Concept Note for Mainstreaming Climate Sensitive Planning of Budgetary Schemes

Water Resources Department

Sep 2018

Introduction - Climate Context and Water Sector

Among the pressing development challenges for the country, coping with climate change impacts would demand utmost policy priority and action from Indian national and State governments. With rural, and particularly farm livelihoods highly vulnerable to projected changes in temperature and rainfall, the economic impacts would have a cascading effect across other sectors as well. While overarching policies and action plans are chalked out for sectoral responses (such as National Missions, SAPCC strategies etc.), it is equally important to enhance the understanding and capacity of government institutions on the dimensions of this challenge as it is to forecast future climate scenarios. This is owing to the significant scale of development programmes designed and delivered by the public administration.

In line with the national guidelines, the State of Chhattisgarh has prepared its SAPCC, with sector-specific strategies. ***The most pertinent climate change risks to the State include rainfall variability, increased periods of drought and rise in temperature. Spatial distribution of rainfall is also projected to become relatively skewed.*** A few important concerns pertinent to the water sector would include an integrated management of land and water resources to reduce impacts of floods/droughts, promoting rain water harvesting and water conservation, ensuring equity in water consumption across various user types (domestic, industrial etc.), improving irrigation access and efficiency.

Analysis of public expenditure for climate linkages

Given the scope of climate change impacts on the State and the importance of addressing the same, ***steps should be taken towards integrating these concerns into the Government's planning and budgeting processes.*** An important step in this effort is the application of a Climate Change Financing Framework (CCFF) on public budgets – this helps the government ***identify and prioritise areas of intervention that are critical from a climate change perspective*****.** The current analysis proposes that deliberations on climate resilience building and climate proofing of interventions become an integral part of the government's annual budgeting decisions.

The fundamental premise of undertaking this exercise is two-fold:

1. **While most ongoing programmes in Departmental budgets may not have an explicit focus on climate change, their implementation could potentially yield climate co-benefits – these are opportunities for resilience building that should be identified.**
2. **If future climate projections were not taken into consideration in ongoing and new programmes, then the intended benefits would be significantly reduced due to adverse impacts of climate change – these are areas to improve the preparedness to future CC risks, i.e. for climate proofing**.

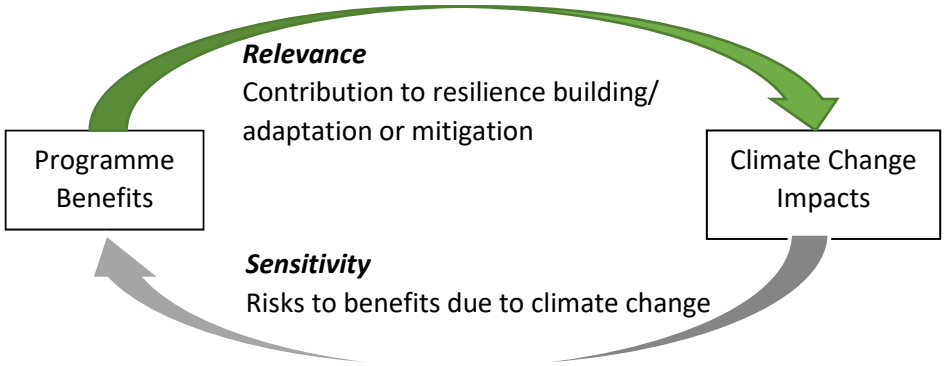
Therefore, the Climate Change Impact Appraisal (CCIA) is being proposed as a prioritisation tool to support the government in analysing and re-orienting its budget to improve the climate resilience of the community and infrastructure. CCIP has conducted this appraisal for three key sectors: Water Resources, Agriculture and Forestry: this report presents the CCIA results for the Chhattisgarh Water Resources Department.

