# Initial Environmental Examination

May 2022

# Nepal: Nuts and Fruits in Hilly Areas

Prepared by Ministry of Agriculture and Land Development for the Asian Development Bank.

## CURRENCY EQUIVALENTS

(as of 10 April 2022)

| | | |
|---|---|---|
| Currency unit | – | Nepalese Rupee (NRe/NRs) |
| NRe1.00 | = | $ 0.0082 |
| $1.00 | = | NRs121.46 |

## ABBREVIATIONS

| | | |
|---|---|---|
| ADB | – | Asian Development Bank |
| CITES | – | Convention on International Trade in Endangered Species |
| EHS | – | Environment, Health and Safety |
| EIA | – | Environmental Impact Assessment |
| EMP | – | Environmental Management Plan |
| EMR | – | Environmental Monitoring Report |
| EPA | – | Environment Protection Act |
| EPR | – | Environment Protection Rule |
| GON | – | Government of Nepal |
| GRC | – | Grievance Redress Committee |
| GRM | – | Grievance Redress Mechanism |
| HH | – | Households |
| IBAT | – | Integrated Biodiversity Assessment Tool |
| IEE | – | Initial Environmental Examination |
| IUCN | – | International Union for Conservation of Nature |
| MoFE | – | Ministry of Forests and Environment |
| MoALD | – | Ministry of Agriculture and Land Development |
| MOLMAC | – | Ministry of Land Management and Cooperative |
| NARC | – | Nepal Agriculture Research Center |
| NPR | – | Nepalese Rupees |
| NCDF | – | National Center for Fruit development |
| PAM | – | Project Administrative Manual |
| PPE | – | Personal Protective Equipment |
| PPM | – | Parts Per Million |
| O&M | – | Operation and Maintenance |
| REA | – | Rapid Environmental Assessment |
| ROW | – | Right-Of-Way |
| SDG | – | Sustainable Development Goal |
| SPS | – | Safeguard Policy Statement, 2009 |
| USD | – | United States Dollar |
| WHO | – | World Health Organization |

## WEIGHTS AND MEASURES

| | | |
|---|---|---|
| $m^3$ | - | cubic meter |
| °C | - | degree Celsius |
| dBA | - | decibels audible |
| $\mu g/m^3$ | - | Microgram per cubic meter |

## NOTES

(i) The fiscal year (FY) of the Government of Nepal and its agencies ends on 15 July. "FY" before a calendar year denotes the year in which the fiscal year ends, e.g., FY2021 ends on 15 July 2021.

(ii) In this report, "$" refers to United States dollars.

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## EXECUTIVE SUMMARY.

1. Nuts and Fruits Hilly Area (NAFHA) project will increase agricultural income of approximately 40,000 farm households in 100 municipalities in hilly areas of five provinces: Province 1, Bagmati, Gandaki, Karnali and Sudurpashchim. This will be mainly achieved through the development of approximately 10,000 hectares (ha) of climate resilient fruit and nut orchards providing value-addition to the nuts and fruits produced by at least 30,000 farm households. The project will also improve the institutional capacity for managing the nursery and horticulture sector. For about 10,000 smallholder households, who are not capable of investing in fruit and nut orchard development in the project provinces, the project will assist them to improve their vegetable and other nutritious crop production and its marketing.

2. The project is aligned with the following impacts: (i) livelihoods of rural households improved, and (ii) resilience of farmers to climate change improved. The project will have the following outcome: *beneficiary farmers' agricultural income from climate resilient horticulture farming increased.*[1] This will be achieved through improved nursery management, enhanced production and productivity in orchards, enhanced value addition and commercialization of fruits and nuts, and supporting marginal or micro smallholders in the same project areas, who would not have been able to invest in commercial fruit and nut farming, to generate income and food security through vegetable and nutritious crop farming.

3. The project will have the following outputs:

**(i)** **Output 1: Institutional capacity for nursery and horticulture sector management improved.** This output will ensure a sufficient supply of quality planting materials for fruit and nut crops in Nepal. At the national level, the project will: (i) prepare nursery standards and regulations and an inspection system; (ii) upgrade horticulture station and/or center facilities for testing, cleaning and maintenance of planting materials, and nursery quality control; (iii) train horticulture station and/or center staff, and organize knowledge exchange programs and workshops to meet internationally accepted sanitary and phytosanitary standards; (iv) private nursery upgrade support to ensure healthy and quality material production, and transfer genetic technologies to private nurseries; (v) commission research on more climate resilient and adaptable varieties of fruits and nuts; (vi) develop a nursery certification scheme and roll out with volunteer private nurseries; and (vii) train and certify cooperatives and private input suppliers which service project clusters. At the provincial level, the project will support: (i) development of interactive crop suitability maps at a crop variety level through integration of climate, soil and landscape information; and (ii) land classification and zoning for orchard development.

**(ii)** **Output 2: Production and productivity of project farmers increased.** This output will develop approximately 10,000 ha of new orchards for almond, apple, avocado, citrus (lime, mandarin, and sweet orange), kiwi, macadamia, pecan, and walnut production, and enhance productivity through: (i) preparation of the packages of practice incorporating climate analysis, soil management, variety recommendation and crop husbandry, drip irrigation and management, and overall orchard management including Good Agricultural Practices, integrated pest

[1] The design and monitoring framework is in Appendix 1.

management, harvest techniques and storage;[2] (ii) training all the beneficiary farmers in the packages of practice through (a) farmer group facilitators; (b) private technical service and input providers; (c) farmer-to-farmer extension program, identifying lead farmers and training them to demonstrate climate change adaptation and best practices; and (d) digital technology based farm advisory system development and promotion; (iii) partial grants for the development of approximately 10,000 ha of new orchards and drip irrigation system;[3] (iv) providing grant incentives to farmers based on plant survival rate;[4] (v) assessing and verifying carbon sequestration benefits from orchards, and exploring carbon financing options; and (vi) supporting beneficiary farmers' loan access by establishing and operationalizing a guarantee fund scheme for smallholder horticulture farmers and rural agribusinesses.[5]

Smallholder farmers with less than 4 *ropani* (0.2 ha) who are unable to invest in commercial fruit and nut orchard development under the project will be supported for irrigated off-season vegetables and wet season nutritious food crop production.[6] Approximately 10,000 farm households will be eligible for this category. The Global Agriculture and Food Security Program (GAFSP) approved grants to finance the following activities: (i) vegetable grower identification and their capacity building through farmer group formation; (ii) extension of drip irrigation and rural financing support for vegetable and other crop production in 1,000 ha; and (iii) partial grants for the establishment of vegetable value-addition equipment and infrastructure at three different levels—cooperative, local and agribusiness levels.[7] The World Food Programme will provide parallel financing of grants from GAFSP for establishing and operating farmer nutrition schools to access and utilize food for improved dietary diversity.

**(iii)** **Output 3: Value addition to hilly area horticulture produce enhanced.** The output will: (i) promote agriculture and/or horticulture cooperatives and commodity-specific marketing associations to aggregate fruit, nuts and other crop produce, better manage quality of horticultural products and improve profits of smallholder

[2] Global Agricultural Practices (GAP) are a set of standards of practices that address environmental, economic and social sustainability for on-farm processes, and result in safe and quality food and non-food agricultural products. Compliance with GAP is verified through a certification process carried out by the governmental sector or by private agencies.

[3] The draft Business Promotion Act which was being reviewed by Ministry of Agriculture and Livestock Development (MoALD) in August 2021 indicates that the maximum ceiling of subsidies for horticultural orchard development is 50%. The project aligns the subsidy level to this draft Act as requested by MoALD and sets the subsidy ceiling at 50% for farmers, farmer groups and cooperatives, and 40% for agroenterprenuers. Some provincial governments have a scheme with a higher subsidy level than 50% and if MOLMACs decide to follow their higher subsidy scheme, the differences will be financed by the provincial government.

[4] Plant survival monitoring system will be established as part of a project monitoring and evaluation scheme and output 1 land database system establishment.

[5] Participating banks will be selected in consideration of (i) their overall lending capacity; (ii) prior experience or planned pilot work in agri-lending and digital finance; (iii) branch or physical presence in project districts and municipalities; (iv) their ability and track record for creative finance, alongside their experience and openness in working with wholesale lenders and cooperatives.

[6] Farmers with less than 4 ropani will be encouraged for irrigated vegetable production during dry season and nutritious food crop production such buck wheat, various millets, naked barley, amaranth and various pulses during wet season.

[7] Global Agriculture and Food Security Program (GAFSP) is a multilateral financing instrument dedicated to fighting hunger, malnutrition, and poverty in the world's poorest countries. GAFSP allocates funds for public investment based on competitive, open, calls for proposals. The proposal for the NAFHA cofinancing project was selected under the 6th call for proposals by the GAFSP Steering Committee in December 2021.

farmers; (ii) strengthen those associations and cooperatives that are willing to invest in value addition activities through developing training programs and conducting training of cooperatives and associations in post-harvest management, food safety control system such as Hazard Analysis Critical Control Point, financial management, business, marketing and entrepreneurship, while promoting female leadership;[8] (iii) provide matching grants to support cooperatives' investment in value addition equipment for crop washing, sorting, grading, cooling, processing, packaging, and quality control; (iv) incentivize agribusinesses and service providers that collaborate with project beneficiaries by providing matching grants for improving, *inter alia*, traceability systems, certification systems, internet-based marketing, organic production and cold chain linkage through public-private partnership;[9] and (v) develop local-level value-addition infrastructure such as commodity storage, collection centers and orchard predator fencing that provide public good benefits.

4. **Description of the Environment.** Nepal, located in the Central Himalaya, has five physiographic regions.[10] Over 82% of the country's land is considered mountainous, while just over 3% are valleys and elevated plains. There is considerable heterogeneity within each physiographic region—in particular the valleys of the Siwalik (Dun valleys), tropical valleys and elevated plains of the Middle Mountains, subtropical valleys of the High Mountains, and the dry Trans-Himalayan area of the High Himalaya.

5. The Middle Mountains have warm to cool temperate monsoons. The High Mountains have a cool temperate to sub-alpine climate. The High Himalaya has an alpine to tundra-type climate. Settlements are mostly in the tropical, sub-tropical and temperate zones. People use Trans-Himalayan and sub-alpine areas for grazing their transhumant livestock and for collecting natural resources for domestic and commercial purposes. The remarkable differences in climatic conditions are due to the rapid change of altitude within a short north-south distance, averaging 193 km.

6. Nepal is made up of eight ecological zones: (i) lower tropical, (ii) upper tropical, (iii) sub-tropical, (iv) temperate, (v) sub-alpine, (vi) alpine, (vii) Trans-Himalayan, and (viii) Nival/arctic. The tropical and sub-tropical zones occupy 58% of the country's area, and the temperate, subalpine, alpine, Trans-Himalayan, and Nival zones occupy 12%, 9%, 8%, 8%, and 5% respectively.

7. **Potential Environmental Impacts and Mitigation Measures.** The project is unlikely to cause adverse impacts that are irreversible, diverse or unprecedented. The environmental management plan will mitigate all anticipated environment impacts during pre-construction, construction, and operation stages for the project components. There will be no biodiversity and habitat related impacts on the natural landscape of Annapurna Conservation Area. The orchard and vegetable areas development are confined within existing private farmlands and no forest will

[8] Hazard Analysis and Critical Control Points (HACCP) is a systematic approach to the identification, evaluation and control of food safety hazards. HACCP attempts to avoid hazards rather than inspect finished products. In the United States, for example, HACCP programs are mandatory for juice and meat.

[9] The cofinancing from the project will be capped at $200,000 per applicant. The eligibility to access the partial grant support is detailed in the Project Administration Manual (accessible from the list of linked documents in Appendix 2).

[10] From south to north, these are the Terai flatlands (below 500 m), Lower Hills (Chure or Siwalik, between 500–1,000 m), Middle Mountains (1,000–3,000 m), High Mountains (3000–5,000 m), and High Himalaya (above 5,000 m). The lowest elevation is 60m asl at Kechana Kalan in Jhapa District of the eastern Terai, and the highest is the peak of Mount Everest at 8,848m asl in the north.

be converted into new orchards. Beneficial environmental impacts are expected in developing orchards through the improvement of land-cover with climate-resilient planting materials, increased carbon sinks, and soil conservation. The project will enhance climate resilience of beneficiaries through capacity building in: (i) climate analysis, assessment and verification of carbon sequestration benefits; (ii) soil management; (iii) fruits and nut variety recommendations, crop husbandry; and (iv) good agricultural practices.

8. **Consultation, Disclosure, and Grievance Redress Mechanism.** Stakeholders were involved during the IEE through discussions on virtual mode. IEE will be made available to the public through the ADB and Ministry of Agriculture and Livestock Development (MoALD) website. The consultation process will continue during project implementation to ensure that stakeholders are fully engaged in the project and have the opportunity to participate in its implementation. A grievance redress mechanism is described within IEE to ensure that public grievances are addressed timely.

9. **Monitoring and Reporting.** MoALD will be responsible for environmental monitoring as a central level monitoring agency. Also, Ministry of Land Management and Copperative (MOLMAC) of each of the provinces are also responsible for their provincial subproject. The semi-annual monitoring reports will be uploaded in the ADB website.

10. **Conclusions and Recommendations.** NAFHA Project will bring benefits to the local farmers and people. Based on the initial environmental examination (IEE) findings, there are no significant impacts, and the classification of the project as Category B per ADB Safeguard Policy Statement (SPS, 2009). The significance of impacts during construction and operation will be low to moderate, temporary and short-termed (i.e., most likely to occur only during peak construction periods). With the EMP in place, the potential impacts will either be eliminated or minimized to insignificant levels. IEE will be updated when unanticipated impacts occur during the project implementation. EMPs will be updated as well based on the specific conditions of areas when beneficiaries and actual sites are defined. Throughout the implementation, environmental safeguard requirements of ADB SPS (2009) and relevant government policies will be complied by the project through the CPMU and PIU with the support from PISC.

# 1. INTRODUCTION

## A. Background

1. Nepalese farmers have been involved in fruit production, agriculture, livestock raising, and small-scale productive activities for hundreds of years. Agriculture including fruits production plays a large role in Nepal's economy, which accounts for one-third of GDP, absorbs two-thirds of the labor force, and is the main source of livelihood for the majority of the population. It is the primary occupation for the vast majority of the economically active smallholders and the poorest households.

2. Rapid population growth and increasing urbanization in Nepal has put increasing demands on agricultural production. The government, donors, and international Non-Government Organizations have spent significant resources on trying to meet food demand by increasing agricultural production. However, the capacity of Nepalese farmers to become productive commercial farmers is still limited. Though the agriculture sector in Nepal has improved over the last decade, it has still not reached its potential when compared with the agriculture output of its neighboring countries.

3. The contribution of the horticulture sector amounts to about 15% of agriculture gross domestic product, where almost half is constituted by fruits. There are 45 species belonging to 37 genera of wild edible fruits[11]. Seasonal fruits harvested from the forests can be seen in many local markets.

4. The proposed project will build upon the ongoing efforts of the Government of Nepal in providing fruits and nuts production increase in the hilly areas. The project will increase agricultural income of approximately 40,000 beneficiary farm households of 5 provinces – Province 1, Bagmati, Gandaki, Karnali and Sudurpashchim. This will be achieved through institutional capacity building for nursery and horticulture sector management; the development of approximately 10,000 ha of fruit and nut orchard, and vegetable and other nutritious crop production in 1,000 ha in 100 municipalities in hilly areas of Nepal; and the value-addition to nuts and fruits produced.

5. The project is aligned with the following impacts: (i) livelihoods of rural households improved; and (ii) resilience of farmers to climate change improved. The project will have the following outcome: beneficiary farmers' agricultural income from climate resilience farming of fruits and nuts increased. This will be achieved through improved nursery management, enhanced production and productivity in orchards, and enhanced value addition in fruits and nuts.

6. The Ministry of Agriculture and Livestock Development (MOALD) will be the project's executing agency. The National Center for Fruit Development (NCFD), under MOALD, will be the central project management unit (CPMU). The CPMU will be led by the chief of the NCFD as the project director who will be supported by a team of government staff and consultants.

7. The implementing agency for this project will be the Ministry of Land Management, Agriculture, and Cooperative (MoLMAC) of five provinces where the proposed project will be implemented. The implementing agencies have their own offices at each of the project districts and there are agriculture divisions on each of the project implementing.

[11] Owing to its greatly varied geographical and climatic conditions, altitude ranging from 70m (Kechana Kalan in Jhapa) to 8,848 m (Mt. Everest) asl, Nepal accommodates wider biodiversity, and this applies to the growing of diverse biotypes of fruit species as well.

8. The Municipality Agriculture Division and District Agriculture Knowledge Center will support for the implementation of the proposed NAFHA Project. The MOLMAC will manage overall day-to-day project implementation at the province level. As well as lead annual province level project planning and budgeting, implementation, financial management including submission of withdrawal applications to NCFD, retain supporting documents, submit all reporting requirements, monitoring and reporting too.

9. The project will be implemented over a 5-year period (indicative implementation period is 2022 to 2026) with first, second and third batch of implementation and will be supported through ADB financing. The project will be implemented in 100 municipalities. The outputs are:

Output 1: Institutional capacity for nursery and horticulture sector management improved
Output 2: Production and productivity of project farmers increased.
Output 3. Value addition to hilly area horticulture produce enhanced.

10. The project will be implemented in the following provinces (see table below):

**Table 1. Salient features of NEP: NAFHA Project**

| **Provinces** | **Districts** | **Municipalities** |
|---|---|---|
| Province-1 | 7 | 22 |
| Bagmati | 3 | 8 |
| Gandaki | 10 | 34 |
| Karnali | 9 | 20 |
| Sudurpaschim | 5 | 16 |
| **Total** | **34** | **100** |
| **Characteristics** | | **Amount** |
| Total target area (ha) | | 10,000 |
| Average area per municipality (ha) | | 100 |
| Average area per municipality (ropani) | | 2,000 |
| Average households per municipality | | 300 |
| Average area per household (ropani) | | 6.7 |
| Total household's beneficiaries | | 30,000 |

## B. Project Selection Based on Criteria

11. Table 2 below shows the criteria of selecting subprojects in line with environmental safeguards during implementation. To avoid unwanted impacts on sensitive areas, the following table shows the recommendations of this IEE for selecting sites, particularly on orchard development and proposed projects under the matching grant. The subproject sites will be screened by using the checklist in Annex 3. This is to ensure that the selection of financing activities under NAFHA subproject are within the criteria. The table below also shows the current findings of the target sites.

**Table 2: Criteria of selecting subprojects and current status of compliance of target municipalities.**

| Subproject Selection Criteria[12] | | Status of Compliance of target municipalities | Remarks |
|---|---|---|---|
| 1. | Not located in ecologically sensitive areas.[13] | Complied. | There are target districts within the boundaries of Annapurna Conservation Area and outside the core protection area, but these lands are already being used for horticulture purposes |
| 2. | Does not directly affect environmentally protected areas, core zones of biosphere reserves, highly valued cultural property. | Complied. | No such as area |
| 3. | Does not cause damage/destruction, removal, alteration or defacement of adjacent or nearby structures/monuments and sites of international, national and local significance.[14] | Complied | No public properties will be destructed by this project |
| 4. | Does not include and/or involve any activities listed in ADB's Prohibited Investment Activities List (Appendix 5 of ADB SPS 2009). | Complied | No such activity |

## C. Basis and Extent of IEE Study

12. ADB policy requires that the environmental implications of project developments are taken into account in the planning and decision-making process and that action is taken to reduce the impacts to acceptable levels. This is done through the environmental assessment process, which has become an integral part of project development and implementation.

13. As per the new Environmental Protection Act (EPA) 2019 and Environmental Protection Regulations (EPR) 2020 of Government of Nepal (GoN), IEE is required where there is introduction of exotic plants[15] more than a hectare area in any of the locality within hilly territory.

[12] To be used for selecting specific sites financing subprojects.

[13] Wildlife/bird sanctuaries, national parks, tiger reserves, elephant reserves, conservation reserves, core zone of biosphere reserves, centrally protected monuments or critical habitat (as defined in ADB Safeguard Policy Statement or SPS)

[14] Subprojects with component activities near (within 50 m from) such sites shall have prior coordination with the Department of Archaeology.

[15] According to Convention on Biological Diversity: "An organism that exists in the free state in an area but is not native to that area. Also refers to animals from outside the country in which they are held in captive or free-ranging populations." Introduction of high yielding crop species are taken as exotic species.

Since this project proposed to introduce the high yielding fruits and nuts plants within 1 to 25 ha area of hilly regions of Nepal, IEE will be required by the GON's policies.

**Table 3. Criteria for the requirement for exotic plants plantation at the site as per Schedule 1, 2 and 3 of EPR, 2020 (1st amendment 24 May 2021)**

| EPR, 2020 (1st amendment 2021) Schedule 1, G threshold for a Brief Environmental Study (BES) | EPR, 2020 (1st amendment 2021) Schedule 2, G threshold for an IEE | EPR, 2020 (1st amendment 2021) Schedule 3, G threshold for an Environmental Impact Assessment (EIA) | Condition for the NEP: NAFHA Project |
|---|---|---|---|
| Plantation of exotic species plants within 0 ha area in a single block will require a BES | Plantation of exotic species plants in hilly area of Nepal with the area 10-25 ha will require an IEE. | If the plantation area of exotic species is more than 25 ha in Hilly area and more than 50 ha in Terai area will requires an EIA | The area proposed for this project is 1-25 ha so it will be required to conduct an IEE as per the EPR, 2020 |

14. This IEE report primarily: (i) provides information on the proposed project and its environmental requirements to ADB and government; (ii) shows necessary baseline conditions of the physical, ecological, physical cultural and socio-economic environments and/or resources in and surrounding the project's area of influence; (iii) identifies and assesses potential impacts arising from the implementation of the project on its environments and/or resources; (iv) recommends measures to avoid, mitigate, and compensate the potential impacts through an environmental management plan (EMP); (v) presents information on stakeholder consultations and participation during project preparation; (vi) identification of monitoring and reporting requirements; and (vii) recommends a mechanism to address grievances on the environmental performance of the project.

## D. Objectives and Scope of the Environmental Study

15. The main objective of the IEE report is to fulfill the requirements of ADB Safeguard Policy Statement (SPS) of 2009. The specific objectives of the IEE study are as follows:

(i) To identify, predict and evaluate the potential beneficial and adverse impacts of the project on the physical, biological and socio-economical resources in the target areas;
(ii) To suggest enhancement measures to augment the benefits of the project and to propose mitigation measures to avoid, minimize/compensate potential environmental impacts of the project;
(iii) To prepare appropriate EMP; and
(iv) To inform public about the proposed subproject and its impact on their livelihood.

16. Scope of the IEE focuses on the environmental impacts and its mitigation measures relating to the location, design, construction, and operation of all the activities under the project that trigger environment safeguards of ADB SPS 2009. This IEE report is based on the implementation design of different project components in five provinces – Province 1, Bagmati, Gandaki, Karnali and Sudurpashchim.

# 2. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

## A. Nepal's Environmental Policy and Legal Framework

17. Most of the national policies and laws of GoN are oriented towards achieving environmentally sound economic development and growth, and conservation of natural resources and cultural heritage of the country. The following are the summaries of the relevant policies, acts and regulations, and guidelines for the proposed fruits and nuts production in hilly areas of Nepal that have been reviewed during the preparation of this IEE report.

18. **The Constitution of Nepal, 2015.** This is the fundamental law of the country, and the sections pertaining with environmental protections are as follows:

(i) Article 30 (1) of the constitution guarantees a "clean environment'' as a fundamental right, and elaborates that "every citizen shall have the right to live in a clean and healthy environment".

(ii) Article 30 (3) encourages the state to formulate necessary legal frameworks to balance environment and development.

19. Nepal has enacted comprehensive and wide range of environmental policies and laws that cover a broad range of environmental and sector issues. Environmental Protection Act (EPA) of 2019 and Environmental Protection Regulations (EPR) of 2020 are two important legal frameworks for environmental protection. According to the EPA and EPR, all development projects should first be screened using criteria that are based on the scale of project stipulated in the Schedules 1, 2 and 3 of EPR to determine the level of environmental assessment required. Projects that could result in some environmental impacts are required to conduct Brief Environmental Study (BES), projects having the moderate environmental impacts is required with IEE, and large projects that could result in major and adverse environmental impacts are required to go through an environmental impact assessment (EIA) process. The EPA makes necessary arrangements to disclose EIA reports to the general public to render opinions and suggestions.

20. The EPR 2020 provides for the institutionalization of the EIA system, pollution control, management of environmental conservation areas, and management of environmental fund.

21. **Environment Protection Act 2019 (2076 BS).** The act emphasis on new aspects like provisions of BES, IEE and EIA under the jurisdiction of local authority, provincial government, and central government. This act is pre-requirement for any type of development project in the country to comply the environment safeguards. Article 2 (3) 1 of this act has given provision of environmental assessment. This clearly mention that the environment assessment is prerequisite before implementation of any project. The detail of the criteria is indicated in Environment Protection Rules 2020.

22. **Environment Protection Rules 2020 (2077 BS).** This rule has defined thresholds and equivalent environmental assessment (i.e., BES, IEE and EIA). For NEP: NAFHA Project, the rule will require an IEE because target orchard areas will be more than a hectare of planting with exotic plant species (i.e., fruits and nuts varieties). The project will prepare an IEE representing orchard development in the entire 100 municipalities and including conservation/protected areas. It has defined the roles of the provincial government and the local government as well in the process of environmental assessment of development projects.

23. **Forest Act 1993.** Ensures the development, conservation, and proper utilization of forests and forest products and calls for carrying out EIA for development proposals if to be implemented in forest areas and/or passes through forest. The Act empowers government to give consent to use of any part or any category of forest areas, in case of absence of alternative, for the implementation of the national priority proposal with the assurance that it does not pose any significant adverse effect in the environment. However, NEP: NAFHA Project does not allow to develop orchards in the forest areas and public lands. There will be no forest lands to convert into orchards and/or other components of the project.

24. **National Parks and Wildlife Conservation Act, 1973**. Deals with the conservation and management of the wildlife and their habitats. The Act restricts entry in National Park area without prior permission. Activities such as hunting of wildlife; building or occupy any houses, shelter, or structure; occupy, clear or plant or grow any part of land; cut, fell or remove overshadow of any tree; and any quarry or any other activities are banned based on the Act. According to the Forest Rules, it provides recommendations for the plant species as well as the methods to be planted in specific areas of national parks. National Parks, and Conservation Area Management Rules provide mechanism to implement the developmental projects in protected and conservation areas. Few of the target districts (i.e., Manang and Mustang) are within the of Annapurna Conservation Area. Therefore, the project will trigger the requirement of Conservation Area Management Rules.

25. Conservation Area Government Management Area Rules 2001 also contain a number of regulatory measures to minimize environmental impacts within the forests, national parks, wildlife reserves and conservation areas. Prior to implementation, the EPA 2076 B.S. (2019 A.D) requires a proponent to undertake BES, IEE or EIA for a proposed project and have the report approved by the concerned sector agency or ministry of environment, respectively. The introduction of the exotic species on the specific location may requires an IEE before the implementation of the project as per the EPR, 2020 Appendixes 1, 2 and 3 Rule 3 a, b, and c.

26. **Pesticide Act, 1991.** This Act serves to manage pesticides utilization in the country. The act calls for the registration of pesticides before these chemicals can be imported, exported, and produced. It requires container and label specification and licensing for any person, institution or agency selling, formulating, or professionally spraying pesticides. The project aims to develop the orchards and nursery, and during operations, there will be requirement to use the various pesticides. These pesticides, when use within the proposed the orchards, will be required to registered at a government entity. The government will prohibit the use of pesticides if these are not registered as per the article 10 f Pesticides Act, 1991.

27. **Labor Act and Labor Rules, 2017 and 2018.** The Act emphasizes the occupational health and safety (OHS) policy, safety and health committee, OHS arrangements including childcare center, workplace safety, environment of work place, and specific labor audit additional rest period for certain female employees. Specific provisions relating to the safety of the works having health hazards are also included in the Act. Chapter 3 has defined the provisions relating to employment, where it has provision on the type of employment and hiring mechanism. Since there will be development of orchards and private nurseries and require labor, project components should comply to this act and rules.

28. **Land Acquisition, Resettlement and Rehabilitation Policy 2015 A.D.** The policy is based on the principles that the assessment of land requirements needs to carry out according to the alternatives of having minimum impacts of land loss, and the need of resettlement and rehabilitation works to ensure livelihoods of the affected persons and family is improved or at least

restored at pre-project level. It also indicates the need to conduct social impacts assessment to identify impacts on affected people, community, and vulnerable group. In case of land acquisition and ownership transfer, land can be acquired also through voluntary donation which will be accepted only if the land provider has agreed without any pressure, and in presence of local authorities to donate land for the purpose. This project strictly prohibits any land acquisition, and only in the private lands where the project should undergo development of orchards and nursery.

29. **Local Government Operations Act 2017.** The Act of 2017 empowers the local authority for the conservation of local natural resources and implementation of environmental conservation activities along with prime responsibility of conducting development projects, which includes water supply, sanitation, and awareness activities. NEP: NAFHA Project will work within 100 municipalities of 34 districts in Nepal. As per the Article 3 and 1.1, the farmers and firms need to take consent to operate the firm in their respective Municipalities.

30. **Solid Waste Management Act 1011 (2068 B.S.).** This act is for the management of the solid wastes in environment friendly manner. Article 4 provides that the management of hazardous, medical, chemical, or industrial waste rests upon the generators of such wastes. Management of solid wastes should be as prescribed in the Act. Chapter 3 have given the mechanism of the collection of the waste and waste discharge. While Chapter 4 covers the involvement of private and community sector in the management of solid wastes. The solid wastes generated in the orchards and nursery are expected to manageable. However, improvement and operations phases of horticultural centers should follow the Solid Waste Management Act of Nepal.

