



# Physico-Environmental Impacts of Dombandi Micro-Watershed Project in Ausgram Block – II of Barddhaman District, West Bengal, India

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Available online at: [www.isca.in](http://www.isca.in), [www.isca.me](http://www.isca.me)

Received 7<sup>th</sup> October 2020, revised 30<sup>th</sup> January 2021, accepted 2<sup>nd</sup> April 2021

## Abstract

*Watershed is a geo-hydrological unit that drains rain water to a common point through runoff. Micro-watershed lies at the lowest level of river system hierarchy. It is considered as an important planning unit. Watershed development fulfills all basic development demands in rural areas. Dombandi micro-watershed project of Ausgram Block – II of Barddhaman district has positive impacts on physico-environmental conditions like - increase in case of ground water level, decrease in soil erosion, decrease in wasteland, increase in vegetative cover and improvement in land use land cover situation. In this paper all such impacts have been clearly analyzed. Various problems and prospects have been also discussed. The paper is based on both primary and secondary data base. Extensive field work has been done. Simple statistical and cartographic techniques have been used.*

**Keywords:** Watershed, Watershed Development, Micro watershed, Land Use Land Cover, Physico-environmental impact.

## Introduction

Watershed is a land and water area, which contribute run off to a common point. All land everywhere is a part of some watershed. A watershed is a land that conveys the overland flow of rain water in the form of run off to an outlet in the main flow channel<sup>1</sup>. For watershed management there need micro level watersheds. Micro watersheds lie at the lowest order of the hierarchical river system. Micro watersheds are the watershed having 500-1500 hector area. As per SLUSI (Soil & Land Use Survey of India), the average size is 1000 hector. Micro watershed management is the process of formulating and carrying out a course of action for manipulation of natural, agricultural and human resources of the watershed area to give resources that are suitable to the watershed community without affecting the soil and water resources. Watershed management is an integrated approach for overall development of abiotic and biotic components of a watershed within it. So proper management of watershed is the adoption of rational and optimum utilization of natural resources and their conservation<sup>2</sup>. Integrated watershed development and management programme is the current trust of rural development planning in India. Recently Government of India is giving emphasis on the micro level planning. Micro watersheds are considered as micro regions which lie at the lowest level of regional or, planning hierarchy. It in the smallest planning region with greater potentialities for development. Micro region or, micro watersheds are the key of planning processes because of local people's greater participation. Here planning is done with local people's demand and implementation is done with the consent of local people.

Besides it considers optimum utilization of local resources, spreading of development benefits among poors, fulfillment of basic needs, greater people's participation, local employment generation and up gradation of local skills etc. So micro watersheds are considered as the best component of micro level rural planning. Integrated watershed management programmes are important holistic approach for natural resource management and sustainable development<sup>3</sup>. Watershed development influences environmental conditions, water resource condition, land use change etc<sup>4</sup>. From physico-environmental point of view land, water and vegetative developments are important. In this paper all types of physico-environmental changes happened by Dombandi micro watershed project has been analyzed.

### Study area and the rationale behind the selection of it:

Dombandi micro watershed is situated in Dombandi mouza of Bhalki Panchayat under Ausgram-II Block of Barddhaman district, West Bengal, India, within 23<sup>o</sup>25'22<sup>''</sup> N to 23<sup>o</sup>27'14<sup>''</sup> N latitude and 87<sup>o</sup>32'40<sup>''</sup> E to 87<sup>o</sup>36'42<sup>''</sup> E longitude. Dombandi watershed was financed by NABARD in 2004. Total treatment area of this watershed is about 265 ha.

Before watershed development the area faced many problems. These problematic situation made the local people and administration to think about various developmental activities. Watershed development is one such activity which was then taken in that area as an area development activity. The major physico-environmental problems are – i. The terrain was difficult as some portion of it is full of red and lateritic soil. ii. Above 70% land of this area is covered with forest which is inaccessible.

iii. Dombandi mouza is full of tribal population who are basically poor. iv. There was huge water crisis or, shortage during summer month. Severe drought condition started in summer months. v. Low agricultural productivity was due to full dependence on monsoon. vi. Huge water loss at rainy season. vii. High rate of soil erosion in rainy season. viii. Lack of irrigation facility. ix. Land degradation and infertility of soil. All such above problems were tried to solve on watershed basis in this area. So the selection of this study area has been justified.