Methodology – The Phased CCIA

The Phased CCIA is an assessment tool that involves an analysis of the benefits of programmes for their linkages with climate change factors (such as projected rise in temperature, erratic precipitation pattern, high intensity floods, longer drought spells etc.). The CCIA identifies 2 dimensions of programme benefits: the climate relevance and climate sensitivity (shown in Figure 1):

1. Climate change relevance: the potential contribution of the benefit to improving CC resilience or mitigation outcomes
2. Climate change sensitivity: the extent to which the benefit is affected by CC risks of the region being analysed

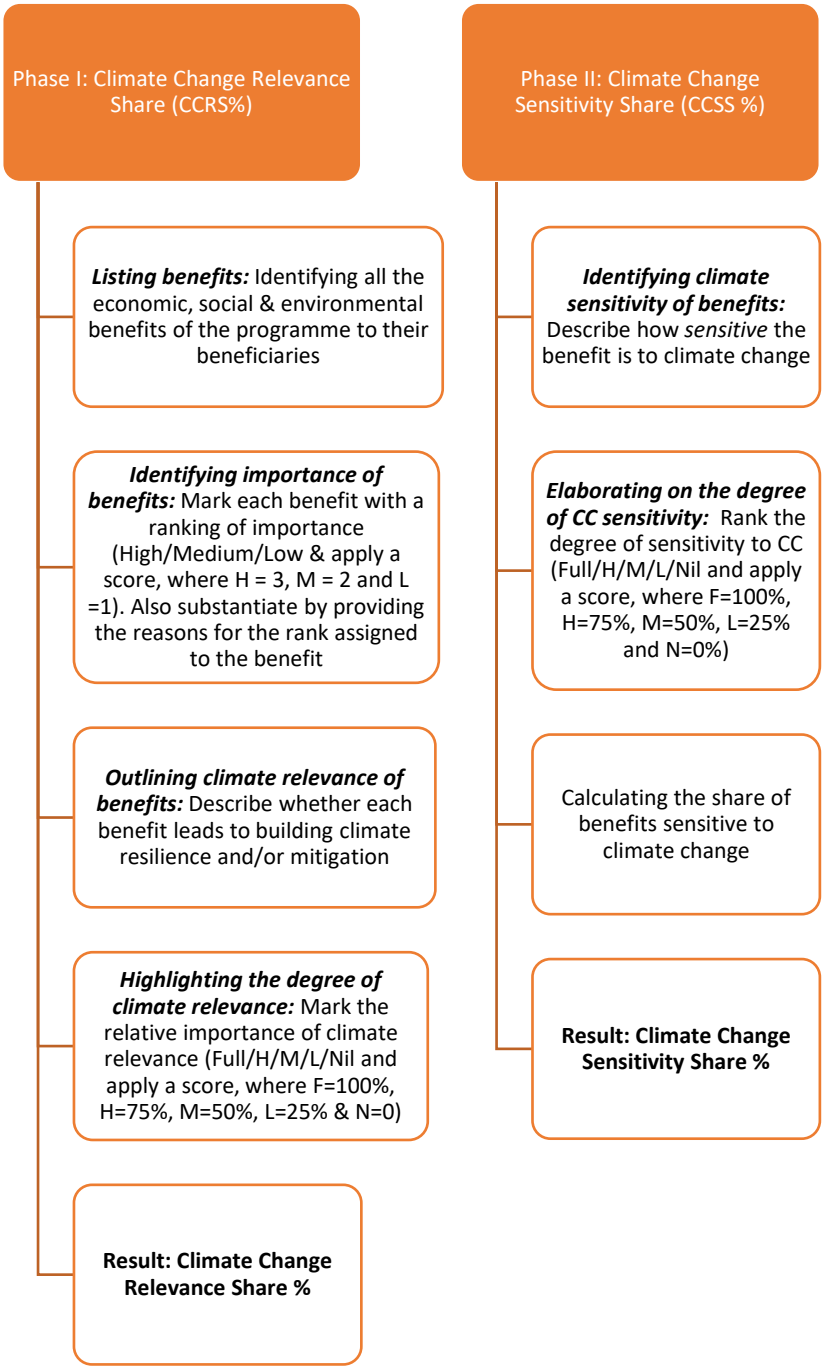
FIGURE 1: Climate Change Relevance and Sensitivity



Programmes/interventions with high CC relevance are valuable because of their default contribution to building CC resilience, and hence are good practices to be retained (and also funded on a sustained basis). High CC sensitivity in programmes relates to components that require some form of proofing effort (design level changes that would help reduce or eliminate adverse CC impacts). It is important that these interventions are funded only with special attention to such proofing – otherwise this investment would be at risk from future CC-induced losses and damages.