31. **Child Labor Prohibition and Regulation Act2001 (2056 B.S.).** Section 3 of the act prohibits a child from engaging in work. Sub-clause 1 of clause 3 states “Nobody shall engage in work a child who has not completed fourteen years of age as a labor.” Sub-clause 2 states “Nobody shall engage a child in a risk full occupation or work set forth in the Schedule.” Section 4 states “Child not to be engaged in work against his will by temptation or fear or pressure or by any other means.” During the operation and development of the project, there should strict compliance to the sections and clauses of the Act.

32. All other statutory clearances such as no objection certificates, site location clearances, permits to construct, permits to operate, and/or road cutting permits as required will be obtained for the project components. No civil works will commence until and unless required statutory clearances are obtained while developing the drip irrigation system in an orchard. The contractor for the nursery and horticulture enhancement will need to comply to all the government laws and regulations as stated above.

**Table 4. Summary of the clearances from GON.**

| Legislation | Objective | Remarks |
|---|---|---|
| Environment Protection Act (EPA) 2019 (2076 BS). | The Act states the requirement of any type of development project to comply with environment safeguards of the government. Environmental assessment is prerequisite before implementation of projects, which is detailed in | Project will prepare an IEE for orchard development in target sites. |

| Legislation | Objective | Remarks |
|---|---|---|
| | Environment Protection Rules 2020. | |
| Environment Protection Rules (EPR) 2020 (2077 BS) | The Rule defines thresholds and equivalent environmental assessment for projects (i.e., BES, IEE and EIA). It provides guidelines on steps and stages to acquire environmental clearance. | Same as above |
| Forest Act 1993. | Ensures the development, conservation, and proper utilization of forests and forest products and calls for carrying out EIA of the development proposals if to be implemented in forest areas and/or passes through forests. | This project will not allow development of orchards on the forest and public lands. |
| National Parks and Wildlife Conservation Act, 1973 | Deals with the conservation and management of wildlife and their habitat. The Act restricts entry in National Parks without prior permission. The Act covers regulatory measures to minimize environmental impacts within the forests, national parks, wildlife reserves and conservation areas. | The project will prepare IEE that will cover government requirement for protected sites, where few of the target districts (i.e., Manang and Mustang) are within Annapurna Conservation Area. One IEE will be prepared to comply with EPA and EPR, and this Act. |
| Pesticide Act, 1991. | The Act calls for the registration of pesticides before chemicals can be imported, exported, and produced. It requires container and label specification and licensing for any person, institution or agency selling, formulating, or professionally spraying pesticides. | The project will prohibit the use of pesticides if not registered as per the Act. |
| Labor Act and Labor Rules, 2017 and 2018. | Emphasizes the OHS policy, safety and health committee, arrangements including child care center, workplace safety, environment of work place, and specific labor audit additional rest period for certain female employees. It | Project will comply to this act and rules during implementation. |

| Legislation | Objective | Remarks |
|---|---|---|
| | includes specific provisions relating to the safety of the works on health hazards. | |
| Land Acquisition, Resettlement and Rehabilitation Policy 2015 A.D. | Land requirements need to carry out according to the alternatives of having minimum impacts of land loss, and also the need of resettlement and rehabilitation works to ensure livelihoods of the affected persons. It indicates the need to conduct social impacts assessment to identify impacts on affected people, community, and vulnerable group. | The project will avoid any land acquisition. |
| Local Government Operations Act 2017. | The Act of 2017 empowers the local authority for the conservation of local natural resources and implementation of environmental conservation activities along with the responsibility of conducting development projects which includes water supply, sanitation, and awareness activities. | The proposed project will work for 100 municipalities of 34 districts in Nepal, and beneficiaries need to take consent from respective Municipalities. |
| Solid Waste Management Act 1011 (2068 B.S.) | The Act provides guidelines to manage hazardous, medical, chemical, or industrial wastes. | The project will ensure compliance to this Act. |
| Child Labor Prohibition and Regulation Act2001 (2056 B.S.). | The act prohibits child from engaging work who has not completed fourteen years of age as a labor. The Act will protect children from working against their will. | The project will strictly comply to the sections and clauses of the Act. |

## B. Environmental Quality Standards

### B.1. National Standards

33. **National Ambient Air Quality Standards for Nepal, 2003.** As shown in the table below, the air quality standards for Nepal have set standards for 7 parameters: total suspended particles (TSP), $PM_{10}$, Sulphur Dioxide ($SO_2$), Nitrogen Oxide ($NO_2$), Carbon Monoxide (CO), Lead (Pb) and Benzene.

34. The World Health Organization (WHO) Air Quality Guidelines has set quality standards

for 4 parameters $PM_{10}$, $PM_{2.5}$, $SO_2$ and $NO_2$. According to ADB SPS 2009, when host country regulations differ from international levels and measures, the project will achieve whichever is more stringent. Both policies provide guidelines and comply with the more stringent standards during construction period.

**Table 5. Standards for ambient air quality for both GoN and WHO.[16]**

| Parameter | Averaging Period | Nepal's Ambient Air Quality Standard (µg/m³) * | WHO Air Quality Guidelines (µg/m³) ** | |
|---|---|---|---|---|
| | | | Global Update 2005 | Second Edition ^ 2000 |
| TSP | Annual | - | - | - |
| | 24-hour | 230 | - | - |
| $PM_{10}$ | Annual | - | 20 | - |
| | 24-hour | 120 | 50 | - |
| $PM_{2.5}$ | 1-year | - | 10 | - |
| | 24-hour | - | 25 | - |
| $SO_2$ | Annual | 50 | - | |
| | 24-hour | 70 | 20 | - |
| | 10-minute | - | 500 | - |
| $NO_2$ | 1-year | 40 | 40 | - |
| | 24-hour | 80 | - | - |
| | 1-hour | - | 200 | - |
| CO | 8-hour | 10,000 | - | 10,000 |
| | 15-minute | 100,000 | - | 100,000 |
| Pb | 1-year | 0.5 | - | 0.5 |
| Benzene | 1-year | 20 | - | - |

Source:

* National Ambient Air Quality Standards for Nepal, 2003. Obtained from Environment Statistics of Nepal 2011, Government of Nepal, National Planning Commission Secretariat, Central Bureau of Statistics, Kathmandu, Nepal.
** Environmental, Health and Safety General Guidelines, 2007. International Finance Corporation, World Bank Group.
^ Air Quality Guidelines for Europe, Second Edition, 2000. WHO Regional Office for Europe, Copenhagen.

35. **Emission standard for diesel generator EPR-14, 2020.** The emissions standards set for new DGs imports is equivalent to Bharat Stage III standards, and for in-use DGs is equivalent to Bharat S Inventories and Black Carbon Emissions in Kathmandu Valley, Nepal. Emissions standards are set for 4 major pollutants: CO, HC, $NO_x$, and PM.

[16] Nepal's air quality standards for $PM_{2.5}$ is 40 $\mu g/m^3$.

**Table 6. Standards for the National Diesel Generators Emission Standards, 2012**

1. Emissions Limits (g/kWh) for Imports of New Diesel Generators

| Category (kW) | CO | HC+NO$_x$ | PM |
|---|---|---|---|
| kW< 8 | 8.00 | 7.50 | 0.80 |
| 8 = kW <19 | 6.60 | 7.50 | 0.80 |
| 19 = kW <37 | 5.50 | 7.50 | 0.60 |
| 37 = kW <75 | 5.00 | 4.70 | 0.40 |
| 75 = kW <130 | 5.00 | 4.00 | 0.30 |
| 130 = kW <560 | 3.50 | 4.00 | 0.20 |

*Note: This standard is equivalent to Bharat III standards.*

2. Emissions Limits (g/kWh) for In-use DG Sets

| Category (kW) | CO | HC | NO$_x$ | PM |
|---|---|---|---|---|
| kW< 8 | 8.00 | 1.30 | 9.20 | 1.00 |
| 8 = kW <19 | 6.60 | 1.30 | 9.20 | 0.85 |
| 19 = kW <37 | 6.50 | 1.30 | 9.20 | 0.85 |
| 37 = kW <75 | 6.50 | 1.30 | 9.20 | 0.85 |
| 75 = kW <130 | 5.00 | 1.30 | 9.20 | 0.70 |
| 130 = kW <560 | 5.00 | 1.30 | 9.20 | 0.54 |

*Note: This standard is equivalent to Bharat II standards.*

*a) Sampling collection point should be located at one-third of the DG set stack height.*

*b) kW= Power Factor * kW*

*c) Testing Methodology: Should be according to ISO 8178 or equivalent to ISO 8178 standard set by the manufacturing country.*

Source: Diesel Power Generation, 2014 by the World Bank

36. **National Noise Standard Guidelines 2012.** The guidelines have set the standards for noise levels, measured in dBA, for industrial, commercial, rural residential, urban residential, mixed residential and quiet areas. It also has provision of standard values for the noise level generated by water pumps and DG as well.

37. For international standards, WHO Noise Level Guidelines has set the noise levels measured in dBA for two areas residential and commercial areas. The project will achieve whichever is more stringent. Both policies provide guidelines to follow and comply with the more stringent standards during construction period.

**Table 7. Standards for noise levels for both GoN and WHO.**

| Receptor / Source | National Noise Standard Guidelines, 2012 (dB) | | WHO Guideline Values for Noise Levels Measured Out of Doors * (One Hour $L_{Aeq}$ in dBA) | |
|---|---|---|---|---|
| | Day | Night | 07:00 - 22:00 | 22:00 - 07:00 |
| Industrial area | 75 | 70 | 70 | 70 |
| Commercial area | 65 | 55 | | |
| Rural residential area | 45 | 40 | 55 | 45 |
| Urban residential area | 55 | 50 | | |
| Mixed residential area | 63 | 55 | | |
| Quiet area | 50 | 40 | - | - |
| Water pump | 65 | | - | |
| Diesel generator | 90 | | - | |

* Guidelines for Community Noise, WHO, 1999.

*Source: Environmental, Health and Safety General Guidelines, 2007.International Finance Corporation, World Bank Group.*

## C. International Environmental Agreements

38. Table 8 below lists of the international environmental agreements that Nepal is party to, and their relevance with NEP: NAFHA Project.

**Table 8. International Environmental Agreements and standards ratified by GoN.**

| International Convention | Year* | Relevant Provisions | Remarks |
|---|---|---|---|
| World Heritage Convention | 1978 | Parties to ensure the protection and conservation of the cultural and natural heritage situated on territory of, and primarily belonging to the State. World Heritage sites are identified as per this convention. | The project components will not impact physical cultural resources and natural heritage during project implementation and operation. |
| Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar Convention) | 1987 | Parties to conserve and wisely use wetlands (i.e., maintaining their ecological character) as a contribution towards achieving sustainable development locally and throughout the world. This convention will identify the Ramsar areas. | The project components are not located in wetlands as classified as Ramsar site. |
| Convention on Biodiversity (CBD) | 1992 | Parties to require the environmental assessment of projects that are likely to have significant adverse effects on biological diversity with a view of avoiding or minimizing such effects. The CBD also identified the biodiversity identified the hot spot areas. | The project will not impact biodiversity hot spot area in the country. |
| UN Framework Convention on Climate Change | 1992 | Parties to take precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects. | The project will help the Government of Nepal comply with this agreement. The project will ensure implementation of resilience of farmers to climate change improved. |
| Basel Convention on the Control of Trans boundary Movements of Hazardous Wastes and their Disposal | 1996 | Parties to, among others, minimize the amount and toxicity of hazardous waste generated, manage the hazardous and other wastes they generate in an environmentally sound manner and as close as possible to the source of generation. | The project will ensure implementation of its EMP as measure to avoid or minimize the generation and disposal of any hazardous wastes. |

*(Year) - Year last amended.

## D. Environmental Safeguards Requirements of ADB SPS 2009

39. Throughout the processing and implementation stages, NEP:NAFHA Project must (i) comply with the SPS 2009[17], (ii) fulfill applicable regulatory requirements, and (iii) mitigate environmental, health, and safety impacts. The policy promotes international good practice as reflected in internationally recognized standards such as the World Bank Group's Environmental, Health and Safety Guidelines[18].

40. Table 9 summarizes the environmental safeguard requirements applicable to the project per ADB SPS 2009.

**Table 9. Environment Safeguards Principles**

| SPS 2009 Environment Safeguard Principles | Remarks |
|---|---|
| Use a screening process for each proposed project, as early as possible, to determine the appropriate extent and type of environmental assessment (EA) so that appropriate studies are undertaken commensurate with the significance of potential impacts and risks. | Rapid environmental assessment checklist has been prepared, which suggests Category "B" project. The types of impacts are not expected to be significant. The impacts are temporary and mitigation measures are readily available. Hence, IEE is sufficient. |
| Conduct EA to identify potential direct, indirect, cumulative, and induced impacts and risks to physical, biological, socioeconomic (including impacts on livelihood through environmental media, health and safety, vulnerable groups and gender issues), and cultural resources in the context of the project's area of influence. Assess potential trans boundary global impacts, including climate change. | IEE has been undertaken to assess the potential impacts of the project. (Impacts are discussed in Section 7). |
| Examine alternatives to the project's location, design, technology, and components and their potential environmental and social impacts and document the rationale for selecting the particular alternative proposed. Also consider the no project alternative. | Analysis of alternatives is discussed in Section 6, particularly for type of irrigation technology for orchards. |
| Avoid and where avoidance is not possible, minimize, mitigate, and/or offset adverse impacts and enhance positive impacts by means of environmental planning and management. Prepare environmental management plan (EMP) that includes the proposed mitigation measures, environmental monitoring and reporting requirements, related institutional or organizational arrangements, capacity development and training, | An EMP has been prepared to address this requirement (Section 8). |

[17] Appendix 1 (Safeguards requirements 1: Environment), ADB SPS 2009: pp. 30 - 40.

[18] https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/policies-standards/ehs-guidelines

| SPS 2009 Environment Safeguard Principles | Remarks |
|---|---|
| implementation schedule, cost estimates, and performance indicators. | |
| Carry out meaningful consultation with affected people and facilitate informed participation. Involve stakeholders, including affected people, women's participation and concerned NGOs, early in the project preparation process and ensure that their views and concerns are made known to and understood by decision makers and taken into account. Continue consultations with stakeholders throughout project implementation to address issues related to EA. GRM to receive & facilitate resolution of affected people's concerns and grievances on project's environmental performance. | Key informant and random interviews, focus group discussions, and meetings have been conducted. A grievance redress mechanism for the resolution of the project-related issues/concerns is presented in Section 9. |
| Disclose a draft EA (including the EMP) in a timely manner, before project appraisal, in an accessible place and in a form and language(s) understandable to affected people & stakeholders. Disclose the final EA and its updates if any to affected people & stakeholders. | IEE and EMP will be disclosed to ADB website. |
| Implement the EMP and monitor its effectiveness. Document monitoring results, including the development and implementation of corrective actions, and disclose monitoring reports. | The PMU will submit the environmental monitoring report in semi-annual basis. |
| Do not implement project activities in areas of critical habitats, unless (i) there are no measurable adverse impacts on the critical habitat that could impair its ability to function, (ii) there is no reduction in the population of any recognized endangered or critically endangered species, and (iii) any lesser impacts are mitigated. If a project is located within a legally protected area, implement additional programs to promote and enhance the conservation aims of the protected area. In an area of natural habitats, there must be no significant conversion or degradation, unless (i) alternatives are not available, (ii) the overall benefits from the project substantially outweigh the environmental costs, and (iii) any conversion or degradation is appropriately mitigated. Use a precautionary approach to the use, development, and management of renewable natural resources. | The project does not cover critical habitats and forest areas. The proposed target sites are within existing private farmlands. |
| Apply pollution prevention and control technologies and practices consistent with international good practices as reflected in internationally recognized standards such as the World Bank Group's Environmental, Health and | This requirement is also applicable to the project in the aspect of and waste management, e.g., waste management from horticulture center enhancements, drip irrigation |

| SPS 2009 Environment Safeguard Principles | Remarks |
|---|---|
| Safety Guidelines. Adopt cleaner production processes and good energy efficiency practices. Avoid pollution/ when avoidance is not possible, minimize or control the intensity or load of pollutant emissions and discharges, including direct and indirect greenhouse gases emissions, waste generation, and release of hazardous materials from their production, transportation, handling, and storage. Avoid the use of hazardous materials subject to international bans or phase-outs. Purchase, use & manage pesticides based on integrated pest management approaches & reduce reliance on synthetic chemical pesticides. | installations, orchard and vegetable area development, nursery expansions, and proposed development under the matching grant. The project will ensure that the contractor's measures and practices are in line with internationally accepted standards. |
| Provide workers with safe and healthy working conditions and prevent accidents, injuries, and disease. Establish preventive and emergency preparedness and response measures to avoid, and where avoidance is not possible, to minimize, adverse impacts and risks to the health and safety of local communities. | EMP provides measures to mitigate health and safety risks during construction and operation phases. |
| Conserve physical cultural resources and avoid destroying or damaging them by using field-based surveys that employ qualified and experienced experts during environmental assessment. Provide for the use of "chance find" procedures that include a pre-approved management and conservation approach for materials that may be discovered during project implementation. | The project will not affect any physical cultural resource. |

41. During implementation, the proposed project will apply applicable practices consistent with international good practices in internationally recognized standards such as the Environmental, Health, and Safety (EHS) Guidelines for Perennial[19] (for nut and fruit) and Annual[20] (for vegetable) crop productions. Both EHS Guidelines contain measures that are generally considered to be achievable in the target farmlands. Several practices consistent with the EHS Guidelines will be performed such as the following aspects.

42. *Soil Conservation and Management*. Physical and chemical degradation of soils may result from unsuitable management techniques in the proposed orchard and vegetable areas, such as use of inappropriate machinery or earthworks associated with plantation preparation and infrastructure development. Chemical degradation of soil may result from insufficient or inappropriate use of fertilizers, failure to recycle nutrients, and failure to correct changes in soil pH that result from long-term use of nitrogen fertilizers and excessive use of poor-quality water, resulting in salinization.

[19] https://www.ifc.org/wps/wcm/connect/debf535b-3479-4d60-a7b6-b50614204c93/FINAL_Perennial_Crop_Production_November_2015.pdf?MOD=AJPERES&CVID=l4WQyA4

[20] https://www.ifc.org/wps/wcm/connect/766c4c6e-e4b1-41ef-a980-3610bce404e8/Annual+Crop+Production+EHS+Guidelines_2016+FINAL.pdf?MOD=AJPERES&CVID=lfe82iC

43. Soil erosion may result from poor crop canopy closure after land preparation and lack of soil conservation structures on sloping land planted with perennial crops. Soil loss prevention practices include appropriate use of the following techniques:

- Practice reduced tillage.
- Use cover crops, intercropping along contours.
- Replenish soil organic matter by recycling crop residues and compost.
- Implement earthworks when weather conditions pose the lowest risk of causing environmental damage.
- Employ erosion control management practices in sloping areas.

44. *Nutrient Management.* Strategies will aim to maintain and/or improve soil fertility and optimize crop yield while minimizing environmental impacts. The project has considered the following practices as part of managing environmental risks in the orchard and vegetable areas:

- Establish and respect setbacks from watercourses to act as a filter for potential nutrient runoff from the land.
- Provide farmers with training in nutrient management.

## E. Administrative Framework

45. Table 10 shows various organizations and corresponding roles and responsibilities to implement the project.

**Table 10. Project Implementation Organizations and their roles**

| Project Implementation Organizations | Management Roles and Responsibilities |
|---|---|
| Project steering committee (PSC) | • Ensure collaboration among federal, provincial, and local levels for the effective implementation of the project and address any implementation issues<br>• Ensure timely and effective implementation of project activities and achievement of project outcome, rectifying any problems that arise during implementation<br>• Promote policy, administrative and legislative reforms to achieve project's goals<br>• Review and approve the annual project work program and budget<br>• Review quarterly financial management report, and semi-annual environment and social safeguards reports<br>• Review semiannual and annual project implementation progress reports<br>• Review internal and external audit observations and recommendations and monitor seven IAs' implementation of these recommendations in a timely fashion<br>• Monitor the use of credit guarantee fund and provide recommendations based on biannual review of the fund |
| Provincial project steering committee (PPSC) in each of the MOLMACs in Province 1, Bagmati, Karnali and Sudurpashchim and MOLMACPA in Gandaki | • Review and approve the annual provincial-level work program and budget, coordinating with existing or new provincial programs and activities to maximize development impact of the project<br>• Ensure timely and effective implementation of project activities and achievement of project outcome, rectifying any problems that arise during implementation |

| Project Implementation Organizations | Management Roles and Responsibilities |
|---|---|
| | • Coordinate with MOALD and NCFD in relation to effective project implementation, budget provision, and dispute resolution<br>• Coordinate among different participating local governments, AKCs and other relevant stakeholders to ensure effective project implementation<br>• Review internal and external audit observations and recommendations and monitor IA's implementation of these recommendations in a timely fashion<br>• Review quarterly progress report including financial management report and semi-annual environment and social safeguards reports<br>• Review annual project implementation progress reports |
| **Executing agency:**<br>Ministry of Agriculture and Livestock Development (MOALD) | The EA shall be responsible for overall coordination, implementation, and monitoring of the project. A working committee of the MOALD shall be established to discuss project matters within the EA. More specifically, the EA will:<br><br>• Provide overall strategic planning and make timely decisions on all matters related to effective project management<br>• Ensure adequacy of overall project financing and secure annual budget allocations for implementation<br>• Lead coordination among implementing agencies<br>• Oversee overall financial management including undertaking financial audits and implement recommended actions<br>• Ensure compliance of loan and grant covenants, and environmental and social safeguards, and facilitate corrective actions as required<br>• Be responsible for providing the status report to the PSC on the use of credit guarantee fund consolidating input from partner financial institutions (supported by a Credit Guarantee Fund Team, comprising 3 rural finance consultants and 5 province-based farm loan facilitators, in the CPMU)<br>• Ensure that a Central Project Management Unit (CPMU) is fully staffed, operational and sufficiently funded<br>• Support ADB project review missions<br>• Ensure compliance with ADB Safeguard Policy Statement (SPS, 2009) and national requirements |
| **Implementing agency 1:**<br>NCFD<br><br>Supported by<br>**Central Project Management Unit (CPMU)** | The IA-1 or NCFD will function as the secretariat to the MOALD/EA and as the overall project's focal point to ADB, supported by the CPMU. In addition, the IA-1 will lead project implementation at the central level.<br><br>Chief, NCFD will head CPMU as Project Director and serve as the focal contact with ADB. Staffing details of the CPMU are provided in the PAM Attachment A.<br><br>The IA-1, supported by the CPMU, will be responsible for the following:<br><br>**General Project Administration**<br>• Manage overall day-to-day project implementation<br>• In coordination with PIUs (NARC and five MOLMACs), be responsible for (i) preparing annual contract awards and |

| Project Implementation Organizations | Management Roles and Responsibilities |
|---|---|
| | disbursement projections; (ii) requesting budgetary allocations for counterpart funds; (iii) collecting and retaining supporting documents; and (iv) preparing and sending withdrawal applications to ADB<br>• Maintain separate advance accounts for each ADB financing source.<br>• Maintain separate book of accounts for the project, prepare consolidated project financial statements and cause them to be audited separately on an annual basis<br>• submit the audited project financial statements (a consolidated one for the entire NAFHA project) to ADB within 9 months from the end of the fiscal year.<br>• Ensure implementation of the GESI/AP<br>• Conduct and coordinate project review missions<br>• Prepare quarterly progress reports for submission to ADB by consolidating implementation progress reports from the implementing agencies<br>• Establish project performance monitoring system, including monitoring of the GESI/AP and a website for disclosure of project information<br>• Ensure performance monitoring and supervision of consultants engaged<br>• Monitor and ensure compliance with loan and grant covenants<br>• Carry out baseline, midterm, and project completion surveys<br>• Prepare project completion report at the end of the project and submit it to ADB<br><br>**Technical Oversight and Support**<br>• Prepare annual work plan and budget for the activities to be implemented by the IA-1<br>• Commission research on more adaptable and resilient varieties of fruits and nuts<br>• Manage partial subsidies for orchard and drip irrigation scheme development (payments greater than NRs 5 million)<br>• Recruit and supervise contractors under output 1 and output 3<br>• Prepare nursery standards, regulation, and inspection system (implementation of output 1 activities)<br>• Develop and roll out a pilot nursery certification scheme with participating private nurseries (implementation of output 1 activities)<br><br>**Safeguards Compliance**<br>• Take overall responsibility for environment and social safeguards by monitoring and ensuring compliance with ADB's SPS 2009, government requirements, and other related requirements in project documents particularly safeguards monitoring reports and tender documents.<br>• Address safeguards issues from affected people following the grievance redress mechanisms established in the project<br>• Consolidate project's safeguard monitoring results updated by PIUs, and provide consolidated input to the project progress and safeguard monitoring reports |

| Project Implementation Organizations | Management Roles and Responsibilities |
|---|---|
| | • Submit semi-annual environmental and social monitoring reports to ADB. |
| **Implementing agency 2:** Province-1 MOLMAC<br><br>**Implementing agency 3:** Bagmati MOLMAC<br><br>**Implementing agency 4:** Gandaki MOLMACPA<br><br>**Implementing agency 5:** Karnali MOLMAC<br><br>**Implementing agency 6:** Sudurpashchim MOLMAC | Led by Secretary, MOLMAC or MOLMACPA, the IA 2-6 will be responsible for the following:<br><br>• Ensure timely delivery of outputs<br>• Ensure that PIUs are fully staffed, operational and sufficiently funded<br>• Monitor and ensure compliance with loan and grant covenants, and environmental and social safeguards related to the work at the provincial and local levels, and facilitate the implementation of safeguard plans<br>• Ensure implementation of the GESI/AP |
| **Project Implementation Unit 1:** Province-1 MOLMAC<br><br>**Project Implementation Unit 2:** Bagmati MOLMAC<br><br>**Project Implementation Unit 3:** Gandaki MOLMACPA<br><br>**Project Implementation Unit 4:** Karnali MOLMAC<br><br>**Project Implementation Unit 5:** Sudurpashchim MOLMAC | A Project Implementation Unit (PIU) at the provincial level will be established within each of the respective MOLMACs /MOLMACPA. A PIU will support each provincial IA (i.e. IA 2-6) for implementing provincial level activities. The PIU will be led by the Senior Horticulture Officer as Project Manager who will serve as the provincial-level focal. Staffing details are provided in Attachment A.<br><br>**General Project Administration**<br>• Manage overall day-to-day project implementation at the province level<br>• Lead annual province level project planning and budgeting.<br>• Maintain separate book of accounts for the project, maintain separate control registers in an agreed format and prepare project financial reports and statements as required.<br>• Support the project audit and address audit observations in a timely manner.<br>• Submit claims and supporting documentation or copies of such documentation to the CPMU, retain supporting documents, submit all reporting requirements, including financial statements<br>• Manage project management support consultant deputed to the province<br>• Coordinate project review missions and prepare progress reports with the CPMU<br>• Support the CPMU to carry out baseline, midterm, and outcome surveys<br>• Establish province-level project performance monitoring system, including monitoring of the GESI/AP and for disclosure<br><br>**Technical oversight and support**<br>• Support NCFD to supervise contractors that are implementing outputs 1, 2 and 3 at provincial level<br>• Manage subsidy for orchard development (payments up to NRs5 million)<br>• Implement nursery standards, regulations, and inspection system at provincial level |

| Project Implementation Organizations | Management Roles and Responsibilities |
|---|---|
| | • Support NCFD to roll out pilot nursery certification scheme with participating private nurseries<br>• Manage cooperative development and capacity building (output-3)<br>• Upgrade horticulture station/center facilities for germplasm maintenance, testing production technologies, sapling quality check, and transfer of genetic technologies to private nurseries<br><br>**Safeguards compliance**<br>• Monitor and ensure safeguards compliance with ADB's SPS 2009, government requirements, and other related requirements particularly safeguards monitoring reports and tender documents at provincial level<br>• Address grievances related to the project following the grievance redress mechanisms established in the project and provide safeguards monitoring inputs to the CPMU<br>• Facilitate public consultations with project beneficiaries and other stakeholders at the provincial level |
| **Implementing agency 7:**<br>NARC<br><br>Supported by<br>**Project Implementation Unit 6:**<br>NARC | Led by Executive Director, NARC, the IA 7 will be responsible for the following:<br><br>• Prepare an annual work plan and budget of project-supported NARC stations<br>• Monitor and ensure compliance with loan and grant covenants, and environmental and social safeguards, and facilitate the implementation of safeguard plans<br>• Ensure that the project-supported NARC stations' compliance with ADB's procurement regulations and upgrade horticulture station facilities for testing and cleaning mother plants, and generation-1 germplasm maintenance, utilizing budget in a timely manner<br>• Ensure implementation of the GESI/AP<br>• Coordinate project review missions and prepare progress reports<br>• Maintain separate book of accounts for the project, maintain separate control registers in an agreed format and prepare project financial reports and statements as required<br>• Support the project audit and address audit observations in a timely manner<br>• Submit claims and supporting documentation or copies of such documentation to the CPMU<br>• Support the CPMU to carry out baseline, midterm, and outcome surveys<br>• Contribute to the implementation of nursery standards, regulations, and inspection system<br>• Address grievances related to the project following the grievance redress mechanisms established in the project and provide safeguards monitoring inputs to the CPMU<br><br>The PIU-6 will be established under the NARC to coordinate the implementation of output 1 activities. PIU-6 will be headed by Project Manager, appointed by NARC as the focal to the project |

| Project Implementation Organizations | Management Roles and Responsibilities |
|---|---|
| | and staffed with NARC's accountant officer. CPMU-based consultants will also support NARC for project administration. |
| Project implementation related committees | • **MOALD working group committee** to coordinate the EA's work (supported by CPMU) and to monitor and report on the compliance of the credit guarantee fund related covenants (scheme 1) supported by a Credit Guarantee Fund Team (comprising 3 rural finance consultants and 5 province-based farm loan facilitators) in the CPMU<br>• **Competitive Grants Management Committee (CGMC)** to review and approve matching grant proposals (related to Schemes 3, 4, 5 and 6) on a competitive basis[a]<br>• **Local Level Coordination Committees (LLCC)** (related to Scheme 2) to (i) advertise a call for expressions (EOI) of interest for partial subsidies for orchard and vegetable farming land development; (ii) conduct preliminary screening of EOIs; (iii) make a selection recommendation to the PIU-led or CPMU-led Subsidy Management Committee (SMC), depending on the size of orchard investment (investment beyond NRs. 5 million goes to the CPMU-led SMC)<br>• **Subsidy Management Committees (SMC)** (related to Scheme 2) to review and approve orchard development applications after LLCC's recommendation. SMCs will be formed at both CPMU and PIU levels (investment beyond NRs. 5 million goes to the CPMU-led SMC) |
| PFI | • Conduct financial due diligence for loans proposed by project beneficiaries, supported by project-financed loan facilitators<br>• Propose loans for guarantee issuance to MOALD through the CPMU credit guarantee fund team<br>• Issue loans to eligible project beneficiaries according to government and ADB policies and requirements<br>• Maintain separate ledger account and accounting records for the funds received under the project<br>• Prepare a statement of utilization of funds annually and cause it to be audited by independent auditor<br>• Submit the audited statement of utilization of funds and audited entity financial statements (AEFS) to MOALD working group committee through CPMU annually |
| ADB | • Review overall implementation of the project including compliance with loan and grant agreements, project agreement and ADB guidelines<br>• Conduct regular loan review missions<br>• Review and issue no-objection to procurement and disbursement documents.<br>• Overall coordination and advisory support.<br>• Review and disclose safeguards screening and monitoring reports |

