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An Over look on Watershed Management with a case study of Ganderbal Watershed, Kashmir, India

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ABSTRACT

Land and water management is increasingly being based on watersheds, and the watershed, or integrated catchment, approach has received wide acceptance for implementing projects for the improvement of water quality. The watershed approach is being promoted as a means of bringing about environmental improvements, particularly at scales that require changes by multiple landholders. This paper provides an outline of the implementation of watershed programs in the Jammu and Kashmir, with particular reference to examples in Ganderbal District. Watershed implementation projects have in-built evaluation activities to monitor progress in terms of farmer participation and effectiveness of their participation. Outcome evaluations in terms of impacts on water quality are much more difficult, generally long term, and expensive.Conflicts are increasing over shared water resources between agriculture, industry, and urban domestic use as well as between State governments. Sustainable water management is thus crucial for economic development and livelihood of the people. Watershed management is necessary for the sustainable protection of natural resources and environmental health. Watershed management, which recognizes the hydrologic (water) cycle as the pathway that integrates physical, chemical and biological processes, is an important approach to achieving the goal of a sustainable environment. Watershed management projects are usually initiated in response to issues and concerns around existing environmental health, proposed land use practices, land use management or restoration demands.

Keywords- Ganderbal, Integrated Watershed Management Programme , Sustainable Development, Watershed Development

1. INTRODUCTION

Watershed is an area of land that contains a common set of streams and rivers that all drain into a single larger body of water, such as a larger river, a lake or an ocean. Watersheds come in all shapes and sizes. They cross county, state, and national boundaries. Small drainage basins generally contribute to streams, while the water from larger drainage basins come together to form large rivers. All India Soil and Land Use Survey 1990 has

divided India into 6 major water regions,35 river basins, 112 catchments, 500 sub-catchments and 3237 watersheds. It is the process of creating and implementing plans, programs, and projects to sustain and enhance watershed functions that affect the plant, animal, and human communities within a watershed boundary. In spite of sufficient rainfall, people have to depend upon tankers for their domestic water supply in summers in most of the areas. This is mainly due to large runoff which is responsible for water loss as well as soil loss of the land.

The raindrops, when flowing along the slope, carry the loose soil along with it. In this case the topmost layer of soil is lost rapidly. Due to high intensity rainfall, it is estimated that, more than 100 tons of soil is lost .The techniques used to avoid this soil and water loss are one of the best techniques of watershed development. Watershed Development program is a revolutionary program aimed at fulfilling the water needs in the water scarce areas. If we take steps to encourage each drop of rainfall to penetrate in the ground at the point where it strikes earth, it will result in addition of one drop to our useful water supply and subtraction of one drop from a potential flood. It is the management of each raindrop falling on the ground. In areas where there is inadequate water supply watershed management offers an ideal solution.

Research to support watershed projects can be identified and established at the planning phase. The planning stage involves the application of scientific knowledge such as the interpretation of routine water quality monitoring data, GIS and other geographic tools, determination of target reductions of pollutant loads to water bodies, identification of priority problem areas, and the assessment of the technical feasibility of objectives. These subjects also provide research agendas for general application for watershed activities.Once implementation gets underway scientific input may be arranged through a scientific support group within the management of the watershed project. This may lead to increased relevance of the scientific, social and economic research to the particular watershed improvement activity.

1.1 Principles and Components of Watershed Management:

Core Components :

a. Soil and water conservation measures such as contour and graded bunds, terraces, check dams and vegetative barriers.
b. Water harvesting structures.

Alternate land use for non-arable lands like afforestation and pasture development. The main principles of watershed management are:

1. Utilising the land according to its capability.
2. Conservation of maximum possible rainfall at the place it falls.
3. Putting adequate vegetal cover on the soil, to prevent soil erosion.
4. Draining out excess water with safe velocity and storing it in ponds etc. for future use.

