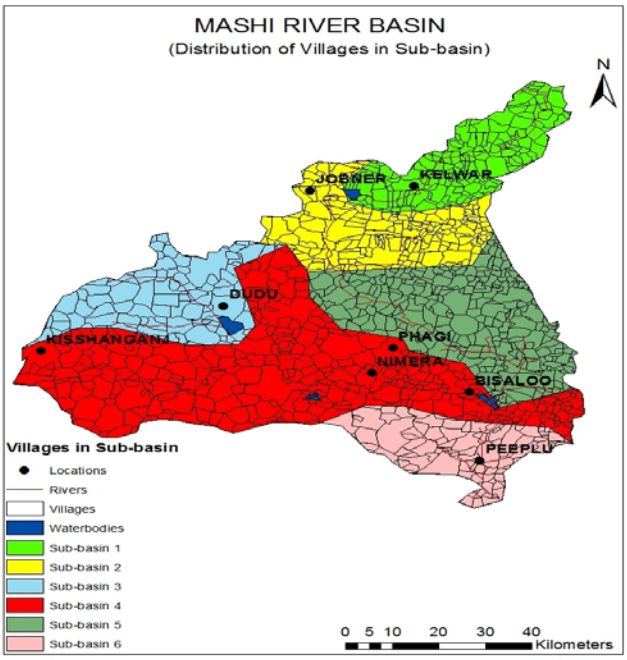
NARURAL RESOURCES MANAGEMENT IN MASHI RIVER BASIN

STAKEHOLDERS CAPACITY BUILDING TRAINING MODULE

Domestic Water Users, Farmers and PRI Representatives



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I. INTRODUCTION

1.1 General Features of MashiRiver Basin

Mashi River Basin is part of the larger River Basin called Banas River Basin, which is located in the middle of the Rajasthan. There are 11 sub basins in Banas River Basin namely;Banas (1,174,039 ha), Dain (306,138.4 ha), Gudia (92,038.56 ha), Kalisil (62,308.94 ha), Khari (639,052.9 ha), Kothari (229,852.1 ha), Mashi (647,615.8 ha), Morel (572,250.7 ha), Sodra (151,942.2 ha) and Berach (830,788.6 ha). The catchment area including all upstream Major/Medium projects is 5,872.0 $Km^2$where as the differential catchment area (area excluding upstream catchment areas of Major/Medium projects) is 3,641.4 Km^2 and falls in Tonk District.

The Mashi River Basin area falls in three districts namely Jaipur, Ajmer and Tonk Districts. The two main tributaries of Mashi River are, namely Bandi and Mashi, which originates from the hills of Samod and Ajmer district respectively. Mashi River originates from the Silora hills about 6 kilometers south of Kishangarh Town in Ajmer district and passing through Phulera tehsil in Jaipur district. It flows initially in an eastward direction and then towards south for about 96 km in partly hilly and partly plain areas along the borders of Jaipur and Tonk districts between the tehsil of Malpura and phagi until it turns south to join the Banas River at Galod village near Tonk. The catchment of the Mashi River is located between latitudes 26°11 and 26°16' and longitudes 74°48' and 75°54'. It has got one tributary called Bandi. Bandi River the tributary of Mashi River originates from hills located in the North-West of Jaipur and passes through Kalwar town near Jobner and meets Mashi near Madhorajpura. These tributaries are fed by large number of small rivulets originating from the plains of tehsil Sanganer, Dudu, Chaksu, Malpura, etc. All of them are non-perennial rivulets.

The Figure 1 shows the automatically delineated catchment of Mashi Sub Basin is shown in Figure 1.