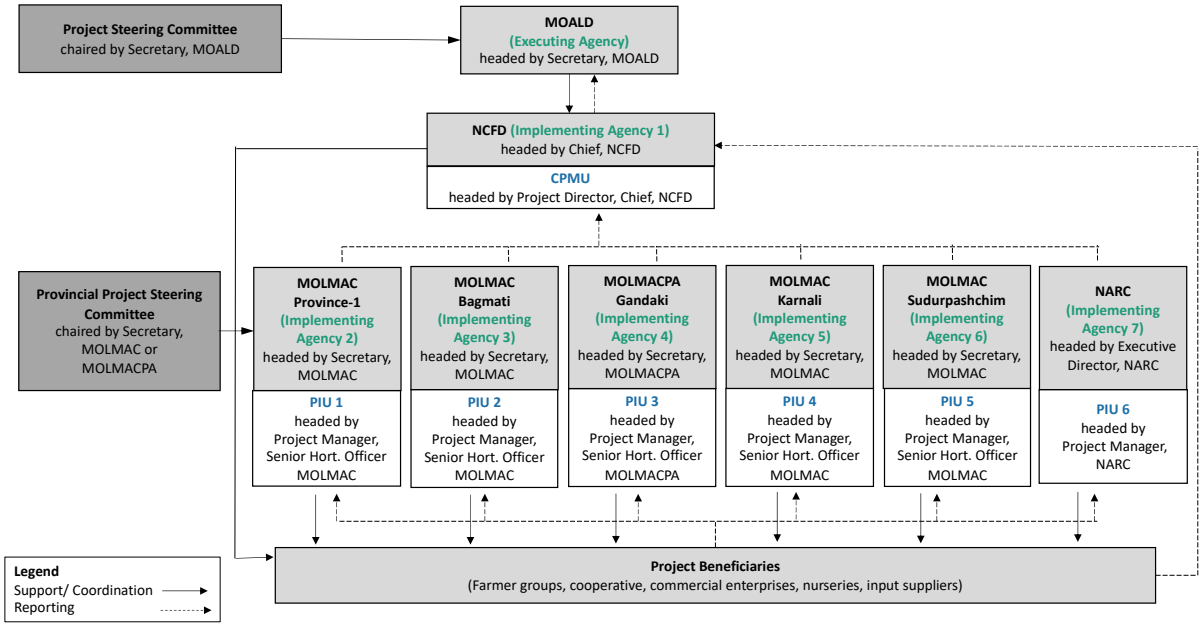



**Figure 1. Diagram showing the institutional framework of NEP: NAFHA.**
CPMU = Central Project Management Unit; MOALD = Ministry of Agriculture and Livestock Development; MOF = Ministry of Finance; MOLMAC = Ministry of Land Management, Agriculture, and Cooperatives; MOLMACPA = Ministry of Land Management, Agriculture, Cooperative, and Poverty Alleviation; NARC = Nepal Agricultural Research Council; NCFD = National Center for Fruit Development; PIU = Project Implementation Unit

# 3. APPROACH AND METHODOLOGIES

46. In order to meet the objectives of the environmental assessment, a systematic and integrated methodology was followed in accordance with standard field study practices for the IEE, and with consultation process designed for COVID-19 movement limitations.

## A. Literature review

47. Available primary and secondary literature in the form of reports and maps; topographic maps, land use maps, aerial photographs, cadastral survey maps etc. were collected and reviewed. Similarly, published, and unpublished reports pertaining to environmental standards, acts, regulations etc. were collected and reviewed. Published and unpublished literatures of the proposed project areas pertaining to biological, social, chemical, physical, and cultural environments were collected from various sources and reviewed to get information on the coverage of the studies and fulfill the data gaps.

## B. Impact Area Delineation

48. Before proceeding to field visit, the area that would be covered by the assessment, the geographical boundary of the influence area is delineated on the available map and termed as impact area delineation. The impact areas have been delineated on the basis of proximity of the project site to the nearby surrounding areas. The impact areas have been delineated as “Core Project Area” and “Surrounding Project Area” on the basis of proximity and magnitude of the impacts due to the proposed project activities.

49. The Core Area indicates the area where permanent development, as well as temporarily facilities, for the proposed project such as development of orchards, expansion of nurseries and constructions of research center premises. This area also includes facilities like drip irrigation, fencing, pipeline for irrigation and canal system that will be developed for the orchard and nursery.

50. Surrounding Area of the proposed subproject sites indicates within the immediate surroundings of the core area. This has low to medium magnitude impact from the proposed project activities. In this proposed project, the surrounding area covers all the municipality of the proposed project is intended to operate.

## C. Field Study

51. Due to the situation of the pandemic, field study had limited visits to get the information.

### C.1. Study of Physical Environment

52. A detail physical environment was assessed based on the various secondary sources and the analysis of the geographical information system (GIS) based maps as sources of data for the physical environment. The extensive physical survey could not be done due to the pandemic situation of the country, and undetermined specific sites of the subprojects. Except for the upgrading of horticultural centers, the actual subprojects sites will be determined during implementation.

### C.2. Study of Biological Environment

53. The information on vegetation was referenced form various secondary sources. Type of vegetation and forest were identified based on the species composition. Ethno-botanical information was obtained from the various secondary sources of published and unpublished data. The protected vegetation (rare, endangered, indigenous etc.) of the influence area as per International Union for Conservation of Nature (IUCN) Red Book, and GoN list species were enumerated based on secondary data sources in the direct impact areas of the subproject.

54. Fauna biodiversity was studied through secondary sources. Threatened and/or endangered species (as per IUCN Red Book) in the area were assessed through available data. The Integrated Biodiversity Assessment Tool (IBAT) information also used to get the baseline information of the existing biological environment at the target project areas.

### C.3. Study of Socio-Economic and Cultural Environment

55. Information on demography and socio-economy were collected through available secondary sources. GIS based data and other secondary sources were used to collect information on the cultural sites, and public institutions such as temples, cremation grounds, and festival sites, historical and archaeological sites, school, and health post within the direct project affected areas. Consultation with stakeholders were conducted in virtual mode to assess the current situation of these facilities and the general status of the communities of the project area.

## D. Stakeholder and Public Consultations

56. Key Informant Interviews through virtual consultation was done for the collection of the stakeholders view and concern regarding the project and its implementation. The potential impacts of the project have also been identified based on the virtual discussion with the local and other stakeholders. At the initial stages of due diligence, desk reviews were done during the month of August 2021. The site visits and consultations were performed during the periods in September, October, and December 2021.

## E. Data Processing and Impact Identification, Prediction and Evaluation Methods

57. The environmental impacts, both beneficial and adverse, were elaborately identified, predicted, and evaluated to the extent possible, for both construction and operational stages. Each impact identified, predicted, and evaluated by using standard methods and techniques on physical, biological, socio-economic and cultural aspects. The impacts were studied in terms of their intensity, duration, spatial extent, and significance of impacts.

# 4. PROJECT DESCRIPTION

## A. Project Rationale

58. Nepal has 147,181 sq.km. in area with around 29.7 million populations (2021). Agriculture has been playing a dominant role in the Nepalese economy providing livelihood and jobs. The total cultivated area is around 3 million hectares, of which around 4.79% is covered by fruit crops. The contribution of the horticulture sector amounts to 15% of agriculture GDP, of which almost half is constituted by fruits. Even though Nepal has few decades of fruit development and research, it is still in infant stage due to lower resources allocation and frequent changes of institutional and human resources on fruit research and development. However, some good groundwork has already been done during the period of less than six decades in major fruits produced in the country.

59. The agroclimatic situations and geophysical locations of Nepal favor growing a variety of fruit species that requires tropical, sub-tropical, and temperate climates at a same period of time. Fruits are very important source for human nutrition as well as improving the rural economy. Fruit development activities were started before 1850 AD in Nepal and fruit plantation in hills received a greater attention since 1975 AD (2032 BS).

## B. Project Locations

60. The target municipalities are selected from 5 provinces—Province 1, Bagmati, Gandaki, Karnali, and Surdurpaschim[21] (see table below) — within which fruit and nut production clusters will be identified during the project preparation. The project will be aligned with the following impacts: (i) livelihoods of rural households improved; and (ii) resilience of farmers to climate change improved. NEP:NAFHA Project will have the following outcome: Beneficiary farmers' agricultural income from climate resilient farming of fruits and nuts increased. The project beneficiaries will be approximately 40,000 fruit and nut farm households in hilly areas.

**Table 11. Provinces of proposed Projects**

| Province | No. of Districts | No. of Municipalities |
|---|---|---|
| Province-1 | 7 | 22 |
| Bagmati | 3 | 8 |
| Gandaki | 10 | 34 |
| Karnali | 9 | 20 |
| Sudurpaschim | 5 | 16 |
| Total | 34 | 100 |

[21] Nepal has five physiographic regions: Terai (below 500m), lower hills (Chure or Siwalik, 500-1,000m), middle mountains (1,000-3,000m), high mountains (3,000-5,000m) and high Himalaya (above 5,000m). ADB. 2015. *Country Environment Note: Nepal*. Manila. The project generally targets the lower hills and middle mountains areas, i.e. between 1,000m–3,000m.

**Table 12. Proposed Municipalities for NAFHA**

| Province No 1 | | Bagmati Province | |
|---|---|---|---|
| **District** | **Municipalities** | **District** | **Municipalities** |
| Panchthar | Hilihang | Sindhupalchok | Chautara Sangachok Gadhi |
| | Phidim | | Indrawati |
| Terhathum | Aathrai | | Melamchi |
| | Laligurans | Nuwakot | Likhu |
| | Myanglung | | Tadi |
| | Phedap | | |
| Dhankuta | Chhathar Jorpati | Dhading | Netrawati Dabjong |
| | Dhankuta | | Tripura Sundari |
| | Mahalaxmi | | Gajuri |
| | Pakhribas | **Gandaki Provinces** | |
| Bhojpur | Arun | **District** | **Municipality** |
| | Bhojpur | Syangja | Biruwa |
| | Pauwadungma | | Chapakot |
| Khotang | Halesi Tuwachung | | Galyang |
| | Rawa Besi | Parbat | Jaljala |
| | Diktel Rupakot Majhuwagadhi | | Kushma |
| Okhaldhunga | Champadevi | | Modi |
| | Manebhanjyang | | Phalebas |
| | Sunkoshi | Mustang | Barhagaun Muktikhetra |
| Solukhumbu | Solududhkunda | | Dalome |
| | Thulung Dudhkoshi | | Gharapjhong |
| | Mapye Dudhkoshi | | Thasang |
| **Karnali Province** | | Manang | Nashong |
| **District** | **Municipalities** | | Neshyang |
| Rukum West | Banfikot | | Chame |
| | Musikot | Myagdi | Annapurna |
| | Sani Bheri | | Beni |
| Salyan | Dhorchaur | Baglung | Badigad |
| | Sharada | | Galkot |
| Jajarkot | Chhedagad | | Jaimuni |
| | Junichande | | Kanthekhola |
| Dailekh | Aathabis | | Nisikhola |
| | Narayan | **Sudurpacschim** | |
| | Chamunda Bindrasaini | **District** | **Municipality** |
| Kalikot | Kalika | Achham | Bannigadhi Jayagadh |
| | Naraharinath | | Kamalbazar |

| Province No 1 | | Bagmati Province | |
|---|---|---|---|
| Jumla | Hima | | Mangalsen |
| | Sinja | | Panchadewal Binayak |
| | Kanakasundari | | Sanphebagar |
| Mugu | Khatyad | | Turmakhad |
| | Soru | Bajura | Budhinanda |
| Humla | Tanjakot | | Pandav Gupha |
| | Adanchuli | | Swami Kartik |
| | | Baitadi | Dasharathchanda |
| | | | Patan |
| | | Bajhang | Chabispathivera |
| | | | Masta |
| Dolpa | Mukechula | | Jaya Prithivi |
| | | Darchula | Shailyashikhar |
| | | | Lekam |

61. The project will be implemented on the lower hills and middle mountains of Nepal to address: (i) an increasing gap between horticulture demand and supply, resulting in growing importation dependence and costs; (ii) smallholder farmers in hilly areas who are growingly dependent on remittances; and (iii) growing opportunities to develop the horticulture sector in the country. Nepal's mid and high hills have agroclimatic zones suitable for high value fruits and nuts such as apple, citrus, kiwi, walnut, and emerging commodities such as avocado, almond, macadamia, pecan, and hazelnut, which are seeing increasing demand from domestic markets.

62. The project will increase the agricultural income of beneficiary farm households in 100 municipalities in 5 provinces: Province 1, Bagmati, Gandaki, Karnali and Sudurpashchim. This will be achieved through institutional capacity building for planting material management, the development of approximately 10,000 ha. of orchards for 9 crops, namely almond, apple, avocado, kiwi, lime, macadamia, citrus (mandarin and sweet orange), pecan and walnut, vegetable and other nutritious crop production in 1,000 ha, and the value-addition to nuts and fruits produced.

63. The project is aligned with the following impacts: (i) livelihoods of rural households improved; and (ii) resilience of farmers to climate change improved.[22] The project will have the following outcome: beneficiary farmers' agricultural income from climate resilience farming of fruits and nuts increased. This will be achieved through improved nursery management, enhanced production and productivity in orchards, and enhanced value addition in fruits and nuts.

### C. Upgrading of Horticulture Centers (under Output 1)

64. The NEP: NAFHA Project will finance the upgrading of 12 public horticulture stations or centers of National Center for Fruit Development (NCFD) and Nepal Agricultural Research Council (NARC). The main objective of upgrading the horticulture centers is to ensure the verified planting materials are provided to project farmers. The project is expected to contribute to long-

[22] Government of Nepal. Ministry of Agricultural Development. 2016. *Agricultural Development Strategy 2015 to 2035*. Kathmandu.

term capacity building of these horticulture stations/centers that can serve broader areas beyond the project's target orchards. During project implementation, upgrading of horticulture centers should comple with ADB SPS 2009 requirements and relevant government policies.

65. The project supports production of the following key crops and horticulture station/center located in each target province. Summarized in the following

**Table 13. Salient features of the horticultural centers for upgrading under the proposed NEP: NAFHA Project.**

| Province | Estimated project-supported orchards | Horticulture station/center to be supported by the project[23] |
|---|---|---|
| Province 1 | Apple 50ha<br>Orange 900 ha<br>Lime 500 ha<br>Avocado 300ha<br>Kiwi 400ha<br>Walnut 50ha | MOLMAC Phapu Solukhumbu<br>NARC Paripatle Dhankuta |
| Bagmati | Orange 300ha<br>Lime 300ha<br>Avocado 150ha<br>Macadamia 300ha<br>Walnut 100ha | MOLMAC Trishuli Bagmati<br>NCFD Kirtipur |
| Gandaki | Apple 100ha<br>Orange 800ha<br>Lime 750ha<br>Avocado 150ha<br>Kiwi 150ha<br>Walnut 250ha<br>Macadamia 250ha | NCFD Marpha Mustang<br>NARC Directorate of Agriculture Research<br>NARC Malepatan Pokhara<br>MOLMAC Pokhara<br>NCFD Palpa Station |
| Karnali | Apple 1,450ha<br>Orange 350ha<br>Walnut 600ha<br>Pecan 100ha<br>Almond 100ha | NARC research station Rajikot Jumla<br>NARC Dailekh Orange |
| Sudurpashchim | Apple 400ha<br>Orange 250ha<br>Lime 100ha<br>Walnut 600ha<br>Pecan 100ha<br>Almond 100ha | MOLMAC Baitadi |

66. The type of horticulture station/center upgrade to be considered by the project will be limited to the following scope:

- High tech nursery/screen house;
- Shade house;
- Seed germination/soil sterilization chamber;

[23] Temperate fruit and nu stations fort almond, apple, kiwi, pecan, walnut; and Tropical and subtropical fruit and nut crop centers for avocado, citrus, macadamia

- Tissue culture facilities;
- Irrigation/rainwater harvesting/drainage;
- Staff residential building;
- Laboratory including pathogen testing, tissue culture;
- Office, training place and security guard house;
- Polymerse Chain Reaction analysis machine;
- Labour cost for terracing, separate mother plant block establishment, etc.;
- Vehicle (after completing cost comparison to rental);
- Nut cracking machinery for research; and
- NCFD office expansion.

**D. Private nursery participation in nursery quality initiative (under Output 1)**

67. NCFD will prepare and advertise a call for proposals for private nurseries that are willing to participate in a volunteer private nursery quality control scheme The scheme will be operationalized twice during the project implementation. The first batch will be 15 nurseries in 2022 and 25 nurseries will be supported in 2023. A total of 40 nurseries will be supported at the maximum value of $25,000 for nursery facility expansion, enhancement and quality control system installation as matching grant.

68. The competitively selected private nurseries will be eligible for the project, through matching grant, for investments that upgrade the quality and quantity of seedling production. The project could finance, *inter alia,* the purchase of mother plants and disease-free rootstock, the installation of insect proof shade houses, drip irrigation systems, the expansion and upgrading of seedling growth areas, etc. The project's financing of up to 50% of the investment cost would not exceed $25,000 per nursery.

**E. Enhancing Access to Rural Finance (under Output 2)**

69. On the average, the estimate of establishing a 1-hectare orchard under the project will require a $4,000 investment, and approximately 10% of that amount for annual operating expenses. Although there is a project subsidy of 50% of the investment cost, orchard beneficiaries will still require loans for the full investment for at least 6 months to 1 year.

70. The project will support the design of an agri-financing mechanism that will ensure flow of both medium to long term capital for investment purpose as well as working capital financing for smallholder farmers, SMEs and other actors involved in the key agricultural value chains. The design will acknowledge the potential roles for commercial banks as well as smaller microfinance institutions such as local cooperatives and wholesale lenders. The project will set-up a compensating balance fund to cover qualified loans that financial institutions will disburse to project beneficiary farmer groups/cooperatives/agro-enterprises. The subsidy will cover establishing improved orchards and developing drip and non-drip irrigation systems.

**F. Establishing Improved Orchards (under Output 2)**

71. The proposed project will support the development of up to 10,000 ha of orchards, and vegetable and other nutritious crop production in 1,000 ha across 100 municipalities within 5 provinces (Province 1, Bagmati, Gandaki, Karnali and Sudurpashchim) . Orchard crops that will be eligible for support include almond, apple, avocado, citrus (lime, mandarin and sweet orange),

kiwi, macadamia, pecan and walnut. Farmers in any municipality will be able to choose amongst the 4 most suitable of these crops for their municipality.

(a) Almond

(b) Apple

(c) Avocado

(d) Kiwi

(e) Lime

(f) Macadamia

(g) Citrus

(h) Pecan

(i) Walnut

**Figure 2. Target horticultural crops under the NEP:NAFHA Project.**

Photographs sources:
(a) https://www.netafim.com/en/crop-knowledge/almonds/
(b) https://www.insidehimalayas.com/where-find-freshest-apples-in-nepal-jumla/
(c) https://www.agrifarming.in/avocado-fruit-farming
(d) https://kathmandupost.com/money/2020/10/14/kiwi-farmers-in-eastern-nepal-told-not-to-harvest-immature-fruits
(e) https://plantsnepal.com/lime-tree/
(f) https://startupbizglobal.com/starting-macadamia-nuts-farming-business-plan-pdf/
(g) https://kathmandupost.com/money/2016/01/14/junar-price-shoots-up-in-top-producer-sindhuli
(h) https://www.agrifarming.in/pecan-seed-germination-time-temperature-process
(i) https://www.efarm.live/products/walnut-plant-%E0%A4%93%E0%A4%96%E0%A4%B0

72. All farm households in the selected 100 municipalities will be eligible to apply for a 50% subsidy support for orchard establishment. Small and medium enterprises will be eligible for 40% subsidy support. Selected beneficiaries will be required to establish the agreed orchard type and area before being eligible for the subsidy payment. Orchard areas developed by farmer groups will not be less than 20 ropani[24] or greater than 500 ropani or the maximum subsidy payment of $250,000, whichever is lower. Annex 2 shows the municipalities and corresponding potential crops.

73. The project will assist eligible beneficiaries to apply to banks for orchard development financing repayable over a five-year period, which, if negotiated with Class A banks, will be available at the prevailing government interest rate subsidy. The loan will cover up to 80% of the orchard establishment cost, with beneficiaries contributing at least 20% in cash. The subsidy, upon release, will be used to repay an equivalent proportion of the loan.

**Table 14. Indicative target area (ha) per province**

| Province | Districts | Municipalities | % share of total | Target Area per province |
|---|---|---|---|---|
| Province-1 | 7 | 22 | 22% | 2,200 |
| Bagmati | 3 | 8 | 12% | 1,150 |
| Gandaki | 10 | 34 | 25% | 2,500 |
| Karnali | 9 | 20 | 26% | 2,600 |
| Sudurpaschim | 5 | 16 | 16% | 1,550 |
| **Total** | **34** | **100** | **100%** | **10,000** |

**Table 15. Indicative priority commodity per province.**

| Province | Apple | Orange | Lime | Kiwi | Avocado | Walnut | Macadamia | Pecan | Almond |
|---|---|---|---|---|---|---|---|---|---|
| Province 1 | | | | | | | | | |
| Bagmati | | | | | | | | | |
| Gandaki | | | | | | | | | |
| Karnali | | | | | | | | | |
| Sudurpaschim | | | | | | | | | |

74. Given the period to produce 2-year-old disease-free saplings and allow farmers to plan, the orchard plantations are scheduled for 3 batches. The batch-1 areas will be the pilot municipalities, and the learning from it will be used to make necessary adjustments for batch-2

[24] One hectare = 19.65 ropani

and batch-3 plantations. Batches 2 and 3 will be implemented in the following years during the summer and winter seasons. Table below shows the target hectares per batch for every province based on the target crops.

**Table 16. Target crops and area (ha) per province in different batches.**

| Target Crop | Suitable Area (ha) | Target Area (ha) | Batch 1 | Batch 2 | Batch 3 |
|---|---|---|---|---|---|
| **Province 1** | | | | | |
| Apple | 100 | 50 | - | 50 | - |
| Orange | 1,691 | 900 | - | 400 | 500 |
| Lime | 12,035 | 500 | - | 200 | 300 |
| Avocado | 74,133 | 300 | - | 100 | 200 |
| Kiwi | 3,799 | 400 | 25 | 100 | 275 |
| Walnut | 631 | 50 | - | 50 | - |
| **Sub-total for Province 1** | | **2,200** | **25** | **900** | **1,275** |
| **Bagmati** | | | | | |
| Orange | 20,240 | 300 | - | 100 | 200 |
| Lime | 9,472 | 300 | - | 100 | 200 |
| Macadamia | 15,292 | 300 | - | 100 | 200 |
| Avocado | 16,224 | 150 | - | 50 | 100 |
| Walnut | 200 | 100 | 25 | 75 | - |
| **Sub-total for Bagmati** | | **1,150** | **25** | **425** | **700** |
| **Gandaki** | | | | | |
| Orange | 57,070 | 800 | 40 | 260 | 500 |
| Lime | 16,261 | 750 | 10 | 240 | 500 |
| Walnut | 2,461 | 250 | - | 100 | 150 |
| Macadamia | 69,701 | 250 | - | 50 | 200 |
| Apple | 2,919 | 150 | - | 100 | 50 |
| Avocado | 39,572 | 150 | - | 50 | 100 |
| Kiwi | 7,016 | 150 | - | 50 | 100 |
| **Sub-total for Gandaki** | | **2,500** | **50** | **850** | **1,600** |
| **Karnali** | | | | | |
| Apple | **20,047** | **1,450** | 50 | 500 | 900 |
| Orange | **19,821** | **350** | - | 150 | 200 |
| Walnut | **31,924** | **600** | - | 200 | 400 |
| Pecan | **42,097** | **100** | - | 50 | 50 |
| Almond | **52,416** | **100** | - | 50 | 50 |
| **Sub-total for Karnali** | | **2,600** | **50** | **950** | **1,600** |
| **Sudurpashchim** | | | | | |
| Walnut | **30,894** | **600** | 50 | 100 | 450 |
| Apple | **4,062** | **400** | - | 120 | 280 |
| Orange | **17,218** | **250** | - | 100 | 150 |
| Lime | **1,534** | **100** | - | 50 | 50 |
| Pecan | **41,576** | **100** | - | 50 | 50 |
| Almond | **38,382** | **100** | | 50 | 50 |
| **Sub-total for Sudurpashchim** | | **1,550** | **50** | **470** | **1,030** |

## G. Assessing and Verifying Carbon Sequestration (under Output 2)

75. The project will apply technical assistance resources to explore the development of a system for securing carbon credits from sustainable smallholder orchard production in Nepal. This work will include:

- studies on methodologies of carbon sequestration benefit measurement of project-supported fruit and nut trees;
- development of a measurement, reporting and verification (MRV) manual and the systematic application of those MRVs on pilot orchards;
- identification of private companies willing to investing in carbon neutrality and development of a model agreement; and
- preparation of the manual on the carbon credit utilization for participating farmer communities.

76. During the preparations of this IEE report, the system of assessing and verifying carbon sequestration benefits from orchards is not yet established.

## H. Developing Drip Irrigation Systems (under Output 2)

77. To support crop establishment and to sustain production, NEP:NAFHA Project will support the development of drip irrigation systems on target orchards. The rationale for drip irrigation is based on efficiency of water use, suitability for the topography, accuracy of application and ease of operation.

78. The drip system comprises five main elements:

- drippers and laterals
- submain
- main
- headworks
- header tank

79. For cropped areas of 5 ropani or less the drips and lateral will be replaced by hoses, as the irrigated area can readily be managed by manual watering. Both the submain and main are installed below ground level for system resilience, and the lateral with drips above ground along the tree rows. About 25% of participating farmers are expected to plant 4 ropani of orchard without drip irrigation.

80. The drippers will be progressively installed commensurate with tree growth, initially two per tree and additional drippers installed (up to 1 per metre) in subsequent seasons with canopy growth. Drippers could be standardized and pressure compensating but also equipped with small connection pipes for maximum flexibility. The pipes should have minimum hydraulic resistance, maximum flexibility, and easy leak-free connectivity between pipes. The lateral pipe should be flexible and allow for dripper insertion, mains and submains should be high impact resistant and cost-efficient. Cost-efficient with regards to the installation in the short term and for operational and maintenance costs (pumping- and repair/replacement) in the long term. The headworks include a screen filter (120 mesh) for removal of organic matter. Depending on the water quality more filters might be needed.

81. The system components will be specified in terms of materials and performance to ensure system reliability and sustainability. The supply and installation of the system will be supported technically through the provision of technical service providers, who will work in collaboration with the Municipality and grower/community association.

82. Pilot plots will be established in the initial project year for the purposes of demonstrating the installation and operation and maintenance of the drip systems. These plots will serve as sites for capacity building of farmers prior to the roll out of the orchard development.

## I. Matching Grant Component (under Output 3)

83. The project will establish four competitive matching grant programs: (i) private nursery upgrading; (ii) improved cooperative value addition grant; (iii) public-private infrastructure grant; and (iv) strengthened local level infrastructure grant.

84. *Private nursery upgrading (Output 1).* There will be up to 40 selected private nurseries will be eligible for matching grants for investments to upgrade the quality and quantity of seedling production. The matching grant will finance, *inter alia,* the purchase of mother plants and disease-free rootstock, the installation of insect proof shade houses, drip irrigation systems, the expansion and upgrading of seedling growth areas, etc. Matching grant financing of up to 50% of the investment cost would not exceed $50,000 per nursery.

85. *Improved cooperative value addition.* Cooperatives who will participate in the project-implemented cooperative development and capacity building program and have the interest to invest in nut and fruit marketing/value addition (e.g., harvesting handling equipment, primary washing, sorting, grading machinery, packaging equipment, short-term storage, marketing) could be eligible to compete for financing, which will finance up to 50% of approved investment cost.

