Climate and Disaster Risk Screening Report for Agriculture Project in India: Hypothetical Agriculture Project for India[1]

[1] This is the output report from applying the World Bank Group's Climate and Disaster Risk Screening Project Level Tool. The findings, interpretations, and conclusions expressed from applying this tool are those of the individual that applied the tool and should be in no way attributed to the World Bank, to its affiliated institutions, to the Executive Directors of The World Bank or the governments they represent. The World Bank does not guarantee the accuracy of the information included in the screening and this associated output report and accepts no liability for any consequence of its use.

1. Introduction

The project level **Climate and Disaster Risks Screening Tool** provides due diligence on climate and disaster risks at an early concept stage. The tool uses an **exposure - sensitivity - adaptive capacity framework** to consider and characterize risks from climate and geophysical hazards, based on key components of a project and its broader development context (Annex 1). The tool helps inform consultation, dialogue, and further work to be done in the course of project design.

The results of applying the project level tool to screen for climate and disaster risks for "Hypothetical Agriculture Project" in India are summarized below.

2. Climate and Disaster Risk Screening Results Summary

2.1 Project Information Summary

Table 1 below provides key project information.

Table 1: Project Information

Project Information	
Title	Hypothetical Agriculture Project
Number	Hypothetical
Region	South Asia
Country	India
Type of Assessment	Agriculture Projects
Purpose of Screening	Screen a Project at the Concept Stage
Current Project Phase	Concept (Identification)
Funding Source	IDA
Keywords	Market access,Value chains
Description of Location	The location of the proposed project is the mountanous state of Himachal Pradesh (HP) in India, situated in the western Himalayas and divided into three physiographical zones - Sivaliks (tropical climate), lesser-middle Himalayas (temperate climate) and Greater Himalayas (cold desert climate). The state has three climate zones and is spread over 21,495 sq mi (55,670 km2), divided into 12 districts and has elevation of 450-7000 meters above MSL. A water rich state, HP has permanent snow fields that feed its perennial rivers. The drainage system includes the rivers: Chenab, Ravi, Beas, Sutlej and Yamuna. Legally defined forest areas constitute 66.52% of the area although area under tree cover is only 25.78% in the state. High hydroelectric potential of 23,000.43 MW exists in five rivers basins. Agriculture constitutes 45% of state's GDP and is largely practised by small holders. Home to 1200 bird and 359 animal species, the state has two major national parks/sanctuaries.
GPS Coordinates	Not particularly helpful for this specific project.
Sub Sectors	Irrigation and Drainage, Crops and Land Management, Storage and Processing
Irrigation and Drainage	The project will be promoting climate resilient on-farm and community investments through technical support and matching grants to enable producers to invest in productivity enhancing technologies. The investment will support (a) harvest, capture, collection, delivery and distribution of water; (b) on-farm water use efficiency; (c) soil moisture and fertility improvements; and (d) climate mitigation related investments (hail nets, hail guns, etc.) including support for upgrading cultivars and rootstocks.
Crops and Land Management	The project would support, among others, (a) funding import and multiplication of true to type diseasefree genetic materials (both root stock and cultivars); (b) strengthening the post quarantine facilities for acclimatization of imported genetic material; and (b) disease and pest surveillance, with a specific focus on horticulture crops. The project will finance the demonstration and adaptation of locationspecific technologies (including technologies that meet the changing climatic conditions like low chill cultivars of apple); demonstration and use of improved crop varieties, integrated pest and nutrition management, as well as appropriate agronomic practices.
Storage and Processing	The project will support Supply chain infrastructure support to establish a modern supply chain,comprising of local collection centers, pack-houses, cold storage/controlled storage, processing facilities and commodity ‘integrators’.
Outcome / Service Delivery	The Project Development Objective (PDO) is to “increase the productivity, profitability and market access of selected horticulture commodities in Himachal Pradesh”. The project will achieve the PDO by: (i) improving producer’s access to knowledge and climate resilient production technologies so that producers are able to respond to climate changes and climate variability and emerging market opportunities; (ii) promoting investments in agribusiness, fostering backward and forward linkages in the value chains for horticulture products, facilitating access to finance for agribusiness entrepreneurs, and, where appropriate, push for process, regulatory and/or policy change; and (iii) supporting the development of an improved platform for market-related information and intelligence, alternative market channels developed outside of regulated markets, piloting negotiable warehouse receipts for horticulture commodities and improved services provided by modernizing traditional wholesale

