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Assessment of Natural and Anthropogenic Impact on Riverine Forest Using Analytic Hierarchy Process Model

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Abstract: Assessment of deforestation factor of riverine-forest; the multi-objective linear software design model considering both natural and anthropogenic parameters have been developed. The AHP model solves the difficult problem and the varied nature of conflicting objectives of the problems. This systematic research is paying attention on defectively area of Riverine forests using the analytic hierarchy process model which gives qualitative and quantitative judgment and ranking of the multi- causes, problems and affected Alternatives due to criteria. The integrated criteria have been derived from field survey data and specialist assessment; the Analytic Hierarchy Process (AHP) is used for weight of conflicting objectives.

Keywords: Analysis deforestation; Analytical Hierarchy Process; Riverine Forest Sindh; hierarchical model;

1. INTRODUCTION

The analytic hierarchy process (AHP) is a decision making model, that supports on human psychology and mathematics algorithm; integrate a single source of analytic hierarchy process model used for ranking of criteria and alternatives. This technique is applied for risk management, hazard assessment, industry- technology and engineering etc. As a result, it is broadly used for (AHP), mathematical model for dynamic approach to resolve large number of complex problems of real world (William. 2007 and Vaidya, *et al.,* 2006). The forests of Sindh province have exclusive precipitation and subordinate- tropical site. These Riverine-forests prior to World War II were approximately completely occupied with special multiplicity of foliage. Reduction of Riverine-forests has been emerged because of unnecessary cut down of forests for development of army application system and railways in the period of Second World War (Abbasi H. U, *el at.*, 2011). Riverine forests are significant natural source and these forests require management and safety from local and worldwide enemies, Riverine-forests are a model of ecology, biodiversity and other environmental significance (Bhatti, *et al.*, 2000, and Sheikh, 2000).

2. Study Area

The Riverine forests width is about 4 to 6 kilometers and length is too long about 855 kilometer, it starts form Guddu barrage to Arabian Sea and inside the banks of Indus mostly the areas are coved with forests and total area of Indus river belts is 1,861,571 Acres shown in **(Fig. 1a-c)** (Siddiqui, *el at.*, 2004). The environment condition of the region is sub-tropical nature; it is contended of warm summers and waterless winter. The yearly rainfall is about 100 to 175mm. July and August are the precipitation months (Shah, 2000). Indus forests are indispensable safe heaven for a large number of mammals and reptiles predominantly Hog deer and other animals like "partridges, wild boars, jackals, sand grouse, wolves, porcupines etc" (Fund, 2008). The majority of significant species of plants are "Acacia nilotica Prosopis spicigera, Prosopis glandulosa, Tamarix *dioica Desmastachya bipinnala Calotropis Procera,"* etc. (Abbasi H. U, *el at.*, 2011).

