ECONOMIC ANALYSIS

A. Introduction

1. This project is designed to address the threat to vulnerable smallholder agricultural production posed by the impacts of climate-change induced rainfall variability and drought. The objective of this project is to empower vulnerable smallholders in the Central Highlands and South-Central Coast regions of Vietnam – particularly women and ethnic minority farmers - to manage increasing climate risks to agricultural production by securing water availability, adopting climate-resilient agricultural practices, and strengthening access to actionable agro-climate information, credit and markets.

2. The project comprises two interlinked outputs that build on best practices and lessons learned from previous and ongoing projects and experiences. These include: 1) ***Enhanced water security for agricultural production for vulnerable smallholder farmers in the face of climate-induced rainfall variability and droughts*** and **2) *Increased resilience of smallholder farmer livelihoods through climate-resilient agriculture and access to climate information, finance, and markets*.**

B. Sector Assessment

3. Agricultural policy objectives are pursued using output and input subsidies, and payments for the provision of services to agriculture generally. The main domestic policy instruments, in order of most used, include price support measures (mainly subsidies to control the rice market), irrigation service fee exemption, seed and livestock breeding subsidies, credit schemes, payment based on area (for rice farmers), (pilot) insurance, income support (exemption or reduction of agricultural land taxes) and extension services (top down, supply driven). General services provided to the agricultural sector include irrigation (largest GoV expenditure in agriculture), and research and development (under the Viet Nam Academy of Agricultural Sciences). Key trade policy instruments are tariffs, import licensing, food safety regulations, export taxes and export licensing.[1]

4. Viet Nam is one of the countries in the world most at risk of damage and loss from weather-related hazards. Germanwatch's Global Climate Risk Index 2018 identifies Viet Nam as the eighth most affected country based on loss from weather-related events from 1997 to 2016. Every year the country is affected by a range of hydro-meteorological and climatological hazards: droughts and forest fires during January-April; (tropical, hail and wind) storms, (coastal, riverine, flash) floods, heavy rainfall and landslides in June-December and extreme temperatures (cold and heat waves) throughout the year. Climate change poses risk to agricultural productivity in Vietnam. One of the most serious impacts of climate change for Viet Nam is its impact on water security and agriculture, for the most vulnerable people, communities and regions that depend on agriculture but lack the necessary resources to adapt to climate change.

5. The 2015-2016 drought damaged or destroyed 90,744 ha of crops, mainly perennial, in Dak Lak; and 18,525 ha of crops, mainly perennial, in Dak Nong.[2] This recent drought, with 40 percent less rainfall than normal in Dak Nong and 49 percent less than normal in Dak Lak for June-September, is projected to be the new normal occurring 1 in 25 years.[3]

C. Economic Rationale

6. The highest risk for water availability in both regions is extreme droughts. As these droughts will likely be longer and more severe, farmers are projected to depend on groundwater resources in 15 out of 100 years,

[1] OECD (2015). Food and Agricultural Policies in Viet Nam.
[2] CCNDPC damage and loss data.
[3] Wade S., Colledge F., Nguyen V. M., Hall J. and Parker D. (June 2017). SC 108211 VIE: Water Efficiency Improvement in Drought Affected Provinces: Climate Change Risk and Vulnerability Assessment. UK Met Office, ADB, p.9.

with extraction of groundwater in this period expected to increase.[4] Coastal areas, particularly in Binh Thuan, will also be affected by saline intrusion as sea levels gradually rise. Increasing sea levels in combination with over-extraction of groundwater and surface water is leading to ingress of seawater and the salinization of coastal waterways and groundwater. Current adaptation strategies of shifting to other crops from rice will not be sustainable under current irrigation system in the communities. In addition, areas where there is currently no irrigation access will require alternative water efficient technology to reduce maladaptation such as the unsustainable extraction of groundwater. With this project, in areas with agricultural land that are primarily rainfed and out-of-reach of irrigation systems, the project will support **on-farm bio-engineered water storage systems** for collecting rainwater or surface water. These storage facilities or ponds will help farmers to accumulate and store water in the wet season for use at critical times during the dry season and extreme droughts combined with application of a holistic approach to on-farm water management and support to farmers with affordable climate resilient **on-farm water efficiency technologies**. This will lower water demand and increase water productivity and enable agricultural systems to withstand drought shocks and stresses; To strengthen the resilience and productivity of cropping systems and value chains and increase access to and use of information, technical support and other resources and services on climate resilient agriculture technologies and practices, the project will implement a large **Farmer Field School (FFS) program**; The Farmer Field School program will focus on the **promotion of Climate Resilient Agriculture (CRA) packages** customized per location and for the target beneficiaries. These packages have been identified and developed based on an in-depth analysis of current and projected climate risks and impacts on water and agricultural productivity, baseline perennial and annual crop or tree systems, soil types, extent of rainfed or irrigated agriculture, local Government priorities, and existing farmer good practices.

D. Demand Analysis

7. The demand analysis focuses on output from the CRA packages and improved market access that will help farmers shift to crops and agricultural practices that are climate resilient. These CRA packages have been developed based on an in-depth analysis of current and projected climate risks and impacts on water and agricultural productivity, baseline perennial and annual crop or tree systems, soil types, extent of rainfed or irrigated agriculture, local Government priorities, and existing farmer good practices (including practices already successfully applied by the poor and near-poor).