2.2 Summary of Exposure to Climate and Geophysical Hazards

Table 2 presents a summary description of exposure to climate and geophysical hazards at the project location for the Historical/Current and Future time frames. The Future time frame is based on changes projected to occur between the 1980-1999 average and a future average. This future average is most likely the 2040-2059 average (i.e., the default in the Climate Change Knowledge Portal - CCKP), but the range is dependent upon the specific time frame that the user applied using the CCKP or other climate information. Again, these descriptions, if based on information in the CCKP, may be supplemented by national data sets.

Table 2: Summary of Exposure to Climate and Geophysical Hazards at Project Location

Hazard	Time Frame	Description of hazards for your location
Extreme Temperature	Current	The annual average increase in temperature in the north western Himalyan Region from 1901-2002 has been 1.6oC, with winter warming at a faster pace. Warming rate was higher from 1991-2002 compared to earlier periods and it was 2.2oC from 1982 to 2002. The historical rate of increase in maximum temperatures in higher altitudes was more than it was for lower altitudes, so warming varied in the different altitudinal zones of the state. In the last century, the NW Himalayan Region warmed significantly more compared to the the global average.
	Future	Daily extremes in surface temperatures, daily maximum and daily minimum will intensify by 2030s. The spatial pattern of change in the lowest daily minimum and hightest daily maximum shows a warming in the range of 1-4oC. The mean annual temperature is projected to increase from 0.9 to 2.6 oC in the 2030s.
Extreme Precipitation and Flooding	Current	The mean annual rainfall has varied from 1268+/-225 and 1604+/-175 with a higher rate of increase in the North Western Part of HP. Districts like Kangra, Chamba, Kullu and Una are likely to receive rainfall with increased intensity. The number of rainy days is increasing with decrease in average intensity in rainfall in the state in general. Change in rainfall variability with reduced rainfall in south eastern part of the state is leading to drought like conditions. Higher incidence of floods and flash floods due to water temperatures, increased variability and intensities are seen in the north western parts of the state. Floods is another disaster that the state experiences every year due to the south west monsooon during the months of June to August which triggers rainfall in excess of 125% of the normal. From 1951 to 1999 floods have occurred in Chamba, Bilaspur, Una, Mandi, Kangra, Hamirpur and Simaur where excess rainfall has ranged from 126-2158% higher than the normal rains.
	Future	There is insufficient understanding of the extent and severity of extreme precipitation and flooding but higher incidence of floods and flash floods due to water temperatures, increased variability and intensities may continue to be seen in the North Western parts of the state.