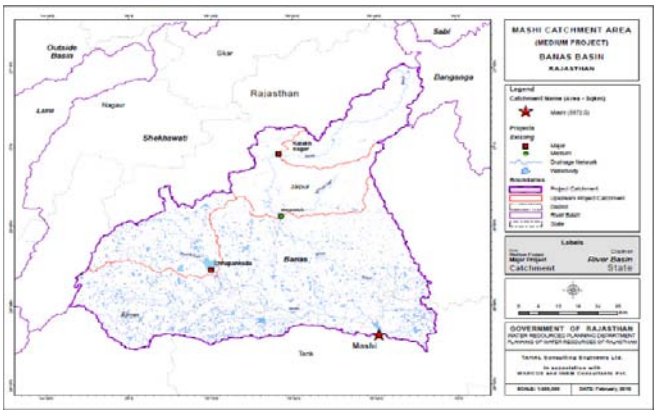

Figure 1: Automatically delineated catchment of Mashi Sub Basin

1.2 Water Management Issues in the Basin

- The soils of the region suffer variously in the different soil regions from excessive drainage, low water retentive capacity, moderate erosion by wind, and low fertility mostly in the upper northern part of the basin. Salinity, alkalinity, poor drainage accompanied moderate to severe erosion are the problem of the soils.
- Five hydrogeological formations viz; ***Younger Alluvium, Older Alluvium, Phyllite& Schist, Quartzite and BGC (Banded Gneissic Complex)*** are the main water bearing formation (aquifer) in the Basin.
- **Land Use**: The Cultivated area (including current and permanent fallow lands) accounts for 78.2 percent of total geographical area of the Basin. The forest area is around 3.6 percent and Barren/ un-culturable/ Wastelands 14.5 percent. Other categories are covering less than 5% area.
- **Surface Water**: The number of Water Harvesting Structures (WHS) constructed in with differential catchment is 3,087 with total water holding capacity is 112.23 Mm^3. Actual mean annual water yield to the Mashi sub basin is computed to be 203.95 Mm^3 (with all interventions).
- Rainfall occurs mainly during the monsoon season in Mashi Project catchment therefore, major portion of stream flow occurs only during these months. The annual dependable water yield at 50% is 59.6 Mm^3, while water yield at 75% dependability is 6.4 Mm^3 (13.3% of gross storage capacity).
- Major and Medium Projects: There are 3 upstream projects in Mashi sub basin catchment. The live storage capacity of these three existing upstream project in the Mashi Sub Basin catchment is 81.36 Mm^3.
- Minor Projects: There are 97 Minor projects in the catchment area of Mashi Sub Basin with total live storage capacity of 90.64 Mm^3. There are large numbers of minor projects constructed in the catchment of Mashi Dam capacity of which exceeds its design yield which may have substantial impact on inflow to project.
- **Groundwater:** Groundwater availability for long-term exploitation, clear of any current state of overdraft is the basic element. Since it is a derivative of rainfall, the dependability level of such rechargeable 'dynamic' groundwater availability relies on the statistic occurrence of precipitation. The total net annually assessed groundwater resource in the Mashi Basin is 2586.29 Mm^3 and groundwater draft 3497.64 Mm^3. The stage of groundwater development in the basin is 135.24 % and the basin is categorized as overexploited basin.
- Groundwater Quality: The groundwater quality in the Mashi Sub Basin has been reported with reference to selected parameters, namely, concentration of Chloride, Fluoride, Nitrate and EC value.
- The average chlorides concentration was relatively stable and ranges from a minimum of 175 mg/l to a maximum of 474 mg/l during the period of 1984 - 2010.
- Fluoride concentrations are above the upper permissible limit for drinking water in most of the basin's area. The 100% non-potable water area belongs to quartzite aquifer unit in Mashi sub basin.

- The average nitrates concentration ranges from a minimum of ~25 mg/l to a maximum of ~267mg/l during the aforementioned time period 1984 – 2010. The concentration rose from a value of ~41mg/l during 1984 to a value of ~100mg/l during 2010, a total rise of ~144% within 27 years. The average nitrate concentration is between the desirable and maximum allowed concentrations for drinking water (45 mg/l and 100mg/l, respectively); nevertheless, the last average value (2010) is very close to the maximum allowed limit. Most of the area in the basin is affected by nitrates ion concentrations above permissible concentrations.
- Encroachments in the riverbed and rivulets
- Sand mining
- Industrial pollution

There are numerous problems of water resources i.e. of availability, distribution, equity in access, quality, competition in usage, water pollution, encroachment on water bodies and catchment areas, ownership and right issues, etc. It is for this reason that this basin was selected to attempt a new model of water resource management. Also the State Government has enacted a River Basin Act without much understanding the implication of it in terms of governance of water. The proposed River Basin Parliament may help in understanding and addressing the future water governance and management needs of the State.

II. CONTENTS OF STAKEHOLDERS TRAINING

The Hydrogeological Module will be common for all the stakeholders as full understanding has to be developed about the river basin and its geological and geohydrological characteristics. Stakeholders should be able to know about the water supply and demand and a perspective has to be developed on Integrated Water Resource Management with community participation.

The training will cover the following topics:

1. Introduction to basics of geology
    a. The earth system
    b. Introduction to maps
2. Physical geology and geomorphology
    a. Types of rocks
    b. Processes that shape the earth
    c. Drainage and landforms
3. Hydrogeology
    a. What is groundwater?
    b. What are aquifers?
    c. Types of aquifers
4. Measurement of weather parameters in groundwater resources investigations
    a. Why study weather?

b. Measurement of weather parameters
c. Weather station
d. Data collection

5. Hydrogeology-quantifying groundwater
    a. Aquifer properties
    b. Recharge-discharge and groundwater balances
    c. Movement of water in a watershed
    d. Movement of groundwater
    e. Groundwater exploration
6. Groundwater quality and groundwater resources management
    a. Groundwater chemistry
    b. Sampling procedures and analysis
    c. Interpreting groundwater quality
7. Managing groundwater resources
    a. Groundwater problems in India
    b. What is groundwater management?
    c. Groundwater legislation

8. Groundwater in agriculture
    a. Introduction to groundwater resources in agriculture
    b. Cropping and irrigation

9. Hydrogeology and Sanitation

10. Water Availability and Water Budgeting

11. Water Balance Modeling

12. Water Pollution and its Consequences

13 Impact of Climate Change on Water Resources

The training will include interactive class-room sessions and Field visit in Mashi basin area to identify and discussed issues and solutions with the people.

Training material will be provided to each participant.