5. Maximising productivity per unit area per unit time per unit of water.
6. Preventing gully formation.

Related Components:

1. Improved production practices like contour farming, mulching, improved crop varieties etc.
2. Horticultural Plantations.
3. Aqua- Culture
4. Animal Husbandry

Objectives of Watershed Management :

1. To control damaging run-off.
2. To protect, conserve and improve land resources.
3. To moderate floods in down-stream area.
4. To conserve rain water.
5. To increase ground water recharge.
6. To utilise natural resources for improving agriculture and allied occupations so as to improve the socio-economic condition of the beneficiaries.

In the water shed approach the development is done on both arable and non-arable lands starting from the highest point to the area of the outlet.

1.2 Watershed Management Programmes :

The following major watershed management programmes are being carried out by the Central and State Governments in India:

1. Drought Prone Area Programme
2. Desert Development Programme
3. National Watershed Development Programme for Rain-fed Agriculture
4. World Bank Assisted Integrated Watershed Development Project

1.3 Approach to Watershed Management :

a. Delination of Watershed :

It is necessary to have a watershed frame for planning and development purpose of watershed. This will involve implementation of measures on barren hill slopes, marginal lands, private agricultural lands and severely eroded streams and river courses for which a national level watershed frame work is required. All India Soil and Land

Survey Organisation have attempted an orderly national level delineation and codification of watershed and came out with 5-stage hierarchical system consisting of:

i. Regions : Area= above 300 lakh hectares
ii. Basin: Area= 30-300 lakh hectares
iii. Catchment: Area= 10-30 lakh hectares
iv. Sub-catchment: Area= 1-10 lakh hectares
v. Watershed: Area= 0.5-2 lakh hectares
vi. Sub-watershed: Area= 0.1-0.5 lakh hectares
vii. Milli-Watershed: Area= 0.01-0.1 lakh hectares
viii. Micro-watershed: Area=0.001-0.01 lakh hectares
ix. Mini-watershed: Area= 0.0001-0.001 lakh hectares

The most appropriate area of micro-watershed for development at field-level is 500 ha.

b. Priority Delineation of Watershed :

The constraints of finance, technical man-power and infra-structure limit the practical magnitude of development plan. Priority approach provides maximum out-turn per unit area. Problem intensity is to be assessed by State or Central Soil survey Organisation as under:

i. Development Potential
ii. Technology available for selected area conditions
iii. Likely catalytic effect-Peoples Participation
iv. Accessibility
v. Investment needed and finances available
vi. Infrastructure availability

1.4 Some Examples:

i. Area yielding maximum silt loads to be identified in the catchment.
ii. For Flood Control- Areas contributing maximum runoff identified.
iii. Areas with salinity and alkalinity problems should be selected for reclamation purposes.

1.5 Steps of Watershed Management :

i. Recognition Phase: Recognition of watershed problems, there causes and the development alternatives for them, which is done by conduction various surveys:

a. Soil Survey

b. Land Capability Survey

c. Agronomic Survey

d. Forest Lands under permanent vegetation survey

e. Engineering Survey Economic Survey

ii. Restoration Phase:

This covers selection of best measures and their application in the watershed management. Including both biological and engineering measures.

iii. Protection Phase:

The general heath of watershed is taken care of and its normal working is ensured.

iv. Improvement Phase:

The overall developments made during management of watershed are evaluated and attention is given to making improvements.

The upper reaches of the watershed usually consist of hilly areas. These areas have an undulating topography; often barren steep slopes and are foci to soil erosion. In these areas vegetation does not get established because of steep slope and severe soil erosion. The uncontrolled runoff from the sloping lands also causes excessive damage to the adjoining agricultural lands. So our objective must be increasing the time of concentration andthereby allowing more runoff to be absorbedand held in the soil profile and inttercepting a long slope in several shortones, so as to maintain less than a criticalvelocity for the runoff water.

2. Watershed Management Work Plan:

A watershed management work plan consists of following contents:

A. Basic information : Description of the watershed

i. Name of the watershed and general description of its characteristics bringing out any special problems of misuse of land and water resources.

ii. Name and code number of watershed.

iii. Aims and objectives of watershed management plan.

iv. Watershed Characteristics: Size, Shape, Relief, Slope and Drainage etc.

v. Climate

vi. Geology

vii. Soil and Soil Survey data

viii. Hydrologic data
ix. Sedimentation data
x. Vegetative cover
xi. Present land use
xii. Socio-economic conditions

B. Watershed problems and needs.

C. Recommended Management practices.

i. General description
ii. Arable lands: Biological or Vegetative measures , Agronomic measures, Engineering measures
iii. Non-arable Lands: Biological and Engineering measures, recommended inputs, water-harvesting structures.