Hazard	Time Frame	Description of hazards for your location
Drought	Current	Drought is a regular feature in Himachal Pradesh despite it being a source of several perennial rivers and being water sufficiant. There are variations in drought occurrence in the different climatic zones of the state. The occurrence of drought is more common in the cold desert and hot humid zones and happens mainly in the pre monsoon and winter seasons. All of this is reflective of spatial and seasonal variations in drought incidence. From 1900-1970 at an overall years there are 8 drought years (1902, 1905, 1907, 1911, 1918, 1928, 1065, 1968) of which 1907 and 1918 were severe drought years. At the disrict level there were many more drought years when rainfall in certain districts was below normal rainfall. From 1971-2009, drought incidence was episodic. few drought years in the 70s; intensification of drought in the 80s; lesser dorught incidence in 90s and persistent rainfall deficit and droughts in the 21st century.
	Future	There is insufficient understanding of the extent and severity of droughts but increased temperatures, increased variability and intensities may continue to lead to droughts in the South Western parts of the state.
Earthquake	Current	Seismic sensitivity of the state is very high due to the stae's location in the great alpine belt of the Himalayan Region. Large earthquakaes have occurred on all parts of the state including the 1905 earthquake in Kangra district. the districts in HP lie in Zone IV and V which are the high damage risk (Lahual-Spiti, Kinnaur, Simla, Solan, Simour) and very high damage risk (Chamba, Kullu, Kangra, Una, Hamirpur, Bilaspur, Mandi) zones. There have been close to 553 earthquakes in various parts of HP from 1800-2008.
Landslide	Current	Lanslides are a common feature in Himachal Pradesh and one or two landslides happen very year. The first landslide occurred in 1971 and then there have been major landslides in 1988, 1993 and 1995. Most of the districts of HP have high to very high-severe vulnerability status where landslides are concerned. Districts such as Simla, Solan, Chamba, Bilaspur and Mandi fall in the very high to severe category for landslides.
Other Hazard (GlacialLakeOutburstFlood)	Current	This is a very common and devastating hazard in the Himalayan region.

2.3 Summary of Overall Project Risk

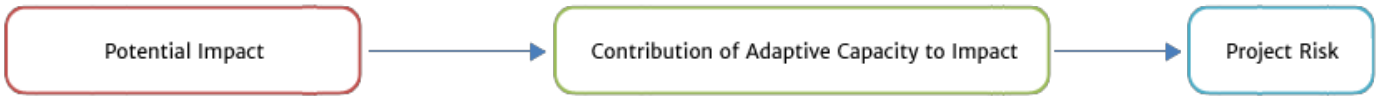
Tables 3A and 3B below summarize ratings for project components and/or project subsectors, and outcome/service level for *Historical/Current* and *Future* time frames. The ratings are derived on the basis of the hazard information, subject matter expertise, contextual understanding of the project, and the larger development context.

The results indicate where risks may exist and where further work may be required to reduce or manage these climate and geophysical risks. An ongoing process of monitoring risks, refining climate and other information, and regular impact assessment may also be appropriate.

2.3.1 Results Summary - by Component

Table 3A summarizes the ratings for the project. The results provide a characterization of risks caused by climate and geophysical hazard on project subsector and components. The potential impact due to exposure from hazards is modulated by the project's non-physical components (enabling and capacity building activities) and the larger development context to determine overall risk to the intended project outcome.

Table 3A: Results Summary - by Component



Subsector	Potential Impact		Non-Physical Components		Development Context				Outcome / Service Delivery	
					Agriculture Sector		Broader Context			
Time Frame	Current	Future	Current	Future	Current	Future	Current	Future	Current	Future
Irrigation and Drainage			Agricultural extension and research: Significantly Reduces Impact Capacity building and training: Significantly Reduces Impact Data gathering, monitoring, and information management systems: Slightly Reduces Impact Overall: Significantly Reduces Impact		Slightly Reduces Impact		Access to technology: Slightly Reduces Impact Gender inequity: Slightly Increases Impact Education: Slightly Increases Impact Overall: Slightly Increases Impact			
Crops and Land Management										
Storage and Processing										

2.3.2 Results Summary by Time-Frame

The matrix below depicted in Table 3B displays the same results as Table 3A, but does so by time frame.