A summary of steps involved in conducting a Phased CCIA is shown below, and a detailed version is provided in Annex 1.

FIGURE 2: Steps in Phased CCIA



Source: Climate Change Innovation Programme, 2018

Table 1 shows the various possible combinations of CC relevance and sensitivity that may arise from the Phased CCIA, along with key policy recommendations. Based on time and resource availability, planners could adopt the appropriate response strategies for programmes in each of the four categories.

TABLE 1: Matrix of climate relevance and sensitivity

Phased CCIA Score		Climate Relevance (resilience building/adaptation/mitigation)	
		High	Low
Climate Sensitivity (loss and damage due to floods/cyclones/droughts)	High	**A high priority for scrutiny**: **Retain benefits** with *positive* climate sensitivity **Climate-proof benefits** with *negative* sensitivity	**Design changes** to enhance climate resilience and also **more climate proofing** effort to insure against welfare losses from climate hazards (in case of negative sensitivity) In case of *positive* sensitivity, enhancing climate resilience would reap dual benefits
	Low	Climate change benefits accrue with relatively less impact (or loss) from climate risks – ***low hanging fruits***	Regular monitoring and review effort – To explore the future scope of mainstreaming climate concerns. Comprehensive assessments needed to **evaluate allocations** in such programmes

Source: Climate Change Innovation Programme, 2018

Results for the Water Resources Sector

The Water Resources Department has a total budget of INR 339.33 crores for the year 2018-19 (Budget Estimates). The Plan outlay accounts for 76% of this, and the top 10 schemes among this have been considered for further study. Table 2 shows these schemes, along with climate change relevance and sensitivity shares obtained from the Phased CCIA analysis.

TABLE 2: Top 10 Schemes included in the analysis

S.No	Scheme Number	Scheme Name	Budget Estimate 2018-19 (in INR `000)
1	5516	Major Irrigation Project Construction Work (NABARD)	5482000
2	3828	Minor Irrigation Scheme	3705000
3	5059	Anicut/Step dam Construction	3120000
4	2898	Dam and Appurtenant Works	2849530
5	7907	Completion of Irrigation works in Command Area (ISBIG)	2450000
6	7422	Industrial water structures	2057976
7	3803	Minor and Micro Irrigation Schemes	1450000
8	2884	Canal and related works	1304024
9	5189	Small Irrigation Works (NABARD)	750000
10	9469	Loan Support from NABARD*	650000

* The CCRS and CCSS for scheme numbers 5189 and 9469 are identical because they are both NABARD-supported minor irrigation projects, with the outlay for Tribal Sub-Plan shown in #5189, and general category shown in #9469.

The following points are important to note in the context of selection of schemes for the current analysis:

- The scope of this analysis is only the top 10 schemes of the Department's Plan budget – this has been done to demonstrate the Phased CCIA approach and familiarise planners in the government of the application of such a prioritisation tool.