D. Schedule of Operations:

i. General description of schedules
ii. Land use with treatment schedules
iii. Co-ordination with other departments

E. Maintenance and Repairs

F. Costs : Abstract and Operational Costs.

G. Sources of Finance

H. Benefits

I. Supplemantal information as appendices

J. Maps

K. Organisation

3. Need for Watershed Management in Jammu and Kashmir:

Jammu and Kashmir faces a string of water related issues. First, most of the lakes in the region, including the famous Dal Lake, have been pushed to the verge of extinction by excessive water pollution. Unplanned development in the city and poor sanitation has resulted in shrinking the Dal Lake to almost half its size. Second, and more significantly, the hydroelectric projects have had devastating environmental effects. India's Kishenganga Project, though currently embroiled, when completed, will submerge and inundate many parts of the beautiful Gurez Valley and displace more than 25,000 Dard Shin people, the natives, from their ancient homeland.

There are few ways that this issue can be addressed. One is by veering away from big hydroelectric projects that have massive human and ecological costs to smaller, community-based projects, and towards joint water projects between India and Pakistan. Another possible method is by enhancing the water availability in Jammu and Kashmir through a water management program. A pioneer example of this has been the Rajiv Gandhi Mission for Watershed Management, Madhya Pradesh (RGMWM). This programme was started in 1994 and has been extremely successful in the sustainable development of the area on a watershed basis. Watershed Management aims for the conservation of natural resources, an increase in agricultural productivity and an improved standard of living for the inhabitants. The process can include enhancing the supply, quality and drainage of water and the overall planning & utilization of watersheds.

The Mission was based on the assumption that people's livelihood insecurity in environmentally endangered areas could be addressed by involving them in the solutions. The programme has led to conservation of land and water resources in Madhya Pradesh (MP). The most significant tenet of this strategy, however, is the aspect of community participation, which provides the local inhabitants with a livelihood. Known as 'NirakhParakh', the strategy ensures transparency through direct community involvement. The activities undertaken and the processes adopted are identified and assessed by the stakeholders in the presence of the entire village and facilitators. The Program succeeded on various levels. One of the main achievements was the increase in cropped area in 46 of the 58 villages in MP. An increase in irrigated area was noticed in 38 of the 58 project villages. There was also a direct increase in employment opportunities, and appreciation of crop yield, land values and livestock.

The mission in the last eight years has grown to be the country's largest watershed management programme covering 7600 villages. It has completed work on over 14.8 lakh hectares of land and is targeted to cover over 34.38 lakh hectares. The watershed mission model started from MP and went across to Andhra Pradesh, Orrisa, Rajasthan and Haryana. Given the current water shortage in J&K, and the people's grievances against the damming of the place, watershed management could and should be a potential solution. The local government must explore this option and like MP, involve the Kashmiris in its implementation. It will give them the opportunity that has so far been denied to them, in managing their own natural resources.

According to the Waste Land Atlas of India 72.5% of the total geographic area of Jammu and Kashmir is waste land. So there is a huge scope of watershed management so as to render the land and resources useful. Given is the table and map showing the category wise distribution of the land in the state.

