



RKVY– RAFTAAR



2021-22

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Executive Summary

Agriculture is the most important sector of Indian as well as state economy. Department of Agriculture & Co-operation (DAC), Ministry of Agriculture, Govt. of India launched Rasthriya Krishi VikasYojana (RKVY) from 2007-08, as an umbrella scheme for ensuring holistic development of agriculture and allied sectors with 4% annual growth. The Natural Resource Management component of the scheme is being implemented all over the State through the different Forest Divisions. **Forest plays a very important role in the agriculture of forest fringe areas inhabited by the economically weaker people, through the different soil moisture conservation works such as gully plugging, contour trenching, boulder sausage walls, river training works and earthen dam which not only safeguards the agricultural lands and crops but also help to replenish the water table of the area benefitting cultivation as a whole.**

Based on the feedback from the States during implementation in the 12th Plan the aim of the scheme was shifted towards making farming a remunerative activity through strengthening farmers efforts, risk mitigation and promoting agri-business entrepreneurship. The erstwhile scheme of RKVY guidelines have been revamped as **RKVY- RAFTAAR – Remunerative Approaches for Agriculture and Allied sector Rejuvenation**, to enhance efficiency, efficacy and inclusiveness of the programme for the remaining period of the Fourteenth Finance Commission. The main objectives of RKVY-RAFTAAR are as follows: -

1. Creation of pre- and post-harvest infrastructures to strengthen the farmers efforts,
2. Promoting value chain addition linked production model,
3. Ensuring local/farmers' needs being better reflected in the agricultural plan of the State,
4. Mitigating risk of farmers with focus on additional income,
5. Empowering youth through skill development, innovation and agri-entrepreneurship,
6. Attending national priorities through sub schemes.

RKVY-RAFTAAR continues to be implemented as a Centrally Sponsored Scheme in the ratio of 60:40 (GOI and State Share respectively).

The State of West Bengal has nearly 3% of the nation's cultivable land and about 8% of the country's population. The agricultural sector is characterized by the predominance of small and marginal farmers tilling more than 68% of the cultivable area of the State. Since the scope of bringing more area under cultivation is limited emphasis has been laid mainly on increasing the productivity of different crops by using quality seeds, fertilizers, plant protection measures, introducing suitable mechanizations and emphasizing on soil amelioration and soil moisture conservation measures being **IMPORTANT PRE-HARVEST STRATEGIES** to ensure optimum crop production. Our objective is to undertake relevant soil moisture conservation works in the forestland to conserve natural resources and achieve consequent improvement in agriculture crop productivity in fringe areas. In order to achieve the goal, relevant work programme have been identified in different sites of West Bengal, which will help in rain water harvesting, reduced erosion, and increase canopy cover, and minimized impacts of floods, increase humidity, increase regeneration and change in micro-climate and thereby ensuring increased farming



opportunity and production to the forest fringe population. The major objectives of the RKVY-RAFTAAR 2021-22 are as follows;

1. To improve the productivity of the areas under treatment.
2. To improve the ground water regime.
3. To control soil erosion and arrest the sedimentation to the extent possible.
4. To create small irrigation system for the agricultural lands in the proximity of forest areas.
5. To develop/create modern infrastructures/centers for improved quality planting materials for enhancing tree covers productivity and biodiversity.

Despite having so much of potentialities forest fringe areas in the region has remained under developed. It is primarily because there are also a number of constraints and problems, which are responsible for the present state of natural resource management and production. These constraints can be grouped under five broad heads at local / regional / national level these are; climatic, infrastructural, biophysical, management and socio-economic constraints.

The major objectives are to improve the productivity of the areas through improving the ground water regime, controlling soil erosion and runoff and arresting the sedimentation to the extent possible, creating small irrigation system for the fringe agricultural lands and developing/creating modern infrastructures/centers for improved quality planting materials for enhancing productivity and biodiversity.

The major reasons for selecting the proposed strategy is to address the change in land use pattern, climate variability, and infrastructure development due to change in socio-economic condition of the adjacent population in the project area. The new approach envisages a broader vision of natural resource management to achieve goal of soil moisture conservation. The project is being implemented in the forest fringe, within the forestland, and aims to benefit the fringe area population in their agricultural endeavor. All the **major interventions** proposed in the **DPR** fall in the category of **Infrastructure & Assets – Pre-Harvest Infrastructure**.

To achieve the goal of soil moisture conservation and the proposed activities and the total estimated budget for 2021-22 is as follows;

- ✓ The 2900 km of contour trenches at a budget of Rs. 1,16,23,200/-
- ✓ The 40 units of earthen dams at a total budget of Rs. 3,26,00,000/-
- ✓ The 11,000 Cum of gully plugging and the total budget of Rs. 2,47,72,000/-
- ✓ The 2506 Cum of River training works to prevent damage to agricultural fields and the total budget of Rs. 70,94,486/-
- ✓ The 11,000 Cum of Hand packed Walls at a total budget of Rs. 3,06,79,000/-
- ✓ The 12,000 Cum of Boulder Sausage Wall at a total budget of Rs. 3,39,72,000/-
- ✓ The 3000 RMT of Catch Water Drain at a total budget of Rs. 70,44,000/-



- ✓ The total infrastructure development proposed cost is Rs. 14,77,84,686/-
- ✓ 1.5% administrative cost is Rs. 22,16,770/- for third party monitoring.
- ✓ Thus the total estimated budget for the proposed development is Rs. 15,00,00,000/-

There are many intangible and tangible benefits of all the proposed developmental activities to improve the agricultural activities. The respective Internal Rate of Return (IRR) calculated in Cost benefit Analysis (CBA) is as follows;

- ✓ Contour Trench; NPV – Rs. 1,74,50,340/- and IRR is 47%.
- ✓ Earthen Dam; NPV – Rs. 6,72,28,370/- and IRR is 37%.
- ✓ Gully Plugging; NPV – Rs. 1,15,62,927/- and IRR is 23%.
- ✓ River training works to prevent damage to agricultural fields; NPV – Rs. 2,12,07,948/- and IRR is 78%.
- ✓ Hand Packed Wall; NPV – Rs. 1,57,87,079/- and IRR is 24%.
- ✓ Boulder Sausage Wall; NPV – Rs. 2,05,03,826/- and IRR is 26%.
- ✓ Catch water Drain; NPV – Rs. 23,37,253/- and IRR is 20%.

The major outcome of the infrastructure development in the forest land is an increase in agricultural crop, timber, fuel wood, biomass, fodder, minor forest produce, hydrological services, soil conservation, biodiversity conservation, carbon sequestration and reduction in soil erosion.

Construction of contour trench, earthen dam, gully plugging, river training, catch water drains, boulder sausage works, hand packed walls, would be some of the most effective strategies for bringing climatic, hydrological and socio-economic change to different parts of forest and non- forest land of West Bengal. These infrastructures would be highly beneficial for forest and agriculture by aligning various sectors through technological, soil and water conservation interventions, and land-use diversification. The various infrastructure developments for soil and water conservation programs and interventions - which are **Pre-Harvest** activities - would result in significant reduction in land degradation and improvement in productivity in different parts of the West Bengal.

Background:

The Additional Central Assistance Scheme-‘Rashtriya Krishi Vikash Yojana’ (RKVY) was launched by the Govt. of India mainly to incentivize the state to attain 4% annual growth rate in agriculture & allied sectors during the 11th plan period. RKVY was introduced as a new Additional Central Assistance Scheme to State Plan with 100% assistance. But from 2015-16, 60% grant is provided by the Govt. of India and the balance 40% fund comes from State Share. The project is taken up for holistic development of agriculture and allied sectors in which Forest Department is a stakeholder along with some other departments.



Some studies have indicated that with increase in population, resulting in increased utilization of surface water, the water availability of surface water per capita per year for population living in basin area of River Damodar would be reduced in future leading to severe water shortage. Studies have shown that the reduction of water availability would be more in case of the Rupnarayan than that of the Damodar watershed. Similarly the river Dwarakeswar including the river Gandheswari would face severe shortage of water followed by other basins such as Kailaghai and Ajoy River. The surface water available per capita per year for population living in catchment of River Kangsabati would face seasonal or regular water stress in the projected scenario where surface water availability per capita per year would be reduced.

As increase in population results in increased demand in agricultural production, conservation and replenishment of water resources and reducing runoff will be of utmost importance. To meet the increasing demand for water, rain water harvesting and recharging of ground water through appropriate soil conservation works for arresting soil erosion and runoff, need to be undertaken in areas with scanty tree cover and exposed to the elements of weathering. Forestsector is included as one of the allied sectors as it supplements to agricultural growth and the agricultural lands are mostly surrounded byforest. Forest Department takes up different forestry activities and soil & moisture conservation works with the objective of reducing runoff and erosion of fertile topsoil through increase in tree cover and other ameliorating measures, thereby improving soil quality and soil moisture, soil productivity and rain water harvesting.

The **contour trench** construction is an extension of the practice of ploughing fields at a right angle to the slope. Contour trenches are ditches dug along a hillside/slope in such a way that they follow a contour and run perpendicular to the flow of water. The soil excavated from the ditch is used to form a berm (a narrow shelf) on the downhill edge of the ditch. The berm can be planted with permanent vegetation (native grasses, legumes) to stabilize the soil and for the roots and foliage in order to trap any sediment that would overflow from the trench in heavy rainfall events. Contour trenches are used to slow down and attract runoff water, which then infiltrates into the soil. Small scale contour trenches can also be used within field level. The water that infiltrates can be used as soil moisture for crops cultivated after a rainfall event, directly for pumped irrigation, or extracted from shallow wells in the area. Suitable conditions are locate trenches in natural run-off areas, but not on slope over 10 % and soil in vicinity needs to have sufficient infiltration capacity and potential sub-surface storage capacity.

An **earthen dam** will be unique to an individual site; although special emphasis will have been given to local conditions, certain guidelines and generalities can be applied to all dams. When followed, such guidelines will allow for the safe and economic construction of embankments. It must be stressed that, although most of the procedures are simple, and more a matter of common sense than advanced engineering knowledge. The main advantages involved in the construction of small earth dams are: Local natural materials are used. Design procedures are straightforward. Comparatively small plant and



equipment are required. Foundation requirements are less stringent than for other types of dam. The broad base of an earth dam spreads the load on the foundation. Earthen dams resist settlement and movement better than more rigid structures and can be more suitable for areas where earth movements are common.

A **gully plug/hand packed wall** is a small, temporary or permanent dam constructed across a drainage ditch, gully, swale, or channel to lower the speed of concentrated flows (like an overflow weir) for a certain design range of storm events. They may be more categorized as a type of floodwater rather than a runoff harvesting technique. A gully plug can be built from logs of wood, stone, pea gravel-filled sandbags or bricks and cement. They have been used widely in India. These structures are relatively cheap and can last about 2-5 years.