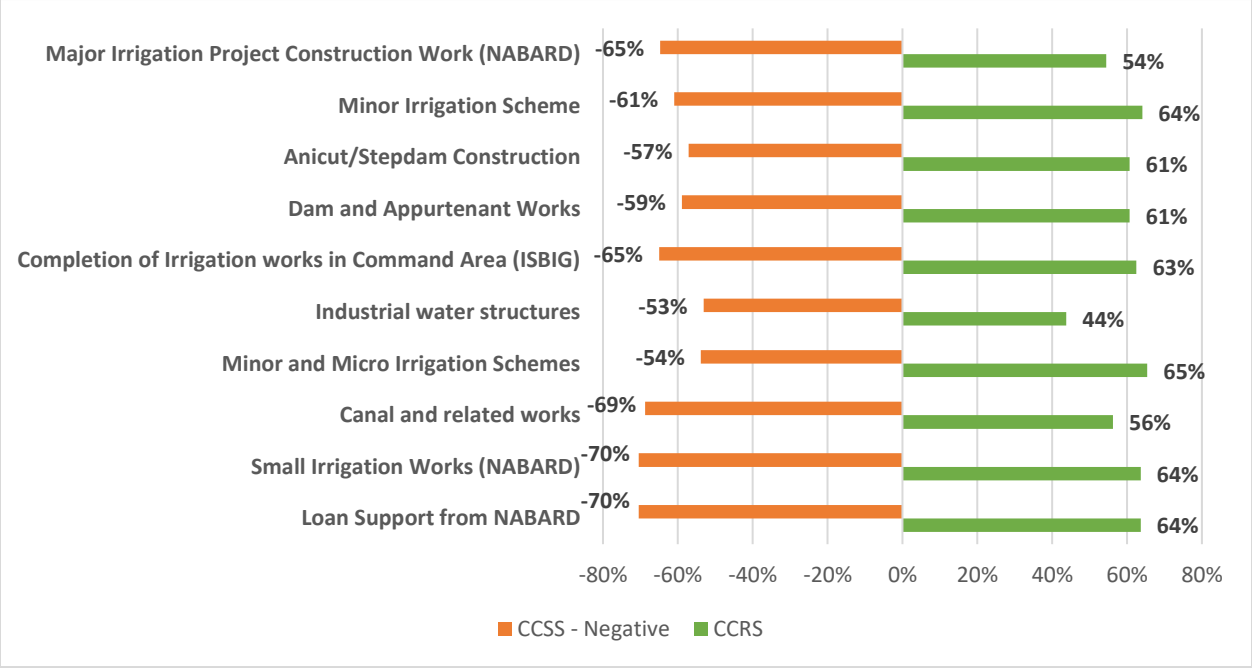
- Moreover, these 10 schemes constitute 93% of the Plan outlay, hence covering a significant part of the Plan budget.

It is observed that the top 10 schemes w.r.t budget outlay primarily relate to creation and expansion of access to irrigation, improvement in drainage networks, canal lining and restoration, upgradation of dam infrastructure, and micro-irrigation projects (partly solar powered). A few observations from the analysis are given below:

- Highly climate relevant components provide benefits such as improved water use efficiency, irrigation potential and access, reduced loss of lives, crops, property from flood protection, increased water availability from new and restored water storage structures etc. Small and minor irrigation schemes with strengthening of embankments, construction of canals, micro-irrigation project funding etc. show a relatively high CCRS, as they build the resilience of the beneficiary community in the face of water stress/droughts or floods.
- Programmes with high climate change sensitivity include components of water storage, construction and restoration of canal lining (and diversions) and improved access to irrigation to boost agricultural productivity. This indicates that these interventions would be at significant risk from CC impacts, i.e. these investments may fail to yield intended returns to the beneficiaries, if they are not designed to weather future CC impacts.

Figure 3 shows the CC relevance and sensitivity of these ten schemes graphically, for comparison.

FIGURE 3: Phased CCIA Results: Water Resources



This analysis has covered 93% of the Plan outlay, including schemes with huge outlays that are integrated and bundled in nature, i.e. include several components, thereby delivering a wide range of benefits. However, more streamlined interventions with smaller budget outlays could have higher climate sensitivity (e.g. schemes with singular focus on flood control or water use efficiency etc.). Therefore, it is

strongly encouraged that upon adoption of such a tool, the planners study the *entire* Plan budget, and identify critical interventions even among schemes with lower budgets.

Climate Proofing Suggestions for Water Resource Department

In the earlier chapters, it has been discussed how the CCIA could be used as a prioritisation tool to support the government in analysing and re-orienting its budget to improve the climate resilience of the community and infrastructure. In this chapter the top 3 most climate sensitive schemes of Water Resource Department have been taken as examples on how to introduce climate-sensitised planning in such schemes. The Department should however look at all the schemes analysed previously and aim to reduce the climate change sensitivity of the individual schemes.