Table 3B: Results Summary - by Time Frame

	Current					Future				
Subsector	**Potential Impact**	**Non-Physical Components**	**Development Context**		**Outcome / Service Delivery**	**Potential Impact**	**Non-Physical Components**	**Development Context**		**Outcome / Service Delivery**
			Agriculture Sector	**Broader Context**				**Agriculture Sector**	**Broader Context**	
Irrigation and Drainage		Agricultural extension and research: Significantly Reduces Impact Capacity building and training: Significantly Reduces Impact Data gathering, monitoring, and information management systems: Slightly Reduces Impact Overall: Significantly Reduces Impact	Slightly Reduces Impact	Access to technology: Slightly Reduces Impact Gender inequity: Slightly Increases Impact Education: Slightly Increases Impact Overall: Slightly Increases Impact			Agricultural extension and research: Significantly Reduces Impact Capacity building and training: Significantly Reduces Impact Data gathering, monitoring, and information management systems: Slightly Reduces Impact Overall: Significantly Reduces Impact	Slightly Reduces Impact	Access to technology: Slightly Reduces Impact Gender inequity: Slightly Increases Impact Education: Slightly Increases Impact Overall: Slightly Increases Impact	
Crops and Land Management										
Storage and Processing										

Insufficient Understanding	Not Exposed No Potential Impact No Risk	Slightly Exposed Low Potential Impact Low Risk	Moderately Exposed Moderate Potential Impact Moderate Risk	Highly Exposed High Potential Impact High Risk

2.4 Key Drivers of Risks

Based on the results above, Table 4 highlights the key drivers of risks for each project component and/or subsector ratings. Specific consideration should be given to those which have high ratings, or are moving from moderate to high ratings. Specific consideration should be given to those which have high/moderate ratings. Note also the overall modulating effects of non-physical components and the broader development context to the project outcome.

Table 4: Key Drivers of Risk

	Historical/Current Drivers	Future Drivers
Hazards and Location	Extreme Precipitation and Flooding Drought Earthquake Landslide Other(GlacialLakeOutburstFlood)	Extreme Temperature Extreme Precipitation and Flooding Drought
Physical Components	Crops and Land Management Irrigation and Drainage Storage and Processing	Crops and Land Management Irrigation and Drainage Storage and Processing
Outcome / Service Delivery	*	*

Key: High Risk  Moderate Risk 

* No high or moderate risks identified for this particular portion of the project.

- Overall, the Non-Physical Components : **Significantly Reduces Impact**
- The Agriculture Sector : **Slightly Reduces Impact**
- Overall, the Broader Development Context : **Slightly Increases Impact**

3. Next Steps

Table 5A provides some general guidance on follow-up based on the risk ratings for the Outcome/Service Delivery. Table 5B lists some climate risk management measures for your consideration. Visit the "Next steps" page of the tool for guidance and a list of useful resources.

Please recall that that this is a high-level due diligence tool, and the characterization of risks should be complemented with more detailed work.

Table 5A: General Guidance Based on Risk Ratings for Outcome/Service Delivery

Insufficient Understanding	Gather more information to improve your understanding of climate and geophysical hazards and their relationship to your project.
No Risk	If you are confident that climate and geophysical hazards pose no risk to the project, continue with project development. However, keep in mind that this is a high-level risk screening at an early stage of project development. Therefore, you are encouraged to monitor the level of climate and geophysical risks to the project as it is developed and implemented.
Low Risk	If you are confident that climate and geophysical hazards pose low risk to the project, continue with project development. However, keep in mind that this is a high-level risk screening at an early stage of project development. Therefore, you are encouraged to monitor the level of climate and geophysical risks to the project as it is developed and implemented. You may also consider gathering additional information to increase your level of confidence in your rating.
Moderate Risk	For areas of Moderate Risk, you are encouraged to build on this screening through additional studies, consultation, and dialogue. This initial screening may be supplemented with a more detailed risk assessment to better understand the nature of the risk to the project.
High Risk	For areas of High Risk, you are strongly encouraged to conduct a more detailed risk assessment and to explore measures to manage or reduce those risks.