The **Catch Water Drains/Runoff Diversion Sites** are manmade drains constructed along the contour lines for the Collection/Diversion of the flow of the streams or minor watercourses. These help in staggering the runoff in peak periods and for utilizing the water during lean periods.

The **River Training Works** are important inside the forest areas especially in the undulating terrain where jhoras and small rivers flow at a high speed specially during the monsoon season, and barriers are essential to restrict the flow of water for preventing flooding of the adjacent agricultural lands. The various **objectives of river training works** are

- (i) To guide the axis of flow and safe passage of floods without overtopping the banks,
- (ii) To protect the bed and banks from erosion and generally improve their alignment by stabilizing the jhoras/river channel,
- (iii) Reclamation of submersible lands
- (iv) Protection of the surrounding lands from flooding.



A. Problems to be addressed:

In spite of having access to abundant natural resources the fringe areas remain socio-economically under developed. It is primarily because there are a number of constraints which are responsible for the present state of low accessibility to natural resources.

The impact of climate change through increased evaporation (due to global warming) combined with regional changes in precipitation characteristics (such as total amount, variability, frequency of extremes) has the potential to affect runoff, frequency and intensity of floods and droughts, soil moisture relation, water availability for irrigation and hydroelectric power generation. In these watersheds with forested catchments, the hydrologic cycle involving precipitation, subsurface flow, groundwater flow and stream flow are closely linked to water quality as the water movement through the forest ecosystem also transports sediments, dissolved nutrients as well as fertilizers and pesticides. Understanding relationship between forested ecosystems and quality of surface and subsurface water, river ecological flow associated with these systems is a key component of river basin management.

Constraints of Climate include heavy rainfall with high intensity and periodic distribution and humidity, low temperature during winter, low light intensity and radiation, recurrent floods as well as drought conditions. Infrastructural Constraints include geographic isolation, lack of water harvesting structures to prevent flooding and erosion. The acidic soil, in accessible areas, the varied undulating topography, soil erosion and degradation, ecological imbalance, recurring floods, abundance of weeds, insects, pests, and diseases and low level technology are some of the important bio-physical constraints limiting agricultural and forest production. There are also a large number of problems connected with management and some important ones are the gap in extension, poor motivation and awareness, inadequacy of training, lack of incentive for the farmers including non-assurance of support price; non availability of improved inputs in time etc.

West Bengal has annual rainfall of 1000 – 2500 mm. North Bengal and Gangetic Delta Plains, has major problems of Gully and stream bank erosion. Many part of West Bengal where the rainfall is 1000 – 1500 mm do face problem of improper land management. (Bhattacharya & etal. 2016)

The major problems to be addressed through the different soil conservation works as:

1. Increased runoff of precipitation in land with reduced the cover;
2. Imbalances in water table;
3. Loss of agricultural production due to water shortage;
4. Loss of top soil due to water and wind erosion;
5. Decrease in soil moisture content and soil nutrition;
6. Decrease in regeneration, vegetation, timber, fuel wood, biomass, fodder;
7. Increase in sedimentation;
8. Soil loss due to soil erosion and sedimentation;
9. Decrease in carbon sequestration;



Major crops in West Bengal are rice, potato and jute. The state possesses about 14 percent of the nation's rice cultivation area. West Bengal agricultural production includes high value commercial crops like jute and tea. The state also produces significant amount of fruits and vegetables. The absence of tree cover results in the precipitation directly hitting the ground resulting in increased runoff and carrying along with it the top soil, instead of reaching the underground water table and recharging it. In the process the precious top soil is also lost exposing the sub-surface soil and depletion of soil nutrient.

Forest cover reduces the magnitude of peak discharge during rainy months and ultimately controls excess runoff in the downstream. Forests induce infiltration which leads to more uniform flow round the year. The water quality results indicate that the organic loading as well as coli form and fecal coli form will be reduced substantially by dense forestlands compared to disturbed forest. In general, conversions to forestland have the potential to reduce erosion and subsequent sedimentation, as well as reduce levels of dissolved nutrients and pesticides in surface runoff and groundwater. These improvements in water quality are a function of lower amounts of runoff and leaching as well as lower concentration of potential pollutants that are expected to result from the conversion of forestland. Part of the banks of river Ganga which is mostly covered by forested catchment, the streams are functioning at present as perennial water safe source and also to maintain the base flow or ecological flow to some extent that may be due to high amount water retained and ultimately recharged through vegetation.

River runoff is a function of precipitation, land use, soil type, porosity, slope etc. Again water availability largely depends on river runoff. Larger runoff will imply lesser availability of water in the catchment. In Eastern India the problem of soil erosion largely causes the increase in runoff. Forest or vegetation can detain the runoff, absence of which may allow water to drain out of the basin with significantly small recharging. In some basins of West Bengal, namely Kangsabati, Rupnarayan, Gandeswari, Dwarakeswar, Damodar, Kalighai, Ajoy etc, high slope causes runoff to increase but dense forest cover helps the catchment to hold the surface runoff to a greater extent. Some studies indicate that there will be severe water shortage per capita per year for population living in basin area of River Damodar. Studies have shown that deficit in water availability would be more in case of the Rupnarayan watershed compared to the Damodar watershed. Similarly shortage of water would be more severe for the rivers Dwarakeswar and river Gandheswari followed by other basins such as Kailaghai and Ajoy river. The population living in catchment of River Kangsabati would face seasonal or regular water stress in the projected scenario where surface water availability per capita per year would be reduced.



B. Aim and objective:

Government of India, has formulated an **Operational Guideline for RKVY – RAFTAAR** for 2017 – 18 to 2020 - 21. The present project proposal for 2021-22 has been prepared as per the guidelines of Government of India.

Objectives:

1. To improve the productivity of the areas under treatment.
2. To improve the ground water regime.
3. To control soil erosion and arrest the sedimentation to the extent possible.
4. To create water impounding structures in the forest fringes for making water available for the agricultural lands in the proximity of forest areas.

Activities:

Based on the identified objectives, the following activities have been shortlisted in this project:

1. Construction of soil conservation and rainwater harvesting structures for water conservation, ground water recharging and irrigation.
2. River training works and slope stabilization in North Bengal.

The infrastructure items will improve the working of the front line staff of the Division and in effect develop the forest area under its jurisdiction by increasing the short agriculturecrop, timber, quick growing (shed tree/ fire wood), game and fodder for wild life, Non Timber Forest Product (NTFP), herbal, fruits, ornamental plants and agriculture areas. The fringe area villages will be benefited from the project. We would be achieving soil moisture conservation, ground water recharge definitely with minimum rainfall. Reduced erosion, reduced run-off, increase canopy cover, increase litter and organic matter of the soil, increased agricultural crops and also increase in vegetable due to increase in water table of the area, the barren land and degraded forests would be regenerated.

The fringe community resilience would be increased due to change in microclimate by the interventions proposed. The erosion and flooding would be reduced and agricultural crop productivity will be increased. The infrastructure items will provide the forest division to effectively and efficiently implement its plans and schemes to improve the forest and better manage of its resources on a long term basis.



C. Strategy:

Among the identified sites of West Bengal, many are drought prone and many are flood prone districts. The only risk to this project is natural disaster like flood and drought etc. The major problems are soil erosion, run-off, decrease in ground water table, decrease in green cover and adverse impacts of crop productivity in changing climatic conditions. The proposed infrastructure developments will help in mitigating the adverse climate impacts. The construction of contour trench, gully plugging, earthen dam, river training will help in mitigating the impacts of drought & flood. All the proposed interventions will mitigate the soil moisture content in draught and flood prone areas of West Bengal. All the concerned DFOs have the list of existed and ongoing activities, and the proposed structures are an updated only so there will be no duplication of activities (Land use map of West Bengal is mentioned in page 13). The major problems and the respective proposed strategy for RKVY 2021-22 for the West Bengal are:

- 1. Increased runoff of precipitation in land with reduced the cover** – The proposed contour trench, gully plugging and river training works will help in reducing run-off during precipitation and also minimized the soil erosion. These infrastructures will help in increasing soil – moisture conservation and increased regeneration. This would increase the green cover and work in soil binding.
- 2. Imbalances in water table**– The proposed construction of contour trench will help in recharging aquifers, earthen dams to do rain water harvesting, gully plugging will also help in rain water harvesting. These rain water harvesting structures for water conservation, ground water recharging and irrigation.
- 3. Loss of agricultural production due to water shortage** – The proposed infrastructures e.g. contour trench, earthen dams, gully plugging and ring well will help to overcome the problem of water scarcity for agricultural produce.
- 4. Loss of top soil due to water and wind erosion** –The top soil erosion is very high due to decrease in canopy cover in West Bengal. The 0.5 lakh tall QPM seed planting material has been proposed to help in increase the ground cover. The QPM seed planting material has reduced mortality because of increase in root – shoot ratio.
- 5. Decrease in soil moisture content and soil nutrition** – All the proposed interventions e.g. contour trench, earthen dam, gully plugging, river training, production centre of quality planting material and ring wells will help in increase in soil moisture content and soil nutrition due to increase in biomass of the proposed areas.
- 6. Decrease in regeneration, vegetation, timber, fuel wood, biomass, fodder** – The ground water decrease, soil moisture & nutrient decrease is actually depleting the production of forest and agriculture. All the proposed interventions will change the quality of natural resources and their management and also result in increase in regeneration, vegetation, timber production, fuel wood, biomass and fodder of the area.



7. **Increase in sedimentation** – Due to continuous decrease in green cover there is increase in soil erosion. This has caused depleting of the water table and agriculture productivity. All the proposed interventions will help in reducing sedimentation and conserve water bodies and agricultural lands.
8. **Soil loss due to soil erosion and sedimentation** – Contour trench, gully plugging, River training works will help in slope stabilization in North Bengal which will reduce soil loss due to soil erosion and sedimentation.
9. **Decrease in carbon sequestration** – The proposed strategy to water harvesting structures i.e. contour trench, gully plugging, earthen dam, and construction of quality planting material will help in increase in carbon sequestration of the area.

Forest plays a very important role in the agriculture of forest fringe areas inhabited by the economically weaker people, through the different soil moisture conservation works such as gully plugging, contour trenching boulder sausage walls, river training works and earthen dam. **All these structures not only help to arrest the soil erosion and water runoff from inside the forest areas onto the adjacent farmers' field which damages the crop in the agricultural fields but actually helps in soil moisture conservation and replenishing the ground water level.**

However, these works are executed inside the forest areas and not in the farmers' fields. Therefore as per the Cost Norm & Pattern of Assistance (SI 4.7) of the Operational Guidelines for RKVY-RAFTAAR 100% assistance requires to be provided for Implementation of the Soil-Moisture Conservation works proposed above.