Table 1: Land use distribution in Jammu and Kashmir

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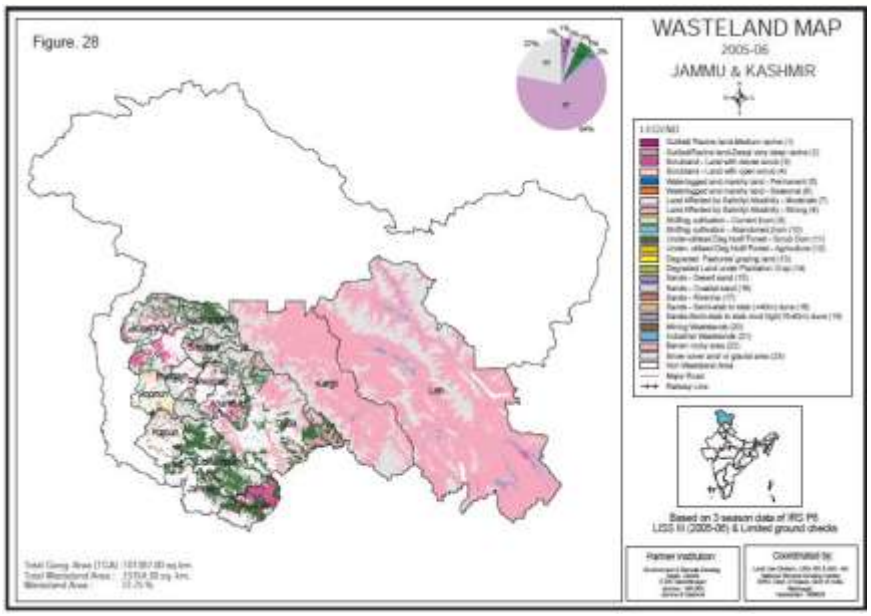


fig 1 : wasteland map of jammu and kashmir

4. CASE STUDY: Integrated Watershed Management Project-I, Ganderbal:

A. Basic Description:

Jammu & Kashmir is a state in India. The Kashmir Valley is surrounded by some of the highest mountain ranges in the world. The valley is located in the northern part of the Indian sub-continent. It is bounded to the northeast by the Uygur Autonomous Region of Xinjiang and to the east by the Tibet Autonomous Region (both parts of China) and the Chinese-administered portions of Kashmir, to the south by the Indian states of Himachal

Category	Anantnag	Badgam	Baramulla	Doda	Jammu	Kargil	Kathua	Kupwara	Leh	Pulwama	Poonch	Rajouri	Srinagar	Udhampur	Total
1	5.16	132.95	0.00	0.00	19.45	0.00	40.15	0.00	17.38	81.56	0.00	104.81	0.00	21.68	423.14
2	0.00	7.41	0.00	0.00	3.73	0.00	70.86	0.00	410.37	1.02	0.00	59.29	0.00	0.56	553.24
3	47.61	9.17	145.43	540.36	10.93	30.33	90.69	59.55	47.92	4.76	83.01	240.18	21.62	185.69	1617.25
4	82.19	14.91	86.27	704.91	53.39	175.41	107.84	36.96	518.38	7.40	115.29	175.60	27.02	175.11	2280.70
5	2.97	6.32	15.80	0.00	0.00	0.00	0.00	0.00	0.00	0.58	0.00	0.00	49.00	0.00	74.67
6	0.00	0.19	0.58	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.86
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.65	0.00	0.00	0.00	0.00	0.00	16.65
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	56.68	0.00	0.00	0.00	0.00	0.00	56.68
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	539.19	35.80	352.51	1552.46	180.47	0.00	191.46	151.61	0.00	135.51	56.40	295.60	395.97	132.28	4019.26
12	0.00	0.47	0.00	175.01	12.43	0.00	0.00	0.92	0.00	0.05	0.00	22.92	0.00	26.49	238.29
13	50.62	18.59	7.92	0.00	0.00	0.00	0.00	32.95	0.00	2.54	3.93	9.60	0.00	0.00	125.55
14	0.45	3.93	0.00	0.00	0.00	0.00	0.00	29.64	0.00	0.71	6.88	0.00	0.00	0.00	41.61
15	0.00	0.00	0.00	0.00	5.82	87.71	0.00	0.00	1568.54	0.00	0.00	0.00	4.05	4.90	1671.02
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	226.06	0.00	0.00	0.00	0.00	0.00	226.07
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.35	1.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.29	0.00	0.00	0.70	0.00	3.88
21	0.00	3.81	0.00	0.00	1.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.98
22	243.86	1.57	74.17	1692.54	49.20	11009.53	23.86	51.97	32929.02	60.06	59.75	25.54	116.18	48.20	46379.45
23	750.26	284.40	828.72	2029.54	0.00	2559.41	0.96	237.30	8360.87	59.49	114.63	43.06	607.94	144.51	16021.09
Total	1722.66	521.06	1510.80	6794.82	336.59	13856.40	525.82	601.01	44151.87	354.97	439.89	976.60	1222.48	739.42	73754.38
TGA	3984.00	1371.00	4588.00	11691.00	3097.00	14036.00	2651.00	2379.00	45110.00	1398.00	1674.00	2630.00	2228.00	4550.00	101387.00
% to TGA	43.24	38.01	32.93	58.12	10.87	98.72	19.83	25.26	97.88	25.39	26.28	37.13	54.87	16.25	72.75