E. Alternatives Analysis

8. The project provides last mile connectivity for farmers close to irrigation systems and bio-engineered water storage system (rehabilitation and provision of new ponds) for farmers that only have access to rainfall agriculture. This is combined with CRA and market access interventions to improve income of already vulnerable groups. Accordingly, the project rehabilitates current ponds rather than building new ones as the best alternative to new ones in the same locations. This is the most cost-effective options for those locations. The FFS approach is also the cost-effective way of increasing adoption of CRA and reaching farmers on effective adaptation strategies. Alternative options for the CRA packages were considered but the CRA packages have been presented to communities (men and women groups, ethnic minorities, poor, near-poor and non-poor smallholders) and local authorities, discussed and refined, with the following priorities as a result (see the sub-assessment report on climate resilient agriculture for more details).

F. Cost-Benefit Analysis

9. **Assumptions.** The economic analysis was carried out for the project by comparing with- and without-project scenarios, following the guidelines for the Economic Analysis of Projects of United Nations Development Program (UNDP 2015). The interventions are considered integrated and benefits should not be isolated given that they all contribute to the resilience of the communities to climate change. “Without”

[4] ADB (June 2017). Climate Risk Assessment and Management for the Project ‘Water Efficiency Improvement in Drought Affected Province’.

the project scenario assumes the status quo which is an underestimation of the impact of climate change on productivity in the regions. Given that the financial cost of the project are largely non-traded goods and services, a standard conversion factor of 0.9 was used.[5] A discount rate (economic opportunity cost of capital) of 10% was assumed. Discounted fund flows period varies by intervention between 15 and 25 years. We assume that after the useful life of each intervention, the benefits become zero.

10. **Economic benefits.** Benefits expected from Strengthening the climate resilience of small-scale farmers in Highland and South-Central Viet Nam (SACCR) under the project include:

(i) Enhanced crop yields and income due to increased and more reliable water during the dry season. With this project, loss of income from drought will be avoided. Climate change projection for the project sites indicates that droughts with 40% less rainfall than normal like the 2014/16 ENSO will increasingly occur and categorized as a 1 in 25-year event. The benefit from increased availability of water is assumed to be 4% per annum based on avoiding a 100% loss of income to these households at the probability of 1/25 per annum.

(ii) With the project, households will benefit from Climate Resilient Agriculture (CRA) package. The Farmer Field School program will focus on the promotion of CRA packages customized per location and for the target beneficiaries. Based on the CRA activities presented CRA investments combined with other interventions through the FFS are expected to lead to about 25-40% increase in agricultural yield. FFSs were shown (Davis et al, 2012) to have positive impact on production and income among women, low-literacy, and medium land size farmers with the middle land area terciles showing significant increase in agricultural income. We assume a 10% increase in income of the households to be conservative.

(iii) Activities 1.1 and 1.2 are excluded from this economic analysis as these two activities are already captured in the Asian Development Bank's Water Efficiency Improvement in Drought Affected Provinces (WEIDAP) that is used as co-financing. **The net present value of net economic benefits of overall WEIDAP project is estimated to be VND 2,793.2 billion.**

11. The economic benefits were derived based on avoided damages from drought and the incremental outputs generated through the CRA and FFS. The economic life of the on-farm bio-engineered water storage systems for collecting rainwater or surface water is assumed to be 25 years with appropriate O&M cost factored in to ensure sustainability while the CRA and FFS are expected to have stream of benefits for 15 years. The ENPV and economic internal rate of return (EIRR) were computed based on those benefits. The project is expected to generate a total ENPV of 34.9 million USD assessed at 10%.

12. **Economic cost.** The financial cost of the project investment for this economic analysis is $24.8 million which is $22.4 million in economic terms.[6] Costs include construction, detailed design and supervision of the ponds, CRA packages and farmer field school with setting up of access to markets and credit. Operation and maintenance (O&M) during the implementation period and during the lifespan of the pond is included in the economic analysis.

13. The net present value of economic benefits of overall project is estimated to be $18.70 million with EIRR of 32%.

G. Sensitivity Analysis

14. The sensitivity analysis was conducted using variation in cost and benefits assumed for the project. Three sensitivity test cases were examined: (i) total cost increased by 20%; and (ii) total benefits decreased by 20%; and (iii) total cost increased by 20% and total benefits simultaneously decreased by 20%. In all

[5] Transfer payments such as taxes, duties and subsidies are typically excluded in calculating economic values. In the case of major tradable goods, economic values are based on border parity prices.

[6] Economic values for project costs are derived by adjusting local costs by an SCF of 0.9.

cases, the project remains economically feasible and EIRR remains above the minimum threshold. Results are presented below.

Table 1: Net present value (million USD) and Economic Internal Rate of Return (EIRR)

	Benefits of climate resilience intervention for small holder farmers in Vietnam	Benefits of climate resilience intervention for small holder farmers in Vietnam (IRR)
Base case	$18.70M	32%
Cost +20%	$15.45M	26%
Benefits – 20%	$11.71M	24%
Cost +20% and benefit -20%	$8.46M	19%

H. Household and Poverty Impact

15. Project beneficiary households' number about 55,603 are all poor and near poor households. The average income per household is about $1577 of which 72% of the income is assumed to be from farm income. The benefits of this project are an incremental increase in income for these households of about 14% (10% from CRA and FFS and 4% from access to water/irrigation pond). A conservative 10% increase in farm income by $113 through the CRA will potentially help the households adapt to climate change impact and reduce climate change shock on income.