Table: Land Use Pattern

District	Geo Area (Reporting Area)	Forest Area	Land under Non Agri. Use	Barren Land	Pasture & other grazing land	Land under Misc. trees	Cultivable Land	Total Rain fed Areas		Other fallow	Current fallow	Not shown areas	Net Irrigated Area	Gross cropped Area
								Cultivated	Cultural waste land					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Burdwan	698762	21165	208526	1367	222	1418	479365	117606	5605	1371	4978	452395	361759	861894
Birbhum	451118	15853	98348	477	231	854	342717	150115	3601	3170	6357	320078	192601	568120
Bankura	687998	148930	147002	2313	806	2823	389258	193116	2035	1620	32317	346866	196082	514447
Purba Medinipur	396594	899	101834	521	47	1964	303400	201983	205	281	1789	287967	101417	519922
Paschim Medinipur	928581	171935	159371	2451	827	10037	593531	356544	4061	2816	12690	560359	236987	982084
Howrah	138676		52031	2	83	1370	91576	50991	90	181	4699	79655	40585	15826A
Hooghly	313379	530	94327	226	89	1552	226369	68231	1569	460	377	214640	158138	554606
North 24 Parganas	386524		123226	64		4475	272055	172769			39125	257405	99286	510901
South 24 Parganas	948710	426300	141297	475		2685	397297	301757	1473	34	18911	373660	95540	539916
Nadia	390655	1216	88938	245	49	3912	308811	136649	788	367	4399	289169	172161	697229
Murshidabad	532499	771	129403	1958	12	1193	409039	202100	1023	155	512	399561	206939	937768
Uttar Dinajpur	312466	580	32671	63	26	2087	279686	203799	88	47	1394	276990	75887	508263
DakshinDinajpur	221909	932	32382	88	43	1028	162573	110983	72	193	1465	185592	51590	326675
Malda	370862	1679	88623			3430	285603	178764	92	332	60709	212455	106839	450766



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District	Geo Area (Reporting Area)	Forest Area	Land under Non Agri. Use	Barren Land	Pasture & other grazing land	Land under Misc. trees	Cultivable Land	Total Rain fed Areas		Other fallow	Current fallow	Not shown areas	Net Irrigated Area	Gross cropped Area
								Cultivated	Cultural waste land					
Jalpaiguri	622700	179000	87939	3090		5276	363041	286215	101	79	11441	335694	76826	550759
Darjeeling	325469	124575	40165	2135	1126	2333	164590	133996	1555	3646	17666	132507	30602	194119
CoochBehar	331565	4256	68081	851	35	5633	264968	224965	116	40	1196	251955	40003	551876
Purulia	625646	75048	104477	5307	2559	3190	443984	377560	8232	4722	102703	317092	66424	373907
West Bengal	8684113	1173669	1798641	21633	6155	55260	5807871*	3468143	30706	19514	322728	5294040	2309666	9801516

Excluding Kolkata, (Source: Evaluation wing, Directorate of Agriculture & Economic Review, Govt. of West Bengal, 2010-2011 & Census Hand book 2001)

* This includes Net Area sown + Current Fallow + Fallow other than current fallow + Culturable waste land + Land under Misc. Tree



D. Target Beneficiaries:

According to the provisional results of the 2011 national census, West Bengal is the fourth most populous state in India with a population of 91,347,736 (7.55% of India's population). There are 18 administrative districts (excluding Kolkata), 66 Sub- divisions, 341 blocks, 333 Panchayat Samities, 3356 Gram Panchayat and 38975 numbers of villages. Hindu population is 6,43,85,546 in West Bengal while Muslim population is 2,46,54,825 as per 2011 census. The state's 2001–2011 decennial growth rates was 13.93%, lower than 1991–2001 growth rate of 17.8%, and also lower than the national rate of 17.64%. The gender ratio is 947 females per 1000 males. As of 2011, West Bengal has a population density of 1,029 inhabitants per square kilometer, making it the second-most densely populated state in India, after Bihar. West Bengal's total fertility rate is 1.6, way below Bihar's 3.4, which is the highest in the entire country. The literacy rate is 77.08%, higher than the national rate of 74.04%. The Scheduled Castes (SC) and Tribes (ST) form 28.6% and 5.8% of the population respectively in rural areas, and 19.9% and 1.5% respectively in urban areas. Kolkata (with a population of 132.05 lakh) and Asansol (population 10.67 lakh) are the largest cities in West Bengal.

Table: Demographic details of West Bengal

S. No	Indicators	Year	Unit	West Bengal	India
1	Geographical Area	2011	Lakh Sq. Km	0.88	32.87
2	Population	2011	Crores	9.13	121.02
3	Decadal Growth Rate	2011	Percentage	13.93	17.64
4	Density of Population	2011	Population/Sq. Km.	1029	382
5	Urban to Total Population	2011	Percentage	31.89	31.16
6	Sex Ratio	2011	Females/1000 Males	947	940
7	Literacy Rate (LR)	2011	Percentage	77.08	74.04

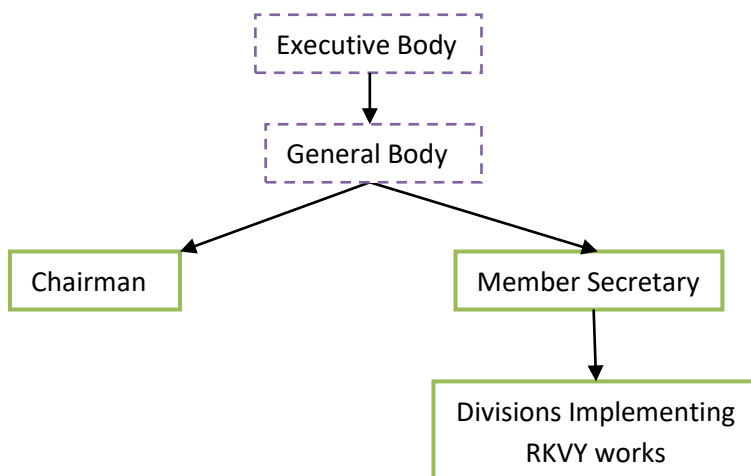
The major implementing divisions where the infrastructure has been proposed are Purulia, Kangsabati (N), Kangsabati (S), Kurseong S.C., Kalimpong S.C., Jalpaiguri S.C., Raigunj, Malda, Howrah, Baikunthapur, Coochbehar, Jalpaiguri, Jaldapara Wild life, Gorumara Wildlife, Darjeeling Wildlife, Bankura (N), Bankura (S), Panchet, Nadia-Murshidabad, Birbhum, Durgapur, Burdwan, Rupnarayan, Jhargram, Kharagpur, Purba- Medinipur, Medinipur, Kurseong, and Darjeeling.





E. Management:

The State Forest Development Agency (SFDA), Department of Forest (DoF), Govt. of West Bengal (GoWB) will be implementation agency of the Forestry Interventions of RKVY scheme, 2021-22. The concerned Divisional Forest Officials (DFO) and their subordinates Range Officers will be implement the RKVY scheme in the field. The monitoring will be taken care of by SFDA. The organization structure of SFDA is as follows;



Implementation of the RKVY 2020 – 21 in the states needs a well-organized and dynamic institution. As per the advice of the NAEB, Government of India, ‘State Forest Development Agencies’ (SFDA) have been created in 2010. PCCF, HoFF will designate one DFO of the district as the Convener. DAP has been managed by all the districts of West Bengal. Baseline share of agriculture and allied sector in its total plan has been maintained. The funds will be channeled through WBSFDA to the Divisions which are the implementing units in the field.



F. Finance:

The cost estimates, budget for the RKVY – 2021-22 project is attached in Annexures. The means of financing and phasing of expenditure is RKVY funds for one year (2021-22). The options for cost sharing and cost recovery (user charges) rule has oriented and there is no scope for explore. The major issues of project sustainability is the state's forests are under tremendous pressure due to the indiscriminate removal of timber, fuel wood, fodder & other forest produce and also decrease in soil moisture, water table, erosion in throughout the West Bengal. Though there are various afforestation and plantation programs being implemented by the State Forest Department, the results will be positive when supported by good and useful infrastructure.

The steady depletion of forest resources and increasing deforestation has brought into focus- the realization that the constructions of contour trench, earthen dam, gully plugging, river training, Hand packed wall, Boulder Sausage wall, Catch water drain and production centers for tall seedling QPM 0.5 lakh capacity. Operation and maintenance of assets after project completion would depend on type of land on which project would be implemented. On forest lands the maintenance would be take care by Forest Department and on private lands by private individuals.

G. Infrastructure and Assets: (Pre-Harvest Infrastructures).

H. Natural Resource management

Under this component Soil and Moisture Conservation activities shall be taken and are described below in detail.

1. Contour Trenches in Forest Areas:

Objectives:

- a. Recharge ground water.
- b. To conserve soil moisture in the plantation areas in the dry seasons.

Activities:-

Under this sub component the digging of contour trenches in the plantation areas along the contour is taken up so that the soil water runoff may be prevented. This activity also helps in conserving the soil moisture, which is of great help for young plantations in the dry seasons. The activity is labour intensive and generates wages in rural areas.



2. Earthen Dam:

Objectives:

- a. To prevent soil erosion.
- b. To harvest Rain water.
- c. To recharge ground water.
- d. To irrigate agricultural field in the command area downstream.
- e. To use the water body for pisciculture and other house hold purpose.

Activities:

Earthen dams are constructed for the purpose of holding excess run-off water by creating bund of suitable size with a small inner core wall. This structure slows down the run-off and water during rainy season is harvested. These have been proved very useful for South West Bengal. This work is labor intensive and generates employment for the local people.

3. Gully Plugging work/ Hand Packed Walls in hills:

Objectives:

- a. To prevent accelerated erosion.
- b. To harvest Rain water.
- c. To improve soil moisture regime.
- d. To recharge ground water.

Activities:

Gully Plugging's are constructed for the purpose of holding excess run-off water by creating obstructions of suitable size. Generally series of such check dams are constructed. These structures slow down the run-off and water during rainy season is harvested. These have been proved very useful for checking gully and reel erosion in South West Bengal. The work is labour intensive and generates employment for the local people.

4. River Training Works/Boulder sausage works to prevent damage to agriculture fields:

Objectives:

- a. To prevent stream bank erosion.
- b. To check landslides and stabilization hill slopes.
- c. To reduce the chance of flooding of agricultural fields by hilly torrents.

Activities:

Boulder sausage works: Upper reaches are treated with this work where bigger boulders are used to construct sausage works to stabilize the slopes.