1. Gullied and/ or ravinous land (Medium)	6. Waterlogged and Marshy land (Seasonal)	11. Under-utilised/degraded forest (Scrub domin)	16. Sands-Coastal	21. Industrial wastelands
2. Gullied and/ or ravinous land (Deep)	7. Land affected by salinity/alkalinity (Medium)	12. Under-utilised/degraded forest (Agriculture)	17. Sands-Desertic	22. Barren Rocky/Stony waste
3. Land with Dense Scrub	8. Land affected by salinity/alkalinity (Strong)	13. Degraded pastures/ grazing land	18. Sands-Semi Stab.-Stab>40m	23. Snow covered /Glacial area
4. Land with Open Scrub	9. Shifting Cultivation - Current Jhum	14. Degraded land under plantation crop	19. Sands-Semi Stab.-Stab 15-40m	Total - Total Wasteland Area
5. Waterlogged and Marshy land (Permanent)	10. Shifting Cultivation - Abandoned Jhum	15. Sands-Riverine	20. Mining Wastelands	TGA - Total Geographical Area

Pradesh and Punjab, to the southwest by Pakistan, and to the northwest by the Pakistani-administered portion of Kashmir.

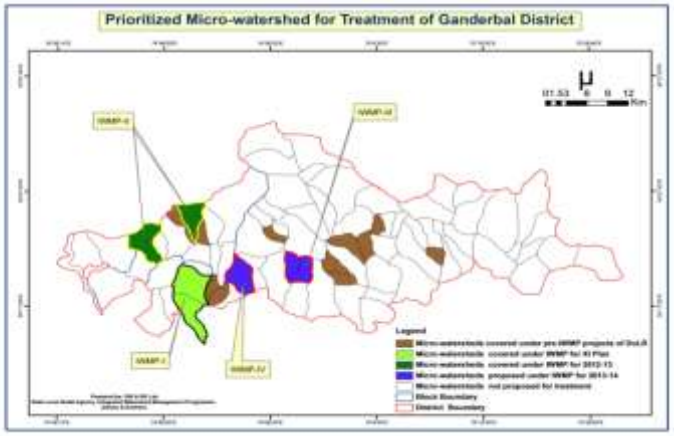
The administrative capitals are Srinagar in summer and Jammu in winter with area of 39,146 square miles (101,387 square km) and population of 12,366,000. The vast majority of the state's territory is mountainous, and the physiography is divided into seven zones that are closely associated with the structural components of the western Himalayas. From southwest to northeast these zones consist of the plains, the foothills, the PirPanjal Range, the Vale of Kashmir, the Great Himalayas zone, the upper Indus River valley, and the Karakoram Range. The climate varies from alpine in the northeast to subtropical in the southwest; in the alpine area, average annual precipitation is about 3 inches (75 mm), but, in the subtropical zone (around Jammu), rainfall amounts to about 45 inches (1,150 mm) per year. The entire region is prone to violent seismic activity, and light to moderate tremors are common. The foothills of the Himalayas, rising from about 2,000 to 7,000 feet (600 to 2,100 metres), form outer and inner zones. The outer zone consists of sandstones, clays, silts, and conglomerates, influenced by Himalayan folding movements and eroded to form long ridges and valleys called *dun*s.