Using the Climate Change Impact Appraisal (CCIA) method discussed in the previous chapters on the top 10 schemes in the Water Resource Department, the following three schemes emerged as being the top 3 most climate sensitive schemes:

1. 2884 – Canal and Related Works
2. 5189 - Small Irrigation Works (NABARD)
3. 9469 – Loan Support from NABARD

Collectively, these schemes aim to achieve the following development benefits:

- Increased irrigation potential through canal systems, CAD works and diversions to feed new storage structures.
- Increased water availability from restoration and creation of new storage structures
- Improved crop yields from irrigation canals created
- Improved land productivity, thereby greater farm incomes
- Increased area under cultivation from improved last mile coverage of farms and diversion projects in the command area
- Improved performance of irrigation infrastructure from canal lining, strengthening and restructuring

Climate proofing suggestions relevant to the benefits would necessarily require the climate proofing of the activities. In other words, how should the activities be done differently so that their climate sensitivity is reduced, and their climate resilience is enhanced, i.e. benefits are realized to the greatest possible extent. Further, these suggestions could be relevant for the other WRD schemes as well and therefore the possibility of integrating these across all the WRD schemes should be explored.

From the budget outlay pertaining to these schemes, the activities can be extrapolated to include the following: (a) upgrading / rehabilitating of water storage infrastructure, (b) expanding access to irrigation in the command areas through creating of new canals, supply and feeder channels, (c) canal lining and restoration, (d) enhancing micro-irrigation and (e) improving drainage networks. For each of these activities, the following modified approaches to these activities are suggested.

Activities & climate-proofing

Upgrading / rehabilitating of water storage infrastructure

Climate proofing requires an increase in decentralized water storage, e.g. dams, to be able to offset the vagaries of precipitation and river flows. Upgrading and rehabilitating water storage infrastructure should be done not only from a safety perspective but also from a storage expansion perspective.

Upgrading / rehabilitating should be given higher importance than creating new water storage infrastructure. Many water storage infrastructures suffer from excessive sediment / silt accumulation that results in reduced storage capacity. Rehabilitation the embankments and other repairs should necessarily be accompanied with removal of sediment / silt.

Further, redundancy in creating water storage infrastructure – wherever possible – should be facilitated as that would enable bearing climate shocks such as cloud burst and excessive precipitation during the monsoon period. These could be considered in cascading fashion. However, the ecological flow and downstream requirement during lean seasons needs to be considered while designing the infrastructure.

In addition to creating such storages, a sub-component of the activity could consider setting up of ground water recharge mechanisms which will increase the soil moisture and lead to lower requirement of expensive storage infrastructure in the longer run. In collaboration with the Agriculture Department, the traditional practice of farm-ponds may also be pursued wherever possible. These may be considered as subsidiary activities within this sub-activity.

Expanding access to irrigation in the command areas through creating of new canals, supply and feeder channels

Expanding access to irrigation in the command areas implies that the farmers who will be benefiting need to be made aware about the proper & effective use of the water that they will subsequently receive. The use of micro-irrigation, crop diversification and mulching should necessarily be integrated in the overall plan of expanding access within the command areas. This is best done with the WRD officers involving the other line departments, particularly Agriculture and Horticulture departments. The use of demonstration plots and farmer field schools to build their awareness & competence on water use should necessarily be planned. This is vitally important as the expanded areas could end-up consuming substantially more amount of water, particularly considering that they are getting access to irrigation for the very first time.

Expanding access should be followed up by regulating water supplies during the kharif season with the aim to improve irrigation potentials during the rabi season. The community itself may be involved in the maintenance of the expanded network by considering incentive and monetizing mechanisms.

Further, while considering the expansion in a particular area, the agriculture planning needs to be looked into and using tools such as CROPWAT to estimate the crop water requirement, the expansion of access should be designed.