5. Catch Water drains/Runoff Diversion Sites:

Objectives:

- a. To prevent water runoff.
- b. To stagger runoff in peak periods.
- c. To store water for use during lean periods.

Activities:

The Catch Water drains/Runoff Diversion Sites are man-made box drains built with boulders constructed along the contour lines for the Collection/Diversion of the flow of the streams or minor watercourses. These help in staggering the runoff in peak periods and for utilizing the water during lean periods.

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**Detailed work program for this stream is shown below:-**

	Natural Resource Management	Rate (Rs)	Unit	Physical	Amount (Rs)
1	Contour trench in Forest Areas	4008.00	km	2900	1,16,23,200.00
2	Earthen Dam	8,15,000.00	Unit	40	3,26,00,000.00
3	Gully Plugging	2,252.00	Cum	11000	2,47,72,000.00
4	River training works to prevent damage to agricultural fields	2,831.00	Cum	2506	70,94,486.00
5	Hand Packed Walls in Hills	2,789.00	Cum	11000	3,06,79,000.00
6	Boulder Sausage Walls	2,831.00	Cum	12000	3,39,72,000.00
7	Catch Water Drains	2,348.00	RMT	3000	70,44,000.00
	Sub Total				14,77,84,686.00
10	Administrative Cost (1.5 % of total project cost for third party monitoring & evaluation)				22,16,770.00
	Total				15,00,01,456.00
Or Say, Rs. 15.00 Crores (Rs. Fifteen Crores Only)					

Implementing divisions: Purulia, Kangsabati (N), Kangsabati (S), Kurseong S.C., Kalimpong S.C., Jalpaiguri S.C., Raiganj, Malda, Howrah, Baikunthapur, Coochbehar, Jalpaiguri, Jaldapara Wild life, Gorumara Wildlife, Darjeeling Wildlife, Bankura (N), Bankura (S), Panchet, Nadia- Murshidabad, Birbhum, Durgapur, Burdwan, Rupnarayan, Jhargram, Kharagpur, Purba- Medinipur, Medinipur, Kurseong, Darjeeling.

These works are executed inside the forest areas and not in the farmers' fields. Therefore as per the Cost Norm & Pattern of Assistance (Sl 4.7) of the Operational Guidelines for RKVY-RAFTAAR 100% assistance requires to be provided for Implementation of the Soil-Moisture Conservation works proposed above.

Estimates: ANNEXURE I,II,III,IV,V,VI,VII.

**Annexure – RKVY 2021-22 Tentative estimates of project activities**

RKVY: Work Programme for 2021-22					
I. Infrastructure & Assets–(Pre-Harvest Infrastructure)					
(i) Natural Resource Management					
S. No.	Particulars of Work	Rate (Rs.)	Physical	Unit	Financial (Rs.)
1	Contour trench in Forest Areas	4008.00	km	2900	1,16,23,200.00
2	Earthen Dam	8,15,000.00	Unit	40	3,26,00,000.00
3	Gully Plugging	2,252.00	Cum	11000	2,47,72,000.00
4	River training works to prevent damage to agricultural fields	2,831.00	Cum	2506	70,94,486.00
5	Hand Packed Walls in Hills	2,789.00	Cum	11000	3,06,79,000.00
6	Boulder Sausage Walls	2,831.00	Cum	12000	3,39,72,000.00
7	Catch Water Drains	2,348.00	RMT	3000	70,44,000.00
	Sub Total				14,77,84,686.00
10	Administrative Cost (1.5% of total project cost for third party monitoring & evaluation)				22,16,770.00
	Total				15,00,01,456.00
Or Say, Rs. 15.00 Crores (Rs. Fifteen Crores Only)					



Annexure.1 - Estimate for Making/Digging Contour Trench

Component of the Scheme :

Soil & Moisture Conservation

SL. No.	Particulars Of Works	Unit	Qty.	Rate	Amount
1	Cost of Surveying & alignment	No.	1	234	234.00
2	Cost of excavation of earth for making/digging contour trench around 1 KM area where necessary over 228.3288 mt x (0.45 x 0.30) x 0.30 = 0.375 PWD Schedule Building item 2	m ³	25.687	119.27	3063.69
	TOTAL(Rs)				3297.69
	Add: Contingency 3%				98.93
	TOTAL(Rs)				3396.62
	Add: GST 18%				611.39
	TOTAL(Rs)				4008.00

Rupees Four Thousands Eight Only

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**Annexure.2 - Estimate for Construction of Earthen Dam**

Component of the Scheme :

Soil & Moisture Conservation

S. No	Particular of Works	Man-days (md) / Quantity	Rate	Material Cost	Total Cost
	Cost of doing the following works in connection with construction of an E.D. in forest area as follows :				
1	Survey, demarcation & cleaning of the site	4 md	234.00 /md		936.00
2	Digging key trench in mixed medium hard soil with morrumover : - Length - 50mt.; Top width - 25mt.; Bottom width - 2mt.; Depth - 90cm. = $(2.5+2.0)/2 \times 0.9\text{mt.} \times 50\text{mt.} = 101.25 \text{ m}^3 = 3543.75\text{cft.}$ Or say 3544cft. by engaging daily labour PWD Schedule (Building) item 2 a & d	101.25 m ³	140.09		14,184.11
3	Making core wall of mud and placing layer after layer (layer not excluding 30cm. Height) by ordinary mixed soil to be excavated over : 1) $(2.5+2.0)/2 \times 0.9\text{mt.} \times 50\text{mt.} = 101.25\text{m}^3$ 2) $(2.0+0.6)/2 \times 1.5 \text{ mt.} = 97.50\text{m}^3 = 198.75 \text{ m}^3$ PWD Schedule Road & Bridge item 3.4 (i)	198.75 m ³	79.90		15,880.13
4	Digging earth and depositing the same layer after layer not excluding 15cm. Including breaking of clodes and rough dressing in mixed medium hard soil with morrum over : 950 m ³ + (add) 10% for settlement i.e. 95 m ³ = 1045 m ³ - (less volume of earth excavation for spill way and core wall) 112.25 m ³ = 932.75 m ³ (a) Spill way - 30mt. x 0.90cm. x $(2.0+1.5)/2$ and (b) Core wall 47.25 m ³ + 65.00 m ³ = 32646 cft. Lead upto 80 ft. and lift upto 3 ft., 55% of earth = 17955 cft. by engaging daily labour PWD Schedule Road & Bridge item 3.4 (i)	505.77 m ³	79.90		40,411.02
	Lead upto 80 ft. and lift from 3 ft. to 6 ft. 45% of earth = 14691 cft. by engaging daily labour	413.83 m ³	79.90		33,065.02
5	Digging spill way to drain out excess water over 47.25 m ³ = 1654 cft. by engaging daily labour	47.25 m ³	79.90		3,775.28
6.	Setting of boulder in front of ED (water logging side) PWD Schedule item 11	54.82 m ³	64.00		3,508.48
	Total :	1325.67 m³			1,11,760.03
	Add: Contingency (Including labour cess) 3%				3352.80
	Total :				115112.83
	Add: GST 18%				20720.31
	Total for 50 mts.				135833.14
	Estimate for 300 mt length of E.D (Rs. 135833.14 x 6)				8,15,000.00

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Annexure.3 - Estimate for Construction of Gully Plugging

Component of the Scheme :

Soil & Moisture Conservation

UNIT = 1 M3

S. No	Item of work	Man days in Nos.	Material in unit.	Rate (in Rs.)	Amount (in Rs.)
	Cost of doing the following works in connection with treatment of gully for protection of gully & soil and moisture conservation works over 1 m ³ . (Size 1mt. X 1mt. X 1mt.)				
1	Making structural works for protection of gully by using of morrum blocks, fitting fixing including foundation trench & supplying of all materials over 1 mt. 20 mt. X 0.75 x 0.75 PWD Schedule Building item 2	11.25	m ³	119.27	1341.79
2	Cost of morrum blocks (1mt. X 1mt. X 1mt. = 1m ³) Bamboo Posts, Bushes etc. including carriage		L.S.		511.10
	Total				1852.89
	Add: Contingency 3%				55.59
	TOTAL(Rs)				1908.47
	Add: GST 18%				343.53
	TOTAL(Rs)				2252.00

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**Annexure.4 - Estimate for River Training**

SL No.	Items of Work	Unit	Quantity	Rate (Rs.)	Amount
1.	WB, PWD (Buildings) SOR-2017 Page No. 1 item No. 2(a). Earth Work in excavation of foundations in all sorts of soil including removing, spreading or stacking the earth within a lead of 75 m, as required. $1 \times 3.00 \times 2.00 \times (0.50 + 2.50) / 2 = 9.00$	CuM	9	134.92	1,214.26
2	WB, PWD (Buildings) SOR-2017 Page No. 302 Item No. 18. Supply of Stone Boulder 150mm of North Bengal variety delivered and stacked at site. $1 \times 3.00 \times 1.50 \times 2.00 = 9.00$ $1 \times 3 \times 1 / 2 \times 0.50 \times 2.00 = 1.50$ $1 \times 3 \times 1 / 2 \times 2.00 \times 0.50 = 1.50$	CuM	12	1726.66	20,719.92
	Total= 12.00				
3	WB, IWD USOR-2018 Page No. C-16 Item No. 2.43(e). Supply of G.I wire metting of 150mmX150mm mesh made with 10 SWG GI wire at site as per direction of the Engineer-in-charge $1 \times 3.00 \times 1.50 \times 2.00 = 9.00$ $1 \times 3 \times 1 / 2 \times 0.50 \times 2.00 = 1.50$ $1 \times 3 \times 1 / 2 \times 2.00 \times 0.50 = 1.50$ Total=12.00X4.25=51.00	Sq.M	51	119.45	6,091.95
4	WB, PWD (Roads) SOR-2015 Page No. 326 Item No. 18.31. Filling properly the empty sausage crates with boulders of any size & shape with hand packing after preparation of bed of placement, placing the crate in position, carriage of boulders from road stacks with a lead up to 150m etc. complete in all respect including stitching the rest of the crate with wire (passage for filling boulders) after filling up the crate with boulders and launching the crate in position if necessary and as directed by the Engineer-in charge. $1 \times 3.00 \times 1.50 \times 2.00 = 9.00$ $1 \times 3 \times 1 / 2 \times 0.50 \times 2.00 = 1.50$ $1 \times 3 \times 1 / 2 \times 2.00 \times 0.50 = 1.50$ Total=12.00	Cu.M	12	481.89	5,782.68
5	WB, PWD (Buildings) SOR-2017 Page No. 1 Item No. 3(a). Earth Work in filling in foundation trenches with earth obtained from excavation of foundation in layers not exceeding 150 mm. $1 \times 3 \times 1 / 2 \times 0.50 \times 2.50 = 1.87$	%Cu.M.	1.87	8771.32	164.02
	Cost for 12 Cu.M.			Rs.	33,972.83
	Cost per Cu.M.			Rs.	2,831.00