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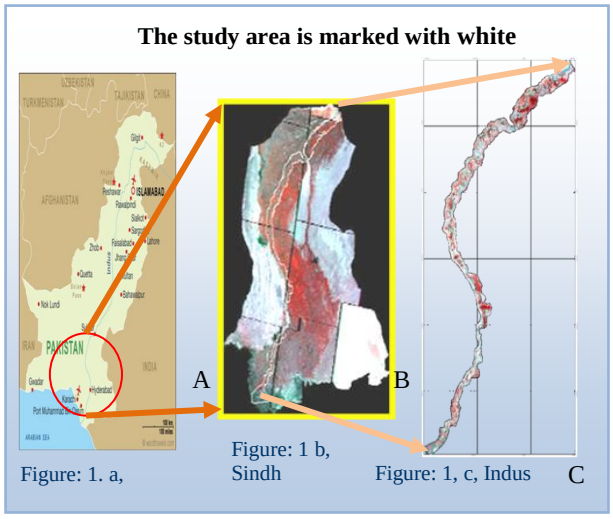
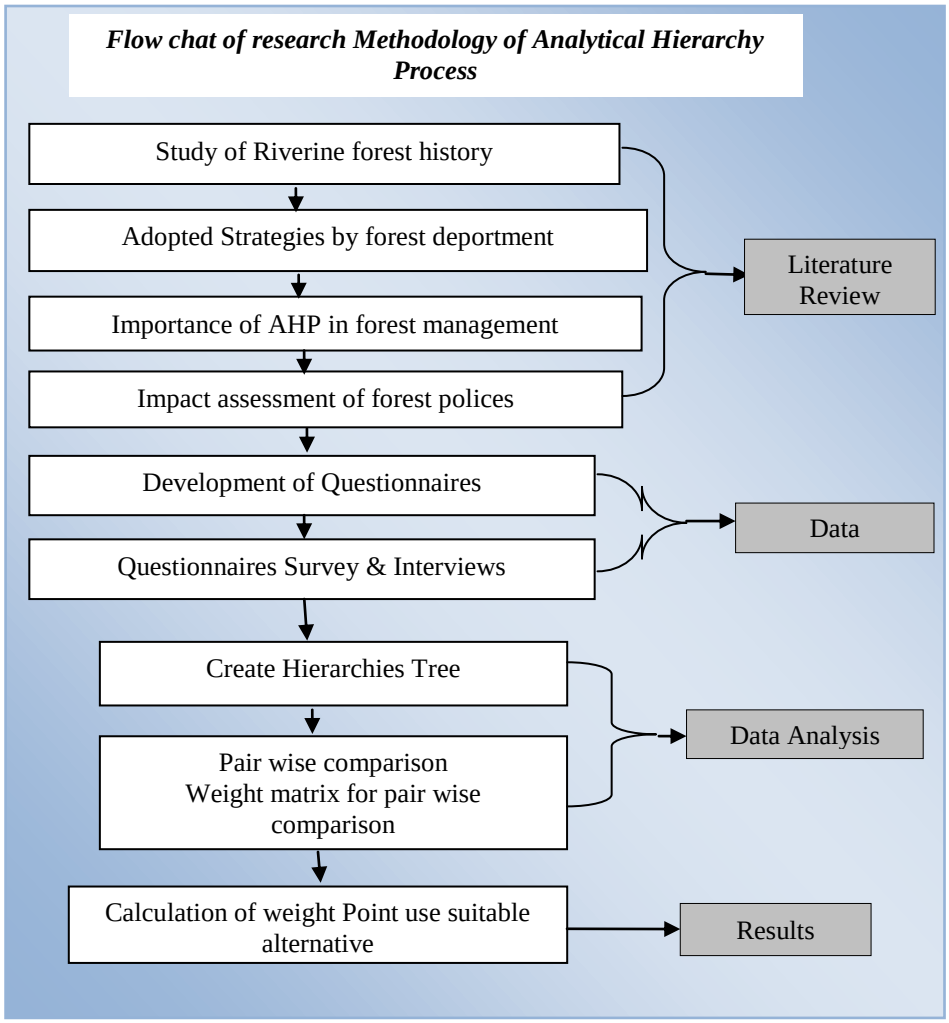


Fig. 1, Study Area,

3. MATERIAL AND METHODS

Study areas of Riverine forests were enclosed in ten criteria and seven alternatives were developed in AHP model and the analytic hierarchical process model was divided into 3 levels, top level of hierarchical model explains the goal; and 2 level illustrate the criteria and 3 level shows the alternatives into a hierarchy model. The systematic evaluation of various elements by comparing criteria and alternatives into a hierarchy **(Fig. 2)**, finally, weights were assigned to the criteria and alternatives in order of relative importance to the main objective and criteria were compared using pair wise comparisons, similarly alternative compared according criteria using Saaty's scale of comparative judgments with help of Expert Choice (EC) software (Ernest *el at.*, 2001).