Improving canal lining and restoration

Canal lining and restoration are being done based on the inspection of their current status. Wherever deterioration is noticed, this is marked for improved lining and restoration. Climate proofing requires focusing not only on deteriorated stretches but also on stretches that could deteriorate due to increased and unexpected water flows. As the goal is the overall efficiency of the canal, restricting to the restoration

of the deteriorated stretches will not suffice. Further, climate proofing requires integrating manmade assets (like the canal) with the natural assets (wells). Canal lining inhibits percolation to the natural water storage assets. Wherever such natural assets exist, there should be an integrated approach, which should be evolved in conjunction with the local community.

Enhancing micro-irrigation

Micro-irrigation reduces the use of water without compromising on crop yields. In itself, it is a climate proofing approach for irrigation. However, micro-irrigation can be combined with crop diversification and mulching in order to maximize effective reduction in the use of water. Further on-farm development (OFD) works and development of groundwater recharge structures to improve the availability of water for more crops should also be explored. In implementing micro-irrigation initiatives, WRD would necessarily need to work with the Agriculture and Horticulture Departments as such integration will ensure the sustainability of improved water use efficiency without compromising on yields. The Agriculture and Horticulture Departments should use the available climate data and predictions in order to determine what would be appropriate mix of crops and cropping methods in the context of quantity of water available.

Improving drainage networks

Drainage is important to ensure that the flows from the command areas are not obstructed. This is particularly so during the climate-induced event of flooding. By itself, ensuring the drainage networks are improved and maintained is a climate proofing activity in general. All improvements in the flows through canal lining and restoration in the upstream of the irrigation should necessarily be integrated with ensuring that the drainage networks are adequate. Further, flexibility in drainage, i.e. multiple ways of draining the water, should be considered wherever possible.

In planning and designing the climate proofing suggestions pertaining to the above activities, WRD should necessarily establish a mechanism for (a) determining past experiences to inform, (b) integrating with the other line departments and their activities within the same command area and (c) being inclusive, participating by consulting the community / beneficiaries whose climate resilience needs to be built.

It is well established that the agriculture sector – the largest consumer of water - is highly exposed to climatic risks. Climate-induced events - droughts, floods, cyclones, and erratic rainfall - have the potential to affect adversely the performance of the agriculture sector. The use of the above-mentioned water management techniques for climate proofing would lead to protecting the agricultural sector. Significant capacity building, training and awareness building for the line departments as well as communities / beneficiaries would have to be done in order to streamline the planning and implementation of these climate proofing suggestions through these and the other WRD schemes.

Further Actions

The climate proofing measures pertaining to these three schemes could also be relevant to other WRD schemes and should be extrapolated suitably. While these are at a scheme level, there is a fundamental change / adoption in the nature of functioning of all departments linked with supply or use of water that is urgently required.

These two broader principles should be accepted and implemented across the WRD at the earliest:

- Implementing these schemes in an integrated manner: Water is a resource that is shared between various uses. There are different line departments responsible for the different uses. If the state as a whole needs to use water efficiently, an integrated approach is mandatory. WRD would require to play a leadership coordination role to bring together the various line departments – Agriculture, Horticulture, Animal Husbandry, Watershed Development, Rural Development and other Departments. This coordinating role is what the WRD Climate Change Cell would need to facilitate. Such coordination is required at the District, sub-basin and panchayat level. And, the facilitating the coordination should be one of the important contributions of WRD's Climate Change Cell.
- Using climate predictions to strengthen water use effectiveness: Integrated water resource management is a pre-requisite. It is a necessary but not a sufficient condition to building effective climate resilience. Given the variability of rainfall, water resource planning needs to be enhanced with the use of climate models to dynamically predict the quantity and timing of rainfall. These predictions have to be periodically ground-truthed and refined in order to reduce the margin of error. these predictions – though generated at the State capital - should reach the District, sub-basin and panchayat levels in order to strengthen water resource planning. With the availability of various technologies such as access to satellite data, remote sensing, IT and mobile communication, it is indeed possible to convey important data/information at the field level to facilitate enhanced decision-making. In this regard, the capacity of the state should be progressively built and this should be the role of the WRD's Climate Change Cell. On the one hand, the Cell should collect the best practice information – from other states nationally and internationally – and channel the same to the appropriate departments / levels within the state. On the other hand, the Cell should provide a constant update on what climate-related data / information pertaining to Chhattisgarh are being collected by the various national and state agencies and facilitate efforts to gainfully use the same at the field level. This should be done on an ongoing basis in order to strengthen decision-making.