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Annexure.5 –Estimate forHand Packed Walls in Hills

Sl.No	Items of work	Unit	Quantity	Rate (Rs.)	Amount (Rs.)
1	Page No. 1 Item No. 2(a). Earth work in excavation of foundations in all sorts of soil including removing, spreading or stacking the earth within a lead of 75 m. as required. 1x1/2x2.00x0.50x1.00=0.50	%Cu.M.	0.5	13491.82	67.46
2	Page No. 23 Item No. 46. Hand Packed rough dressed stone walls by masons with hard stones from approved quarries including all carriage of materials to site. 1x2.00x1.50x1.00=3.00	Cu.M.	3	2774.61	8,323.83
3	Page No. 1 Item No. 3(a). Earth work in filling in foundation trenches with earth obtained from excavation of foundation in layers not exceeding 150 mm. 1x1/2x2.00x0.50x1.00=0.50	%Cu.M.	0.5	8771.32	43.86
	Cost for 3.00 Cu.M.			Rs.	8,367.69
	Cost per Cu.M.			Rs.	2,789.23
	Say			Rs.	2,789.00

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**Annexure.6 - Estimate for Boulder Sausage Wall**

SL No.	Items of Work	Unit	Quantity	Rate (Rs.)	Amount
1.	WB, PWD (Buildings) SOR-2017 Page No. 1 item No. 2(a). Earth Work in excavation of foundations in all sorts of soil including removing, spreading or stacking the earth within a lead of 75 m, as required. $1 \times 3.00 \times 2.00 \times (0.50 + 2.50) / 2 = 9.00$	CuM	9	134.92	1,214.26
2	WB, PWD (Buildings) SOR-2017 Page No. 302 Item No. 18. Supply of Stone Boulder 150mm of North Bengal variety delivered and stacked at site. $1 \times 3.00 \times 1.50 \times 2.00 = 9.00$ $1 \times 3 \times 1 / 2 \times 0.50 \times 2.00 = 1.50$ $1 \times 3 \times 1 / 2 \times 2.00 \times 0.50 = 1.50$ Total= 12.00	CuM	12	1726.66	20,719.92
3	WB, IWD USOR-2018 Page No. C-16 Item No. 2.43(e). Supply of G.I wire metting of 150mmX150mm mesh made with 10 SWG GI wire at site as per direction of the Engineer-in-charge $1 \times 3.00 \times 1.50 \times 2.00 = 9.00$ $1 \times 3 \times 1 / 2 \times 0.50 \times 2.00 = 1.50$ $1 \times 3 \times 1 / 2 \times 2.00 \times 0.50 = 1.50$ Total=12.00X4.25=51.00	Sq.M	51	119.45	6,091.95
4	WB, PWD (Roads) SOR-2015 Page No. 326 Item No. 18.31. Filling properly the empty sausage crates with boulders of any size & shape with hand packing after preparation of bed of placement, placing the crate in position, carriage of boulders from road stacks with a lead up to 150m etc. complete in all respect including stitching the rest of the crate with wire (passage for filling boulders) after filling up the crate with boulders and launching the crate in position if necessary and as directed by the Engineer-in charge. $1 \times 3.00 \times 1.50 \times 2.00 = 9.00$ $1 \times 3 \times 1 / 2 \times 0.50 \times 2.00 = 1.50$ $1 \times 3 \times 1 / 2 \times 2.00 \times 0.50 = 1.50$ Total=12.00	Cu.M	12	481.89	5,782.68
5	WB, PWD (Buildings) SOR-2017 Page No. 1 Item No. 3(a). Earth Work in filling in foundation trenches with earth obtained from excavation of foundation in layers not exceeding 150 mm. $1 \times 3 \times 1 / 2 \times 0.50 \times 2.50 = 1.87$	%Cu.M.	1.87	8771.32	164.02
	Cost for 12 Cu.M.			Rs.	33,972.83
	Cost per Cu.M.			Rs.	2,831.00

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**Annexure.7- Estimate for Catch Water Drain**

Sl.No	Items of work	Unit	Quantity	Rate(Rs)	Amount (Rs)
1	Page No. 1 Item No. 2(a). Earth work in excavation of foundations in all sorts of soil including removing, spreading or stacking the earth within a lead of 75 m. as required. 1x100.00x0.90x0.55= 49.50	%M3	49.5	13491.82	6,678.45
2	Page No. 302 Item No. 18 & Page No. 229 Item No. 12. (1272.00+20%+12%+1%/1000*150=Rs. 259.00+Rs. 50.00)= Rs. 309.00 Hand Packed Stone Soling including Cost of supplying stone boulders of minimum size 150mm of North Bengal variety and labour for laying soling including rough dressing, hand packing and ramming down small pieces in the interstics without rolling and preparing the bed to proper level and filling up all joints with sandy clay or earth. 1x100.00x0.90= 90.00	M2	90	309	27,810.00
3	Page No. 34 Item No. 22(I)(B)(b). Cement concrete (1:4:8) with graded stone ballast (40 mm N.B. Variety stone metal). 1x100.00x0.90x0.10= 9.00	M3	9	6092.19	54,829.71
4	Page No. 22 Items No. 44(a). Rubble masonry in cement (1:4) with hard dressed stones from approved quarries and clean, coarse and washed sand including carriage of all materials to site in Jhora Work. 2x100.00x0.30x0.30= 18.00	M3	18	4885.43	87,937.74
5	Page No. 24 Item No. 4(b). Ordinary cement concrete (1:2:4) with graded river bazree (20mm size). 1x100.00x0.30x0.05(Ave.th)= 1.50	M3	1.5	6974.53	10,461.80



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Sl.No	Items of work	Unit	Quantity	Rate(Rs)	Amount (Rs)
6	Page No. 189 Item No. 1(ii)(a). 20 mm thick Cement Plaster (1:4). 1x100.00x1.50= 150.00	M2	150	267.42	40,113.00
7	Page No. 192 Item No. 15. Neat Cement Punning 1.5mm thick. 1x100.00x1.50= 150.00	M2	150	46.15	6,922.50
	Cost of 100 RMT			Rs.	2,34,753.20
	Cost of 1 RMT			Rs.	2,347.53
	Say			Rs.	2,348.00



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I. Time Frame:

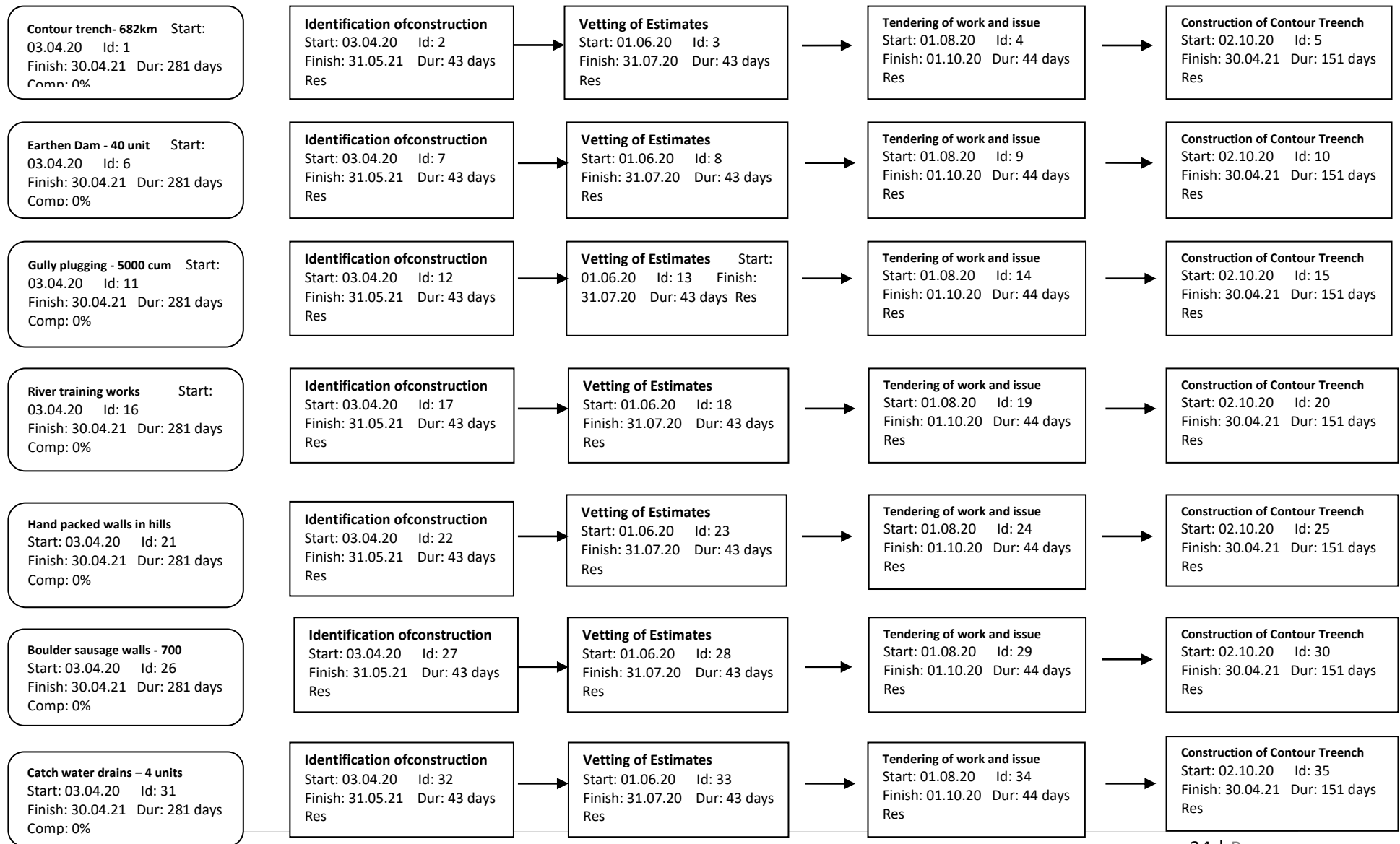
S. No	Activities (Time Line)	2021-22											
		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
		1	2	3	4	5	6	7	8	9	10	11	12
i.	Natural Resource Management												
1	Contour trench-2900 km												
A.1.	Identification of construction area & approval												
A.2	Vetting of estimates												
A.3	Tendering of work and issue of work order												
A.4	Construction of Contour trench												
2	Earthen Dam - 40 Unit												
A.1.	Identification of construction area & approval												
A.2	Vetting of estimates												
A.3	Tendering of work and issue of work order												
A.4	Construction of Earthen Dam												
3	Gully Plugging - 11000 Cum												
A.1.	Identification of construction area & approval												
A.2	Vetting of estimates												
A.3	Tendering of work and issue of work order												
A.4	Construction of Gully Plugging												
4	River training works to prevent damage to agricultural fields- 2506 cum												
A.1.	Identification of construction area & approval												