Table 5B: Types of Climate Risk Management Measures for typical Agriculture Projects

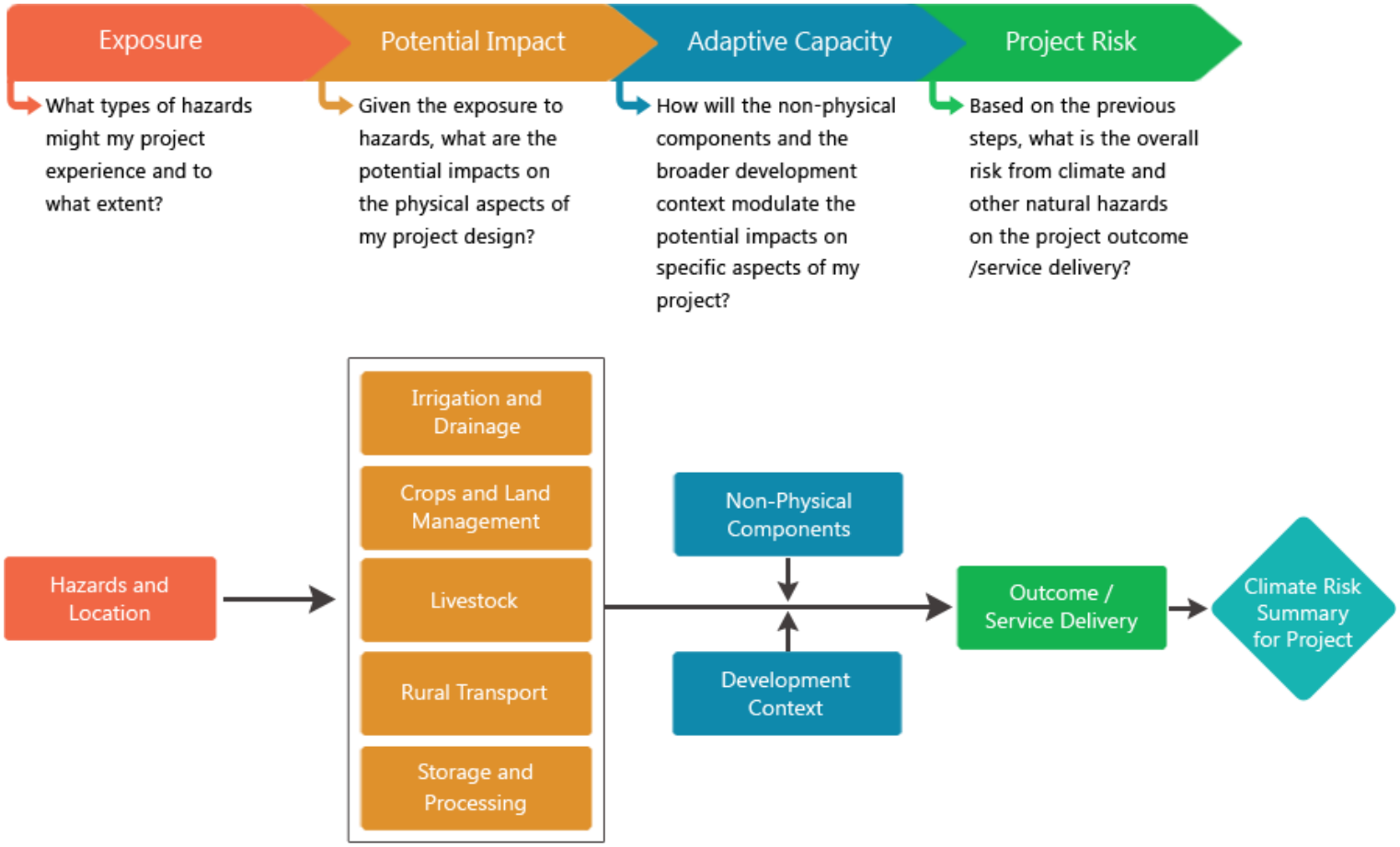
CATEGORY	PROS	CONS	EXAMPLES
Accommodate and Manage	• Flexible • Typically low-cost • Useful when risk is low, but projected to rise in the future	• Temporary solution • Can be insufficient in preventing losses	• Increasing repair and maintenance budgets • Instituting policies for proactive rerouting during severe weather
Protect and Harden	• Can be used for existing and new assets • Responds to immediate risks	• High cost • Inflexible • Effectiveness may decrease over time	• Elevating a roadway • Expanding buffer zones • Designing roads with larger drainage systems • Engineering bridges with elements of seismic-resistant design
Retreat and Relocate	• Long-term solution • Responds to immediate risk	• High cost • Inflexible	• Moving a road alignment away from a river • Moving infrastructure further inland or onto higher ground