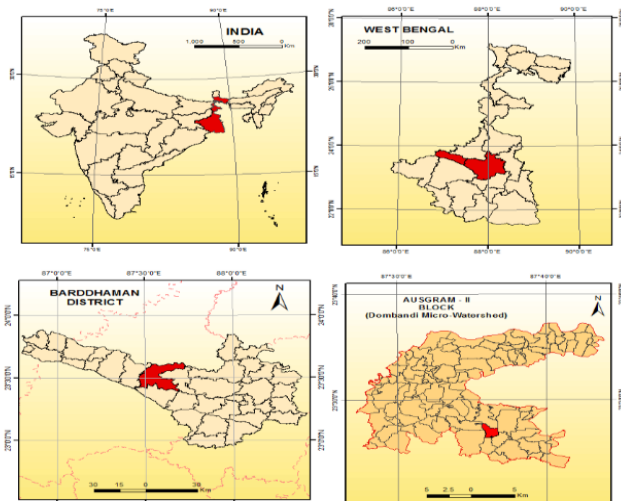


Figure-1: Location of the study area.

**Objectives:** i. To investigate the physico-environmental impacts as well as LULC conditions of Dombandi watershed project. ii. To evaluate the major physico-environmental impacts. iii. To study the problems of pre project phase and to suggest suitable recommendation measures for further development.

### Methodology

The present paper is mainly based on extensive field survey and household survey in Dombandi mouza. Survey of India Topo. Sheet 73M/11 and mouza map of Dombandi (sheet 1 & 2) have been used for various mapping. Feasibility study report of Dombandi micro watershed have been also consulted. Simple cartographic and statistical techniques have been used to represent data.

### Results and discussion

**General physico-environmental impacts:** Before project pre monsoon water table was 40-45 feet and post monsoon was 20 – 25 feet (BGL) which are now 20-25 feet and 7-10 feet (BGL) respectively after the completion of the project. Biomass index has been increased due to new plantation, horticulture development & meditational plant development in about 18 ha lands. Soil erosion reduced and soil fertility increased due to checking of soil erosion and greater rainwater harvesting. Waste land has been decreased due to land leveling in 2-3 ha land.

Gradually erosion has also reduced. Previously there were 8 ponds but now there are 4 extra new ponds with 3 re-excavated ponds which increase rainwater harvesting rate. Area under horticulture has been also increased. Mango trees were planted in about 2.5 ha land and lemon was planted in 0.5 ha land. Besides medicinal plants like – aloevera, sarpagandha etc. were also planted in about 0.5 ha land. Land leveling was done in about 45 ha lands for cultivation and for plantation. New plantation was done in 6 ha land like sonajhuri, eucalyptus etc. Many contour bunds, contour trenches, check dam, field drain etc have been also constructed to improve physico-environmental situation of the watershed area. These all above facts indicates biophysical changes or, development in Dombandi watershed area. Not only that a lot of structural measures were constructed in the area like – 44 number of gully plugging activities, 8359.75 cu.m earthen drain, 4.5 cu.m field bund, 11 number of inlet & outlet and 21597.6 cu.m contour bunds etc. These all structures are also responsible for soil & water conservation.

**Land Use Land Cover changes:** Land use-land cover are very dynamic in nature<sup>5</sup>. Watershed development in Dombandi micro watershed area has brought a tremendous spatio-temporal change in total land use pattern from pre to post project situation. Significant changes occurred in case of increase in double crop land, areas of ponds, plantation, meditational plantation etc. which are 4.86%, 1.58%, 4.35% and 0.23% respectively. On the other hand, in case of single crop land, fallow land and scrub forest land there has been a sudden fall in the percentage area from pre to post project situation. It carries a sign of success in watershed development from land use development point of view.

Table-1: Pre and post project Land Use Land Cover situation.

LULC Class	Pre Project (ha)	Area in %	Post Project (ha)	Area in %
Brick Kiln	-	-	1.77	0.67
Cropland (Double)	-	-	12.88	4.86
Crop land (single)	24.64	9.30	14.89	5.62
Earthen Drain	-	-	0.60	0.23
Fallow land	28.76	10.85	0.44	0.17
Forest	186.80	70.49	197.53	74.54
Forest Plantation	-	-	5.91	2.23
Lakes / Ponds	1.36	0.51	4.19	1.58
Medicinal Plants	-	-	0.61	0.23
Plantation	-	-	11.55	4.36
Mixed Settlement	4.03	1.52	7.42	2.80
Playground	-	-	1.01	0.38
Scrub Forest	19.40	7.32	6.21	2.34
Total	265.00	100%	265.00	100%