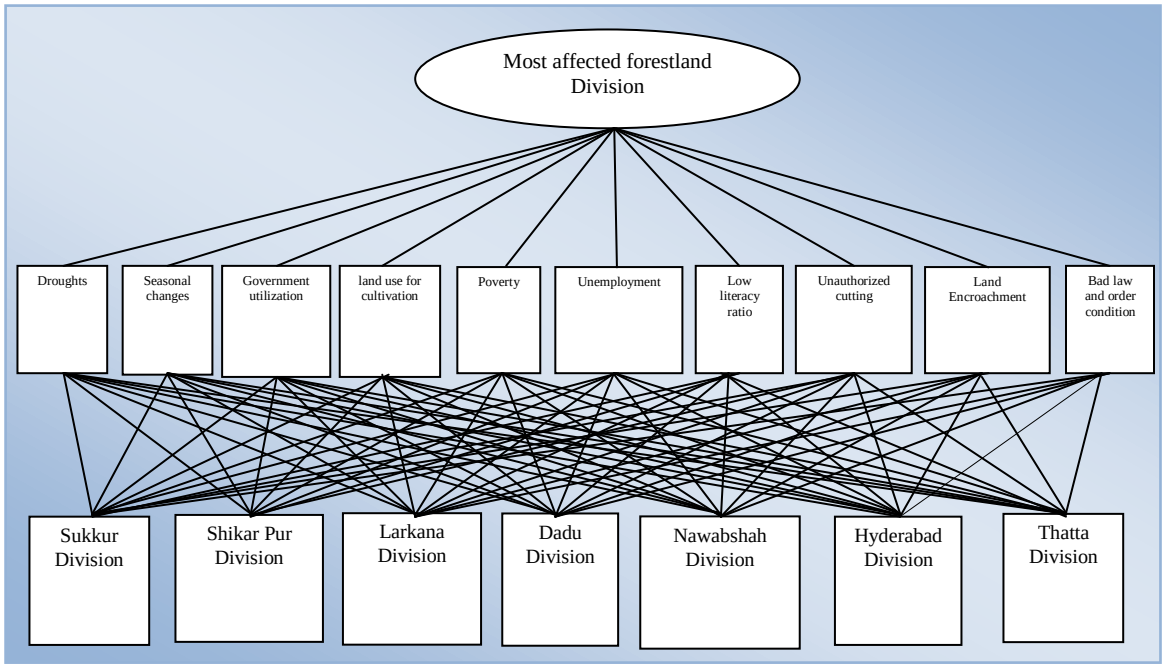


Fig. 2, Hierarchical structure of the Riverine forests for goal, criteria and alternatives, the goal is most affected forests land division, the criteria are droughts, unauthorized cutting, poverty, unemployment, low literacy ratio, government utilization, land encroachment, bad law and order situation, land use for cultivation, and the alternatives are divisions Thatta, Shikarpur, Sukkur,

AHP Model developed on Indus River basin, from left side is alternatives and from right side show the criteria.