86. *Public-private infrastructure.* Agribusinesses and service providers interested to collaborate with cooperatives in nut and fruit value addition and market development will be eligible to compete for financing for the matching grant. Investments can include “hardware” such as infrastructure and equipment as well as "software" such as traceability and certification systems, internet-based marketing, organic production, and other services. Areas of investment could include, inter alia: (i) innovative business, market and service linkages and market promotions activities; (ii) joint investments in and management of facilities and associated innovative contract or pricing mechanisms; (iii) technology for climate adapted productivity enhancement and value addition in the area of production, post-harvest handling, processing, packaging, transportation and marketing; (iv) aggregator models linking rural cooperatives to higher value urban markets including supermarkets; (v) joint investments in distribution and sales networks; or (vi) certification systems – organic certification, geographic indication, farm to fork traceability, etc.

87. *Strengthened local level infrastructure.* The project will support local-level applications for grants for market-linked infrastructure investments that provide public good benefits essential to targeted nut and fruit value chain engagement and/or climate change adaptation at the local level. Public good infrastructure investment subprojects would be identified and prioritized through: (i) municipality infrastructure plans; (ii) municipal-based cooperative and farmer group development needs; and (iii) local and regional agribusiness development requirements. Investments could include, *inter alia,* public utility connection for project supported investments, commodity storage, market/collection centers, farmer group orchard fencing or collective irrigation water access investments.

88. The matching grant components will follow the recommendations in the IEE and EMP. Proposals under the matching grant having potential adverse environmental impacts will not be financed by the project's matching grant. The matching grant and subsidized orchard development components will:

(i) ensure that subproject investments comply with the requirements of ADB SPS 2009 and applicable national laws and regulations;
(ii) apply the prohibited investment activities list of ADB SPS 2009 to subprojects financed by ADB;
(iii) not finance subprojects that are categorized as A for environment;
(iv) utilize recommendations in the IEE and measures in the EMP for environmental safeguard activities; and
(v) monitor environmental management activities during implementation.

**Table 17. Salient features of NEP: NAFHA Project**

<table>
<tr><td>Districts</td><td>Province1: Panchthar, Terhathum , Dhankuta , Bhojpur, Khotang , Okhaldhunga and Solukhumbu<br><br>Bagmati : Sindhupalchok, Nuwakot and Dhading<br><br>Gandaki: Gorkha, Lamjung , Syangja, Tanahu, Kaski, Syangja, Parbat, Mustang, Myagdi and Baglung<br><br>Karnali: Rukum West, Salyan, Jajarkot, Dailekh, Kalikot, Jumla, Mugu, Humla and Dolpa<br><br>Sudurpaschim: Accham, Bajura, Baitadi, Bajhang and Darchula</td></tr>
<tr><td>Targeted Numbers of Municipalities per Provinces</td><td>Province-1 — 7 districts — 22 municipalities<br>Bagmati — 3 districts — 8 municipalities<br>Gandaki — 10 districts — 34 municipalities<br>Karnali — 9 districts — 20 municipalities<br>Sudurpaschim — 5 districts — 16 municipalities</td></tr>
<tr><td>Targetted Area</td><td>Total target area (ha) — 10,000 and 1,000<br>Average area per municipality (ha) — 100<br>Average area per municipality (ropani) — 2,000<br>Average households per municipality — 300<br>Average area per household (ropani) — 6.7</td></tr>
<tr><td>Species wise proposed area in (Ha)</td><td>
<table>
<tr><td>Apple</td><td>2,050</td></tr>
<tr><td>Orange</td><td>2,600</td></tr>
<tr><td>Lime</td><td>1,650</td></tr>
<tr><td>Avocado</td><td>600</td></tr>
<tr><td>Kiwi</td><td>550</td></tr>
<tr><td>Walnut</td><td>1,600</td></tr>
<tr><td>Macadamia</td><td>550</td></tr>
<tr><td>Pecan</td><td>200</td></tr>
<tr><td>Almond</td><td>200</td></tr>
<tr><td>Vegetables and crops</td><td>1,000</td></tr>
<tr><td>Total</td><td>11,000</td></tr>
</table>
</td></tr>
</table>

| | |
|---|---|
| **No of Research Centers to be Upgarded** | 12 |
| **Total Orchard Development Area** | 10,000 ha |
| **Total beneficial Households** | 30,000 |

**Table 18. Summary of the Project components that will entail civil works and covered in the IEE.**

| Project component | Output | Remark | With civil works? (yes or no) | Covered by IEE? (yes or no) |
|---|---|---|---|---|
| Upgrading of Horticulture Centers | 1 | Improvement of operation and production of high quality planting materials. | Yes | Yes |
| Private nursery participation in nursery quality initiative | 1 | Improvement of operation and production of high quality planting materials. | Yes | Yes |
| Enhancing Access to Rural Finance | 2 | Design an agri-financing mechanism to ensure flow of capital for investment and working capital in the agricultural value chains. | No | No |
| Establishing Improved Orchards | 2 | Development of orchards (10,000 has) and vegetable areas (1,000 has) across 100 municipalities within 5 provinces | Yes | Yes |
| Assessing and Verifying Carbon Sequestration | 2 | Development of a system for securing carbon credits from sustainable smallholder orchard production in Nepal. | No | No |
| Developing Drip Irrigation Systems | 2 | Water will be supplied to orchard and vegetable areas through drip irrigation | Yes | Yes |
| Matching Grant Component | 3 | Project will support cooperatives, agri-enterprises and private nurseries | Yes | Yes |

# 5. DESCRIPTION OF THE ENVIRONMENT

110. Nepal is a land-locked country nestled in the foothills of the Himalayas. It occupies an area within latitude 26° 22' N to 30° 27' N and of longitude 80° 4' E to 88° 12' E. Without any border touching an ocean or sea, the altitude ranges from a minimum of 64 meters to a maximum of 8,848 meters above sea level (masl), which the climate varies with its topography.

## A. Physical Environment

### A.1. Geography

111. Nepal has its diverse features in terms of physiography, climate, elevations as well as its geology. The different geographical features have their own different characteristics. Based on these characteristics, whole country and its features are identified as the following:

**Table 19. Geographic features and their characteristics**

| Physiographic region | Altitude (m) | Area (km²) | Topographical feature | Climate | Mean Temperature °C |
|---|---|---|---|---|---|
| Terai | 60–500 | 21,104 (14.3%) | Flat land with slope gradients from 0.2% to 1% | Hot monsoon and mostly tropical | <20 |
| Siwalik | 200–1,000 | 18,858 (12.8%) | Consisting of Dun valleys, about 25%; gradient < 300 m and rarely > 1000 m (75%) | Hot monsoon and mostly sub-tropical | |
| Middle Mountains | 1,000–2,000<br>2,000–3,000 | 44,436 (30.1%) | Tropical valleys and elevated plains, about 6%; relief up to 1000 m is common, maximum up to 2000 m (94%) | Sub-tropical to warm temperate monsoon<br>Cool temperate monsoon | 15–20 |
| High Mountains | 3,000–4,000<br>4,000–5,000 | 29,594 (20.1%) | Sub-tropical–temperate valleys, about 10%; average relief 2000 m | Sub-alpine<br>Alpine | 10–15 |
| High Himalaya | Above 4,000 | 33,492 (22.7%) | Dry Trans-Himalayan area | Tundra type and arctic | <10 |
| **TOTAL** | | **147,484** | | | |

Source: Country Environment Note: Nepal (adb.org), 2015

112. The target subproject sites will be at the hilly regions and middle mountain. Hilly regions are characterized by moderate elevation range and covers 29% of the country's area. Lying at the northern part of the hill, the topography of middle mountains is characterized by steep slopes and narrow valleys. Covering 20% of the country's area, the elevation ranges of the from 800 to 2,400 m. Some regions of lower hills are also included in the proposed project. The proposed sites for the orchards and vegetables areas are characterized by sub-tropical, temperate and cool climates.

### A.2. Topography

113. Topographically, Nepal is divided into 3 distinct ecological regions, these are mountains, hills, and terai (or plains). The mountain region ranges in altitude from about 4,800 to 8,839m asl and covers a land area of 51,817 sq. km. Due to the harsh terrain, transportation and communication facilities in this region are very limited and only about 8% of the total population are residing in this region.

114. In contrast, the hilly regions, which altitude ranges from 610 to 4,800m asl is densely populated. About 45% of the total population of Nepal are in the hilly regions, which cover an area of 61,345 sq. km. This region also includes a number of very fertile regions such as the Kathmandu and Pokhara valleys. Although the terrain is rugged in this region, transportation and communication facilities are much more developed than in the mountain's areas because of higher concentration of people.

### A.3. Climate

115. There is significant variation of the country's climate in regards with seasonal and according to the elevation of the land. Nepal has different climate zones according to altitude that ranges from the Terai region[25] to the High Himalayan region[26].

116. The average temperatures in the southern part of the country is over 24°C, and it goes down below 0°C at Nepal's highest mountains. According to the Nepal's Climate Risk Profile (WBG and ADB, 2021), precipitation is spatially variable with some central and northerly pockets of the country receiving more than 3,000 mm, the central and southern plains typically receiving 1,500–2,000 mm, and some high-altitude areas in the north receiving less than 1,000 mm. For the target areas of the project, the orchards, research centers and other components of the project will expect 1,000 – 3,000 mm of rainfall annually. Based on the WBG Climate Change Knowledge Portal[27], the mean annual temperature is 13.22°C and mean annual rainfall is 1,340.9 mm, which is recorder from 1991 to 2020.

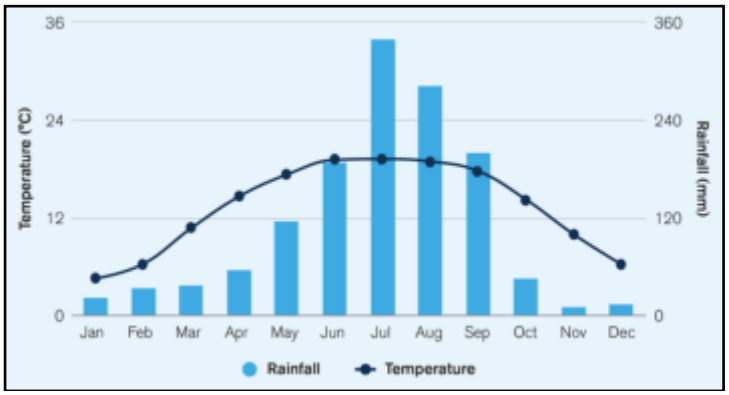



**Figure 3. Average monthly observed temperature and rainfall (1901 – 2020) across Nepal.**
Source: Climate Risk Country Profile: Nepal (2021): The World Bank Group and the Asian Development

### A.3.1. Nepal's Temperature

117. Maximum and minimum temperatures vary across the country.[28] The Himalayas regions have 5ºC to 10ºC that is the lowest normal annual maximum temperature for the country. Terai region has the highest normal annual maximum temperature, which is above 30ºC. The annual minimum temperature ranges from -4ºC to 19ºC, while the maximum temperature varies from 4ºC to 30ºC. One of the target districts of the proposed project, Manang is experiencing the lowest

[25] In the range of 60 – 200 masl, the Terai region is an alluvial plain covering 14% of Nepal. This region has sub-tropical climate with warmer summer and mostly above freezing temperature during winter. Major rivers of the country deposit huge amount of sediments in this region where surface flow decelerates significantly. As grain basket of Nepal, Terai is considered as the fertile region of the country.
[26] In the north at over 5,000 m. above sea-level
[27] https://climateknowledgeportal.worldbank.org/country/nepal/climate-data-historical
[28] From the areas of the north with low temperatures in high altitudes to warmer temperatures in the southern plains,

annual average maximum temperature at <5ºC. Most of the southern plain districts have the highest normal annual maximum temperature that is usually above 30ºC.

118. Based on the Vulnerability and Risk Assessment and Identifying Adaptation Options (May 2021), the analysis of temperature data reveals that the lowest normal annual minimum temperature is observed in Humla, Mugu and Dolpa districts in the province of Karnali Pradesh, and districts of Mustang and Manang in Gandaki. Except for Dolpa, the districts with the lowest normal annual minimum temperatures are the target locations of the project's orchard and nursery development and drip irrigation components. The highest normal annual minimum temperature in the southern part of country are districts of Surkhet, Tanahu, Makwanpur, Sindhuli and Udaypur. The normal annual minimum temperature for these districts are from 15ºC – 20ºC, which is based on 44 years (1971 to 2014) data analysis of the historical temperature records of the country. Tanahu in Gandaki is the only district that is included in the project's target areas.

#### A.3.1.1. Temperature Conditions in Province 1

119. Province 1 can be divided into 3 types of climatic regions: (i) subtropical, (ii) temperate and (iii) alpine. At the subtropical areas, temperature is warmest at the Terai, inner Terai and lower foothills. The area between the Mahabharat range and Himalayas has a temperate climate, and temperature varies as well. The Himalayas and inner Himalayas have alpine, dry and arid type of climate where snowing occurs. Based on the information from World Bank's Climate Change Knowledge Portal (CCKP), the coldest periods are from months of November to February. The temperatures are peaking in the middle of the year or in the months of June to August.

#### A.3.1.2. Temperature Conditions in Bagmati

120. The province of Bagmati has climatic variations that is associated with the diverse nature of its topography and altitude. Climatic zone of the province starts from the north or high Himalayas (above 5,000 m. with tundra and arctic climate) to lower hills (or Siwalik) region in the south (500-1,000 m. with sub-tropical climatic zone). Based on the historical records (1901 – 2020) from the CCKP, the mean temperature ranges from -0.60ºC to 27.6ºC. The months of November to February are the coldest period of the year, which is from 8.23ºC to 12ºC in terms of the mean temperatures. According to the CCKP, the maximum temperature for this part of Bagmati is 33.3ºC in the month of May, while the minimum temperature is at -8.8ºC in January.

#### A.3.1.3. Temperature Conditions in Gandaki

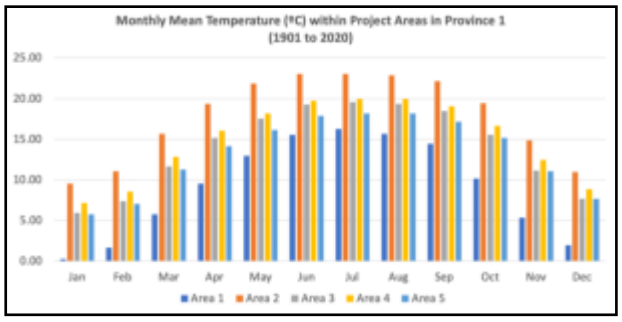
121. The different climatic conditions of Gandaki Province is associated with topography and altitude. The mountainous areas of less than 1,500m asl has pronounced sub-tropical climate. For areas ranging from 1,500 – 3,000m asl, these places have temperate climate, and Himalayan regions (3,000 to 4,500 masl) has cold Alpine climate conditions. In the high Himalayan region of Gandaki, there is Tundra (cool summer season and cold winter) climatic condition. Shown below in the figure below, particularly (c) Gandaki, is the monthly mean temperature of the target districts for the project for the whole year. The coldest periods are from months of November to February, which is similar with Province 1 and Bagmati. The mean temperature is highest in the month of July and coldest during the months of December and January.

### A.3.1.4. Temperature Conditions in Karnali

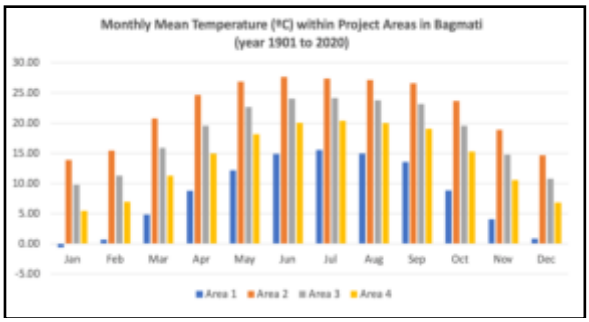
122. Climatic zone of Karnali Province starts from high Himalayas in the north (above 7,000 masl with tundra and arctic conditions) to the Chure region in the south with sub-tropical climate. Average mean temperature of the province is 26.10ºC, and the maximum and minimum temperature is increasing yearly by 0.05 (maximum) and 0.01 (minimum)[29]. The monthly mean temperature for the target areas in Karnali Province is shown in (d) Karnali. The lowest average mean temperature, which the measurement ranges from -7.8ºC to 9.7ºC. The temperature is coldest in January and warmest in June.

### A.3.1.5. Temperature Conditions in Sudurpashchim

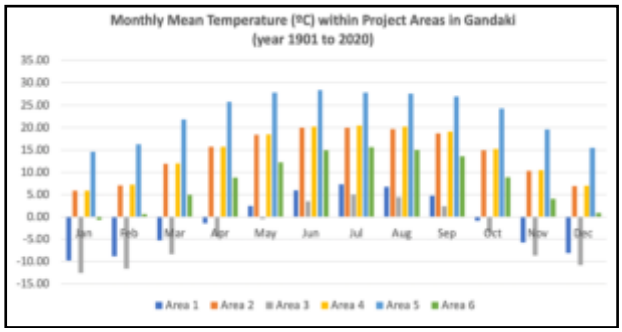
123. The province is divided into 4 main regions (i) high Himalayan, (ii) Mahabharat, (iii) mid mountains and (iv) plain lands of Teria in the south. The highest peak point in Sudurpaschim is Api Himal (7,132m asl), and the lowest elevation of 109 m lies in Kailali district. The project covers 5 districts in the province, which are Accham, Bajura, Baitadi, Bajhang and Darchula. According to the historical records of CCKP (1901 to 2020), the mean temperature ranges from -6.10ºC to 23.60ºC. The months of November to March are the coldest months of the year. Maximum temperature for this part of Sudurpaschim is 29.3ºC in the month of May, while the minimum temperature is at -13.ºC recorded in the month of January.



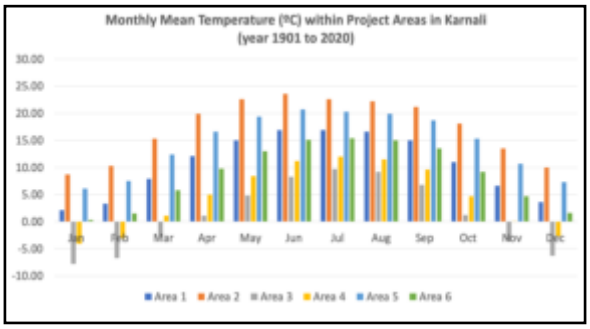

(a) Province 1




(b) Bagmagti

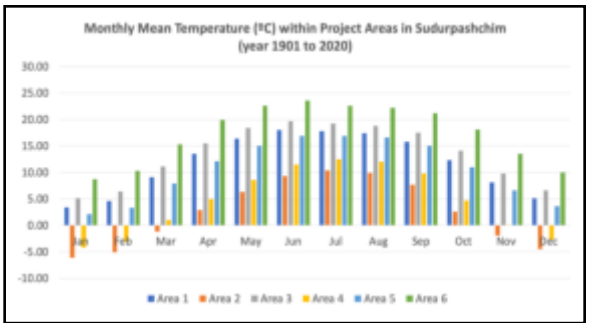



(c) Gandaki




(d) Karnali

[29] https://nepaloutlook.com/karnali-province/




(e) Sudurpashchim

**Figure 4. Monthly average temperatures recorded from the target provinces.**

### A.3.2. Nepal's Precipitation

#### A.3.2.1. Precipitation Conditions in Province 1

124. Figure 5 (a) shows the monthly precipitation in Province 1. Based on the CCKP information on rainfall, the highest average precipitation annually at 182.56 mm in the municipalities of (i) Phidim and Hilihang in the district of Panchthar, (ii) Asthrai, Laligurans, Myanglung, and Phedap in Terhatum District, and (iii) Arun, Bhojpur and Pauwadungma in Bhojpur District. The amount of precipitation in the target areas is at peak during the month of July, where the precipitation reaches up to 555.5 mm at the eastern part of the province. Precipitation starts to increase in the months of April and May, while the period of August and September has been observed to decline.

#### A.3.2.2. Precipitation Conditions in Bagmati

125. The climatic conditions of the province of Bagmati is associated with the diverse nature of its topography and altitude. Annual precipitation ranges from 150 – 200 mm in the high Himalayas, and higher amounts at 1,100 – 3,000 mm in the southern plains of the province. The municipalities of Likhu and Bidur in Nuwakot District, which experienced 183.7 mm average rainfall every year is the highest average rainfall. The month of July is the period of the year when Bagmati Province is receiving the highest amount of rainfall at 468.73 mm, while the month of November is the lowest observed rainfall at 8.88 mm.

#### A.3.2.3. Precipitation Conditions in Gandaki

126. The province of Gandaki has various climatic conditions, which is associated with its topography and altitude. The high Himalayan district of Mustang has the lowest annual rainfall, while Parbat and Syangja districts of the province have highest records. Mustang District is located at the northern part of the province, where the average annual precipitation for these parts of the province is 76.06 mm. and 70.94 mm. For the districts of Parbat and Syangja, the municipalities are receiving an average annual rainfall of 147.68 mm. and 181.69 mm.

127. Data of average precipitation is taken from the CCKP between the years 1901 to 2020. According to the data, precipitation starts to increase in the month of May, peaks during the period of July and declining every September. The highest average rainfall, in the month of July, reaches up to 346.65 mm. The data in the months of October to April show least amount of rainfall received in Gandaki Province. There is only an average of 11.22 mm. of precipitation recorded for November.

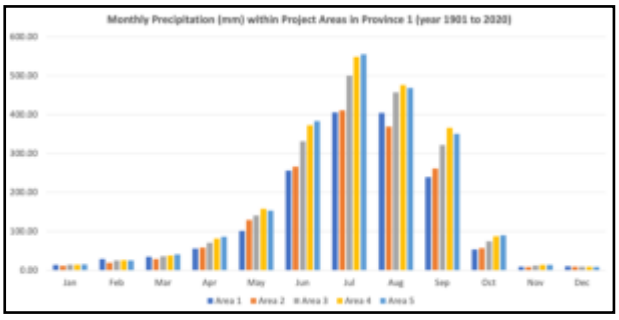
### A.3.2.4. Precipitation Conditions in Karnali

128. The province of Karnali is the largest province in the country at 27,984 sq. km., which is bordered by provinces of Gandaki, Sudurpashchim and Lumbini. The average annual precipitation of the province is 1,479 mm, and according to studies Karnali Province is facing decrease in annual precipitation yearly. The municipalities with the highest rainfall received per year, under the proposed project, are: (i) Sharada and Dhorchaur in Salyan District, (ii) Narayan, Chamunda Bindrasaini and Aathabis in Dailekh District, and (iii) Kalika and Naraharinath in Kalikot District. These areas is receiving average annual precipitation of 111.53 mm to 113.24 mm. The northern districts of the province, also the coldest part of Karnali, has received the least precipitation. The average annual rainfall for districts of Bajura, Humla, Mugu and Jumla is 66.03 mm.

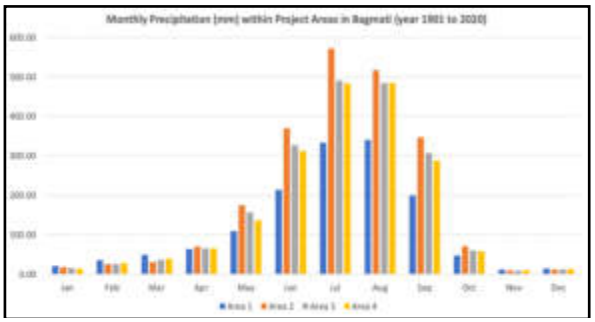
129. The average monthly precipitation starts to increase in the month of June and declines in September. During the months of July and August, target areas in the province are receiving the highest amount of rainfall of the year at an average of 255.15 mm (July) and 244.1 mm (August). Similarly with other the provinces, the lowest amount of rainfall is recorded in November at 11.73 mm average monthly rainfall (10.5 mm – 12.7 mm).

### A.3.2.5. Precipitation Conditions in Sudurpashchim

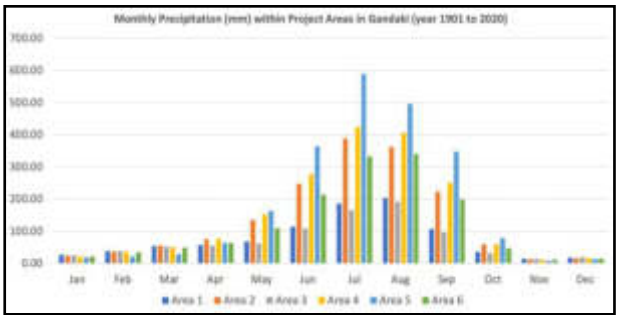
130. The province of Sudurpashchim is at the most western part of the country and experiencing the least amount of rainfall among the provinces under the project. The municipalities of Kamalbazar and Mangalsen in Accham Districts are receiving rainfall from 10.5 mm in November to 347.3 mm in July. District of Bajhang has the least average rainfall record at 65.35 mm per year. As shown in Figure 5 (e), the months of January to April show almost uniform average monthly rainfall from the year 1901 to 2020. There is a small increase in the month of May at 15.53 mm from the rainfall average record for April. In the month of June, the target areas in the province starts to receive higher precipitation and declines in August (228.3 mm). July is the period of peak rainfall as documented in the CCKP, and measured at an average of 237.67 mm. Only at 10.23 mm, the rainfall is at the lowest records for the target areas in Sudurpashchim.



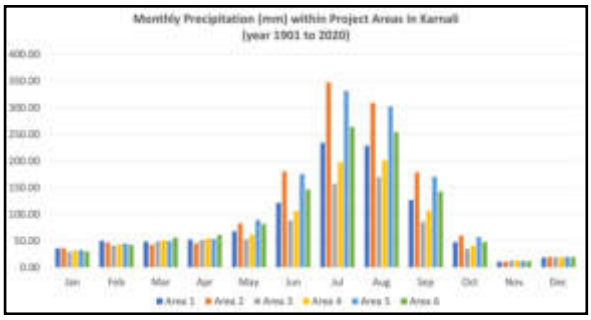

(a) Province 1



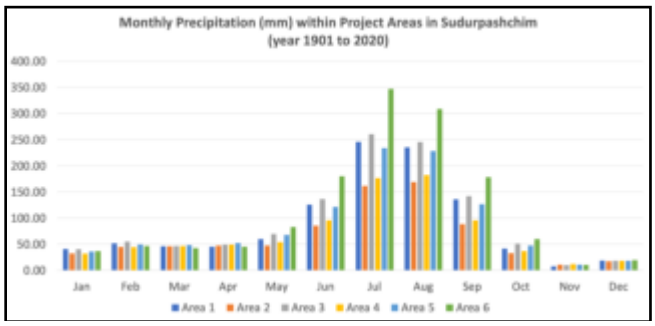

(b) Bagmagti




(c) Gandaki




(d) Karnali




(e) Sudurpashchim

**Figure 5. Monthly average rainfall recorded from the target provinces**.

### A.4. Climate change

131. Climate change is a global issue and affects global temperature, precipitation, wind patterns and other measures of climate that occur one several decades or longer. The agriculture practices in the country will also be affected by the change in climate patterns. Through the proposed project, the development of orchards and associated activities are means to improve climate resiliency mechanism for horticulture.

#### A.4.1. Temperature Change

132. For over 40 years of temperature data, the annual maximum temperature is increasing by 0.056°C per year, and minimum temperature trend is observed to be increased by 0.002°C per year based on the study by Department of Hydrology and Meteorology (DHM) in 2017. Within the target areas of the project in a few mountainous sites such as in Humla and Manang Districts, the minimum temperature is found to be a negative trend. The middle mountainous region across Nepal, where the target districts are located, have experienced highest increase in temperature trend in the country. The study of DHM shows that maximum temperature increase is uniformly higher in the mountainous/hilly districts of the country. The Manang district has experienced extreme temperature conditions because there are observed highest decreasing rate of minimum temperature and the highest increasing rate of maximum temperature.

#### A.4.2. Precipitation Change

133. According to Climate Risk Country Profile of Nepal (2021), there have been only minor changes to historical annual precipitation rates in the country and these vary spatially and include both positive and negative movements. Some regions (notably western Nepal) are believed to

have experienced an increase in the frequency and intensity of extreme precipitation events.[30] One study has suggested that wet areas are becoming wetter, and dry areas are becoming drier.[31] Another study suggested the Himalayan region has experienced increasing average annual precipitation at a rate of 6.5mm/yr between 1982–2006.32 Other factors affecting inter-annual precipitation variability include global climate phenomena such as El Niño-Southern Oscillation (ENSO) and the Indian Ocean Dipole.[33] ENSO has been shown to have complex relationships with both drought and extreme precipitation.[34]

### A.4.3. Future Climate Conditions

134. The Coupled Model Inter-comparison Project Phase 5 (CMIP5) models, which are utilized within the Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC), providing estimates of future temperature and precipitation. For Nepal, the CMIP5 models show a trend of consistent warming that will be more significant for northern regions. While rainfall projections are less certain, projected precipitation trends show a decrease in rainfall in the 2050s and an increase in rainfall for the 2090s. More precipitation is expected to be received through increased intensity and occurrence of extreme events (WBG and ADB, 2021).

135. On average, Nepal's annual precipitation has declined by 1.3 mm per year over the observed period (i.e., 1971-2014). According to a report released by the Ministry of Forests and Environment (MoFE) and the International Center for Integrated Mountain Development (ICIMOD), average annual precipitation is expected to rise in both the medium-term (2030) and long-term (2050). Besides, the annual average temperature will continue to rise. According to the study, average annual precipitation may increase by 2-6 percent in the medium term (2016-2045) and by 8-12 percent in the long term (2036-2065). In addition, the average temperature may rise by 0.92-1.07 °C in the medium term and 1.30-1.82 °C in the long term. The post-monsoon season is expected to have the highest rates of mean temperature increase (1.3-1.4 °C in the medium-term and 1.8-2.4 °C in the long-term) and the winter season (1.0-1.2 °C in the medium-term and 1.5-2.0 °C in the long-term).