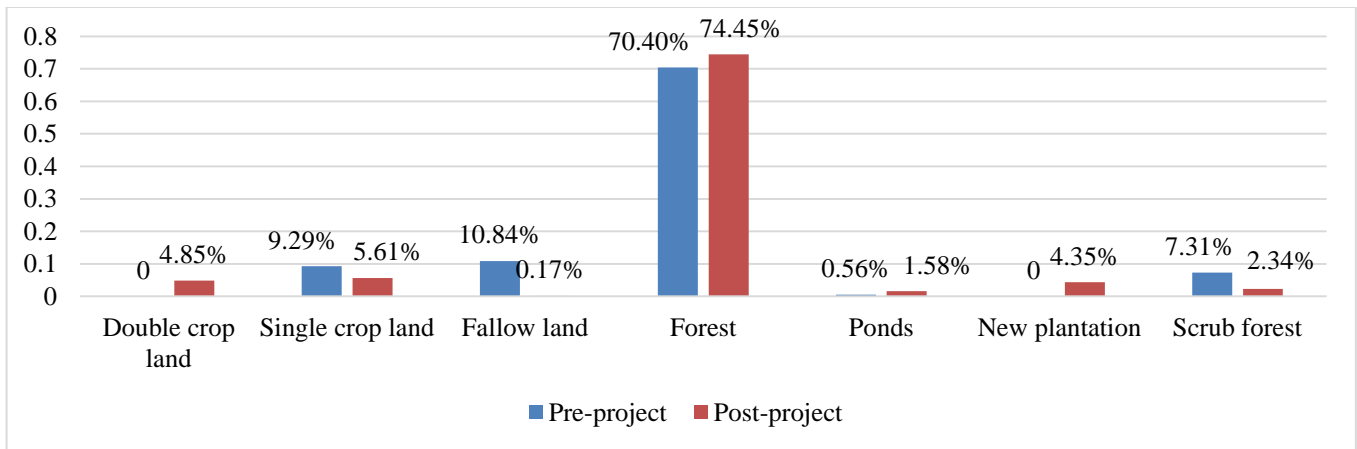


Figure-2: Pre and post project major Land Use Land Cover percentage changes.

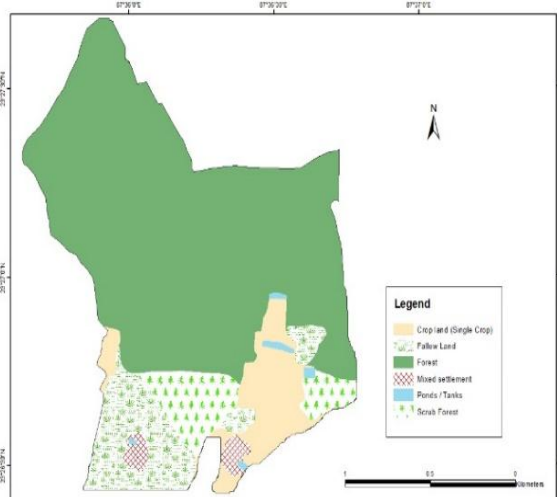


Figure-3: Land Use Land Cover, Dombandi Micro Watershed (Before Micro-Watershed Project).

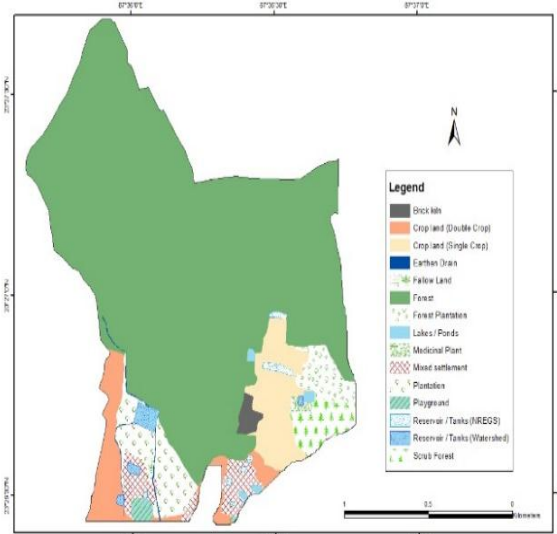
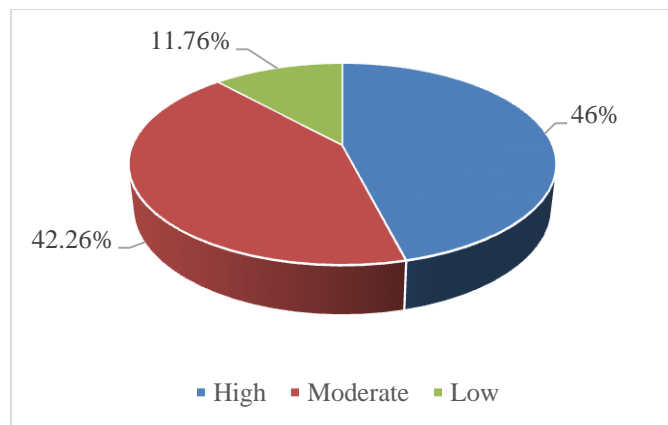


Figure-4: Land Use Land Cover, Dombandi Micro Watershed (After Micro-Watershed Project).