The inner zone consists of more-massive sedimentary rock, including red sandstones of Miocene age (roughly 5.3 to 23 million years old), that has been folded, fractured, and eroded to form steep spurs and plateau remnants. River valleys are deeply incised and terraced, and faulting has produced a number of alluvium-filled basins, such as those surrounding Udhampur and Punch. As precipitation increases with elevation, the lower scrubland gives way to pine forests. The PirPanjal Range constitutes the first (southernmost) mountain rampart associated with the Himalayas in the state and is the westernmost of the Lesser Himalayas. It has an average crest line of 12,500 feet (3,800 metres), with individual peaks rising to some 15,000 feet (4,600 meters). Consisting of an ancient rock core of granites, gneisses, quartz rocks, and slates, it has been subject to considerable uplift and fracturing and was heavily glaciated during the Pleistocene Epoch.

Soil and water conditions vary across the valley. The climate is characterized by annual precipitation of about 750 mm, derived partially from the summer monsoon and partially from storms associated with winter low-pressure systems. Snowfall often is accompanied by rain and sleet. Temperatures vary considerably by elevation; at Srinagar the average minimum temperature is in the upper −2°C in January, and the average maximum is in the upper about 31°C in July. Up to about 7,000 feet (2,100 meters), woodlands of deodar cedar, blue pine, walnut, willow, elm, and poplar occur; from 7,000 to 10,500 feet (3,200 meters), coniferous forests with fir, pine, and spruce are found; from 10,500 to 12,000 feet (3,700 meters), birch is dominant; and above 12,000 feet are meadows with rhododendrons and dwarf willows as well as honeysuckle.

B. Ganderbal Profile :

The name Ganderbal has been derived from the famous spring "GANDERBHAWAN" which once used to be the Gateway to Central Asia during ancient period. Ganderbal is among the eight newly created districts which



came into existence in 2007 by deletion of areas of Ganderbal and Kangan from the erstwhile Srinagar district. District Ganderbal is located on the north side of world famous Srinagar city of Kashmir valley at an elevation of 1650 to 3000 meters above Mean Sea Level (MSL). The Sind River, a major tributary to the Jehlum River flows through this district. The water of the river is mainly used for irrigation, and generation of hydroelectricity. There are three hydroelectric power stations, Lower Sindh Hydroelectric Power Project Ganderbal, Upper Sindh Hydroelectric Power Project 1st Kangan and Upper Sindh Hydroelectric Power Project 2nd Sumbal generating electricity on the Sind River. The district is located between 34.23°N Longitude and 74.78°E Latitude, with a population of about 297446. The district is flanked by District Baramulla in the west, district Srinagar in the south, district Bandipora in the North West, and district Kargil in the east. Ganderbal district enjoy a unique geographical position and it represents the last station depicting all the scenic features of the Kashmir valley. Farming in Ganderbal is the main occupation as more than 80% (84.19%) of the working population is engaged with it. The main income of the district comes from agriculture for which land been put to use is about 5758 Hectares. However, the district Ganderbal is on the path of the industrialization despite topographical limitations. Industrial Sector has been declared as main vehicle for accelerating economic activity besides providing employment to the unemployed youth. The area under forest in the district is about 988 Hectares of land.

fig 2 : prioritized micro-watershed for treatment of ganderbal district

C. Profile of the Watershed Project

1.	Name of the State	Jammu & Kashmir (J & K)
2.	Name of the project	IWMP-I,/2011-12 (Ganderbal (Gbl 1-1 and 1-2)
3.	Name of the District	Ganderbal
4.	Names of the Block	Ganderbal
5.	Names of Gram Panchayats in the project	1. Gutlibagh(00101300) 2. Baba Daryadin (00040200)
6.	**Names of Village, Gram Panchayat, Census code, Block, Tehsil:**	
7.	Four major reasons for selection of watershed	1. Scarcity of irrigation/drinking water facilities 2. Area prone to soil erosion and flash floods 3. Predominance of degraded land 4. Predominance of SC/ST population
8.	Name, Address, Phone No and Reg.No.. of the PIA(s)	Project Manager, IWMP, Watershed Cell cum Data Center (WCDC), Ganderbal.
9.	Area of the Project (ha.)	4016 ha
10.	Area proposed to be treated	3923 ha
11.	Financial Year of sanction	2011 – 12
12.	Project duration	From April 2009 to March 2016
13.	Project Cost (Rs. in Lakhs)	Rs.589.80 lakh