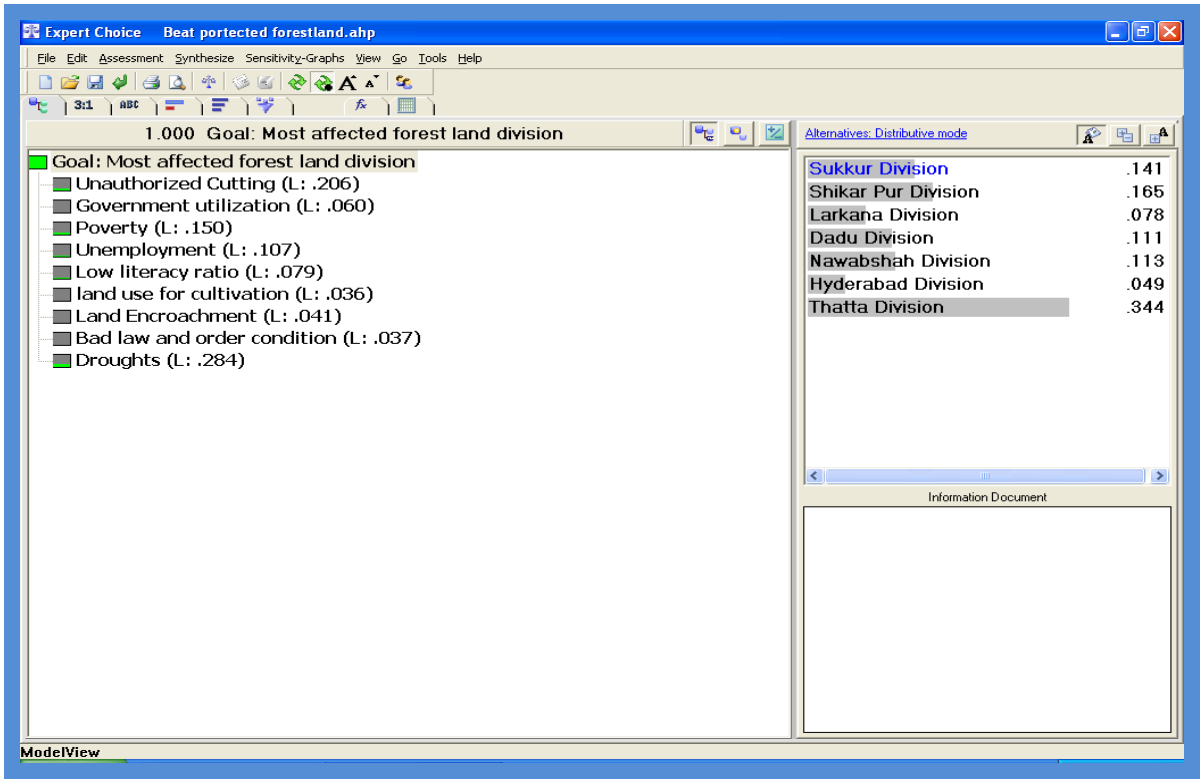


Fig. 3: AHP model input

4. RESULTS

Analysis of deforestation of Riverine forests has been prioritized by AHP model, based on the consequences of the research associated to Riverine forests atmosphere and anthropogenic assessment. The seven alternatives were selected and were prioritized based on the judgment of five hundred residential people as well as specialists through appropriate questionnaires used with ten criteria. The significant statistic data has been controlled through sensitivity analysis shown in **(Fig:4.5.6).** The inconsistency ratio (CI) related to questionnaires was established, the results verify that drought has maximum precedence than other criteria shown in **(Fig. 4),** and Thatta division is on high risk between other alternatives shown in **(Fig. 5).** The research has accomplished that a bigger center of attention is required on Thatta for protection (Tan, *el at.*, 2010).

4.1 Criteria priorities factors of Riverine forests

The outcome shows it the mainly impacted cause is drought and an inconsistency index CI = **0.09** which is acceptable.

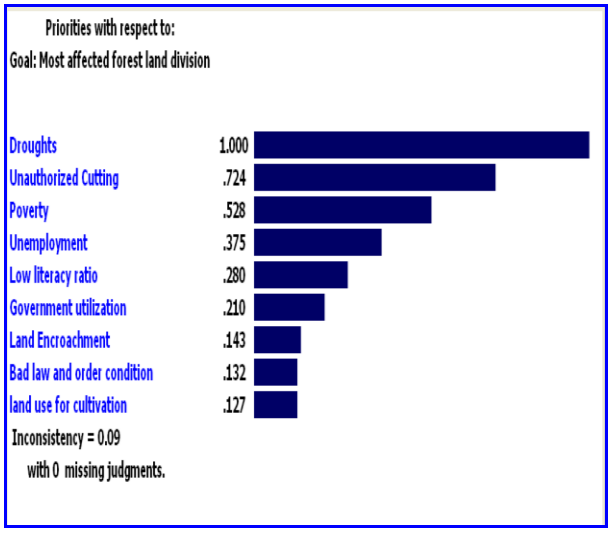


Fig. 4, Criteria priorities,

4.2 Alternatives priorities of most affected forest land division

The Alternative priorities of Riverine forests division the essential outcome alternative is Thatta division and an inconsistency ratio **0.09** which is acceptable.