**Evaluation of physico-environmental impacts:** To evaluate the physico-environmental impacts of Dombandi micro watershed project, total fifty sample respondents have been interviewed and on the basis of their responses categorization has been done. Here overall high responses have been given by 46% respondents, moderate by 42.26% and low by 11.76% respondents. High responses are more in case of increase in ground water level (84%) and soil erosion reduction (80%). Moderate responses are more in case of increase in vegetative cover (50%), irrigation improvement (76%), pasture land development (56%), increasing fertility of soil (44%) and increasing organic matter of soil (50%). So it is said that there is an increasing trend of improvement in physico-environmental condition in watershed area.

Table-2: Measurement of physico-environmental impacts (n=50).

Components	Responses of respondents		
	High	Moderate	Low
Increase in vegetative cover	20(40)	25(50)	05(10)
Increase in ground water level	42(84)	06(12)	02(4)
Irrigation improvement	08(16)	38(76)	04(8)
Soil erosion reduction	40(80)	05(10)	05(10)
Pasture land development	18(36)	28(56)	04(8)
Increasing water holding capacity of land	20(40)	20(40)	10(20)
Increasing fertility of soil	18(36)	22(44)	10(20)
Increase in the presence of organic matter of soil	18(36)	25(50)	07(14)
Average	23(46)	21.13 (42.26)	5.88 (11.76)



**Figure-5:** Respondent's percentage responses about physico-environmental impacts (n=50).

**Major findings:** i. After the watershed project, there is an increase in pre and post monsoon water table i.e. 20–25 ft. (BGL) and 7–10 ft. (BGL) respectively. ii. After watershed project, 4 extra new ponds have been excavated and 3 ponds have been re-excavated which have increased the rain water harvesting rate. iii. Vegetative cover has been increased as new plantation was done in extra 6 ha land. iv. Soil erosion has been reduced due to the construction of contour bund, contour trenches, check dam, pond embankment etc. v. From LULC point of view, there are significant changes in case of the increase in double crop land (4.85%), plantation area (4.35%), new ponds (1.58%) and medicinal plants (0.23%). vi. From the evaluation of physico-environmental impact point of view, 84% respondents gave high responses in case of increase in ground water level and 80% respondents gave high responses in soil erosion reduction.

**Recommendations:** Following measures are to be taken to overcome all physico-environmental problems for sustainable watershed management: i. Re-excavation of some ponds to increase water holding capacity. ii. Storing of mud in some lateritic pond to increase water holding capacity. iii. Arrangement of polythene coating to control much infiltration of water. iv. Excavation of some other ponds specially in east and in south west to cover more agricultural land for irrigation. v. Arrangement of post watershed maintenance measures, funding and monitoring. vi. There need to reclaim the structural works of watershed development i.e. water harvesting structures. vii. In every pond, there need a storage tank in front of inlet. Then the water is to be kept in the pond. This process will then reduce siltation in the pond. Maximum silt will be then stored in the storage tank. viii. There need to clear the silt of the drains, filed channel etc. to increase their water carrying capacity. ix. Drought farming is to be popularized. x. Instead of

boro cultivation, emphasis is to be given on winter crops and vegetable farming. xi. Use of shallow and submersible are to be prevented. xii. New plantation is also essential in vacant spaces. xiii. There need to increase bio-fertilizer use. xiv. There need more contour bund, trench, check dams in forested area with proper consent of forest officials. xv. Forest cutting, forest fire and over grazing are to be stopped. xvi. Mass awareness and interest are to be grown.

## Conclusion

From the above discussion it is clear that Dombandi micro watershed project has greater impact on physico-environmental situation. It improves the tribal livelihood pattern by the fruitful effects of physico-environmental changes like – water resource improvement, checking of soil degradation, increase of vegetative cover and wasteland management. Though many problems have been solved by watershed development activity but still there are some problems which could be solved by further maintenance and monitoring with proper involvement and participation of local people. Besides local administration is to be also active regarding this matter.

## Acknowledgement

I am thankful to the villagers of Dombandi mouza for their kind assistance at the time of field survey. I would like to acknowledge the every persons and officers who have helped me to complete this paper.

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