ANNEX 1: PHASED CCIA – DETAILED STEPS

Listing and scoring the benefits:

- Describe (and discuss among yourselves) the activities/ scope of the scheme as well as the most pertinent risks of the climate scheme being analysed
- List all the benefits of the scheme, including development and climate relevant benefits. Include any major spillover or co-benefits of the programme, even if these are not explicit objectives of the scheme objectives (Column 1)
- Assign the degree of importance of each benefit (H/M/L) and score them as 3,2,1 respectively (Columns 2 & 3). Give the reason of the classification in the matrix (Column 4), for better understanding. Total up these scores.

Guide to scores:
High = 3
Medium = 2
Low = 1

Phase I - Climate Change Relevance:

- Describe whether the benefit can contribute towards CC resilience building or CC mitigation, with specific reference to CC factors identified in Step 1 (Column 5).
- Assign the degree of CC relevance (F/H/M/L/N) at (100% ,75% ,50% ,25% ,0 %) respectively (Columns 6 & 7). Ask the question: How strong is this benefit in contributing to CC resilience/mitigation? Give the reason of the classification in the matrix, for better understanding.

Guide to scores:
Nil = 0% (No scope/link with CC resilience)
Low = 25% (Very limited/marginal significance to CC)
Medium = 50% (Moderate linkage to CC resilience)
High = 75% (Predominant factor in contributing to CC resilience)
Full = 100% (Benefit has value only in the event of CC – e.g. mitigation outcomes)

Assess the parameters/factors that help building climate change resilience and decide how prominent each benefit is?
i.e. the more exclusive the benefit is, in contributing to CC resilience/mitigation, the higher its CC relevance. *List the CC relevance scores by comparing the importance of the benefit in the climate change scenario as compared to the non-climate change scenario.*

- Calculate the Climate change Relevance Share (CCRS) of benefits (Column 8) as:

CCRS = Degree of Relevance (Benefit score) * Total of degree of CC relevance
CCRS = Column 3 * Column 7

Total the CCRS of all these benefits and divide by total of benefit ranks. This gives the combined CCRS of the scheme

Phase II - Climate Change Sensitivity:

- Describe the risks from CC to each benefit (Column 9).
- Assign a score of (F/H/M/L/N) comprising 100%, 75%, 50%, 25% and 0 respectively (Columns 10 & 11). Ask the question: How exclusive are the risks to this benefit because of the climate change as compared to other factors? How strongly will the benefit be impacted in a climate change scenario as compared to the non-climate change scenario?
  Note: *Always consider the benefit through the context of the specific scheme: Not as the Generic/Sectoral phenomenon, independent of the scheme context.*
  Give the reason of the classification in the matrix, for better understanding.

Guide to scores:
Nil = 0% (No sensitivity to climate change impacts)
Low = 25% (Very limited/marginal sensitivity to CC impacts)
Medium = 50% (Moderate sensitivity to CC (CC is among the many factors that could affect this benefit, but not the dominant one)
High = 75% (Predominant sensitivity to CC i.e. CC impacts are likely to cause more damage than any other factors)
Full = 100% (The benefit is ONLY exposed to climate change risks, and not any other factor)

- Calculate the CC Sensitivity Share of the scheme (CCSS) of benefits (Column 12):

  Rank of Importance of benefits (Benefit score) * Degree of importance of CC sensitivity
  CCSS = Column 3 * Column 11

Total the CCSS of all the benefits and divide by total of the benefit ranks. Thus, CCSS of the scheme is the addition of CCSS of all the benefits

ANNEX 2: Phased CCIA Results of most climate sensitive schemes in the Water Resources Sector