S. No	Activities (Time Line)	2021-22											
		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
		1	2	3	4	5	6	7	8	9	10	11	12
A.2	Vetting of estimates												
A.3	Tendering of work and issue of work order												
A.4	Construction of River training work to prevent damage to agricultural fields												
5	Hand Packed walls in Hills –11000km												
A.1.	Identification of construction area & approval												
A.2	Vetting of estimates												
A.3	Tendering of work and issue of work order												
A.4	Construction of Hand Packed walls in Hills												
6	Boulder Sausage Walls –12000km												
A.1.	Identification of construction area & approval												
A.2	Vetting of estimates												
A.3	Tendering of work and issue of work order												
A.4	Construction of Boulder Sausage Walls												
7	Catch Water drains – 3000 RMT												
A.1.	Identification of construction area & approval												
A.2	Vetting of estimates												
A.3	Tendering of work and issue of work order												
A.4	Construction of Catch Water drains												



PERT Chart – Soil Moisture Conservation Project (RKVY-RAFTAAR– 2021-22) and cost Rs. 15.00 crores





J. Cost Benefit Analysis:

1. Cost Benefit analysis of Contour Trenches

Cost Benefit Analysis (CBA) - Contour Trench in Forest Area		
Input parameters	Unit	Value
Total Capital Cost Contour Trench	Rs/ km	1,16,23,200
Number of Contour Trenches	per km	2900
Unit Capital Cost Contour Trench	Rs/ km	4,008
Operational Cost (Annual) (O&M)	Percentage of Capital cost	1%
Life	Years	5
No of days of operation	Days	365
Average daily hours of operation	hours	24
Depreciation (on straight line basis)	Percentage	20%
Escalation cost	Percentage	1.50%
Discount Factor	Percentage	10%

Expected Benefits from Contour Trench

S. No	List of Benefits	Direct/Indirect	Cost associated with Benefit /day	Cost per year	Expected year of Benefit	Yearly increment expected in Benefit
1	Recharge of Ground water	Direct	Intangible			
2	Increase in Soil Moisture Content during dry season	Direct	Intangible			
3	Reduced Run-Off / Erosion	Direct	Intangible			
4	Reduced Evaporation	Direct	Intangible			
5	Increase in Canopy Cover	Direct	Intangible			
6	Increase in Biomass	Direct	Intangible			
7	Increased Humidity	Direct	Intangible			
8	Improvement in Micro-climate	Direct	Intangible			
9	Drinking water availability for wild animals & birds	Direct	Intangible			
10	Improvement in Plant mortality rate by 4%	Direct	Tangible			
10a	4% more stock of timber quality plants that can be felled after (http://www.fao.org/docrep/ARTICLE/WFC/XII/0634-C2.HTM)	Direct	Tangible	7920	4	10%



S. No	List of Benefits	Direct/Indirect	Cost associated with Benefit /day	Cost per year	Expected year of Benefit	Yearly increment expected in Benefit
11	Increased Agriculture Productivity (conventional method) ftp://ftp.fao.org/agl/agll/docs/sb79.pdf	Direct	Tangible			
11a	Labour Charges (person - day)	Direct	272	81600	2	10%
11b	Net Farm Productivity (rice) http://sap.ipni.net/article/west-bengal	Direct		6500	2	10%
12	Pisciculture Productivity	Direct	Tangible			
13	Labour Charges (person - day)	Direct	272	8160	2	10%
14	Net fish catch http://rkvy.nic.in/static/SAP/WB/WB.PDF	Direct	Kg/ Ha / year	3500	2	10%
15	2% EDC & FPCs benefited in West Bengal http://www.westbengalforest.gov.in/publication_pdf/state_for est_report_06_07.pdf	Direct	83.86	107680		
16	Benefits	Direct		9030045		

Cost Benefit Analysis - Contour Trench

CBA - Contour Trench						
Cash Flow	0	1	2	3	4	5
Capital Cost	1,16,23,200	0	0	0	0	0
Operational Cost	0	1,16,23,200	1,16,23,200	1,16,23,200	1,16,23,200	1,16,23,200
Depreciation (on straight line basis)	23,24,640	23,24,640	23,24,640	23,24,640	23,24,640	23,24,640
Escalation cost	1,74,348	1,74,348	1,74,348	1,74,348	1,74,348	1,74,348
Benefits	0	9030045	9933049	10926354	12018990	13220889
Total Benefit	-1,41,22,188	65,31,057	74,34,061	84,27,366	95,20,002	1,07,21,901
Discount Factor (10%)	1	0.909090909	0.8264463	0.7513148	0.6830135	0.6209213
Present Value	-14122188	5937324	6143852	6331605	6502289	6657457
Net Present Value (NPV)	17450340					
IRR	47%					



2. Cost Benefit analysis of Earthen Dam

Cost Benefit Analysis (CBA) - Earthen Dam		
Input parameters	Unit	Value
Total Capital Cost Earthen Dam	Rs/ km	32600000
Number of Earthen Dam	Number of Unit	40
Unit Capital Cost Earthen Dam	Rs/ km	815000
Operational Cost (Annual) (O&M)	Percentage of Capital cost	0%
Life	Years	10
No of days of operation	Days	365
Average daily hours of operation (Dry Season)	hours	4
Depreciation (on straight line basis)	Percentage	10%
Escalation cost	Percentage	1.50%
Discount Factor	Percentage	10%

Expected Benefits from Earthen Dam

S. No	List of Benefits	Direct/Indirect	Cost associated with Benefit /day	Cost per year	Expected year of Benefit	Yearly increment expected in Benefit
1	Recharge of Ground water	Direct	Intangible			
2	Increase in Soil Moisture Content during dry season	Direct	Intangible			
3	Reduced Run-Off / Erosion	Direct	Intangible			
4	Reduced Evaporation	Direct	Intangible			
5	Increase in Canopy Cover	Direct	Intangible			
6	Increase in Biomass	Direct	Intangible			
7	Increased Humidity	Direct	Intangible			
8	Improvement in Micro-climate	Direct	Intangible			
9	Drinking water availability for wild animals & birds	Direct	Intangible			
10	Water availability for irrigation	Direct	Intangible			
11	Improvement in Plant mortality rate by 4%	Direct	Tangible			
11a	4% more stock of timber quality plants that can be felled after (http://www.fao.org/docrep/ARTICLE/WFC/XII/0634-C2.HTM)	Direct	Tangible	7920	4	10%



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S. No	List of Benefits	Direct/Indirect	Cost associated with Benefit /day	Cost per year	Expected year of Benefit	Yearly increment expected in Benefit
12	Increased Agriculture Productivity (conventional method) ftp://ftp.fao.org/agl/agll/docs/sb79.pdf	Direct	Tangible			
12a	Labor Charges (person - day)	Direct	272	81600	2	10%
12b	Net Farm Productivity(rice) http://sap.ipni.net/article/west-bengal	Direct		64900	2	10%
13	Pisciculture Productivity	Direct	Tangible			
14	Labor Charges (person - day)	Direct	272	8160	2	10%
15	Net fish catch http://rkvy.nic.in/static/SAP/WB/WB.PDF	Direct	Kg/ Ha / year	3500	2	10%
16	2% EDC & FPCs benefited in West Bengal http://www.westbengalforest.gov.in/publication_pdf/state_forest_report_06_07.pdf	Direct	83.86	166080		
17	Benefits	Direct		13927469		

Cost Benefit Analysis –Earthen Dam

Cash Flow	0	1	2	3	4	5	6	7	8	9	10
Capital Cost	3,26,00,000	0	0	0	0	0	0	0	0	0	0
Operational Cost	0	3,26,00,000	3,26,00,000	3,26,00,000	3,26,00,000	3,26,00,000	3,26,00,000	3,26,00,000	3,26,00,000	3,26,00,000	3,26,00,000
Depreciation (on straight line basis)	32,60,000	32,60,000	32,60,000	32,60,000	32,60,000	32,60,000	32,60,000	32,60,000	32,60,000	32,60,000	32,60,000
Escalation cost	4,89,000	4,89,000	4,89,000	4,89,000	4,89,000	4,89,000	4,89,000	4,89,000	4,89,000	4,89,000	4,89,000
Benefits	0	13927469	15320216	16852237	18537461	20391207	22430328	24673361	27140697	29854766	32840243
Total Benefit	-3,63,49,000	1,01,78,469	1,15,71,216	1,31,03,237	1,47,88,461	1,66,42,207	1,86,81,328	2,09,24,361	2,33,91,697	2,61,05,766	2,90,91,243
Discount Factor (10%)	1	0.909090909	0.826446281	0.751314801	0.683013455	0.620921323	0.5644739	0.5131581	0.4665074	0.4240976	0.3855433
Present Value	-36349000	9253153	9562988	9844656	10100718	10333501	10545122	10737505	10912400	11071393	11215934
Net Present Value (NPV)	67228370										
IRR	37%										



3. Cost Benefit analysis of Gully Plugging

Cost Benefit Analysis (CBA) - Gully Plugging		
Input parameters	Unit	Value
Total Capital Cost Gully Plugging	Rs/ km	24772000
Number of Gully Plugging	Cum	11000
Unit Capital Cost Gully Plugging	Rs/ km	2252
Operational Cost (Annual) (O&M)	Percentage of Capital cost	1%
Life	Years	5
No of days of operation	Days	365
Average daily hours of operation	hours	24
Depreciation (on straight line basis)	Percentage	20%
Escalation cost	Percentage	1.50%
Discount Factor	Percentage	10%

Expected Benefits from Gully Plugging

S. No	List of Benefits	Direct/Indirect	Cost associated with Benefit /day	Cost per year	Expected year of Benefit	Yearly increment expected in Benefit
1	Recharge of Ground water	Direct	Intangible			
2	Increase in Soil Moisture Content during dry season	Direct	Intangible			
3	Reduced Run-Off / Erosion	Direct	Intangible			
4	Reduced Evaporation	Direct	Intangible			
5	Increase in Canopy Cover	Direct	Intangible			
6	Increase in Biomass	Direct	Intangible			
7	Increased Humidity	Direct	Intangible			
8	Improvement in Micro-climate	Direct	Intangible			



