subsequent loss of other traditional livelihoods. This was observed in 9 livelihoods (cotton ginning, agriculture, sugar processing, weaving, pottery, leaf plate making, bangle making and rope making). Traditional livelihoods such as weaving and dyeing, cotton ginning, lacquer toy making have adapted resource replacement by utilising synthetic alternatives (chemical dyes and paints), which are likely to pollute the water and soil. The changed livelihood activities or adaptation to synthetic raw materials is leading to environmental pollution (air, water and soil) in 7 livelihoods out of 14. Resource adaptation to synthetic alternatives indicates absence of raw materials in neighbourhood villages which is likely to pollute the environment. From this observation it can be thus concluded that loss of natural resources has either led to replacement of natural raw materials from synthetic raw materials or complete loss of livelihood.

Conclusion

From the above interpretations it can be concluded that the traditional socio-ecological patches of riparian landscape of River Narmada have lost diversity over time and consequently a large number of long-standing traditional livelihoods of some of the resident tribes and people of lower social hierarchy have been lost in recent past. The current practices of landscape management undertaken in the riparian landscape of the basin do not take this into consideration and at the same time the traditional livelihoods in the context of landscape resource loss, have switched over to other raw materials thereby leading to loss of sustainability. Future research could perhaps look into morphological study and documentation of the socio landscape patches for the full stretch of the Narmada River for preparing a complete picture and derivation of challenges in its riparian landscape conservation and management. Similar studies can be undertaken for other major rivers. Also, future studies could lead to understanding how ecologically diverse patches in the selected districts that are of vital significance for production of traditional crafts be protected though regulatory framework and landscape management? The findings of the study can aid to develop suitable strategies and more sustainable landscape development proposals to revive traditional economies and retain socio-cultural and economic values of landscapes.

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