TABLE A.1: Scheme 2884: Canal and Related Works

S.No	Benefits of the Project (including CC Benefits)	Relative importance of Benefit (H/M/L)	Score	Reason for benefit score	Climate resilience building and/or mitigation relevance	Relative Importance of climate relevance (F/H/M/L/N)	Score	Climate Change Relevance Share	Nature of sensitivity of benefit to CC	Relative importance of climate sensitivity (F/H/M/L/N)	Score	Direction	Climate sensitivity score
1	Increased irrigation potential, from canal systems, and CAD works	High	3	This is a primary outcome of the works	Improved availability of water for farm use in the context of erratic supply (rainfall patterns in the context of climate change)	H	75%	2.25	Greater benefit of irrigation access to farm lands with expected risks of drought and rainfall variability. Yet, conscious preparedness of infrastructure to these risks is absent	H	75%	Negative	-2.25
2	Improved crop yields from irrigation canals created	Low	1	This is contingent upon maintenance of the assets created under this scheme	Contributes to less volatile farm incomes for irrigation dependent regions	M	50%	0.5	Risks of drought and rainfall variability limit the benefit of irrigation access to farms	H	75%	Negative	-0.75
3	Improved land productivity, thereby greater farm incomes	Medium	2	This is an associated benefit of increased land under cultivation	This strengthens farm incomes, contributing to financial resilience	M	50%	1	Risks of drought and rainfall variability limit the benefit from improved farm productivity, as farming is highly rainfed	H	75%	Negative	-1.5
4	Increased area under cultivation, from improved last mile coverage of farms	High	3	These are primary outcomes of the works		M	50%	1.5		H	75%	Negative	-2.25
5	Improved performance of irrigation infrastructure	High	3		This contributes to #1 above	M	50%	1.5	Similar to reasons in #1 above - in the absence of planning for climate risks w.r.t topography	M	50%	Negative	-1.5
		Total	12				Total	6.75				Total	-8.25
CCRS								**56%**	**CCSS**				**-69%**

TABLE A.2: Schemes 5189: Small Irrigation Works (NABARD) & 9469: Loan Support from NABARD

S.No	Benefits of the Project (including CC Benefits)	Relative importance of Benefit (H/M/L)	Score	Reason for benefit score	Climate resilience building and/or mitigation relevance	Relative Importance of climate relevance (F/H/M/L/N)	Score	Climate Change Relevance Share	Nature of sensitivity of benefit to CC	Relative importance of climate sensitivity (F/H/M/L/N)	Score	Direction	Climate sensitivity score
1	Increased irrigation potential from canal systems, diversions to feed new storage structures etc.	H	3	This is a primary outcome of the works in this scheme	Improved availability of water for farm use in the context of erratic supply (rainfall patterns in the context of climate change)	H	75%	2.25	Expected climate risks for the state include drought and rainfall variability, hence there is greater benefit of irrigation access to farm lands. Yet, conscious preparedness of infrastructure to these risks is absent	H	75%	Negative	-2.25
2	Increased water availability from restoration and creation of new storage structures	H	3	This is a secondary benefit (part of the scheme coverage pertains to storage structures/reservoirs)		H	75%	2.25	Same as above - impact on water availability/distribution among uses in case of drought	H	75%	Negative	-2.25
3	Improved land productivity, hence greater farm incomes	L	1	This is an associated benefit from increased land under cultivation	This strengthens farm incomes, contributing to financial resilience	M	50%	0.5	Risks of drought and rainfall variability limit the benefit from improved farm productivity, as farming is highly rainfed	H	75%	Negative	-0.75
4	Increased area under cultivation, from diversion projects in command area	M	2	This is a primary outcome of the works in this scheme		M	50%	1		H	75%	Negative	-1.5
5	Improved performance of irrigation infrastructure (from canal lining, strengthening and restructuring)	M	2	This is a secondary benefit, realised over a period of time	This contributes to benefit #1 above	M	50%	1	In the absence of planning for climate risks in relation to topography, this benefit is at risk for reasoning similar to #1	M	50%	Negative	-1
		Total	11				Total	7				Total	-7.75
CCRS								**64%**	**CCSS**				**-70%**

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