S. No	List of Benefits	Direct/Indirect	Cost associated with Benefit /day	Cost per year	Expected year of Benefit	Yearly increment expected in Benefit
9	Drinking water availability for wild animals & birds	Direct	Intangible			
10	Improvement in Plant mortality rate by 4%	Direct	Tangible			
10a	4% more stock of timber quality plants that can be felled after (http://www.fao.org/docrep/ARTICLE/WFC/XII/0634-C2.HTM)	Direct	Tangible	7920	4	10%
11	Increased Agriculture Productivity (conventional method) ftp://ftp.fao.org/agl/agll/docs/sb79.pdf	Direct	Tangible			
11a	Labour Charges (person - day)	Direct	272	81600	2	10%
11b	Net Farm Productivity (rice) http://sap.ipni.net/article/west-bengal	Direct		58440	2	10%
12	Net fish catch http://rkvy.nic.in/static/SAP/WB/WB.PDF	Direct	Kg/ Ha / year	3500	2	10%
13	Labour Charges (person - day)	Direct	272	10800	2	10%
14	2% EDC & FPCs benefited in West Bengal http://www.westbengalforest.gov.in/publication_pdf/state_forest_report_06_07.pdf	Direct	83.86	162260		
15	Benefits	Direct		13607124		



Cost Benefit Analysis –Gully Plugging

Cash Flow	0	1	2	3	4	5
Capital Cost	2,47,72,000	0	0	0	0	0
Operational Cost	0	2,47,72,000	2,47,72,000	2,47,72,000	2,47,72,000	2,47,72,000
Depreciation (on straight line basis)	49,54,400	49,54,400	49,54,400	49,54,400	49,54,400	49,54,400
Escalation cost	3,71,580	3,71,580	3,71,580	3,71,580	3,71,580	3,71,580
Benefits	0	13607124	14967836	16464620	18111082	19922190
Total Benefit	-3,00,97,980	82,81,144	96,41,856	1,11,38,640	1,27,85,102	1,45,96,210
Discount Factor (10%)	1	0.909090909	0.826446281	0.751314801	0.683013455	0.620921323
Present Value	-30097980	7528312	7968476	8368625	8732396	9063098
Net Present Value (NPV)	11562927					
IRR	23%					

**4. Cost Benefit analysis of River training works to prevent damage to agricultural fields**

Cost Benefit Analysis (CBA) - River Training		
Input parameters	Unit	Value
Total Capital Cost River Training	Rs/ km	7094486
Number of River Training	Cum	2506
Unit Capital Cost River Training	Rs/ km	2831
Operational Cost (Annual) (O&M)	Percentage of Capital cost	0%
Life	Years	5
No of days of operation	Days	365
Average daily hours of operation	hours	24
Depreciation (on straight line basis)	Percentage	20%
Escalation cost	Percentage	1.50%
Discount Factor	Percentage	10%

Expected Benefits from River Training

S. No	List of Benefits	Direct/Indirect	Cost associated with Benefit /day	Cost per year	Expected year of Benefit	Yearly increment expected in Benefit
1	Recharge of Ground water	Direct	Intangible			
2	Increase in Soil Moisture Content during dry season	Direct	Intangible			
3	Reduced Run-Off / Erosion	Direct	Intangible			
4	Reduced Evaporation	Direct	Intangible			
5	Increase in Canopy Cover	Direct	Intangible			
6	Increase in Biomass	Direct	Intangible			
7	Increased Humidity	Direct	Intangible			



S. No	List of Benefits	Direct/Indirect	Cost associated with Benefit /day	Cost per year	Expected year of Benefit	Yearly increment expected in Benefit
8	Improvement in Micro-climate	Direct	Intangible			
9	Drinking water availability for wild animals & birds	Direct	Intangible			
10	Increased Agriculture Productivity (conventional method) ftp://ftp.fao.org/agl/agll/docs/sb79.pdf	Direct	Tangible			
10a	Labour Charges (person - day)	Direct	272	81600	2	10%
10b	Net Farm Productivity (rice) http://sap.ipni.net/article/west-bengal	Direct		5444	2	10%
11	Pisciculture Productivity	Direct	Tangible			
12	Labour Charges (person - day)	Direct	272	2720	2	10%
13	Net fish catch http://rkvy.nic.in/static/SAP/WB/WB.PDF	Direct	Kg/ Ha / year	3500	2	10%
14	2% EDC & FPCs benefited in West Bengal http://www.westbengalforest.gov.in/publication_pdf/state_forest_report_06_07.pdf	Direct	84	93264		
15	Benefits	Direct		7834176		



Cost Benefit Analysis – River Training

CBA - River Training						
Cash Flow	0	1	2	3	4	5
Capital Cost	70,94,486	0	0	0	0	0
Operational Cost	0	70,94,486	70,94,486	70,94,486	70,94,486	70,94,486
Depreciation (on straight line basis)	14,18,897	14,18,897	14,18,897	14,18,897	14,18,897	14,18,897
Escalation cost	1,06,417	1,06,417	1,06,417	1,06,417	1,06,417	1,06,417
Benefits	0	7834176	8617594	9479353	10427288	11470017
Total Benefit	-86,19,800	63,08,862	70,92,279	79,54,038	89,01,974	99,44,703
Discount Factor (10%)	1	0.909090909	0.8264463	0.7513148	0.6830135	0.6209213
Present Value	-8619800	5735329	5861388	5975987	6080168	6174878
Net Present Value (NPV)	21207948					
IRR	78%					



5. Cost Benefit analysis of Hand Packed Wall

Cost Benefit Analysis (CBA) - Hand Packed Wall		
Input parameters	Unit	Value
Total Capital Cost Hand Packed Wall	Rs/ km	30679000
Number of Hand Packed Wall	Cum	11000
Unit Capital Cost Hand Packed Wall	Rs/ km	2789
Operational Cost (Annual) (O&M)	Percentage of Capital cost	0%
Life	Years	5
No of days of operation	Days	365
Average daily hours of operation	hours	24
Depreciation (on straight line basis)	Percentage	20%
Escalation cost	Percentage	1.50%
Discount Factor	Percentage	10%

Expected Benefits from Hand Packed Wall

S.No	List of Benefits	Direct/Indirect	Cost associated with Benefit /day	Cost per year	Expected year of Benefit	Yearly increment expected in Benefit
1	Recharge of Ground water	Direct	Intangible			
2	Increase in Soil Moisture Content during dry season	Direct	Intangible			
3	Reduced Run-Off / Erosion	Direct	Intangible			
4	Reduced Evaporation	Direct	Intangible			
5	Increase in Canopy Cover	Direct	Intangible			
6	Increase in Biomass	Direct	Intangible			
7	Increased Humidity	Direct	Intangible			



S.No	List of Benefits	Direct/Indirect	Cost associated with Benefit /day	Cost per year	Expected year of Benefit	Yearly increment expected in Benefit
8	Improvement in Micro-climate	Direct	Intangible			
9	Drinking water availability for wild animals & birds	Direct	Intangible			
10	Improvement in Plant mortality rate by 4%	Direct	Tangible			
10a	4% more stock of timber quality plants that can be felled after (http://www.fao.org/docrep/ARTICLE/WFC/XII/0634-C2.HTM)	Direct	Tangible	0	4	10%
11	Increased Agriculture Productivity (conventional method) ftp://ftp.fao.org/agl/agll/docs/sb79.pdf	Direct	Tangible			
11a	Labour Charges (person - day)	Direct	272	108800	2	10%
11b	Net Farm Productivity (rice) http://sap.ipni.net/article/west-bengal	Direct		96000	2	10%
12	2% EDC & FPCs benefited in West Bengal http://www.westbengalforest.gov.in/publication_pdf/state_for est_report_06_07.pdf	Direct	83.86	204800		
13	Benefits	Direct		17174528		



Cost Benefit Analysis of Hand Packed Wall

CBA - Hand Packed Wall						
Cash Flow	0	1	2	3	4	5
Capital Cost	30679000	0	0	0	0	0
Operational Cost	0	30679000	30679000	30679000	30679000	30679000
Depreciation (on straight line basis)	61,35,800	61,35,800	61,35,800	61,35,800	61,35,800	61,35,800
Escalation cost	4,60,185	4,60,185	4,60,185	4,60,185	4,60,185	4,60,185
Benefits	0	17174528	1,88,91,981	2,07,81,179	2,28,59,297	2,51,45,226
Total Benefit	-3,72,74,985	1,05,78,543	1,22,95,996	1,41,85,194	1,62,63,312	1,85,49,241
Discount Factor (10%)	1	0.909090909	0.8264463	0.7513148	0.6830135	0.6209213
Present Value	-37274985	9616857	10161980	10657546	11108061	11517620
Net Present Value (NPV)	15787079					
IRR	24%					

**6. Cost Benefit analysis of Boulder Sausage Wall**

Cost Benefit Analysis (CBA) - Boulder Sausage Wall		
Input parameters	Unit	Value
Total Capital Boulder Sausage Wall	Rs/ km	33972000
Number of Boulder Sausage Wall	Cum	12000
Unit Capital Cost Boulder Sausage Wall	Rs/ km	2831
Operational Cost (Annual) (O&M)	Percentage of Capital cost	0%
Life	Years	5
No of days of operation	Days	365
Average daily hours of operation	hours	24
Depreciation (on straight line basis)	Percentage	20%
Escalation cost	Percentage	1.50%
Discount Factor	Percentage	10%

Expected Benefits from Boulder Sausage Wall

S. No	List of Benefits	Direct/Indirect	Cost associated with Benefit /day	Cost per year	Expected year of Benefit	Yearly increment expected in Benefit
1	Recharge of Ground water	Direct	Intangible			
2	Increase in Soil Moisture Content during dry season	Direct	Intangible			
3	Reduced Run-Off / Erosion	Direct	Intangible			
4	Reduced Evaporation	Direct	Intangible			
5	Increase in Canopy Cover	Direct	Intangible			
6	Increase in Biomass	Direct	Intangible			
7	Increased Humidity	Direct	Intangible			
8	Improvement in Micro-climate	Direct	Intangible			