136. The study of MoFE and ICIMOD shows that seasonal precipitation will rise in all seasons except the pre-monsoon, which is expected to fall by 4-5 percent in the medium term. Besides, the post-monsoon season may have the greatest increase in precipitation for the reference period, increasing by 6-19 percent in the medium term and 19-20 percent in the long term. As a result, the extreme temperature and precipitation variations are likely to harm food production, water resource management, and other livelihood resources.

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### A.4.4. Spatial characteristics of adaptation capacities

137. The WFP-IFAD geospatial climate vulnerability assessment in Nepal shows distinctively higher vulnerability in the West and Northwest regions, the northeastern as well as part of the Southwest regions. Overall, approximately 16% of the country is exposed to very high vulnerability, 19% to high vulnerability, and 30% to medium. In the Northwest region, temperature increase is the most important variable while the southwestern region as well as some districts in the northwest is characterized by a relatively concentrated rainfall season. Mountain regions in the Northwest have the lowest adaptation capacity while adaptative capacity generally improves towards lower elevation regions.

### A.5. Geography and Land Use

138. In the mountain areas, cultivable river-side terraces are less extensive than these are in the mid hills, since rivers tend to develop deep v-shaped incisions and leave little room for cultivation. The little agricultural land available in mountain area is found in the valleys and in some cases in sheltered pockets of the hills-slopes, like in Jumla. Throughout the mountain districts, agriculture land can normally support only one crop of buckwheat, barley or potato once a year or even once every two years. Extensive areas of pastureland are found in the form of alpine pastures in mostly western mountain districts of Humla, Mugu and Jumla. Migrating livestock from lower areas utilize the pastures of this area during the monsoon.

139. There are many water resources in the project area, where main source in the hilly areas of Nepal is from surface water. Hilly region is a mountainous area, which does not generally contain snow. It is situated at the south of the Himalayas (the snowy mountain region). The hilly region (target areas) begins at the lower Himalayan range, where a fault system called the main boundary thrust creates an escarpment 1,000 to 1,500 m (3,000 to 5,000 ft) high, to a crest between 1,500 and 2,700 m (5,000 and 9,000 ft). It covers 68% of the total area of Nepal.

140. The total land area of the target municipalities is 20,334.51 sq km. The whole area is dominated with the forest and vegetation cover. The total forest area at the target municipalities is about 9,220 sq km.

141. The second largest land use is the barren area with the 2,095.40 sq km. At the municipalities, barren areas are characterized by sloping hills.

142. For the other land uses, agriculture land is 332.4 sq km, built-up areas are 494.05 sq km, grassland is 146.87 sq km, snow cover is 909.44 sq km, shrubland is 7,004.35 sq km, waterbodies are 112 sq km. The details of the land use and land cover areas as per the province and municipalities are discussed in the following paragraphs.

**Table 20. The land use of the proposed project area**

| Provinces | AL | BL | BU | F | GL | IS | SL | WB | Total Area |
|---|---|---|---|---|---|---|---|---|---|
| | sq. km. | | | | | | | | |
| Province 1 | 16.11 | 54.53 | 102.08 | 2,159.05 | 5.14 | 11.38 | 1,277.07 | 19.97 | 3,646.35 |
| Bagmati | 52.03 | 3.14 | 73.13 | 513.5 | 0.59 | 197.54 | 6.01 | 845.94 | |
| Gandaki | 148.8 | 2,018.08 | 268.65 | 3,307.32 | 43.4 | 896.88 | 2,978.67 | 56.55 | 9,736.01 |
| Karnali | 79.36 | 8.1 | 36.54 | 1,972.74 | 68.61 | 1.14 | 1,523.40 | 12.29 | 3,702.52 |
| Sudurpaschim | 36.1 | 11.55 | 13.65 | 1,268.03 | 29.13 | 0.04 | 1,027.67 | 17.52 | 2,403.69 |
| **Total** | 332.4 | 2095.4 | 494.05 | 9,220.64 | 146.87 | 1106.98 | 6,812.82 | 952.27 | 19,488.57 |

AL: Agricultural Land; BL: Bare Land; BU: Built-up Areas; F: Forest; GL: Grassland; IS: Ice snow; SL: Shrubland; WB: Waterbodies

143. Since the proposed project areas includes five provinces of Nepal, the highest forest cover is manifested in the Gandaki Province and its municipalities. The lowest forest area cover is in the municipalities of Bagmati Province. Municipalities of Gandaki Province shows the highest agricultural land, while municipalities in Province 1 have the lowest hectarage of land for agriculture. The municipality wise land uses are seen shown in the map below.

**Table 21. Land-use types percentages in the target provinces.**

| Land Use | Province 1 (%) | Bagmati (%) | Gandaki (%) | Karnali (%) | Sudurpaschim (%) |
|---|---|---|---|---|---|
| Agricultural Land | 0.44 | 6.15 | 1.52 | 2.14 | 1.50 |
| Bare Land | 1.49 | 0.37 | 20.72 | 0.21 | 0.48 |
| Built-up Areas | 2.79 | 8.64 | 2.75 | 0.98 | 0.57 |
| Forest | 59.21 | 60.70 | 33.96 | 53.28 | 52.75 |
| Grassland | 0.14 | 0.06 | 0.44 | 1.85 | 1.21 |
| Ice snow | 0.31 | - | 9.21 | 0.03 | 0.001 |
| Shrubland | 35.02 | 23.35 | 30.59 | 41.14 | 42.75 |
| Waterbodies | 0.54 | 0.71 | 0.58 | 0.33 | 0.72 |

### A.5.1. Province 1

144. The largest land-use in the target areas of Province 1 is forest, which is 59.21% or 2,159 sq km. Shrublands cover 35.02% of the target municipalities, while only 2.79% are built up and settlement areas. There is 1.49% land area that is characterized by barren places. Only 0.44% coverage is used for the agriculture purpose. The proposed orchard will be developed in private lands of farmers and beneficiaries, and not convert any forest lands for the project. The table below shows the detailed land use and corresponding coverage in the target municipalities.

**Table 22. Types of land use and coverage at the target municipalities in Province 1.**

| District | Palika (Rural Municipalities) | AL | BL | BU | F | GL | IS | SL | WB | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Sq. Km. | | | | | | | | |
| Terhathum | Aathrai | 0.09 | 0.08 | 2.01 | 106.59 | 0.06 | | 56.89 | 2.54 | 168.26 |
| Bhojpur | Arun | 0.58 | 1.29 | 0.54 | 91.47 | 0.06 | | 58.45 | 3.37 | 155.76 |
| Bhojpur | Bhojpur | 4.55 | 0.01 | 6.39 | 104.00 | 0.09 | | 45.43 | 0.04 | 161.51 |
| Okhaldhunga | Champadevi | 0.50 | 0.11 | 3.22 | 59.32 | 0.29 | | 63.51 | 0.62 | 127.56 |
| Dhankuta | Chhathar Jorpati | 0.72 | 0.56 | 6.81 | 74.16 | 0.08 | | 20.32 | 0.87 | 103.52 |
| Dhankuta | Dhankuta | 0.30 | 0.18 | 19.30 | 67.42 | 0.08 | | 23.16 | 1.14 | 111.58 |
| Solukhumbu | Dudhkoshi | 0.23 | 0.05 | 1.68 | 111.92 | 0.27 | | 54.05 | 0.43 | 168.63 |
| Khotang | Halesi Tuwachung | 0.11 | 2.09 | 0.92 | 122.10 | - | | 153.71 | 2.82 | 281.75 |
| Panchthar | Hilihang | 0.11 | 0.05 | 0.92 | 78.26 | 0.05 | | 44.19 | 0.33 | 123.91 |
| Terhathum | Laligurans | 0.14 | - | 5.13 | 62.66 | 0.08 | | 22.85 | 0.02 | 90.88 |
| Dhankuta | Mahalaxmi | 0.41 | 0.03 | 4.34 | 93.81 | 0.02 | | 31.53 | 0.11 | 130.25 |
| Okhaldhunga | Manebhanjyang | 0.94 | 0.24 | 1.46 | 61.56 | - | | 81.28 | 1.92 | 147.40 |

| District | Palika (Rural Municipalities) | AL | BL | BU | F | GL | IS | SL | WB | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Sq. Km. | | | | | | | | |
| Terhathum | Myanglung | 2.43 | 0.07 | 8.23 | 60.80 | 0.08 | | 28.49 | 0.81 | 100.91 |
| Dhankuta | Pakhribas | 0.59 | 0.01 | 6.08 | 106.46 | 0.03 | | 32.01 | 0.06 | 145.24 |
| Bhojpur | Pauwadungma | 0.22 | 0.24 | 0.78 | 61.48 | - | | 55.62 | 1.28 | 119.62 |
| Terhathum | Phedap | 0.75 | 0.10 | 2.15 | 72.63 | 0.01 | | 35.42 | 0.55 | 111.61 |
| Panchthar | Phidim | 0.50 | 0.01 | 6.15 | 137.35 | 0.01 | | 49.88 | 0.01 | 193.91 |
| Khotang | Rawa Besi | 0.29 | 0.01 | 0.81 | 67.35 | 0.01 | | 29.10 | 0.41 | 97.98 |
| Khotang | Rupakot Majhuwagadhi | 1.49 | 0.03 | 5.47 | 147.74 | 0.51 | | 92.71 | 0.01 | 247.96 |
| Solukhumbu | Solududhakunda | 0.87 | 49.12 | 15.62 | 322.25 | 2.80 | 11.38 | 165.35 | 0.76 | 568.18 |
| Okhaldhunga | Sunkoshi | 0.19 | 0.14 | 2.01 | 60.36 | - | | 81.10 | 0.70 | 144.50 |
| Solukhumbu | Thulung Dudhkoshi | 0.10 | 0.11 | 2.06 | 89.36 | 0.61 | | 52.02 | 1.17 | 145.43 |
| | **Total** | **16.11** | **54.53** | **102.08** | **2,159.05** | **5.14** | **11.38** | **1,277.07** | **19.97** | **3,646.35** |

AL: Agricultural Land; BL: Bare Land; BU: Built-up Areas; F: Forest; GL: Grassland; IS: Ice snow; SL: Shrubland; WB: Waterbodies

### A.5.2. Bagmati Province

145. The land use of the Bagmati Province shows that the highest land cover is forest area in the proposed municipalities. The total land area with forest cover is 513 sq km. The percentage of the forest cover is 60%. The second highest land cover area is shrublands. The total shrubland coverage of the project municipalities is 23.35%. The proposed municipalities have 6 % agriculture coverage. The remaining part is covered with grassland, barren lands and Built up areas.

**Table 23. Types of land use and coverage at the target municipalities in Bagmati Province.**

| District | Palika (Rural Municipalities) | AL | BL | BU | F | GL | SL | WB | Total |
|---|---|---|---|---|---|---|---|---|---|
| | | sq. km. | | | | | | | |
| Sindhupalchok | Chautara SangachokGadhi | 6.08 | 0.10 | 19.61 | 104.90 | 0.12 | 33.55 | 1.60 | 165.96 |
| Dhading | Gajuri | 3.76 | 0.03 | 3.40 | 93.15 | 0.04 | 38.42 | 0.93 | 139.73 |
| Sindhupalchok | Indrawati | 5.80 | 0.40 | 9.97 | 67.92 | 0.07 | 21.26 | 0.13 | 105.55 |
| Nuwakot | Likhu | 9.92 | 0.49 | 3.80 | 27.25 | - | 5.82 | 0.77 | 48.05 |
| Sindhupalchok | Melamchi | 5.99 | 1.46 | 21.92 | 92.35 | 0.26 | 38.36 | 0.93 | 161.27 |
| Dhading | Netrawati Dabjong | 4.22 | 0.05 | 3.91 | 45.36 | - | 17.13 | 0.05 | 70.72 |
| Nuwakot | Tadi | 3.35 | 0.04 | 2.90 | 30.08 | 0.02 | 33.49 | 0.17 | 70.05 |
| Dhading | Tripura Sundari | 12.91 | 0.57 | 7.62 | 52.49 | 0.08 | 9.51 | 1.43 | 84.61 |
| | **Total** | **52.03** | **3.14** | **73.13** | **513.50** | **0.59** | **197.54** | **6.01** | **845.94** |

AL: Agricultural Land; BL: Bare Land; BU: Built-up Areas; F: Forest; GL: Grassland; SL: Shrubland; WB: Waterbodies

### A.5.3. Gandaki Province

146. The total area of the proposed project municipalities in Gandaki Province is 9,736 sq km. Out of this, 33.96% area is covered by forest. This is the largest land use, which is at 3,307 sq km. The second largest land use is shrubland at 30% coverage in the target municipalities. Then, 20% of the land area is baren land, and the remaining land area is covered by the grassland, ice snow area and waterbodies.

**Table 24. Types of land use and coverage at the target municipalities in Gandaki Province**

| District | Palika (Rural Municipalities) | AL | BL | BU | F | GL | IS | SL | WB | Total Area |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Sq. Km. | | | | | | | | |
| Gorkha | Aarughat | 3.12 | 0.32 | 7.12 | 113.94 | 0.17 | | 35.44 | 1.16 | 161.27 |
| Kaski | Annapurna | 0.85 | 51.48 | 8.20 | 176.78 | 5.96 | 73.39 | 101.27 | 0.42 | 418.37 |
| Myagdi | Annapurna | 0.23 | 76.27 | 3.43 | 189.30 | 4.61 | 76.00 | 205.78 | 1.55 | 557.17 |
| Baglung | Badigad | 1.54 | 0.03 | 1.52 | 105.70 | 0.04 | | 70.71 | 0.25 | 179.79 |
| Mustang | Barhagaun Muktikhsetra | 0.10 | 512.58 | 0.73 | 0.51 | 1.06 | 77.27 | 290.30 | 0.71 | 887.02 |
| Myagdi | Beni | 1.21 | 0.09 | 10.95 | 38.07 | 0.86 | | 23.75 | 1.72 | 76.65 |
| Lamjung | Besishahar | 7.31 | 0.07 | 8.52 | 89.21 | 0.38 | | 20.47 | 1.97 | 127.93 |
| Syangja | Biruwa | 0.61 | 0.02 | 1.75 | 56.04 | 0.01 | | 37.50 | 0.01 | 95.94 |
| Manang | Chame | 1.10 | 4.12 | 0.92 | 17.38 | 1.05 | 23.31 | 30.43 | 0.31 | 79.02 |
| Syangja | Chapakot | 9.75 | 0.39 | 4.31 | 77.61 | - | | 26.85 | 1.86 | 120.77 |
| Mustang | Dalome | 0.16 | 771.53 | 0.11 | 0.27 | 1.92 | 139.59 | 430.12 | 2.36 | 1,349.47 |
| Baglung | Galkot | 1.01 | | 6.44 | 142.84 | 0.05 | | 44.14 | 0.12 | 194.56 |
| Syangja | Galyang | 1.03 | 0.14 | 4.96 | 68.37 | 0.09 | | 46.15 | 2.13 | 122.87 |
| Mustang | Gharapjhong | 0.14 | 91.17 | 1.66 | 35.09 | 2.97 | 18.99 | 157.31 | 0.92 | 317.30 |
| Baglung | Jaimuni | 1.42 | 0.09 | 1.44 | 61.84 | 0.19 | | 52.44 | 1.43 | 118.85 |
| Parbat | Jaljala | 1.21 | - | 4.68 | 54.17 | 0.28 | | 21.98 | 0.03 | 82.35 |
| Baglung | Kanthekhola | 0.89 | | 5.13 | 46.20 | 0.25 | | 30.50 | | 82.97 |
| Parbat | Kushma | 5.53 | 0.02 | 6.29 | 51.98 | 0.19 | | 28.65 | 0.64 | 93.30 |
| Lamjung | MadhyaNepal | 6.81 | 0.20 | 3.85 | 73.04 | 0.24 | | 29.64 | 0.32 | 114.10 |
| Kaski | Madi | 2.55 | 36.26 | 4.07 | 331.38 | 0.74 | 72.07 | 114.65 | 2.32 | 564.11 |
| Lamjung | Marsyangdi | 3.39 | 37.40 | 3.48 | 334.14 | 2.83 | 15.46 | 200.36 | 1.60 | 598.66 |
| Parbat | Modi | 1.54 | 0.05 | 5.24 | 108.15 | 0.12 | | 29.36 | 0.33 | 144.79 |
| Tanahu | Myagde | 7.45 | 0.20 | 7.54 | 85.34 | 0.03 | | 14.15 | 0.88 | 115.59 |
| Manang | Nashong | 3.13 | 118.56 | 0.46 | 85.67 | 1.25 | 185.51 | 313.14 | 3.51 | 711.24 |
| Manang | Neshyang | 0.04 | 259.28 | 2.28 | 32.11 | 2.48 | 176.18 | 216.24 | 7.09 | 695.87 |
| Baglung | Nisikhola | 1.50 | 0.10 | 2.20 | 156.18 | 2.94 | | 81.39 | 0.15 | 244.46 |

| District | Palika (Rural Municipalities) | AL | BL | BU | F | GL | IS | SL | WB | Total Area |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Sq. Km. | | | | | | | | |
| Gorkha | Palungtar | 33.68 | 0.19 | 10.59 | 92.29 | 0.02 | | 21.16 | 1.08 | 159.01 |
| Parbat | Phalebas | 3.21 | 0.01 | 2.53 | 57.33 | 0.13 | | 22.55 | 0.05 | 85.81 |
| Kaski | Pokhara Lekhnath | 24.89 | 1.79 | 121.59 | 235.84 | 4.32 | | 62.09 | 13.72 | 465.05 |
| Lamjung | Rainas | 6.32 | 0.08 | 6.89 | 46.62 | 0.04 | | 11.41 | 0.78 | 72.14 |
| Tanahu | Rhishing | 3.82 | 0.33 | 1.76 | 162.77 | 0.05 | | 42.89 | 3.89 | 215.51 |
| Gorkha | Siranchok | 4.98 | 0.09 | 6.77 | 84.60 | 0.08 | | 24.53 | 0.93 | 121.98 |
| Lamjung | Sundarbazar | 7.45 | 0.04 | 7.32 | 40.50 | 0.03 | | 16.18 | 0.69 | 72.21 |
| Mustang | Thasang | 0.83 | 55.18 | 3.92 | 56.06 | 8.02 | 39.11 | 125.14 | 1.62 | 289.88 |
| **Total** | | **148.80** | **2,018.08** | **268.65** | **3,307.32** | **43.40** | **896.88** | **2,978.67** | **56.55** | **9,736.01** |

AL: Agricultural Land; BL: Bare Land; BU: Built-up Areas; F: Forest; GL: Grassland; IS: Ice snow; SL: Shrubland; WB: Waterbodies

### A.5.4. Karnali Province

147. The total land area for the municipalities of the proposed project is 3,702.5 sq km. Like on the other provinces, the proposed municipalities' forest cover contributes the highest land cover at 53.28% The second largest land use type is shrubland that is 41% of the areas of interests (1,523.4 sq km). The third largest coverage is agriculture land, covering 2.14 % of the proposed municipalities. The remaining land is covered by the grassland and ice snow areas.

**Table 25. Types of land use and coverage at the target municipalities in Karnali Province**

| District | Palika (Rural Municipalities) | AL | BL | BU | F | GL | IS | SL | WB | Total Area |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Sq. Km. | | | | | | | | |
| Dailekh | Aathabis | 3.63 | 0.44 | 0.49 | 105.45 | 0.08 | | 56.68 | 0.92 | 167.69 |
| Humla | Adanchuli | 0.20 | 0.03 | 0.04 | 63.33 | 1.05 | | 84.84 | 0.89 | 150.42 |
| Rukum W | Banfikot | 3.26 | 0.22 | 4.23 | 108.90 | 0.16 | | 72.35 | 1.21 | 190.33 |
| Dailekh | Chamunda Bindrasaini | 16.56 | 0.03 | 0.30 | 39.19 | 0.03 | | 34.21 | 0.12 | 90.44 |
| Jajarkot | Chhedagad | 14.68 | 0.16 | 0.55 | 166.28 | 0.28 | | 101.04 | 0.91 | 283.90 |
| Salyan | Dhorchaur | 1.47 | - | 3.33 | 57.67 | - | | 26.80 | 0.01 | 89.28 |
| Jumla | Hima | 2.86 | 0.05 | 0.11 | 67.18 | 5.54 | | 55.84 | 0.59 | 132.17 |
| Jajarkot | Junichande | 4.99 | 0.88 | 0.16 | 177.60 | 6.90 | | 155.24 | 0.06 | 345.83 |
| Kalikot | Kalika | 1.03 | - | 0.34 | 63.93 | 0.02 | | 31.65 | 0.19 | 97.16 |
| Jumla | Kanakasundari | 4.38 | 0.05 | 0.51 | 121.74 | 24.18 | | 74.04 | 0.27 | 225.17 |
| Mugu | Khatyad | 2.93 | 0.03 | 0.89 | 139.80 | 11.11 | | 125.90 | 0.11 | 280.77 |
| Dolpa | Mudkechula | 5.05 | 3.18 | 0.30 | 93.03 | 3.23 | 1.14 | 143.58 | 0.48 | 249.99 |
| Rukum W | Musikot | 1.23 | 0.49 | 7.09 | 84.86 | 0.17 | | 41.67 | 0.51 | 136.02 |
| Kalikot | Naraharinath | 0.85 | 0.09 | 0.72 | 69.49 | 3.09 | | 68.93 | 0.44 | 143.61 |

| District | Palika (Rural Municipalities) | AL | BL | BU | F | GL | IS | SL | WB | Total Area |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Sq. Km. | | | | | | | | |
| Dailekh | Narayan | 6.39 | 0.04 | 4.52 | 58.26 | 0.28 | | 40.39 | 0.59 | 110.47 |
| Rukum W | Sani Bheri | 0.37 | 1.90 | 0.80 | 78.08 | 0.02 | | 50.87 | 1.67 | 133.71 |
| Salyan | Sharada | 4.89 | 0.04 | 11.68 | 134.66 | 0.04 | | 46.83 | 0.02 | 198.16 |
| Jumla | Sinja | 3.76 | 0.13 | 0.20 | 78.11 | 10.54 | | 59.96 | 0.42 | 153.12 |
| Mugu | Soru | 0.79 | 0.09 | 0.23 | 188.38 | 0.86 | | 172.68 | 2.37 | 365.40 |
| Humla | Tanjakot | 0.04 | 0.25 | 0.05 | 76.80 | 1.03 | - | 79.90 | 0.51 | 158.88 |
| **Total** | | **79.36** | **8.10** | **36.54** | **1,972.74** | **68.61** | **1.14** | **1,523.40** | **12.29** | **3,702.52** |

AL: Agricultural Land; BL: Bare Land; BU: Built-up Areas; F: Forest; GL: Grassland; IS: Ice snow; SL: Shrubland; WB: Waterbodies

### A.5.5. Sudurpaschim Province

148. At 52.3%, the land cover of the Municipalities of the Sudurpaschim Province is dominated by the forest area as well at a total of 1,228 sq km of the land being targeted by the project. This is followed by the 42.75% land area covered by the shrubland. The 1.5 % land is covered with the agriculture and the remaining land area types is covered with grassland, built up, area ice and water bodies. The detail land use is given in the table below.

**Table 26. Types of land use and coverage at the target municipalities in Sudurpaschim Province**

| District | Palika (Rural Municipalities) | AL | BL | BU | F | GL | IS | SL | WB | Total Area |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Sq. Km. | | | | | | | | |
| Achham | Bannigadhi Jayagadh | 1.82 | 0.01 | 0.64 | 28.62 | 0.02 | | 26.97 | 0.06 | 58.14 |
| Bajura | Budhinanda | 0.57 | 6.08 | 0.59 | 86.77 | 17.82 | 0.04 | 119.85 | 0.39 | 232.11 |
| Bajhang | Chabispathivera | 1.22 | 0.39 | 0.52 | 39.83 | 2.17 | | 71.12 | 0.81 | 116.06 |
| Baitadi | Dasharathchanda | 3.46 | 0.18 | 1.79 | 73.88 | 0.01 | | 54.84 | 0.55 | 134.71 |
| Bajhang | JayaPrithivi | 0.06 | 0.70 | 1.05 | 95.38 | 0.12 | | 67.54 | 1.57 | 166.42 |
| Achham | Kamalbazar | 4.68 | 0.23 | 0.45 | 62.37 | 0.07 | | 52.26 | 0.48 | 120.54 |
| Darchula | Lekam | 1.35 | 0.25 | 0.21 | 37.80 | 0.05 | | 43.10 | 0.95 | 83.71 |
| Achham | Mangalsen | 4.72 | 0.04 | 2.98 | 160.65 | 0.25 | | 50.57 | 0.45 | 219.66 |
| Bajhang | Masta | 1.02 | 0.09 | 0.08 | 57.42 | 0.35 | | 49.93 | 0.12 | 109.01 |
| Achham | Panchadewal Binayak | 4.24 | 0.91 | 0.56 | 61.29 | 0.13 | | 77.93 | 2.42 | 147.48 |
| Bajura | Pandav Gupha | 0.14 | 0.16 | 0.25 | 96.98 | 7.59 | | 64.85 | 1.49 | 171.46 |
| Baitadi | Patan | 2.35 | 0.07 | 1.16 | 134.96 | - | | 80.03 | 0.02 | 218.59 |
| Achham | Sanphebagar | 2.45 | 1.51 | 2.24 | 94.76 | 0.09 | | 63.94 | 1.35 | 166.34 |
| Darchula | Shailyashikhar | 1.80 | 0.23 | 0.51 | 42.83 | 0.01 | | 71.10 | 0.96 | 117.44 |

| District | Palika (Rural Municipalities) | AL | BL | BU | F | GL | IS | SL | WB | Total Area |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Sq. Km. | | | | | | | | |
| Bajura | Swami Kartik | 0.04 | 0.01 | 0.12 | 51.24 | 0.38 | | 58.53 | 0.07 | 110.39 |
| Achham | Turmakhad | 6.18 | 0.69 | 0.50 | 143.25 | 0.07 | | 75.11 | 5.83 | 231.63 |
| **Total** | | **36.10** | **11.55** | **13.65** | **1,268.03** | **29.13** | **0.04** | **1,027.67** | **17.52** | **2,403.69** |

## A.6. Soil

149. The vast diversity of soils can be found in the hilly and mountainous area of Nepal. Most of hilly farmers use indigenous knowledge for identification and classification of soil based on soil color, soil texture, consistency and depth. Most indigenous classes can readily be converted to commonly used scientific classification. The countrywide survey carried by Land Resources Mapping Project (LRMP) in 1986 reported 14 soil groups in the hilly and mountainous areas of Nepal. These are mainly Entisols, Inceptisols, Mollisols and Alfisols. Soil orders Spondosols, Histosols, Ultisols and Aridisols are occasionally found.

150. Entisols are the least developed soils generally found at hill sides and river courses and have not much agricultural importance. While inceptisols are the soils important for agricultural and forestry use. Ustochrepts (group occurs in Inceptisols) are present at the far-western regions of Nepal. Dystrochrepts and Udochrepts are common in the central and eastern regions. Mollisols are common in Western Nepal at higher elevations and rich in organic matter and base. Alfisols are found in mountainous regions of Western Nepal. Gullying is the major problem of this soil. Ultisols are acidic and have low base saturation, so they have not much agricultural importance. Aridisols are the dry soils found in higher altitude such as Manang and Mustang districts of Nepal where annual precipitation is less than 300mm.

151. *Soil Fertility*. Various secondary research has been referenced for the evaluation of the fertility status of soil in hilly areas. In general, soils of the hill's region (i.e., hill and middle mountains) of Nepal were more acidic in nature (40-87%). With regard to soil organic contents, differences appear less distinct, however, the plains region had a slightly higher overall proportion of soils falling in the 'low' category than the hills.

152. The overall status of inherent soil fertility is poor in most of the cultivated soils in the hills of Nepal. According to Shreier et al (1995) and Brown (1997) nitrogen and phosphorus levels in the soils are highly deficient with low organic matter content and supply. However, due to wide distribution of mica dominated bed rocks, potassium is abundantly available (Shreier 1999). Fertility declines of the mid hill's soils have been reported by many authors (Carson 1992, Turton et al 1995, Schreier et al 1999, Neupane and Thapa 2001 and Pilbeam et al 2005).

## A.7. River Network

153. Basin and morphologic characteristics of the river are the intricate components of the river system. The geology, tectonics, topography, climate, land use, and human activity determine the geomorphic and hydrologic characteristics of the basin in the hill catchments. The basin characteristics, in turn, influences the hydrological response and river morphology downstream. The target municipalities for orchards in the hilly areas of Nepal have dense type of river systems. The total number of the rivers within the target provinces 795, and breakdown of the number of rivers is shown in Table 27. Each of the target municipalities have 5 - 6 rivers.

**Table 27. Number of rivers in the target provinces of NEP:NAFHA**

| SN | Provinces | Quantity of Rivers |
|---|---|---|
| 1 | Province Number 1 | 382 |
| 2 | Bagmati | 113 |
| 3 | Gandaki | 795 |
| 4 | Karnali | 391 |
| 5 | Sudrpaschim | 394 |

154. The major river systems of Nepal, which originate in the Himalayas, are Koshi, Narayani (Gandaki), Karnali and Mahakali. There are 5 medium river basins, particulalry Kankai, Kamala, Bagmati, West Rapti and Babai. Each of the river basins are primary, rainfed and originate in Mahabharat Range. These rivers are also perennial, with groundwater and springs sustaining the river-flow during the dry period. The total catchment area of these rivers at around 17,000 sq km, and the average combined runoff (at various gauging stations) is estimated at 461 $m^3$/sec (14.5 BCM per annum).