Annex 1: Tool Approach

Tool Approach

The framework below describes the approach taken to screen the project. Climate and natural hazards information used to screen the project is most likely obtained from the World Bank's Climate Change Knowledge Portal, which houses numerous global data sets with historical records and future projections as well as country-specific adaptation profiles.

Figure 1: Project Level Climate and Disaster Risk Screening Tool: Approach for Agriculture projects



Annex 2: Notes

Table A2-1 summarizes the sub-national locations of high risk noted during the assessment, if the user entered these sub-national locations. Table A2-2 summarizes all the notes entered by user for each section while completing the assessment, if the user elected to enter notes. These notes can help shed light on specific ratings as well as considerations and limitations of the user's expertise.

Table A2-2 Summary of Comments by Section

Section		Notes
Hazards and Location	Extreme Temperature	Future temperature increases are a concern to the location of this project.
	Extreme Precipitation and Flooding	Extreme precipitation has been and will continue to be a concern at the project location.
	Drought	Droughts are a current and historical problem, and will likely be so in the future.
Non-Physical Components	Agricultural extension and research	Access to technology and knowledge through improved extension services on seeds, soil, land treatment, nutrient and pest management and market-information will significantly reduce the impact of climate on the project outcomes
	Capacity building and training	The project includes capacity building for participatory planning and plan implementation of collective actions. Capacity building on technological aspects of adoption of high yeidling cultivars of apple and diversification into vegetable farming and the associated package of practices for phasing in high density and high productivity apple orchards, combined with market awareness/intelligence; value chain efficiency and financial linkages will significantly reduce the impact of climate on the project outcomes.
	Data gathering, monitoring, and information management systems	The project will invest in setting up of a monitoring and evaluation (M&E) system for the project, including a project management information system and contracting an external M&E agency to monitor project activities and impact. Improved data gathering and M&E that positively impacts decisions in the project will contribute to reducing the impact of climate and sustain outcomes.
	Non-Physical component overall	Combined, these components of the project will significantly reduce impact, taking the risk down a level.
Outcome / Service Delivery	Irrigation and Drainage	In the current scenario inadequate irrigation systems combined with increasing temperatures and rainfall variability contributes to lowering productivity and incomes of small holders in the horticulture sector. The project will invest in small and micro irrigation infrasturcture and watershed managment practices that will help to overcome the climate risks to some extent and its related constrains on production.
	Crops and Land Management	Literature shows that variation in annual diurnal temperatures, intensity and timing of rainfall and snowfall play in important role in apple production. Untimely frost during spring time, long dry spells during summer months and insufficiently low temperatures during winter months can affect apple production. Apple production is becoming more suited to higher altitudes as the number of chilling hours are suitable for breaking dormancy and subsequent fruit development. The project interventions and enabling environment include: selection of appropriate cultivars based on atltitude; diversification into vegetables; improved soil/ irrigation technology and capacity building systems will sigficantly reduce the impact of climate on project outcomes.
	Storage and Processing	The lack of post harvest infrastructure such as storage and processing results in significant wastage of horticulture produce and loss to farmers. Project investments in storage and processing combined with market intelligence will help the farmers to manage risks related to climate and market prices and thereby secure / improve incomes