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S. No	List of Benefits	Direct/Indirect	Cost associated with Benefit /day	Cost per year	Expected year of Benefit	Yearly increment expected in Benefit
9	Drinking water availability for wild animals & birds	Direct	Intangible			
10	Improvement in Plant mortality rate by 4%	Direct	Tangible			
11	4% more stock of timber quality plants that can be felled after (http://www.fao.org/docrep/ARTICLE/WFC/XII/0634-C2.HTM)	Direct	Tangible	7920	4	10%
12	Increased Agriculture Productivity (conventional method) ftp://ftp.fao.org/agl/agll/docs/sb79.pdf	Direct	Tangible			
12a	Labour Charges (person - day)	Direct	272	97920	2	10%
12	Net Farm Productivity (rice) http://sap.ipni.net/article/west-bengal	Direct		100500	2	10%
13	Pisciculture Productivity	Direct	Tangible			
14	Labour Charges (person - day)	Direct	272	24480	2	10%
15	Net fish catch http://rkvy.nic.in/static/SAP/WB/WB.PDF	Direct	Kg/ Ha / year	3500	2	10%
16	2% EDC & FPCs benefited in West Bengal http://www.westbengalforest.gov.in/publication_pdf/state_forest_report_06_07.pdf	Direct	84	234320		
17	Benefits	Direct		19682880		



Cost Benefit Analysis of Boulder Sausage Wall

CBA - Boulder Sausage Wall						
Cash Flow	0	1	2	3	4	5
Capital Cost	3,39,72,000	0	0	0	0	0
Operational Cost	0	3,39,72,000	3,39,72,000	3,39,72,000	3,39,72,000	3,39,72,000
Depreciation (on straight line basis)	67,94,400	67,94,400	67,94,400	67,94,400	67,94,400	67,94,400
Escalation cost	5,09,580	5,09,580	5,09,580	5,09,580	5,09,580	5,09,580
Benefits		19682880	21651168	23816285	26197913	28817705
Total Benefit	-4,12,75,980	1,23,78,900	1,43,47,188	1,65,12,305	1,88,93,933	2,15,13,725
Discount Factor (10%)	1	0.909090909	0.8264463	0.7513148	0.6830135	0.6209213
Present Value	-41275980	11253545.45	11857180	12405939	12904811	13358330
Net Present Value (NPV)	20503826					
IRR	26%					



7. Cost Benefit analysis of Catch Water Drain

Cost Benefit Analysis (CBA) - Catch Water Drain		
Input parameters	Unit	Value
Total Capital Cost Catch Water Drain	Rs/ km	7044000
Number of Catch Water Drain	Number of Unit	3000
Unit Capital Cost Catch Water Drain	Rs/ km	2348
Operational Cost (Annual) (O&M)	Percentage of Capital cost	0%
Life	Years	5
No of days of operation	Days	365
Average daily hours of operation (Dry Season)	hours	12
Depreciation (on straight line basis)	Percentage	10%
Escalation cost	Percentage	1.50%
Discount Factor	Percentage	10%

Expected Benefits from Catch Water Drain

S. No	List of Benefits	Direct/Indirect	Cost associated with Benefit /day	Cost per year	Expected year of Benefit	Yearly increment expected in Benefit
1	Recharge of Ground water	Direct	Intangible			
2	Increase in Soil Moisture Content during dry season	Direct	Intangible			
3	Reduced Run-Off / Erosion	Direct	Intangible			
4	Reduced Evaporation	Direct	Intangible			
5	Increase in Canopy Cover	Direct	Intangible			
6	Increase in Biomass	Direct	Intangible			
7	Increased Humidity	Direct	Intangible			



S. No	List of Benefits	Direct/Indirect	Cost associated with Benefit /day	Cost per year	Expected year of Benefit	Yearly increment expected in Benefit
8	Improvement in Micro-climate	Direct	Intangible			
9	Drinking water availability for wild animals & birds	Direct	Intangible			
10	Water availability for irrigation	Direct	Intangible			
13	Increased Agriculture Productivity (conventional method) ftp://ftp.fao.org/agl/agll/docs/sb79.pdf	Direct	Tangible			
13a	Labour Charges (person - day)	Direct	272	8160	2	10%
13b	Net Farm Productivity (rice) http://sap.ipni.net/article/west-bengal	Direct		16332	2	10%
14	Pisciculture Productivity	Direct	Tangible			
15	Labour Charges (person - day)	Direct	272	6800	2	10%
16	Net fish catch http://rkvy.nic.in/static/SAP/WB/WB.PDF	Direct	Kg/ Ha / year	3500	2	10%
17	2% EDC & FPCs benefited in West Bengal http://www.westbengalforest.gov.in/publication_pdf/state_for_est_report_06_07.pdf	Direct	83.86	34792		
18	Benefits	Direct		2917657		



Cost Benefit Analysis of Catch Water Drain

CBA - Catch Water Drain						
Cash Flow	0	1	2	3	4	5
Capital Cost	70,44,000	0	0	0	0	0
Operational Cost	0	70,44,000	70,44,000	70,44,000	70,44,000	70,44,000
Depreciation (on straight line basis)	7,04,400	7,04,400	7,04,400	7,04,400	7,04,400	7,04,400
Escalation cost	1,05,660	1,05,660	1,05,660	1,05,660	1,05,660	1,05,660
Benefits		2917657.12	3209422.832	3530365.115	3883401.627	4271741.789
Total Benefit	-78,54,060	21,07,597	23,99,363	27,20,305	30,73,342	34,61,682
Discount Factor (10%)	1	0.909090909	0.826446281	0.751314801	0.683013455	0.620921323
Present Value	-7854060	1915997	1982944	2043805	2099134	2149432
Net Present Value (NPV)	2337253					
IRR	20%					



Risk Analysis:

In the process of drafting the FIG for West Bengal, the Forest Directorate has held consultations with several departments, institutions, stakeholders. The consultative groups are given in the chart enclosed. The program is designed with plans and resources to ensure transparent decision making and implementation, including mechanisms for redressing potential grievances. Given the framework approach adopted for infrastructure investments, the proposed project has some high inherent risks.

Table: Major Risks, Mitigation Measures, and Rating of Residual Risks

<i>Risk factors</i>	<i>Description of risk</i>	<i>Rating of Risk</i>	<i>Mitigation measures</i>	<i>Rating of Residual risk</i>
I. Sector-specific Risks				
Sector Governance	Governance and financial accountability framework rest with multiple agencies. Issues include: (a) weak coordination, resulting in poor planning and implementation delays; (b) weak capacity at intermediate and lower levels which are responsible for service delivery; and inadequate performance management and accountability systems; (c) M&E systems are not very strong; and (d) despite a strong framework of sanctions, there remains patronage and direct theft of public money.	Substantial	(a) Institutionalization of co-ordination with dedicated institutions for implementing FIG, WB with emphasis on training of staff. (b) Sector governance and financial accountability assessments have to be conducted at the executing agency level. (c) Various technical assistance activities have to be initiated including capacity building of all associated agencies, (d) The design of the project includes better internal control systems, third party quality assurance, better systems for M&E and expenditure tracking; prudent systems for financial and procurement management; and process reforms supporting transparency and accountability.	Moderate
Sector Institutions and Policies	Basin-level management across three key sectors – water resources, environment, and urban development - will be challenging, with weak service delivery institutions, insufficient cross-sectoral coordination, and no proven models for river basin clean-up/management in the country	Substantial	(a) Cross-sectoral coordination to be built with institutional design, (b) The program will be supported by ongoing reforms in these sectors/states, (c) Improving financial sustainability of service delivery through rational charges and tariffs and improved financial management.	Moderate
II. Operation-specific Risks				
Operational	ULBs do not currently have adequate technical	High	(a) No investments will be considered without explicit consent of	Substantial



capacity and ownership at the ULB level	and financial capacity.		ULB. (b) ULBs are being sensitized through workshops and communications program.	
Operational Capacity of institutions	Successful implementation requires competent and dedicated executive bodies at state levels.	Substantial	(a) The SPMGs at the state level are to be set up as registered societies, with agreed structure and staffing plans, to enhance administrative and financial autonomy and promote single-point accountability. (b) Up-front support for capacity building being provided, including project management and technical support consultancies.	Moderate
Investments Preparation and Execution	Technical quality of investment preparation (including city-level planning) is inadequate, and long-term sustainability is not addressed satisfactorily	Substantial	(a) Investments framework with criteria for selecting, appraising and implementing investments have to be developed to ensure technical quality, effectiveness and sustainability of investments. (b) A rigorous review process has to be designed, requiring feasibility and planning analyses and independent reviews	Moderate
	Householders do not connect to sewer networks	Substantial	ULB to be empowered for suitable mechanism for the same	Moderate
Transparency, Accountability redressal	Lack of citizen voice in investment planning and implementation; inadequate disclosure measures; weak grievance redressal	Moderate	(a) Consultations, communication and disclosure are mandated by framework (b) All RTI Act provisions will apply, (c) Project to include social audits and publicly disclose all M&E reports (d) Dedicated grievance redressal system to be incorporated.	Low
Social and environmental safeguards	Inadequate attention to social and environmental impacts of project/program interventions.	Moderate	(a) SPMG to be staffed with competent social and environment specialists to ensure ESMF compliance (b) Project provides for systematic and long-term effort to track social and environmental issues in the basin,	Low
Reputational risks	Unrealistic public expectations that the river will become clean by the time the project is completed.	High	(a) Design includes strong communications and outreach program, (b) Communications will focus on managing expectations, including the fact that the Ganga clean-up will require longer time and more resources than possible in one project.	Substantial
III. Overall Risk				
Overall Risk	The project is complex in scope and of high visibility in India. Even though the PDO, components, and institutional arrangements have been designed to integrate the mitigation measures described above, the overall risk remains high.			High
Rating of risks on a four-point scale – High, Substantial, Moderate, Low – according to the likelihood of occurrence and magnitude of potential adverse impact.				



K. Outcome:

Land use type	Activities	Forest	Outcome of the infrastructure development (Service and Benefit)									
			Timber	Fuel Wood	Biomass	Fodder	Reduced Erosion	Minor produce	Hydrological benefit	Soil Conservation	Biodiversity	Carbon Sequestration
Land use type	Contour Trench	Degraded Natural Forest	+	++	++	++	+++	++	+++	+++	++	++
	Earthen Dam		++	++	++++	++	+++	++	+++	+++	++	+++
	Gully Plugging		+	++	++	+++	+++	+	++	+++	+	++
	River Training		++	+	++	+++	+++	0	+	+++	+	+
	Hand packed wall in hills		+	++	++	+++	+++	+	++	+++	+	++
	Boulder Sausage Walls		++	+	++	+++	+++	0	+	+++	+	+
	Catch Water Drains		+	++	++	+++	+++	+	++	+++	+	++

Extent of Benefit – +++ High, ++ Medium, + Low, 0 None, - Negative

Type of beneficiary – Local Regional National / Global



L. Evaluation:

The primary monitoring of the RKVY works is done by the Divisional Forest Offices at the Divisional level and by the Chief Conservator of Forests in the Circle comprising different Divisions.

However as per the recent guidelines an independent 3rd party monitoring of the RKVY projects, implemented in the field, has been put in auction following the observation of CAG that deficiency in monitoring in monitoring was the biggest weakness of the programme.