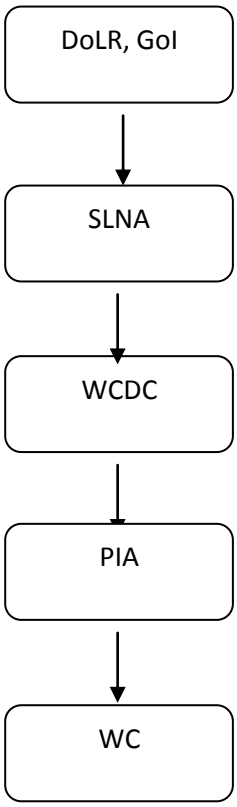
D. Watershed information :

S no	Name of Project	Watershed Code	Micro-Watershed Code	Villages to be Treated	Geographical Area(Ha)	Treatable Area(Ha)	Approval Year
1	Baba Daryadin	Gbl 1-1	Baba daryadin (Gbl 1-1)	Baba Daryadin	596	356	2011-12
				Darend	607	424	2011-12
				Mir Mohallah	485	380	2011-12
				Dignibal	500	411	2011-12
2	Gutlibagh	Gbl 1-2	Gutlibagh (Gbl-1-2)	Gutlibagh	511	300	2011-12
				Banjar	283	455	2011-12
				Labour Mohallah	276	345	2011-12
				Khyber	273	460	2011-12
				Malkund	236	379	2011-12

				Chanhar	249	422	2011-12

E. Watershed Committee:

Watershed committee was formed in the Gram Sabha in which the quorum was present. Gram Sabha unanimously elected the Watershed Development Committee. This Gram Sabha was conducted at Gram Panchayats.The State Level Nodal Agency (SLNA) of J & K state has appointed an agency named Watershed Cell cum Data Center (WCDC) for implementing Integrated Watershed Management Programme (IWMP) at district level. Watershed Cell cum Data Center (WCDC), Ganderbal is a district level nodal agency and was established on 14th August 2012 to oversee the smooth implementation of IWMP project in the district. WCDC consists of one Project Manager who is from line department (Kashmir Administrative Services Officer), a Technical Expert, an Account Assistant, Data Entry Operator and a helper. At present WCDC, Ganderbal is involved in implementing total one IWMP project (IWMP-I, Ganderbal-1-1 and 1-2) which was sanctioned during financial year 2011-12. The WCDC acts as Project Implementing Agency (PIA) for the project. Fund flow mechanism is given in the flow chart:



F. Entry Point Activities and Base Line Survey

EPA activities are taken up under watershed projects to build rapport with the village community at beginning of the project. Generally, certain important works which are in urgent demand of the local community are taken up. The details of various EPA activities undertaken in all five Micro-watersheds are described below:

S. No.	Name of Micro-watershed	Name of village	Activity under EPA	Total Expenditure/Proposed Budget	Current status	No. of families benefitted
1	Baba Daryadin (Gbl-1-1)	Baba Daryadin	Construction of KucchaPucca Retaining wall for the Graveyard at Darend.	143216.00	Completed	210
2	Baba Daryadin (Gbl-1-1)	Baba Daryadin	Expansion of yard of mosque and construction of utility shed at Baba Daryadin	267038	Completed	321
3	Baba Daryadin (Gbl-1-1)	Baba Daryadin	Development of community play ground by way of earth filling at Darend.	342772	Completed	566
4	Baba Daryadin (Gbl-1-1)	Baba Daryadin	Estimate for the Retaining wall for the community play Ground at Darend.	348932	Completed	566
5	Gutlibagh (Gbl-1-2)	Gutlibagh	Construction of toilet block at Mir Mohallah MSW Gutlibagh	128788.00	Completed	203
6	Gutlibagh (Gbl-1-2)	Gutlibagh	Construction of toilet block and patch for Jamia Masjid Chanhar	149904.00	Completed	186
7	Gutlibagh (Gbl-1-2)	Gutlibagh	Grave yard fencing at BanjarBasti	173053.00	Ongoing	234
8	Gutlibagh (Gbl-1-2)	Gutlibagh	Construction of drain from Khyber Mohallah to main road Gutlibagh	283388.00	Complete	250
9	Gutlibagh (Gbl-1-2)	Gutlibagh	Construction of passenger shed at Gutlibagh.	Proposed	Proposed	578
10	Gutlibagh (Gbl-1-2)	Gutlibagh	Fencing and filling of yard of mosque at	363673.00	Ongoing	218