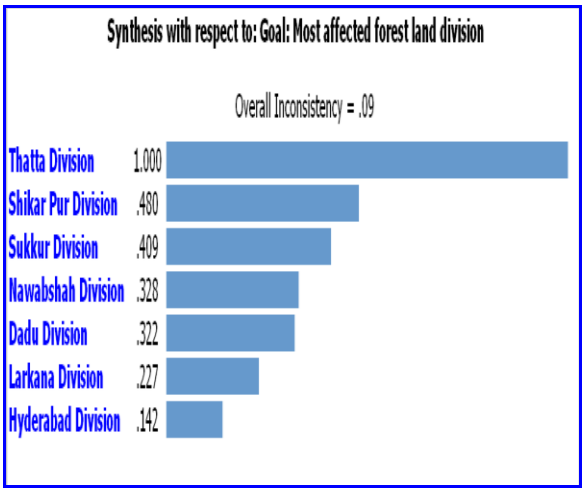


Fig. 5, Alternative priorities related to goal,

4.3 The Sensitivity Analysis with Respect to Goal

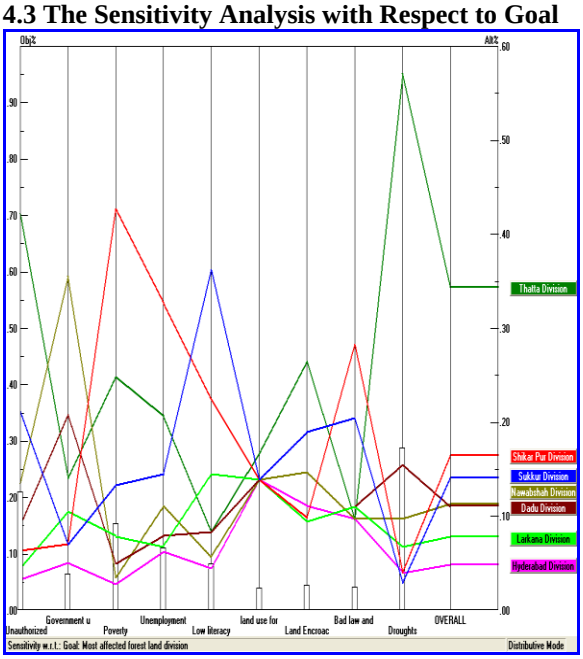


Fig. 6, Sensitivity Analysis result,

4.4 Recommendations and Mitigation

This research work has also discovered that reeducation in natural floods and manmade mismanagement of Riverine forests mainly in the lower stream Kotri has been facing shocking circumstances. The decline in flood, marine hard water has come into 50kilometers into river basin

1.
2.
3.

which produces ecological, climatic dilapidation which is the major reason of forests depletion in Thatta region. Because large scale of erosion of the river Delta, the marine hard water has occupied sweet water area of river. Hence the study finding recommends the administration must construct a barrage at "KHARO-CHAN" to trap ocean hard water in period off-season by sealing the gate of barrage to avoid interruption of ocean hard water.

5. CONCLUSION

The deforestation in Riverine forests has been prioritized using Analytical Hierarchy Process (AHP), based on the results of the studies related to forests environment evaluation; the relevant data were controlled through sensitivity analysis and Inconsistency rate 0.09 these results proved that drought is dominated factor and drought is 54% reasonable for deforestation of Riverine forests that is on highest priority criteria and Thatta division is maximum affected due to drought as comparative to other. Hence, it can be concluded that a greater focus is needed on Thatta for protection.

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