### A.8. Water Quality

155. One of the research projects from Tribhuvan University in 2020 found that the surface water of the hilly areas is within the thresholds of National Water Quality Standard (2006). The average value for pH of the hilly area was 7.8 and the electrical conductivity value ranged from 630 - 1500 micro siemens/cm. The bicarbonate alkalinity ranged from 140 - 350 mg/L, indicating a medium salinity hazard in the catchment. The water in the hilly areas was found to be moderately hard with an average of 75mg/L CaCO3 hardness. Nitrate, sulphate, ammonia, chloride, fluoride and sodium absorption ratio were <0.1mg/l, < 1mg/l, <1.5mg /l, <3mg/l, <1mg/l and < 2 respectively. Iron content in the water was also below the permissible limits in some samples and not available in other samples. None of the spring samples, as well as ground water samples, exceed the National Drinking Water Standards (NDWS) for electrical conductivity, total dissolved solids, total suspended solids, chloride, and nitrate. Similarly, none of the samples exceeds the standards for total hardness indicating soft nature of the water. The spring samples were within the NDWS for Manganese and Iron

### A.9. Air quality

156. Environmental Performance Index (EPI) of Nepal's air quality ranked 177th out of 180 countries. According to a report of World Health Organization (WHO), the maximum status of fine Particulate Matter ($PM_{2.5}$) in urban areas of Nepal was noted to be 140 $\mu g/m^3$ which is 10 times higher than the desirable value. Ministry of Science and Technology, in 2012, had published a guideline on "National Ambient Air Quality." The values set on these parameters were still higher than those set by WHO. The targeted $PM_{10}$ and $PM_{2.5}$ values were 120 $\mu g/m^3$ and 40 $\mu g/m^3$, respectively, which were approximately two times higher than the WHO targeted value.

157. The Department of Environment is planning to establish air quality monitoring stations throughout the country. As of today, it is limited in nine places, three stations inside Kathmandu Valley and six stations outside the valley. According to Department of Environment, in 2017, 24-hour average of Total Suspended Particles (TSP) in a site in Kathmandu was 4,749 $\mu g/m^3$, average $PM_{10}$ was 2,928 $\mu g/m^3$, and $PM_{2.5}$ was 226 $\mu g/m^3$. This is to find out seasonal variation of air pollution, a study conducted in Kathmandu Valley measured $NO_2$, CO, and $PM_{2.5}$ concentration on daily basis in all the four seasons of a year.

158. The maximum level of each of these parameters was seen during winter and spring seasons in Pokhara. The air quality of Pokhara valley as per the Department of Hydrology and Meteorology (DHM) and Ministry of Forest and Environment the $PM_{10}$ instantaneous is 24.1 $\mu g/m^3$. The $PM_{10}$ is 24.89 $\mu g/m^3$and $PM_{2.5}$ is 24.6 $\mu g/m^3$.

159. The air quality of Dhankuta Bazar (Province no 1) as per the Department of Hydrology and Meteorology (DHM) and Ministry of Forest and Environment the PM 1 instantaneous is 39.9 $\mu g/m^3$. The $PM_{10}$ is 48.29 $\mu g/m^3$ and $PM_{2.5}$ is 43.4 $\mu g/m^3$.

160. Bhaktapur: The air quality of Bhaktapur (Bagmati Province) as per the DHM and Ministry of Forest and Environment the $PM_{10}$ is 28 $\mu g/m^3$. The $PM_{10}$ is 43.5 $\mu g/m^3$ and $PM_{2.5}$ is 35.64 $\mu g/m^3$.

161. The air quality of Rara area of Karnali seems in good condition in comparison with other stations as per DHM and Ministry of Forest and Environment the $PM_{10}$ is 7.59 $\mu g/m^3$. The $PM_{10}$ is 9.3 $\mu g/m^3$ and $PM_{2.5}$ is 8.1 $\mu g/m^3$.

162. The air quality of Mahendranagar (Sudurpaschim) based on the DHM and Ministry of Forest and Environment the $PM_{10}$ is 47.3 $\mu g/m^3$. The $PM_{10}$ is 65.4 $\mu g/m^3$ and $PM_{2.5}$ is 53.7 $\mu g/m^3$.

## B. Biological Environment

### B.1. Biodiversity of Hilly Areas

163. The proposed project areas are in the mountainous and hilly areas of Nepal, where a hundred municipalities from eastern to western mountains and hill areas are considered for the NEP: NAFHA. The vegetation on the mountain slopes in the Mahabharat and mid hills of eastern and western of the country is very different. In the eastern Nepal, there is comparatively dense forest dominated by several species of oaks and rhododendrons, depending on the altitude. In contrast, western Nepal is relatively dry and suitable for large areas of pine forests. The Himalayan region has a similar type of vegetation except in western Nepal where conifers dominate. In the eastern part, moist climatic conditions favor oak and other broadleaved species over conifers. The composition of the vegetation in the alpine zone differs in the eastern and western Nepal, especially in terms of rhododendron species.

164. Nepal's great biodiversity is attributed to its very variable topography and climate. The heterogeneity in the vegetation, from subtropical to alpine, provides a mosaic of habitats for a great variety of animals, which form the basis of the interconnected Himalayan ecosystem.

165. Conservation in Nepal focuses mainly on the protection of flagship species, the protected areas for which are mostly located in the southern and northern part of the country. The Himalayan region is rich in biodiversity that is protected by an extensive network of protected areas and a landscape conservation project. However, the mid-hills and Mahabharat are under-represented in the protected area system. Historically, these regions were the first to be colonized by man, which resulted in the degradation of the forests. Thus, it is now necessary to initiate conservation programs in the Mahabharat and mid-hills in order to improve the interconnectedness of the eco-regions. Such conservation approach will improve the altitudinal connectivity for the seasonal migrations of mammals and birds. In view of the diversity of habitats and ecosystems, and anthropogenic threats, Nepal still needs an inter-ecoregion level research-based conservation program. Such a program will ensure long-term conservation of the Himalayan hotspot, of which Nepal makes up one third.

## B.2. Flora in the Project Area

166. The hilly region of Nepal lies in the middle belt from east to west, which represent portion of sub-tropical ecological zone, mostly temperate and up to sub-alpine zone. These regions have their own types of vegetation. The temperature of the region is neither cool nor warmer in lower region and is warmer in the upper region. Thus, this region can also be categorized as mid-hills and high-hills and the vegetation varies accordingly. The growth of plant slows down with decrease in temperature, therefore, the plant growth in high hills is slower compared to mid-hills in lower belt. The vegetation varies according to the altitude, thus, the tree species available in mid hills and high hills are tabulated separately while some of them can be intermixed able but categorized based on its abundance in respective region.

167. The project area is a mix of agricultural land, settlements, and forest areas with rich surface flow of water bodies. There is only scattered tree cover and grass land within the project area. Table 28 and 29 show the plants commonly found in the target areas.

**Table 28. Tree Species of Mid-hills of Nepal**

| S. No. | Botanical Name | Family Name | Common Name | Local Name | Conservation Status |
|---|---|---|---|---|---|
| 1 | *Acer oblongum* | Aceraceae | Himalayan Maples | Phirphire | LC |
| 2 | *Aesculus indica* | Hippocastanaceae | Indian Horse Chest Nut | Lekh Pangre | LC |
| 3 | *Alnus nepalensis* | Betulaceae | Alder | Utis | LC |
| 4 | *Brassaiopsis hainla* | Araliaceae | Chuletro | Seto Chuletro | - |
| 5 | *Brassaiopsis glomerulata* | Araliaceae | Blume | Kalo Chuletro | LC |
| 6 | *Bridelia retusa* | Euphorbiaceae | Asan | Gayo | LC |
| 7 | *Buddleja asiatica* | Buddlejaceae | White Butterfly Bush | Bhimsen Pati | LC |
| 8 | *Castanopsis hystrix* | Fagaceae | Katus | Patle Katus | - |
| 9 | *Castonopsis indica* | Fagaceae | Indian/Oak Chestnut | Dhale Katus | LC |
| 10 | *Castonopsis tribuloides* | Fagaceae | Chinquapin | Musure Katus | - |
| 11 | *Cordia dichotoma* | Cordiaceae | Indian Cherry | Bohori | LC |
| 12 | *Daphniphyllum himalense* | Cordiaceae | Benth | Rakchan | - |
| 13 | *Erythrina arborescence* | Papilionaceae | Himalayan Coral Tree | Phaledo | - |
| 14 | *Eurya acuminate* | Theaceae | Sakaki | Thulo Jhingane | - |
| 15 | *Exbucklandia populnea* | Hamamelidaceae | Malayan Aspen | Pipla | LC |
| 16 | *Fraxinus floribunda* | Oleaceae | Himalayan Ash | Lankuri | LC |
| 17 | *Ilex excelsa* | Aquifoliaceae | Japanese Holly | Puwanle | LC |
| 18 | *Juglans regia* | Juglandaceae | Walnut | Okhar | |
| 19 | *Lannea coromandelica* | Anacardiaceae | Indian Ash Tree | Jhingat, Hallongre | LC |

| S. No. | Botanical Name | Family Name | Common Name | Local Name | Conservation Status |
|---|---|---|---|---|---|
| 20 | *Leucosceptrum canum* | Labiatae | Hairy White-Wand | Bhusure, Ghurmiso | - |
| 21 | *Michelia champaca* | Magnoliaceae | Champak | Champ | LC |
| 22 | *Pinus roxburghii* | Pinaceae | Chir Pine | Rani Salla | LC |
| 23 | *Pinus wallichiana* | Pinaceae | Blue Pine | Gobre Salla | LC |
| 24 | *Prunus cerasoides* | Rosaceae | Wild Himalayan Cherry | Painyu | LC |
| 25 | *Quercus lalmellose* | Fagaceae | Oak | Thulo Phalant | - |
| 26 | *Quercus leucotricophora* | Fagaceae | Banjh Oak | Sano Banjh | - |
| 27 | *Quercus semicarpifolia* | Fagaceae | Oak | Khasru | - |
| 28 | *Salix babylonica* | Salicaceae | Willow | Bains | - |
| 29 | *Saurauria nepaulensis* | Saurauiaceae | Gogan | Gogan | - |
| 30 | *Schima wallichii* | Theaceae | Cheloni | Chilaune | LC |

LC: Least Concerned

**Table 29. Tree Species in High Hills of Nepal**

| S. No. | Botanical Name | Family Name | Common Name | Nepali Name | IUCN Redlist Category |
|---|---|---|---|---|---|
| 1 | *Abies pindrow* | Pinaceae | Silver Fir | Chingure, Gobre Salla | LC |
| 2 | *Abies spectabilis* | Pinaceae | Himalayan Fir | Talispatra, Bunge Salla | NT |
| 3 | *Betula utilis* | Betulaceae | Birch | Bhojpatra | LC |
| 4 | *Cedrus deodara* | Pinaceae | Deodar | Deodar | LC |
| 5 | *Cupressus torulosa* | Cupressaceae | Cypress | Dhupi | LC |
| 6 | *Juniperus indica* | Cupressaceae | Juniper | Dhupi | LC |
| 7 | *Picea smithiana* | Conifereae | Spruce | Jhulle Salla | LC |
| 8 | *Rhododendron arboretum* | Ericacear | Rhododendron | Lali Gurans | LC |
| 9 | *Taxus baccata* | Taxaceae | Himalayan Yew | Thingure Salla | LC |
| 10 | *Tsuga dumosa* | Pinaceae | Hemlock | Thingure Salla | LC |

LC: Least Concerned; NT: Not Threatened

### B.3. Non-Timber Forest Products (NTFPs) in the Project Area

168. NTFPs are also known as minor forest products and non-wood forest products. There is no uniformity in the use of term. Some define it very broadly, to include all forest products except timber, while many others have been using the term narrowly to focus on certain groups of forest products. The local use and trade of NTFPs in and from Nepal has been a little recognized but necessary component of the subsistence of many Nepalese. About 100 plant species are already

in trade and some 800 additional species find subsistence uses in Nepal. These goods provide needed medicines, foods, oils, fibers, dyes, tannins, gums, resins, incenses, building materials, etc hilly and mountainous areas are rich in NTFP. The main NTFP species found in the project area are like Harro (*Termnalia chebula*), Barro (*Terminalia bellirica*), Amala (*Emblica officinalis*), Titepate (*Artemisia Indica*) and Sarpagandha (*Rauwolfia serpentine*) are among the NTFPs found in the project area.

(a) Amala (*Emblica officinalis*)

(b) Titepate (*Artemisia Indica*)

(c) Sarpagandha *(Rauwolfia serpentine)*

(d) Harro (*Termnaliachebulai*)

**Figure 6. Sample NTFPs in the hilly and mountainous areas.**
source: https://www.nationalexports.com/wholesale/herbs-spices-produce/mug-wort-tite-pati/

### B.4. Fauna in the Project Areas

169. Nepal is a highly diverse and unique country harboring an extraordinary variety of landscapes, cultures, and wildlife. Despite making up less than 1% of the world's total land mass, its physiographic features range from the highest terrestrial ecosystem in the world, the Himalayas, to the subtropical lowlands of the Terai.

170. This contrast makes Nepal one of the most biodiverse countries in the world, containing within its small area of 141,181 km²: 4.2% of all mammals, 8.5% of all birds and 2.2% of all flowering plants on Earth, including threatened flagship species such as the Royal Bengal Tiger (Panthera tigris tigris In addition to the vast faunal diversity, 35 forest types and 118 ecosystems are present in Nepal (GoN, MoFSC 2009). Almost 25% of the country's landmass is designated as protected area, with 10 national parks, three wildlife reserves, five conservation areas and one hunting reserve.

171. The country is a state member of IUCN, the Nepal Red Data Book was published by IUCN-Nepal by categorizing the mammals of Nepal based on red data book in 1994. Currently there

are 58 mammals, 40 birds, 13 reptiles, 1 amphibian, 2 insects and 13 plants which appear in various categories.

### B.4.1. Integrated Biodiversity Assessment Tool (IBAT)

172. The Integrated Biodiversity Assessment Tool (IBAT) was used to determine the different wildlife present in the target hilly areas, and the classification of each species according to the International Union for Conservation of Nature (IUCN). This is a web-based platform tool that provides basic information on the different wildlife and conservation status. The tool draws together information on globally recognized biodiversity information from a number of IUCN Knowledge Products such as (i) IUCN Red List of Threatened Species, (ii) Key Biodiversity Areas and (iii) Protected Planet/The World Database on Protected Areas. Through its interactive mapping tool, the IEE report used the up-to-date information to identify biodiversity risks and opportunities within the 5 provinces of Nepal.

173. According to the report generated from IBAT, there are 13 different taxonomic groups recorded in the whole project area. Table below shows the summary of species-classification from the IBAT report. Hence, only those taxonomic groups potentially affected are discussed on the following sections.

**Table 30. Summary of the IBAT results for the target areas of NEP:NAFHA Project.**

| Classes | Total Assessed | Total | CR | EN | VU | NT | LC | DD |
|---|---|---|---|---|---|---|---|---|
| Province No 1 | | | | | | | | |
| Mammals | 138 | 22 | 1 | 7 | 14 | 12 | 101 | 3 |
| Reptiles | 40 | 12 | 2 | 5 | 5 | 2 | 24 | 2 |
| Amphibians | 35 | | | | | 2 | 32 | 1 |
| Magnoliopsida | 74 | 3 | | | 3 | 1 | 68 | 2 |
| Insects | 80 | | | | | | 78 | 2 |
| Aves | 665 | 25 | 5 | 6 | 14 | 29 | 611 | |
| Bagmati | | | | | | | | |
| Mammals | 126 | 16 | 1 | 5 | 10 | 11 | 97 | 2 |
| Reptiles | 20 | 4 | 1 | 1 | 2 | | 15 | 1 |
| Amphibians | 28 | | | | | 1 | 25 | 2 |
| Magnoliopsida | 84 | 1 | | | 1 | 2 | 79 | 2 |
| Insects | 75 | | | | | | 73 | 2 |
| Aves | 583 | 20 | 3 | 6 | 11 | 23 | 540 | |
| Gandaki | | | | | | | | |
| Mammels | 118 | 13 | 1 | 4 | 8 | 11 | 80 | 5 |
| Reptiles | 30 | 10 | 1 | 5 | 4 | 1 | 18 | 1 |
| Amphibians | 23 | | | | | 1 | 22 | |
| Magnoliopsida | 129 | 3 | | | 3 | 3 | 123 | |
| Insects | 81 | | | | | | 78 | 3 |
| Aves | 594 | 22 | 4 | 7 | 11 | 20 | 552 | 5 |
| Karnali | | | | | | | | |
| Mammals | 92 | 13 | 1 | 4 | 8 | 9 | 79 | 1 |
| Reptiles | 13 | 1 | | | 1 | | 10 | 2 |
| Amphibians | 16 | 3 | | | 3 | 1 | 11 | 1 |
| Magnoliopsida | 41 | 1 | | | 1 | 1 | 38 | 1 |
| Insects | 58 | | | | | | 56 | 2 |

| Classes | Total Assessed | Total | CR | EN | VU | NT | LC | DD |
|---|---|---|---|---|---|---|---|---|
| Aves | 432 | 13 | 3 | 4 | 6 | 13 | 406 | |
| Sudurpaschim | | | | | | | | |
| Mammals | 105 | 15 | 1 | 4 | 10 | 10 | 79 | 1 |
| Reptiles | 15 | 2 | 1 | | 1 | 0 | 12 | 1 |
| Amphibians | 15 | 3 | | | 3 | 1 | 11 | |
| Magnoliopsida | 58 | 1 | | | 1 | 1 | 54 | 2 |
| Insects | 74 | | | | | | 72 | 2 |
| Aves | 473 | 17 | 4 | 6 | 7 | 15 | 441 | |

CR: Critically Endangered; EN: Endangered; VU: Vulnerable; NT: Not Threatened; LC: Least Concerned and DD: Data Deficient

### B.4.2. Fauna Classes

174. *Amphibia*. The species under the Amphibia taxonomic group are small vertebrates that includes frogs, toads, salamanders, and newts. These species are ectothermic[35], which unable to regulate their own body heat, hence, they depend on sunlight for warmth. These species nourish, reproduce and spend part of their lives in water and on land. To survive, Amphibians need water and moist environment. Samples of species under the Amphibia Class reported by IBAT are Sphaerotheca *swani*, Zhang's Horned Toad (*Megophrys zhangi*), and *Amolops nepalicus*.

**Figure 7. Megophryidae - South Asian frogs are around 138 species of frogs and toads in this family.[36]**

#### B.4.2.1. Mammalia

175. Species under the Mammalia group are vertebrate animals and characterized by the (i) presence of mammary glands, which females produce milk for feeding their young, (ii) a neocortex (a region of the brain), (iii) fur and hair at least at some point of the life cycle, and three middle ear bones. These characteristics distinguish them from reptiles and avian species.

176. In the forest areas of hilly region there are various species of Mammals, particularly in Province 1 and Gandaki provinces. Large and small mammals are living in the forested areas in the hilly areas such as Spotted Deer (*Axis axis*) LC, Muntjac Deer (*Muntiacus reevesi*) LC, Golden Jackal (*Canis aurens*) LC, Wild Boar (*Sus scrofa*) LC, squirrel spp. (*Sciuridae*), Hispid hare

35 Organism in which internal physiological sources of heat are of relatively small or of quite negligible importance in controlling body temperature.

36 Source: http://www.nhptv.org/wild/Megophryidae.asp

(*Caprolagus hispidus*) EN, and rabbit (*Lepus nigricollis*) EN. The orchards will be developed in only the area outside of the habitat of any type of wildlife.

(a) Spotted Deer (*Axis axis*)

(b) Golden Jackal (*Canis aurens*)

(c) Wild Boar (*Sus scrofa*)

(d) Hispid hare (*Caprolagus hispidus*)

**Figure 8. Few examples of mammals in the hilly areas**

Sources:

(a) https://www.jungledragon.com/image/50391/nepalese_axis_deer.html
(b) https://nepalensis.com/golden-jackal/
(c) https://www.inaturalist.org/taxa/499898-Sus-scrofa-cristatus
(d) https://petkeen.com/hispid-hare/

### B.4.2.2. Aves

177. Habitat structure and floristic composition are known to have a significant role in determining the occurrence of bird species. Major habitat for Nepal's bird consists of forest, wetland and grassland. Forest and bushes holds 77% of Nepal's breeding birds (Grimmet et al. 2000). Over half (53%) of Nepal's nationally threatened birds inhabits in forests, 27% in wetlands, 15% in grasslands, 8% in cultivated land, 5% in shrub, 9% in open canopy, 3% near human habitation, and 1% in semi-desert areas (Inskipp et al. 2013).

178. The major threats of birds of Nepal are poaching and illegal trade, habitat loss and destruction due to agricultural activities, overgrazing, overharvesting for fodder and poisoning.

Habitat loss is the major threat, about 86% of the birds at risk under habitat loss (Birdlife Nepal 2013). Out of 871 species of Bird species of Nepal, about 36 species recorded in Nepal are listed in IUCN Red List of globally threatened birds (BirdLife International 2012).

179. Sixteen orders and 61 families of birds have been recorded in Nepal forming more than nine percent of the world's known bird species (BCN and DNPWC 2011). Spiny Babbler (*Turdoides nipalensis*) is the only endemic bird of Nepal (Grimmet et al. 2003).

180. In 2010, the alarming number of 149 bird species, 17% of Nepal's birds is considered nationally threatened, 61 species are thought to be Critically Endangered, 38 are endangered and 50 are Vulnerable (BCN and DNPWC 2011). A total of 35 globally threatened species, 19 near threatened species and 15 restricted-range species of birds are recorded in Nepal.

181. The avian species such as Crow (*Corvus splendens*), Bengal Flourian (*Hubaropsis bengalensis*), Hutityau (*Tringa hypoleucos*), Sparrow (*Passer domesticcus*), Rock Dove (*Columba livia*), *Cacatua sp.*, are among the bird species in the status of threatened. However, the proposed area does not have habitat of the critical endangered and endangered species of avifauna.

(a) Crow (*Corvus splendens*)

(b) Bengal Flourian (*Hubaropsis bengalensis*)

(c) *Tringa hypoleucos*

**Figure 9. Sample avian species in the project areas**

Sources:

(a) https://birdsoftheworld.org/bow/species/houcro1/cur/introduction

(b) http://www.edgeofexistence.org/species/bengal-florican/
(c) https://www.iucnredlist.org/search?query=Tringa%20hypoleucos&searchType=species

182. The common birds found in and around the project area is listed below.

**Table 31. List of birds within the target subproject areas**

| S.N. | English Name | Local Name | Scientific Name | IUCN Conservation Status |
|---|---|---|---|---|
| 1 | Dove | Dhukur | *Streptopelia* | LC |
| 2 | Crow | Kaag | *Corvus splendus* | *LC* |
| 3 | Cuckoo | Koili | *Cucuclusmicropterus* | *LC* |
| 4 | Indian Nightjar | ChukchukeChaite Chara | *Caprimulgus asiaticus* | *LC* |
| 5 | Large Adjutant Stork | Garud | *Leptoptilus dubius* | *LC* |
| 6 | Abbotts's Babbler | MotothudeBhyakur | *Malacocinclaabbotti* | *LC* |
| 7 | Red-vented bulbul | Jureli | *Pycnonotuscafer* | *LC* |
| 8 | Bengal Floricans | Kharamjur | *Houbaropsisbengalens* | *LC* |
| 9 | Pigeon | Parewa | *Columba livia* | *LC* |
| 10 | Rufous-vented grass babbler | KailokantheDikurebhyakur | *Laticillaburnesii* | *LC* |
| 11 | Sparrow | Bhangera | *Passer domesticus* | *LC* |
| 12 | Striated Grassbird | NarkatGhansechari | *Megalurus palustris* | *LC* |
| 13 | Swamp Francolin | Simatitra | *Francolinusgularis* | *LC* |
| 14 | Water Cock | ThuloJhilli | *Gallicrex cinerea* | *LC* |
| 15 | White Tailed Stonechat | KaseJhyaapsi | *Saxicola leucurus* | *LC* |
| 16 | Jungle crow | Ban Kag | *Corvus macrorhynchos,* | *LC* |
| 17 | House sparrow | Bhangera | *Passer domesticus* | *LC* |

### B.4.2.3. Herpitofauna

183. Commonly found Herpitofauna (reptiles and amphibians) in the project area are as follows.

**Table 32. List of Herpitofauna found in the target subproject areas**

| S.N. | Scientific Name | English Name | Local Name | IUCN Conservation Status |
|---|---|---|---|---|
| 1 | *Sphaerothecaswani* | Frog | Bhyaguto | Not Stated |
| 2 | *Calotes versicular* | Garden lizard | Chheparo | LC |
| 3 | *Hemidactylus Flaviviridis* | House Lizard | Mausuli | LC |
| 4 | *Ptyasmucosus* | Rat snake | Dhaman | LC |
| 5 | *Varanus Bengalensis* | Common Indian Monitor | Bhainse Gohoro | LC |

| S.N. | Scientific Name | English Name | Local Name | IUCN Conservation Status |
|---|---|---|---|---|
| 6 | *Atretium Schistosum* | Olive Keelback Water Snake | Pani Sarpa | LC |
| 7 | *T. albolabris* | Green Pit Viper | Hariyo Sarpa | LC |

### B.4.2.4. Aquatic wildlife

184. Nepal has a wide variety of fish with about 200 species available, of which around 190 are indigenous species and remaining are exotic species. Among the 59 indigenous cold water fish species of Nepal, *Neolissocheilus hexagonolepis, Schizothoraichthys spp, Schizothorax spp and Tor spp* are the most important fish from the economic and sport fishery point of view. These are also an excellent food fish. Katli (*Neolissocheilus hexagonolepis)* is an important food and sport fish of Nepal. Among other fish species are the Common Carp (*Cyprinus carpio*), Rara Snow (*Schizothorax raraensis*), and Dinnawah Snowtrout (*Schizothorax progastus*).

**Table 33. Fishes found in the target subproject areas**

| S.N. | Scientific Name | English Name | Local Name | Conservation Status | IUCN Category |
|---|---|---|---|---|---|
| 1 | *Neolissocheilus hexagonolepis* | Katli | Katli | NT | Threatened |
| 2 | *Mastacembelus Armatus* | Spiny Eel | Bam | LC | LC |
| 3 | *Channa Gachua* | Dwarf Snakehead | Hile | LC | LC |
| 4 | *Schizothorax Progastus* | Dinnawah Snowtrout | Chuhhe Asala | LC | LC |
| 5 | *Psilorhynchus Pseudecheneis* | Stone Carp | Tite | LC | LC |

### B.5. Protected Areas and Sensitive Receptors

185. There are 2 districts (i.e. Manang and Mustang) under the proposed project that are located in the Annapurna Conservation Area (ACA), and this area is categorized as the conservation area[37] as per the Conservation Area Management Rules 2053. The ACA is the largest protected area in Nepal covering 7,629 sq. km. (or 762,900 has) (IUCN Protected Area category VI, subject to IUCN verification) that is managed by an autonomous non-governmental organization, the National Trust for Nature Conservation (NTNC).

186. ACA is the most visited protected area by foreigners in Nepal (DNPWC 2010), attracting over 60% of the country's total trekkers (Source: forestrynepal.org/project/2923). ACA thus offers very good prospects for regional economic development through tourist expenditure and associated revenue. Among other features, ACA hosts the 10th highest peak in the world, Mt.

[37] "Conservation Area" means an area to be managed according to an integrated plan for the conservation of natural environment and balanced utilization of natural resources as per the *National Parks and Wildlife Conservation Act, 2029 (1973) where* as "National Park" means an area set aside for the conservation, management and utilization of flora, fauna and scenery along with the natural environment. Annapurna Conservation Area is set as per the Conservation Area Management Rule,1996.

Annapurna (8,091m) and the world's deepest river valley, the Kali Gandaki gorge (ACAP 1997, cited in Baral et al. 2008).

187. The ACA area is home to over 120,000 residents of different cultural and linguistic groups. ACA is particularly rich in biodiversity harboring 1,226 species of flowering plants, 102 mammals, 474 birds, 39 reptiles and 22 amphibians (Baral et al. 2008, NTNC 2013). The region contains the world's largest rhododendron forest in Ghorepani region and Tilicho Lake, the world's highest altitude freshwater lake.

188. The orchard development and drip irrigation in Manang and Mustang will be within lands that were previously utilized for horticulture crops production and no other components of the project will be implemented in these two districts. No forest land will be converted in the ACA. MOALD will follow government requirement on the establishment of orchards in ACA particularly in the district of Manang and Mustang.

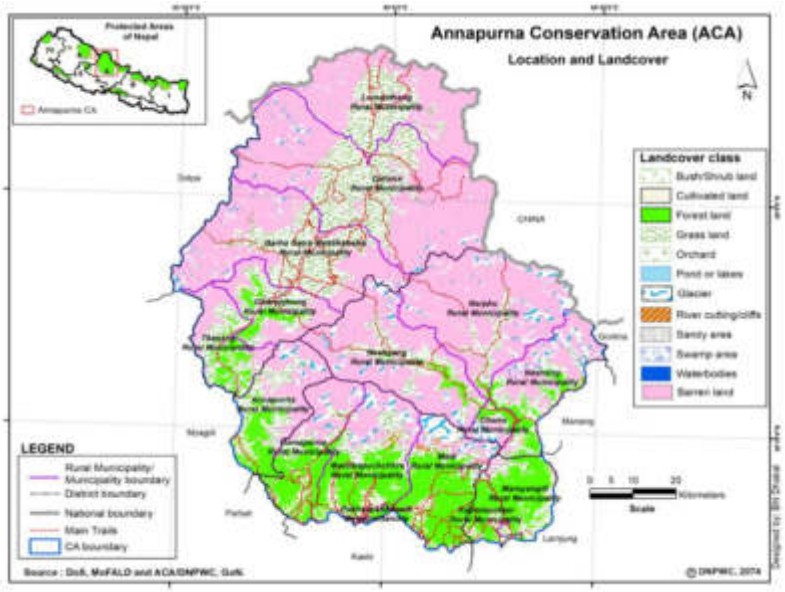


**Figure 10. Map referenced from the Department of National Parks and Wildlife Conservation's website, ACA encompasses the Annapurna Himalayan range and also contains the world's deepest valley Kali Gandaki River Valley.**[38]

189. Within the target municipalities, the distances of settlements and potential areas for orchard and vegetables vary from different places. The settlements are located within several meters to few kilometers from farmlands. These settlements are considered receptors of potential minor impacts due to the project activities and environmental benefits from developing selected lands as orchard areas.