			Khyber Mohallah			

G. Expected End Results:

The implementation of IWMP in the Micro Watershed will increase the optimum utilization of the local resource, which indirectly help to increase the livelihood option to the community. Community organization in the form of SHG, UG and WC would be forming the core of the watershed processes which would ensure transparently implementation and sustainable utilization of the resource livelihood assets developed/created under the project. SHG would be carrying out savings and credit activities along with accessing credit from bank. The farmers, SHG, UG and WC organize necessary support system for production and productivity enhancement of various resources treated under the project. The developed/treated resource would enhance cereal production, vegetable production and other Livestock development. Overall, such production will provide an additional income of minimum 40 to 50% to the present income.

1	2	3	4	5	6
S.No	**Item**	**Unit of Measurement**	**Pre Project Status**	**Expected Post Project Status**	**Remarks**
1.	Status of water table (Depth to Ground water level)	Meters	60	55	The water level will increase through the recharging structure implemented in the project.
2.	Ground water structures repaired/ rejuvenated	No	20	05	Will be repaired under IWMP
3.	Quality of drinking water	Description	Raw	Good	Will be upgraded under IWMP
4.	Availability of drinking water	Months	8	10	There is avg. 5 months drought as water level goes below 10 mts.
5.	Change in cropping/ land use pattern	Description	The area is Mono-cropped	25 % of the area will be double cropped.	New improved technology will be introduced through training, exposure.
6.	Net increase in crop production area				
7.	Change in Soil Loss	Mm			The soil loss will decrease because of the creation of the agro, horti models.
8.	Perenniality of flow and change in Runoff	Ha	871	368	The runoff will reduce but to put a value for this needs a detail scientific study.
9.	Recharge of ground water	Meter	No recharge structure	2 to 3	The water conservation structures are main focus and will create 2-3 meter ground water recharge.
10.	No. of SHGs	No	0	20	There is no SHG operational in

	Promoted				the project area, under IWMP project WDT have formed new SHGs.
11.	Increase in no. of livelihoods	No	0	21	The livelihood activity of the project area will increase the financial condition of the asset less.
12.	Increase in income	Rs.	1050 to 1300 .	2000 to 2500	Overall implementation will increase the crop production; Livelihood activity will increase the per capita income
13.	Status of Migration	No	156	52	The employment will be generated in the project area.

5. Conclusion :

Watershed management has a huge scope in Jammu and Kashmir. The case study of Ganderbal disctrict well depicts the success of Intergrated Watershed Management Project in Kashmir provision. Many such projects should come up in each district of Jammu and Kashmir and their performance should be evaluated in a time bound frame of reference. The scope of IWMP in other areas of development should also be evaluated. This paper can be used as a guide to evaluating such projects.

S. No.	Name of Micro-Watershed	Panchayat Halqa	Name of Village	Census code	Block	Tehsil
1.	**Gutlibagh (Gbl 1-2)**	Gutlibagh	Gutlibagh	00101300	Ganderbal	Ganderbal
2.	**Baba Daryadin (Gbl 1-1)**	Darend	Baba Daryadin	00111700	Ganderbal	Ganderbal

REFERENCES

[1] Watershed Management Design and Practices by P.K.Singh

[2] Soil and Water Conservation Engineering by R.Suresh

[3] Watershed Management for Water Quality Improvement by I.R. Willett

[4]IWMP Detailed Project Report Ganderbal