190. There are religious areas within the municipalities under the project, which are:
- Halesi Temple, Halesi Tuwachung Municipality
- Muktinath Temple, Barhagaun Muktikhetra, Mustang Disrict of Gandaki Province
- Baglung Kalika Temple, Baglung Municipality, Baglung District (12 km far from the Jaimuni Municipality)
- Panchadeval Binayak Temple.

[38] http://www.dnpwc.gov.np/en/conservation-area-detail/68/

191. These religious sites will not be affected by orchard and vegetable areas development because there will be no interventions in these locations.

## C. Socio-economic Information

### C.1. Demography

192. There is uneven distribution of populations in the country with an annual growth of 2.2 percent. Geographically, over 7% of the population lives in the mountains, 45% in the hilly regions, and 48% in the lowlands. Administratively, the country is divided into 7 provinces and 77 districts. Nepal is also a rich mosaic of ethnicities. Over 80% of the population is Hindu followed by Buddhists and other minority groups. Majority of the ethnic groups live in the hilly region of the country.

193. The total population of the proposed project Municipalities is 2,567,177 as per the data of 2020. Among them the male population is 1,192,304. The female population is 1,374,873. The total households in the proposed project municipalities is 575,404. Among them the largest population as per the provinces is from Gandaki.

194. *Province 1.* The total target municipalities for the proposed project in this province are 22 within 7 districts. The total population of the province is 511,784. The male populations in the target municipalities are 237,753 and the female population is 274,031. The number of households are 113,196.

195. *Bagmati Province.* There are 8 municipalities in 3 districts namely Dhading, Nuwakot and Sindhupalchok. The total population in these municipalities is 218,055. The male population is 102,125 and female population is 115,930. Likewise, the total households that in the province project is 48,501. The Brahmin[39], Chhetry[40], Tamang and Gurung[41] are the main caste of this population.

196. *Gandaki Province.* The total target municipalities in the province is 34 within 10 districts. Total population of the proposed project municipalities is 1,101,995. The male population of these municipalities is 50,1792 while the female populations is 600,203. The total households are 275,749. This is the province with highest beneficiaries of households as well as the population. The Brahmin, Chhetry, Gurung, Magar and Kami, Damai are the main caste of these municipalities.

197. *Karnali Province.* The target 20 municipalities are located in 9 districts. There are 379,364 people residing in these districts. Male population is 184,429 and female population is 194,935. Number of households are 70,586. The population is dominated by Chhetry followed by Brahmin and other caste.

198. *Sudurpaschim Province.* There are 16 target municipalities in this province. The project will cover 5 districts. The population of these 16 municipalities is 355,969. In the total population,

[39] Brahmin is a caste (Varna) among Nepali people of Nepal. Their origins are from Indo-Aryans of Nepal and South Asia

[40] Chhetri is considered a direct derivative of the Sanskrit word Kshatriya. According to the 1854 Legal Code (Muluki Ain) of Nepal, Chhetris are the social group among the sacred thread bearers (Tagadhari) and twice-born people of the Hindu tradition.

[41] Indigenous ethnic group of Nepal,

number of males is 166,205 while the female population is 189,774. The households within the target municipalities are 67,372.

**Table 34. Summary of the number of populations in the target provinces of the project.**

| S.No. | Provinces | Households | Female | Male | Total |
|---|---|---|---|---|---|
| 1 | Province No 1 | 113,196 | 274,031 | 237,753 | 511,784 |
| 2 | Bagmati | 48,501 | 115,930 | 102,125 | 218,055 |
| 3 | Gandaki | 275,749 | 600,203 | 501,792 | 1,101,995 |
| 4 | Karnali | 70,586 | 194,935 | 184,429 | 379,364 |
| 5 | Sudurpaschim | 67,372 | 189,774 | 166,205 | 355,979 |
| | **Total** | 575,404 | 1,374,873 | 1,192,304 | 2,567,177 |

199. The majority of the population of the mountainous and hilly areas depends on subsistence agriculture and natural resources for its livelihood. About 90% of the farmers in mountainous areas rely on marginal and small land holdings, where they typically cultivate less than one hectare per household and mostly rely on traditional farming and animal husbandry. In many cases, they augment their income by using other natural resources, mostly collection of NTFPs. Trade has been important for ethnic groups like Thakali and Sherpa. Tourism is important for Mustang, Manang and Solukhumbu. Collection of high value medicinal herbs has become an important income source in many of the western districts, notably Dolpa. The importance of cash crops is still low in the mountain areas, except apples in Jumla and Mustang.

200. The general conditions of the high mountain districts are physical and socioeconomic marginalization of the rural population, low population density, harsh climate with low rainfall, prolonged dry periods, low temperature and severe winter, unseasonable snow, a rugged and fragile terrain, high soil erosion rates due to wind and water run-off, food deficiency due to short growing seasons, limited suitable agriculture land, and limited/ lack of access to basic technical services.

201. In the agriculture sector, declining productivity is a critical concern in food crops and in horticulture. Problems of increasing soil acidity, loss of crop vigor, lack of appropriate technological inputs and inadequate technical outreach as well as changes in weather patterns as possible causes contributing to lower productivity. In addition, subsequent soil nutrient losses and diseases occur frequently and hamper the sustainability of benefits. Furthermore, the increasing use of pesticides on horticultural crops has been reported and poses additional health and safety challenges.

202. In the livestock sector, milk from cattle and meat from sheep and goat shows progressive decline due to low quality of fodder and forage, particularly during the winter months. For the livestock, the carrying capacity of pastureland is low due to the unavailability of nutritious plants and overgrazing.

203. Poverty incidence in the mountains is 33% which is close to the country's average. There are however considerable differences between and within districts. The mid and far western mountain districts belong to the poorest in the country in terms of income and food security. In district like Solukhumbu, the Northwest Municipalities has benefited greatly from tourism, whereas the eastern municipalities are among the poorest for East Nepal. Food availability in the mountain districts is for four to five months (in some cases, may be less) – food security for the rest of the year has to be ensured through food imports. Western districts (Humla, Mugu, Jumla and Dolpa)

are more prone to food deficits compared to eastern districts. Poor accessibility is a major constraint in transporting food to food shortage districts in the mountain areas.

204. Poverty is directly related to resource poverty, remoteness, and social exclusion. For example, poverty incidences for the remote, drier and more mountainous Midwestern region, Dalits and disadvantaged indigenous people, are substantially higher than the average, and also higher than for accessible Western, Eastern and Central Regions, and for advantaged groups of Newar, Brahmins and Chhetris). However, because of the higher population densities in the Central and Eastern regions, more poor people live there than in the much poorer Mid and Far West. Several years ago, 7.5% of all people below the poverty line lived in the mountains.

**C.2. Economic Growth**

205. In fiscal year 2019/20, the GDP growth was estimated to increase by 2.27%. Likewise, GDP growth was expected to rise by 2.28% in 2019/20. The revised estimate of economic growth (producer's price) was 7.0% in 2018/19 and such growth was 6.7% in fiscal year 2017/18.

206. The gross value added of agriculture and non-agriculture sector in fiscal year 2019/20 was estimated to be 2.6% and 2.3%, respectively. Such growth rates were 5.1% and 7.4% in the last fiscal year. In fiscal year 2019/20, fisheries sub-agriculture sector is expected to gain rise in gross value added compared to that of the fiscal year 2018/19. Likewise, the gross valued added of non-agriculture sector - mining and exploration, industry, construction, hotels and restaurants, transportation, storage and communication sectors is expected to decrease in fiscal year 2019/20.

207. Contribution of agriculture sector to GDP is decreasing whereas non-agriculture sector's is increasing. In fiscal year 2019/20, contribution of agriculture sector to GDP is estimated to be 27.6% and non-agriculture sector 72.4%. The contribution of agriculture and non-agriculture sector to GDP were 27.5% and 72.5%, respectively in fiscal year 2018/19.

**C.3. Provincial Economic and Social Situation**

208. Economic activities are increasing at provincial and local levels owing to the structural and institutional setups developed to functionalize federalism. The grants and revenue mobilization provided as financial transfers are based on transparency, laws, procedures and criteria. Remarkable progress is achieved in areas of infrastructure development, drinking water supply and sanitation improvement, effective internal resource mobilization, small and medium scale industries establishment and operation, promotion of governance at province and local levels. Public services delivery is becoming smart, reliable and qualitative. Financial access at local level has increased with the expansion of financial institutions. The roles of provincial and local economies have increased to enable national economy.

209. Of the total GDP of Rs.3767.04 billion, the share of Bagmati Province is estimated to be the highest with 35.8% and Karnali the lowest with 4.3% in fiscal year 2019/20. The share in GDP of Province 1, Province 2, Karnali province and Sudurpaschim province has increased in current fiscal year 2020/21 compared to that of the last fiscal year2019/20.

210. Though the economic activities of Sudurpaschim Province were expanding till the mid-March 2019/20. But after the measures adopted to prevent and control the outbreak of coronavirus are expected to affect the economy. Economic growth of the Sudurpaschim province is expected to be the highest 4.1% and the will be at Bagmati for up to 1.2%. In 2020/21 the

contribution of agriculture sector to GDP, based on industrial classification of economic activities, is the highest in all provinces.

### C.4. Socio-economic Trend

211. According to future projections, Nepal's population will reach 34 million by 2031 and 42 million by 2050. From the current urban population of 20%, the urban population will increase to 48% by 2051. There will be an overall reduction in poverty at the national level. A rapid increase in male labor migration, primarily in Bagmati Province and other provinces not under NEP:NAFHA Project. The migration of young household members increases the sensitivity of those left behind (elderly people, children, and women) and increases the number of female-headed households (de-facto household head).

212. If current trends continue, female-headed households will increase to 3.1 million by 2051, up from 1.3 million today. These findings indicate that, as a result of demographic and socioeconomic changes, future exposure and sensitivity to climate change will be greater, resulting in increased climate change risks and vulnerabilities impacting the women and girls, Indigenous Peoples, poor and marginalized households.

# 6. ANALYSIS OF ALTERNATIVES

## A. Irrigation Overview

213. Adequate water supply is important for farmers in their horticultural lands to ensure crop production. Horticultural crops must receive additional water through irrigation, where rainfall amount is not sufficient and may vary in the future. There are different methods to supply water in farmlands for crop yield (see examples in the figures below). Each method has its advantages and disadvantages, and these should be taken into account when choosing the most suited to local conditions and in order to manage environmental impacts.

**Figure 11. Sample of irrigation technologies**

(a) surface irrigation

(b) sprinkler irrigation

(c) drip irrigation

Sources of photographs:

(a) Surface Irrigation | SSWM - Find tools for sustainable sanitation and water management!
(b) FAO - News Article: World Water Council and FAO step up their partnership
(c) Guidelines for Efficient Irrigation after drip irrigation installation (metzer-group.com)

## B. Considerations for selecting irrigation technology

214. The key objective in irrigation system is to maintain soil moisture available for plants, and how could this be attained is significant for the project. The irrigation technology is a complex conveyance water systems in irrigating orchards. Irrigation extends across many technical and non-technical disciplines. Water supply system for crop production works efficiently when all the components and factors are integrated smoothly. These considerations are discussed in the following paragraphs.

215. *Compatibility.* Irrigation system for farmlands in the hilly areas must function together with other practices such as land preparation, soil cultivation, and crops harvesting. Extensive utilization of agricultural machines and equipment may entail larger farm spaces. The type of irrigation must not interfere with machine operations and may need to be functional outside cropland boundaries. An appropriate technology would be surface irrigation for this kind of farm area. Irrigation technology is different for conditions in the hilly areas, where smaller equipment, cultivation with animals or manual labor is a common cultural practice. Permanent irrigation system is more suitable for small fields such as sprinkler and drip irrigation system.

216. *Economics.* The selection of the type of irrigation system must reflect economic considerations. The maintenance costs and expected service-life along with different annual costs should be included in the selection of an irrigation system as well. Pressurized irrigation systems have high costs on investments and operations, however, may utilize minimal work and conserve water resources. This type of irrigation system is for high value crops such as vegetables and fruits. Other irrigation systems are less expensive to build and operate, however would require high level of labor requirements. Surface irrigation often requires higher labor input for construction and operation as compared with sprinkler and drip irrigation systems. Accurate land

levelling and regular maintenance of farmer groups are required for surface irrigation. While sprinkler systems and drip irrigation would be less labor-intensive during operation and maintenance.

217. *Topographical characteristics.* Another major factor affecting irrigation is the form and features of horticultural lands in the proposed project sites. The location and elevation of water supply relative to the target sites of the project, size and configuration of existing farmlands, and access by roads and utility lines (i.e., power and, water) are important considerations in the project's hilly areas. Field slope and its uniformity are two of the most important topographical factors. Drip irrigation are preferred than surface irrigation on unevenly sloping lands (i.e. hilly areas) as they require little or no land levelling.

218. *Soils.* The moisture-holding capacity of soil, infiltration rate and depth are the key criteria affecting the selection of the type of irrigation system. Other important soil properties that influence the selection of irrigation system are physical, biological and chemical properties, and hydraulic characteristics. Drip irrigation is suitable for most soils in the hilly areas. For clayish soils, water must be applied slowly to avoid ponding and surface runoff. While for farmlands with sandy soil type, higher water discharge from drippers would be needed to ensure adequate lateral wetting of the ground making available for horticulture crops' consumption.

219. *Water supply*. Drip irrigation is most suitable for fruit, nuts and vegetable crops where one or more drippers can be provided for each plant. It involves supplying water onto the ground at low rates from small diameter plastic pipes with outlets drippers. Water is supplied close to crops, because the intention is to wet only part of the soil where roots grow. Unlike surface and sprinkler technology, these irrigation methods involve wetting the whole soil profile. Through drip irrigation, water applications are more frequent than with other methods and this provides a favorable moisture level in the soil in which plants can grow. Further, irrigation efficiency is higher with drip irrigation than surface irrigation. Thus, this method is preferred in areas where water resources need for conservation.

220. *Social influences.* Irrigation is a community enterprise, where it is beyond the confines of an individual person's farmland. As proposed in the project, individuals farmers and PMU must cooperate to build, utilize and maintain irrigation systems. The irrigation system design must consider an important goal of irrigation community which is the assurance of equity among its beneficiaries. Hence, the operation of the irrigation system must achieve sharing and allocation. Irrigation is a technological intervention of the project even if irrigation has been practiced locally. Introduction of technology mean new operation and maintenance practices. If the community is not sufficiently adaptable to the development, irrigation systems may not succeed.

221. *Impact on the environment.* Irrigation has contributed significantly to poverty alleviation, food security, and improving the quality of life for rural populations. However, the sustainability of irrigated farmlands could be compromised due to potential negative environmental effects. The sustainability of irrigation systems depends on the consideration and mitigation of environmental impacts. The expansion and intensification of agriculture due to irrigation has the potential for causing (i) increased erosion, (ii) pollution of surface water and groundwater from agricultural chemical use, and (iii) water quantity issues. To help farmers to sustain production and lesser environmental footprint, the project will support the development of drip irrigation systems on project supported orchards. The system will be able to conserve water resources and reduce the potential environmental risks due to severe erosion and agricultural chemical leach out of the field.

## C. Choice of Irrigation Technology

222. To support farmers on improving crop yield and sustain their production, the project will support the development of drip irrigation systems on orchards selected under the project. The rationale for drip irrigation is based on efficiency of water use, suitability for the topography, accuracy of application and ease of operation.

223. Drip irrigation is not only practical compared to other of irrigation methods for the proposed project, it also gives farmers an efficient and simple way to operate their farms, where they will be able to achieve:

- Higher consistent quality yields
- Water savings (less evaporation, run off and wastage)
- Uniformly in any topography and soil type
- Energy savings
- Efficient use of fertilizer and crop protection
- Less dependency on weather or rainfall

# 7. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

## A. Beneficial Impacts

224. Development of orchards and vegetable areas in the hilly areas will provide crops for the beneficiaries, and additional income from agriculture-based business. The climate resilient agriculture techniques are another beneficial aspect of the orchard development of the project. The overall enhancement of the quality of life, increase the economic activities, maintenance of environmental condition and a way of resilient agriculture system are the main benefits of the proposed project.

### A.1. Socio-economic Benefits

#### A.1.1. Employment Generation

225. The project will generate direct employment opportunities, where a total of 300 man-days of skilled labors and 18,000 man-days of unskilled labors person days are required to work for the project's drip irrigation. Almost 30% will be from the local manpower from the community to work under the project. Construction activities such as laying and joining of pipelines will create opportunities for about 50 local people. The earning will positively affect the local economy, thereby reducing the chances of seasonal migration of the local people.

#### A.1.2. Skills Enhancement

226. The construction of the project will not only provide direct employment opportunities but also ensure the transfer of skills and technical proficiency to the local workforce and project beneficiaries. The POP will enhance the capacity of farmers and other beneficiaries on horticulture production. In the future, these skills will be useful for locals to generate income as well as implement when the need arises. The impact is thus indirect in nature, local in extent, medium in magnitude and long-term induration.

#### A.1.3. Local Trade and Business Opportunities

227. The development of the orchards would cause positive economic transition. Orchard development and operation, and improvement of value chain activities will enhance the production of fruits, nuts and vegetables which can lead to economic benefits. The plantation and other infrastructures like fencing, drip irrigation will cause the enhancement of local trade and business opportunities as well. The production of fruits and nuts will be consumed by the farmers and beneficiaries, which results to improve healthy food diet.

### A.2. Environmental Benefits

#### A.2.1. Carbon Sequestration

228. $CO_2$ concentration in the atmosphere has increased by 31% since the beginning of the industrial era, from 280 to 360 ppm (IPCC, 2001). Burning of fuels and deforestation are major anthropogenic activities that cause the emissions of $CO_2$ into the atmosphere. Planting trees, rehabilitating, and enriching land cover contribute to the mitigation of atmospheric GHG atmospheric content as these increase the rate and quantity of carbon sequestration in trees'

biomass. For orchard development, this may play an important carbon pool[42], which continuously cycle $CO_2$ with the atmosphere.

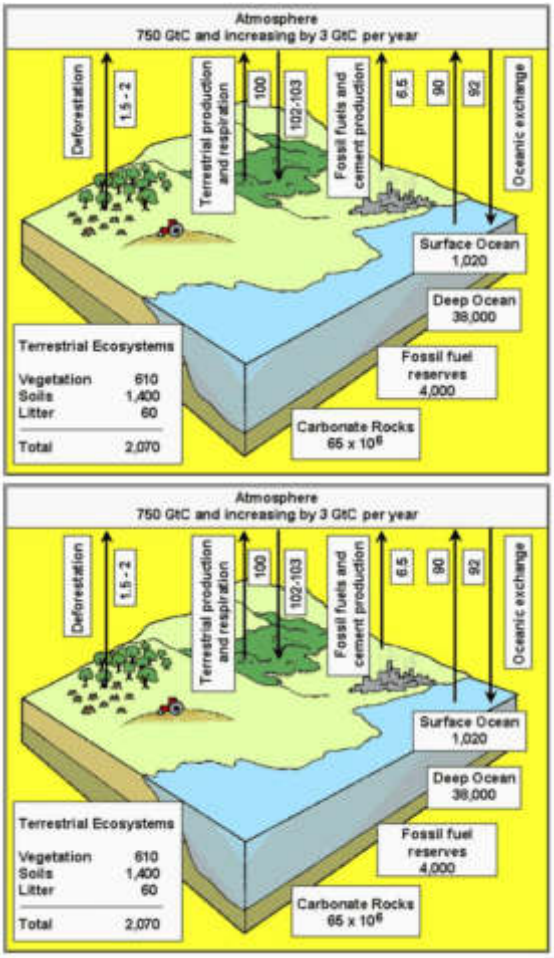


**Figure 12. Illustration of carbon pools and $CO_2$ fluxes between land and the atmosphere.[43]**

229. The studies by Sofo et al. 2005, Page et al. 2011 and Montanaro et al. 2017 have shown that fruit orchards such as kiwifruit, apple, peach, orange and olive could sequester from 2.4 to 12.5 tC/ha/year. During the initial growing years in orchards, the amount of $CO_2$ sequestered by horticulture trees is the similar with capacity of forest areas because photosynthesis is high for young trees (Wu et al. 2012). Moreover, horticultural practices such as pruning, which is normally performed for trees in orchards, heightens the photosynthesis rates. The organic carbon produced yearly in the whole tree can reach up to 8.54 t C/ha at harvest (Demestihas, 2017).

230. Agricultural management of potentially recyclable elements of orchards such as pruning wood, mowed grasses or senescent leaves may help close the carbon biogeochemical cycle (Demestihas, 2017). Carbon content and humus production from the decomposition of senescent leaves and pruning material have demonstrated that significant amounts of carbon are sequestered in this way (Sofo et al. 2005).

[42] A reservoir of carbon. A system which has the capacity to accumulate or release carbon.
[43] Source: *Edinburgh Centre for Carbon Management* (http://www.eccm.uk.com/climate.htm)

### A.2.2. Soil Improvement

231. Orchard provides major natural services including soil improvement. The capacity of trees to maintain or improve soils is manifested in controlling soil erosion and nutrient cycling. During the lifetime of trees in orchards, different parts such as leaves, and branches fall to the ground as litter. These organic materials from trees will be source of nutrients that will be taken up by trees. Same cycle will happen all throughout the trees' growth and development.

232. The trees in the orchard will be managed, and the biomass from the tree may be utilized as mulch. In many situations, rainfall is more erosive than places where there are no trees. Canopies of trees for the proposed orchards only reduce the erosive effect of rainfall where raindrops are intercepted. If soil is covered with litter or mulch, erosion is reduced to low levels.

233. Another benefit of orchards is the generation of the biomass litter that contribute to the organic matter content of the soil. The soil with rich organic matter has high capacity to absorb and retain water, and more resistant to erosion. A good cover of litter or mulch can also be very effective in suppressing weeds.

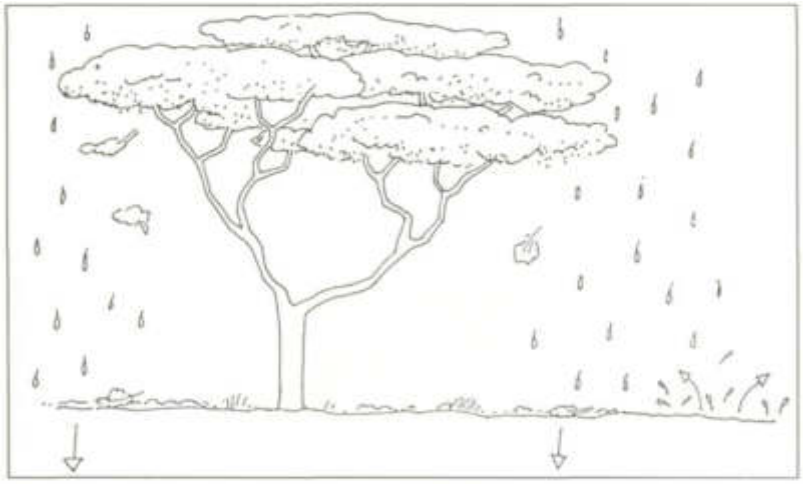

**Figure 13. From the World Agroforestry Center website, an illustration of tree intercepting direct rainfall and litter minimizing splash erosion.[44]**

234. Compared to exposed land, soil have high organic matter and better soil physical properties under trees. Trees in orchards can improve soil fertility by processes of increasing litter to the soil, and improving soil physical, chemical and biological conditions. The key processes are those triggered by trees as sources of horticultural crops such as: (i) check runoff and soil erosion over the proposed orchard areas; (ii) maintain the soil organic matter and physical properties throughout the project's operation; (iii) increase nutrient inputs, through nitrogen fixation and uptake from deep soil horizons as the orchards are being managed by farmers; and (iv) improvement of nutrient cycling.

### A.3. Quality of Life

235. The general provision of potable water and proper sanitation facilities will bring about better personal, household and community hygiene practices, resulting to better health for the family and community, and ultimately an overall improvement in the locals' quality of life.

[44] Source: http://apps.worldagroforestry.org/Units/Library/Books/Book%2006/html/5.2_how_tree_imp_soi.htm

236. Overall, the Project will lead to improved economic status of the local farmers, and environment, significantly improving the project areas and beneficiaries of the fruits and nuts orchards.

## B. Analysis of the Impacts

### B.1. Environmental Risk and Impact Classifications

237. The identification of potential impacts requires defining the environment based on the physical, biological, and social components of the project's area of influence. These components may be affected due to the implementation of project's outputs in all of the target districts. These environmental components for the NAFHA Project were drawn from the environmental baseline and are as follows:

(i) *Physical environment* – This is defined by the geographic area and abiotic components that influence the condition and define the characteristics of a location. These factors include the land use, terrain or topography, air quality, noise levels, water resources and soil. The physical environment is examined in terms of whether the activities of the project changes and/or damages these abiotic components within the geographic area.

(ii) *Biological environment* – Presence of flora and fauna within the target areas of the project.

(iii) *Social environment* – Immediate physical and social setting in which there are people interactions, and something develops such as public infrastructures, occupational health and safety and cultural resources.

238. The assessment of potential environmental impacts requires the classifications of the risks associated with the orchard development, drip irrigation, improvement of research centers, and enhancement and expansion of nurseries in terms of the following categories.

(i) Intensity*:* The intensity of the potential risks of a particular project component refers to the level of disruption to the environment. Three levels have been defined:

  (a) *Low*: No or minimal change in the characteristics and conditions of the environment;
  (b) *Average*: There is noticeable change in certain characteristics and conditions of the environment;
  (c) *High*: Significant change in the environment.

(ii) Duration*:* This is the time aspect of the potential environmental risks. The terms permanent, temporary and short are used to describe the period (or time):

  (a) *Short term*: the effect disappears promptly or even no impact at all;
  (b) *Temporary*: limited during construction period;
  (c) *Permanent*: change and/or impact on the environment throughout the life of the infrastructure or component.

(iii) Spatial extent: This describes the coverage of the potential risks caused by an action in the environment. It refers to the distance and area covered by the disruption. The terms regional, local and limited are used to describe the scope:

(a) *Limited*: Only within or immediate the project components' site boundaries or no impact at all;
(b) *Local*: beyond project components' site boundaries (<500m).
(c) *Widespread*: when the action affects areas beyond the study area far beyond project components' site boundaries (>500m)

(iv) *Assigning Significance of impacts*. Three classifications are incorporated into the impact matrix, thus defines the potential environmental risks into one of three categories below.

*(a)* *Minor:* Impacts are minimal or does not affect the environmental component in any observable or quantifiable way, and that it is related to a randomly occurring natural effect.

*(b)* *Moderate:* Potential impacts are less adverse on particular environmental component and/or not irreversible.

*(c)* *Major:* Signifies an effect that is severe and that affects the integrity, diversity and sustainability of the environment. Such an effect substantially or immediately alters the quality of the environment.

The analysis of environmental impacts focus on the environmental components found in the geographic areas of the proposed project. A matrix for impacts of each environmental component is prepared in relation with the projects components (i.e. orchard and vegetable areas development (OV), drip irrigation (DI), nursery improvement (NI) and upgrading of horticulture centers (UHC)).It includes the classifications (i.e. intensity, duration and spatial extent) and likely level of these environmental risks. The color indicates the level of risks, where green signifies low risks, red is high and amber is between the classification of low and high risks. Significance of impacts define whether the potential risks will be included in the environmental management plan (EMP). The matrix is shown below.

**Table 35. Risks assessment matrix for the proposed subprojects.**

| Environmental Components | Potential Risks | Subprojects | Intensity | Duration | Spatial Extent | Significance of impacts | EMP (Y/N) |
|---|---|---|---|---|---|---|---|
| Physical Environment | | | | | | | |
| Land use | Change in land use at target site or project influence areas | OV | Low | Short | Local | Moderate | Y |
| | | DI | Low | Short | Limited | Minor | N |
| | | NI | Low | Short | Limited | Minor | N |
| | | UHC | Low | Short | Limited | Minor | N |
| | Change in topography/ terrain | OV | Low | Short | Limited | Minor | N |
| | | DI | Low | Short | Limited | Minor | N |
| | | NI | Low | Short | Limited | Minor | N |
| | | UHC | Low | Short | Limited | Minor | N |
| Ambient air quality | Decline of ambient air quality - dust and suspended particulate matter from land clearance | OV | Low | Short | Local | Minor | N |
| | | DI | Low | Short | Local | Minor | N |
| | | NI | Low | Short | Local | Minor | N |
| | | UHC | Low | Temporary | Local | Minor | Y* |

| Environmental Components | Potential Risks | Subprojects | Intensity | Duration | Spatial Extent | Significance of impacts | EMP (Y/N) |
|---|---|---|---|---|---|---|---|
| | and earthworks | | | | | | |
| | Decline ambient air quality - emissions from use of construction vehicles and equipment | OV | Low | Short | Local | Minor | N |
| | | DI | Low | Short | Local | Minor | N |
| | | NI | Low | Short | Limited | Minor | N |
| | | UHC | Low | Temporary | Local | Minor | Y* |
| Ambient noise and vibration | Increase of ambient noise and vibration levels - mobilization of construction equipment and machinery | OV | Low | Temporary | Local | Minor | N |
| | | DI | Low | Temporary | Local | Minor | N |
| | | NI | Low | Temporary | Limited | Minor | N |
| | | UHC | Low | Temporary | Local | Minor | Y* |
| Water resources: quantity of surface and groundwater | Decline on the available local water resources | OV | Low | Permanent | Local | Moderate | Y |
| | | DI | Low | Permanent | Local | Moderate | Y |
| | | NI | Low | Permanent | Local | Moderate | Y |
| | | UHC | Low | Permanent | Local | Moderate | Y |
| Water resources: quality of surface and groundwater | Decline in quality of water or proximate waterbodies | OV | Low | Short | Limited | Minor | N |
| | | DI | Low | Short | Limited | Minor | N |
| | | NI | Low | Short | Limited | Minor | N |
| | | UHC | Low | Short | Limited | Minor | N |
| | Pollution of land/soil and water bodies due to use of chemicals for fertilizer and insecticides | OV | Average | Permanent | Local | Moderate | Y |
| | | DI | Low | Short | Limited | Minor | N |
| | | NI | Average | Permanent | Limited | Moderate | Y |
| | | UHC | Average | Permanent | Limited | Moderate | Y |
| Soils | Loss of topsoil and subsoils during land clearance, and earthworks | OV | Low | Temporary | Limited | Minor | N |
| | | DI | Low | Temporary | Limited | Minor | N |
| | | NI | Low | Temporary | Limited | Minor | N |
| | | UHC | Low | Temporary | Limited | Minor | N |
| | Erosion during operation | OV | Low | Temporary | Local | Minor | N |
| | | DI | Low | Temporary | Limited | Minor | N |
| | | NI | Low | Temporary | Limited | Minor | N |
| | | UHC | Low | Temporary | Limited | Minor | N |
| Waste management | Generation and inappropriate disposal of inert spoil, solid and hazardous wastes from construction sites and facilities sources | OV | Low | Short | Limited | Minor | N |
| | | DI | Low | Short | Limited | Minor | N |
| | | NI | Low | Short | Limited | Minor | N |
| | | UHC | Average | Temporary | Local | Moderate | Y |
| **Biological Environment** | | | | | | | |
| Flora and Fauna | Loss of vegetation | OV | Low | Temporary | Local | Minor | N |
| | | DI | Low | Short | Limited | Minor | N |
| | | NI | Low | Short | Limited | Minor | N |

| Environmental Components | Potential Risks | Subprojects | Intensity | Duration | Spatial Extent | Significance of impacts | EMP (Y/N) |
|---|---|---|---|---|---|---|---|
| | | UHC | Low | Short | Limited | Minor | N |
| | Disturbance to terrestrial fauna | OV | Low | Temporary | Limited | Minor | N |
| | | DI | Low | Short | Limited | Minor | N |
| | | NI | Low | Short | Limited | Minor | N |
| | | UHC | Low | Short | Limited | Minor | N |
| | Loss of habitat areas | OV | Low | Short | Limited | Minor | N |
| | | DI | Low | Short | Limited | Minor | N |
| | | NI | Low | Short | Limited | Minor | N |
| | | UHC | Low | Short | Limited | Minor | N |
| | Disturbance to protected areas | OV | Low | Temporary | Limited | Moderate | Y |
| | | DI | Low | Short | Limited | Minor | N |
| | | NI | Low | Short | Limited | Minor | N |
| | | UHC | Low | Short | Limited | Minor | N |
| | Forest fragmentation | OV | Low | Short | Limited | Minor | N |
| | | DI | Low | Short | Limited | Minor | N |
| | | NI | Low | Short | Limited | Minor | N |
| | | UHC | Low | Short | Limited | Minor | N |
| | Wildlife conflict | OV | Low | Permanent | Limited | Moderate | Y |
| | | DI | Low | Short | Limited | Minor | N |
| | | NI | Low | Short | Limited | Minor | N |
| | | UHC | Low | Short | Limited | Minor | N |
| Social environment | | | | | | | |
| Construction workers | Health and safety including: Communicable diseases as workers coming into contact with communities from elsewhere, including COVID-19 | OV | Average | Temporary | Local | Moderate | Y |
| | | DI | Average | Temporary | Local | Moderate | Y |
| | | NI | Average | Temporary | Limited | Moderate | Y |
| | | UHC | Average | Temporary | Local | Moderate | Y |
| | Occupational Health and safety risks including: Hazards created during the construction period, e.g. movement of heavy equipment, vehicles, and machineries, working conditions, etc. | OV | Low | Temporary | Limited | Moderate | Y |
| | | DI | Low | Temporary | Limited | Moderate | Y |
| | | NI | Low | Temporary | Local | Minor | N |
| | | UHC | Low | Temporary | Limited | Moderate | Y |
| Local communities | Community health and safety | OV | Low | Short | Limited | Minor | N |
| | | DI | Low | Short | Limited | Minor | N |
| | | NI | Low | Short | Limited | Minor | N |
| | | UHC | Low | Short | Limited | Minor | N |
| | Damage to property | OV | Low | Short | Limited | Minor | N |
| | | DI | Low | Short | Limited | Minor | N |
| | | NI | Low | Short | Limited | Minor | N |

| Environmental Components | Potential Risks | Subprojects | Intensity | Duration | Spatial Extent | Significance of impacts | EMP (Y/N) |
|---|---|---|---|---|---|---|---|
| | | UHC | Low | Short | Limited | Minor | N |
| Physical cultural resources | Loss or damage of physical cultural resources (historical cultural elements/ fossils) | OV | Low | Short | Limited | Minor | N |
| | | DI | Low | Short | Limited | Minor | N |
| | | NI | Low | Short | Limited | Minor | N |
| | | UHC | Low | Short | Limited | Minor | N |

OV = orchard and vegetable areas development, DI = drip irrigation, NI = nursery improvement, and UHC upgrading of horticulture centers

Y* = Significance of impacts are minor, however, EMP is needed for construction activities that will create environmental risks.

## C. Summary of Impacts Assessment and Mitigation Measures

239. Potential environmental impacts due to the implementation of different components, and associated mitigation measures are discussed in details below. Those potential environmental impacts that are assessed as minor in the table are not included in the following paragraphs. This is for the reason that these potential environmental risks will have no and/or minimal impacts on the environment. Only environmental risks that is identified as moderate will be given attention by providing mitigation measures.

### C.1. Physical Environment

#### C.1.1. Land-use and Topography

240. The project is targeting to support 10,000 ha. of orchard and 1,000 ha. for vegetable and other crops within the 100 municipalities across the target hilly provinces of the country. Before planting at target farmlands, there may require some earth works, ploughing and other land preparation related activities. For sloping areas where required to ease the steepness of the land, there may require for the use of equipment and machines. The terrain of orchards needs to be prepared as per the fruits, nuts and vegetables requirements. Forest areas are not expected to be cleared in the project, but the topography of the farmlands may be altered during the implementation of the proposed project components.

241. The following are the mitigation measures for the potential impacts for orchard development component.

a. Beneficiaries will use screening checklist (see Annex 3) to identify the orchards that will be planted with fruits and nuts varieties.
b. There will be no forest areas designated by the government of Nepal will be developed as orchards.
c. PIU will help the project beneficiaries by preparing orchard establishment and management plan before land clearing and preparation.
d. PIU and project beneficiaries will consult and seek agreement with local communities on the locations for any temporary nursery in the district or locality.
e. Planting of fruits and nuts will be limited within the farmlands identified for orchard development.

f. During detailed orchard site surveys, identify presence of any unstable land, steep slopes, etc. Planting of nut and fruits will avoid any unstable land and/or steep slopes.
g. Natural slope disturbances will be minimized, as much as possible, during land preparation and site clearing.
h. Limit use of heavy equipment and machineries to minimize further impact on the landscape. Manual labors would be promoted.
i. On the completion of planting fruits and nuts, planting suitable intercrops to minimize land erosion
j. Schedule land preparation and clearing, and planting of horticulture crops based on the local activities surrounding the target site to avoid disturbance of other farmlands activities.
k. Restore temporarily used sites to at least their pre-project condition following works.
l. Orchard development and vegetable production areas will reduce the risk of damage to roads, utilities, structures, drains etc. by minimize the use of heavy machineries.
m. Locate stockpiles away from properties and only in designated areas where no access will be blocked.
n. On completion of works restore all temporarily used sites to at least their pre-project condition following works. This will involve cleaning site of any debris or wastes, left over material and soil/rocks/sand.

### C.1.2. Ambient Air Quality

242. The mitigation measures will be applied for construction packages (through inclusion in bidding documents and contracts) that will require clearing of land, transport of construction materials, and/or use of construction vehicles that will likely to cause increase in fugitive dust and suspended particulate matter.

243. The following mitigation measures will be implemented to minimize impacts of air quality.

a. Vehicles delivering loose and fine materials like sand and aggregates shall be covered.
b. Dust suppression measures like water sprinkling, will be applied in all dust prone locations such as unpaved haulage roads, earthworks and stockpiles.
c. Material storage areas shall also be located downwind of the habitation area.
d. Construction vehicles and machineries will be periodically maintained.
e. Require construction equipment and vehicles to meet national emissions standards (see Chapter 2).
f. Regular checks, and maintenance of construction equipment and vehicles to keep them in good working order to meet emission standards.
g. Cover stockpiles with tarpaulin.
h. Locate stockpiles at least 500m from residential property to avoid inconvenience from fugitive dust and ensure they are enclosed by a fence or similar to minimize windblown dust.
i. Position any stationary emission sources (e.g. diesel generators, compressors, etc.) as far as practical from sensitive receptors (houses, schools, clinics, temples, etc.).
j. Impose speed limits on construction vehicles to minimize exhaust and dust emissions along areas where sensitive receptors are located (houses, schools, clinics, temples, etc.).
k. Trucks importing fill material must be covered.
l. Strictly prohibit the burning of wastes generated by project-related activities.

m. Ensure workers working in close proximity to or having long exposure to vehicle exhausts and earthworks are provided with clean N95 dust masks to minimize inhalation of particulate matter and other pollutants.
n. Construction air quality monitoring will be carried out per the Environmental Monitoring Plan (EMoP).

### C.1.3. Ambient Noise and Vibration Levels

244. Noise and vibration impacts are unavoidable consequence for enhancements and upgrading of horticulture research centers. There will be construction vehicles and machines/equipment that will be used for these components of the project. For WHO guidelines, noise levels should not exceed 55 dBA (day time) and 45 dBA (night time) in residential settings and 70 dBA in both day and night time in industrial and commercial areas. Nepal standards (see Chapter 2) which are more stringent in some locations will also be complied with.

245. The mitigation measures will be applied for construction packages (through inclusion in bidding documents and contracts), where there will be potential increase of noise and vibrations in horticulture centers.

a. Limit the duration of noisy construction activities to daylight hours, whenever possible, in the vicinity of sensitive receptors.
b. Workers exposed to high noise levels will be provided with ear plugs.
c. The contractors will provide prior notification to the community on the schedule of construction activities.
d. Whenever possible, noisy equipment will be completely enclosed which can significantly reduce noise levels.
e. Any stationary equipment that produce high noise levels (e.g., portable diesel generators, compressors, etc.) will be positioned as far as is practical from sensitive receptors.
f. Construction traffic routes will be defined in cooperation with local communities and traffic police to minimize noise and nuisance.
g. Vehicle speeds will be reduced around sensitive receptors.
h. Temporary noise barriers will be installed along the edge of the road, as necessary, in front of sensitive receptors facing heavy construction activities.

### C.1.4. Available Local Water Resources

246. Under the proposed project, orchard and vegetable areas will require installation of drip irrigation system, and the supply of water may come from groundwater sources and nearby rivers. Similarly, enhancement of private nurseries and horticulture centers will require water for their construction and operations phases. The intensity of the impacts of the water use for the irrigation, nursery and horticulture centers are expected to be low and local, but water use will be permanent or during the lifetime of the orchard that may affect the available water resources.

247. The following are the mitigation measures for the potential impacts for orchard development component.

a. During orchard site survey, PIU will identify presence of any suitable water sources and confirm if any are used by local communities.
b. PIU will seek agreement with local communities to use any community resources (i.e., water supplies) for the drip irrigation.

c. PIU and project beneficiaries will ensure compliance with government policies on the use of water for drip irrigation systems in the targeted orchard areas.
d. Beneficiaries to report any leaks or damage on the drip irrigation to PIU.
e. PIU will perform periodic monitoring and maintenance of the drip irrigation system and immediately fix any damage in the water supply.

248. The following are the mitigation measures for the potential impacts for private nursery operations, upgrading of horticulture centers and proposed subprojects for the matching grants.

a. Beneficiaries will acquire or ensure validity of permit for the use of water for their operations and comply with the conditions of the government.
b. Display information on water management highlighting the practices in use at the facility at places in a highly visible areas.
c. Perform periodic monitoring and maintenance of the water system and immediately fix any damage in the piping systems.

**C.1.5. Water Quality of Nearby Waterbodies**

249. There may have potential impacts on water bodies located within the project area during implementation. The following are the mitigation measures for the potential impacts of orchard and vegetable area development on water quality, which are adapted from EHS Guidelines for Perennial and Annual crop productions.

a. As far as practical, earthworks will be done during the dry season to minimize exposed areas subject to erosion by surface water runoff.
b. PIU will promote intercropping to reduce the erosion from exposed lands to climatic elements.
c. Maintaining vegetative cover, as much as possible, to minimize direct impacts of raindrops and to impede surface flow.
d. Improving soil physical conditions through light and infrequent tillage to prevent crusting and increase infiltration and reduce surface runoff.
e. Following agricultural practices such as terracing so as to reduce slope length.
f. Management of soil erosion can be done through agronomic/soil management and mechanical measures that will be guided by PIU.
g. Use of mulch to help improve the soil's structure, drainage, and nutrient-holding capacity as they decompose.
h. Periodic application of compost, manure, and some other organic materials to improve the water-infiltration capacity of soils.
i. All orchard development will be done across the contour of the sloping field rather than up and down the slope.
j. Provide soil and water management periodic orientations to beneficiaries of the project.

250. The following are the mitigation measures for the potential impacts of matching grant subproject proposals on water quality.

a. Contractor to schedule, as far as practical, earthworks during the dry season to minimize exposed areas subject to erosion by surface water runoff.
b. If any surface waterbodies or groundwater sources within 100m, Contractor is to undertake a baseline water quality to confirm the current water quality status at least one week prior to the commencement of any actively on-site.

c. Establish dedicated fuel, oil, and chemicals stores on impermeable bunded area to avoid spills and leaks contaminating soil and affecting water quality.
d. Avoid storage of fuel, oil, and chemicals in areas ideally within 500m to water sources (surface water and groundwater wells, springs etc.) to avoid direct contamination or contamination through run off, if this is not possible minimum distance is to be 100m.
e. Undertake refueling only on areas of hard protected soil, preferably bunded, ideally 500m from water sources (surface water and groundwater wells, springs etc.) but if this is not possible minimum distance to be 100m, with all drainage directed through oil interceptors.
f. Undertake construction during the dry season as much as possible to minimize exposed areas subject to erosion by surface water runoff.
g. Minimize soil erosion and surface water runoff by reducing the extent of earthworks, and covering storages of sand and spoil with tarpaulin.
h. Do not allow washing of equipment or vehicles near surface water and ensure all washing water is discharged to sedimentation basin and oil interceptor instead of directly to surface water.
i. Cement will be stored in storage facilities, enclosed and not exposed to the elements.
j. Do not undertake any concrete mixing ideally within 500m of surface water, if this is not possible minimum distance is to be 100m.
k. Provide portable sanitary facilities/toilets and washing facilities for construction workers, so as to avoid surface and ground water pollution. Locate these at least 500m away from surface waterbodies including rivers/ponds and groundwater sources including springs/wells/pumps, away from waterlogged land and shallow groundwater.
l. Strict prohibition on open defecation and urination by construction workers, use of pit latrines or toilets for worker camps.
m. Toilets and washing facilities to be connected to existing sewerage system, septic tank (with soak pit) or as portable self-contained units for disposal of wastewater off site to sewage treatment works.
n. No untreated wastewater is to be discharged direct to surface water or onto the ground. Water will be treated through available facility such as soak pits or municipal sewage system.

### C.1.6. Use of Chemicals as Fertilizer and Insecticides

251. Agricultural contaminants such as nutrients and pesticides can impact land and quality of water resources. Fertilizers and pesticides are not stationary where these are applied in the orchard areas and nursery. Runoff and infiltration into the ground transport these contaminants into nearby rives and groundwater table. Additionally, when land has intensified into orchard use and nursery operations, the landscape is modified to be optimized for fruit and nuts and seedlings production. Oftentimes these modifications have unintended environmental impacts on receiving waters and their ecosystems, including changes in water quality and quantity.

252. The possible entrance of contaminants into land and human food chain will possibly increase chemicals residues in products. These will lead to contamination of fruits and nuts due to use of hazardous pesticides. There is also impact on land and water by the potential loss of soil organisms, non-targeted beneficial insects and aquatic life due to toxic effects of chemicals and pesticides. Also, increasing chemical resistively by crops and plants requiring higher doses in future

253. The following are the mitigation measures for the potential impacts of orchard and vegetable area development adapted from EHS Guidelines for Perennial and Annual crop productions.

a. PIU will provide orientations to orchard beneficiaries in adopting nutrient management techniques by applying nutrients (fertilizer and manure) in the right amount, at the right time of year, and with the right method.
b. Orchard farmers will practice conservation drainage practices to manage water movement on and soils through the guidance from PIU.
c. Ensure year-round ground cover to prevent periods of bare ground on farm fields when the soil and nutrients it contains are most susceptible to erosion and loss into waterways.
d. Planting of shrubs and grasses along the edges of fields to minimize nutrient loss from fields by absorbing or filtering out nutrients before they reach a water body.
e. Reduce frequency and intensity of tilling.

254. Laboratories in horticulture centers and private nurseries may be using fertilizers and chemical during operations. From the use of these chemicals, excess may be washed away with site water run-off and contribute to land and water pollution.

a. Ensure effluents containing chemicals are not directly discharged into lands and water bodies.
b. Use only registered fertilizers and chemicals from government approved sources.
c. Laboratory generated hazardous wastes shall be properly treated before its disposal. Regulatory measures shall be complied.

### C.1.7. Inert Spoil, Solid Wastes and Hazardous Wastes

255. For the civil works activities involved in the upgrading the horticulture centers and matching grant component, there would be construction wastes (such as solid wastes: plastics, pipes, stones, woods etc., and liquid waste: paint, oil, etc.) from the construction sites and general wastes (solid wastes: papers, containers, residues of food, fruits etc., and liquid waste: wastewater from kitchen) from the workers' and their camps. There is likely to generate wastes and effluents, but expected amount of construction wastes and general wastes are not high due to the scope of works. However, the generation of wastes may pose risks on the environment, health and safety if these are not collected and/or inappropriately stored and disposed. Waste generation can lead to risks for community health and safety when the level exceeds the ability of Contractors and beneficiaries to properly handle wastes. The following mitigation measures will be adopted.

a. Reuse spoil and other materials for construction purposes.
b. Maintain proper material storage system and ensure to control littering of construction materials outside the designated places.
c. Stockpiling site of construction materials will be designated at demarcated places.
d. Provide solid waste container inside the construction site.
e. Ensure that the labor camps have proper facilities for waste segregation and even for composting of the biodegradable waste.
f. Give health, hygiene and sanitation training to workers.
g. Provide temporary prefabricated mobile toilets in the construction sites.

h. Separate provision for collection and disposal of hazardous waste, if any, as prescribed by government rule and regulations.

## C.2. Biological Environment

### C.2.1. Terrestrial Fauna and Wildlife

256. Orchard and vegetable area development component will cover existing farmlands in the hilly areas. The project expects no clearance of forest to accommodate the developments across the target municipalities. However, disturbance to terrestrial wildlife may occur during the implementation of the orchard component due to land development and intensification of horticultural practices. There would also have potential conflict with wildlife at the operation stage. Mammals and avian species may come consume and damage crops. The following are the recommended mitigation measures for such the potential impact.

a. Cutting trees at the proposed sites will be kept to an absolute minimum and only be permitted when it is obstruction in the planting design and laying of drip irrigation pipes.
b. Ensure clear demarcation of the orchard and vegetable areas avoid encroachment outside the agreed corridor of impact.
c. Tree cutting permit is obtained prior to the start of land clearing works where cutting tree cannot be avoided.
d. PIU will verify with authorities for any presence of any wildlife of concern within the target areas.
e. Before land clearing and/or site preparation, perform a detailed survey of the number and species of trees in order to calculate the compensatory tree replacement.
f. If there will be removal of vegetation, important tree species to be retained as identified by District Forest Office will be marked separately and protected.
g. Felled trees recovered after cutting will be handed over for use according to the national laws and regulations.
h. Fencing of orchards wherever there is expected animal movement.
i. A record of wildlife sighting shall be kept.
j. In case there are wildlife conflict in the area, the farmers will inform immediately the PIU on such occurrence.
k. With the help of local forest department, the PIU will provide awareness on wildlife and habitat protection to farmers.

### C.2.2. Protected Areas

257. There are efforts from the government to minimize loss of biodiversity by designating protected areas such as the Annapurna Conservation Area (ACA). This conservation zone is the largest protected area and being managed by National Trust of Nature Conservation (NTNC)[45]. There are 2 districts of under project that is within the ACA (i.e. Mustang and Manang). The implementation of orchard under the NEP:NAFHA within the protected area, but only at existing

[45] Established in 1982 by a Legislative Act, NTNC is an autonomous and not-for-profit organization mandated to work in the field of nature conservation in Nepal. NTNC works closely with the Government of Nepal in the management of protected areas by directly managing three mountain protected areas and assisting the government in all the low land parks.

private farmlands, may cause the disturbances such as movement of the wildlife and impacts habitat without mitigation. The following are the mitigation measures for the potential impacts of orchard development in the ACA.

a. No orchard will be developed without compliance with the requirement of Ministry of Forest and Environment.
b. Orchard beneficiaries will comply with the conditions set by Ministry of Forest and Environment.
c. Only private land will be developed for orchard development in ACA.
d. PIU will strictly ensure that no forest areas and wildlife corridors will be converted into orchard.
e. No tree cutting should be done for the orchard development.
f. Each of the orchards in the ACA will prepare environment code and approved by the PMU.
g. Identify any permits and mitigation measures through consultation with ACA and beneficiaries.
h. The beneficiaries must ensure not to disturb the movement of wildlife by construction of the movement corridor.
i. The registration and consent from the local management committee should be attained prior to development of orchards.
j. PIU will monitor orchard and vegetable area development and operations in line with the requirement of the government.

### C.3. Social Environment

#### C.3.1. Health and Safety

258. During the implementation stage of the project, occupational health and safety risks are associated with the civil works for horticulture center upgrading and proposed developments under matching grant due to potential injuries from construction works. Although the civil works are minor there may be risks of health and safety. Also, workers need to operate instruments and equipment where could harm them. Similarly, there is health and safety risks for people who will be installing drip irrigations, and soil works and orchard plantation such as ploughing activities in the orchard soil. For the operation of the orchards and nursery, there may be required to spray fertilizers and pesticides that could have health risks with farmers and workers. Such impacts may be long term throughout the operation, but in minor intensity.

259. All types of occupational health and safety risks manageable and can be minimized through adequate interventions, which protect workers from accident and disease, and limit the damage to the environment related with civil works. Since occupational health and safety risks would occur at the target areas under NEP:NAHFA, preventive and control measures should be initiated jointly by the Contractor, workers, PIUs and beneficiaries. The following are the mitigation measures to manage the impacts on occupational health and safety.

a. Undertake a health and safety risk assessment through a facilitated workshop during the pre-construction survey. The health and safety risk assessment to consider both occupational and community health safety.
b. Through the health and safety risk assessment, prepare a Construction Health and Safety Management Plan (CHSMP) including site-specific measures as needed for each construction site addressing both occupational and community health and safety.

c. Keep CHSMP as a living document, to be updated as required and re-approved by PIU if any changes in construction methods, site conditions, in response to accident, near miss etc.
d. Provide worker training on health and safety and daily/weekly briefings led by site-appointed Health and Safety Officer.
e. Personal protective equipment (PPE) to be provided for all workers.
f. Ensure all workers have received appropriate occupational health and safety trainings.
g. Ensure good housekeeping in the premises at all times, including on construction site, workers camps, storage areas, etc.
h. Project area is to be kept neat and tidy, with no trip hazards on the ground e.g. open channels, materials, equipment, trash laying around.
i. Provide clear and visible warning and danger signs at and around the construction and/or planting site.
j. Information board displaying the activities proposed, duration of construction, name and contact number of environmental safety officer of contractor.
k. On completion of works restore all temporarily used sites to at least their pre-project condition following works. This will involve cleaning site of any debris or wastes, left over material and soil/rocks/sand.

### C.3.2. COVID-19 Health and Safety

260. In the context of the COVID-19, workers may be exposed to occupational hazards that put them at risk of disease, injury and even death. The movement of people in the orchard area, nursery and horticulture centers can transmit COVID-19 infections, specially there are various variants spreading throughout the country and globe. Mitigating hazards and protecting the health and safety of workers requires well-coordinated and comprehensive measures for infection prevention and control, occupational health and safety and health workforce management. Insufficient occupational health and safety measures can result in increased rates of work-related illness among workers and reduced productivity. The following are the mitigation measures to manage the risk of COVID-19.

a. Prepare and implement a comprehensive COVID-19 Health and Safety Guidance Plan following i) following national regulations and health advice, and (ii) international good practice recommendations (see Annex 4).
b. The health and safety guidance plan is a live document that is to be updated as new information arise and should include the protocols on the following, but not limited to:
    (i) Prerequisite measures before opening the worksites;
    (ii) Worksite entrance;
    (iii) Worksite management;
    (iv) Camp management;
    (v) Worksite awareness-raising;
    (vi) Risk exposure assessment guidance;
    (vii) Engage an employee/staff to oversee health and safety issues, and
    (viii) Monitoring and reporting mechanism.
c. The protocols should include requirements on wearing masks PPE, physical distancing, hand washing, disinfection, checking body temperature, ventilation, management of waste, awareness, and morning briefings.
d. Ensure all equipment and vehicles used are routinely disinfected.

e. Provide thermometer, soap, sanitizer, disinfectant, PPE at worksite/camp.
f. Place adequate washbasins, disinfectant tub, dispenser for sanitizer.
g. Provide regular briefing/training on preventive requirements to the workers and post enough COVID-19 awareness posters throughout the worksites.
h. Maintain COVID-19 weekly monitoring and reporting mechanism at the worksite; including any necessary actions to be taken.

# 8. ENVIRONMENTAL MANAGEMENT PLAN

## A. Environmental Management Plan Overview

261. This is the chapter for the Environmental Management Plan (EMP) prepared for the different components of NEP: NAFHA Project, which exhibits the mitigation measures against potential environmental impacts. The EMP is a management tool and seeks to manage and keep to a minimum the negative impacts of the orchard development, nursery enhancement, upgrading of horticultures centers and other infrastructure development under the project and at the same time, enhance the positive and beneficial impacts of NEP:NAFHA Project. The EMP has been developed as part of the IEE report to avoid, minimize, and mitigate potential negative impacts of the project.

262. The purpose of the EMP is to guide the selection of sites for development, project implementation, and operation and maintenance in accordance with Nepali environmental, health and safety and ADB Safeguard Policy Statement (2009) requirements. To ensure the mitigation measures are implemented, the CPMU and PIU, supported by PISC, will undertake a program of environmental supervision and monitoring during project implementation.

263. The objectives of the EMP are to:

a. Display range of measures to mitigate potential impacts to minimal or insignificant levels;
b. Identify measures that could optimize beneficial impacts;
c. Establish a method of monitoring environmental management practices during all phases of development;
d. Ensure project implementation and operational phases are within the principles of ADB SPS 2009 and national environmental policies;
e. Ensure that the health and safety recommendations are complied with;
f. Propose mechanisms for monitoring compliance with the EMP and reporting thereon; and
g. Specify time periods within which the measures contemplated in the final environmental management plan must be implemented, where appropriate.

## B. Institutional Setting to Implement the Environmental Safeguards

264. The CPMU is responsible for the full compliance of the project with the loan agreement, ADB's SPS, and all applicable laws and regulations of the government. The CPMU will be supported by PIUs to ensure compliance with environmental safeguards stated in this PAM and the IEE report. The CPMU will:

a. Comply with Government of Nepal's environment protection act 2076 and regulation 2077, and other environment-related statutory requirements of the project in a timely manner;
b. ensure environment safeguards sections and EMP are included in bidding documents and contracts;
c. review and approve the construction EMPs prepared by the Contractor/s, when applicable, with the support of PIUs and consultants;
d. ensure the preparation, review, and submission of semi-annual (or as stated on the loan agreement) environmental monitoring reports for disclosure on the ADB's websites;

e. implement effective environmental monitoring during pre-construction, construction, and operation phases;
f. review and approve, for submission to ADB, periodic environmental monitoring reports;
g. inform ADB on any unanticipated environmental impact/s occurred during project implementation phase;
h. participate and/or lead public consultations; and
i. ensure grievance redress mechanism, as envisaged in the IEE and in this PAM, is in place and fully operational from the onset of project implementation. Facilitate the resolution of safeguard related grievance from affected people and other stakeholders.

265. The PIUs (1-6) will:

a. Ensure that the project, and all Contractors, nursery operators, research centers, and matching grant's beneficiaries to obtain permits, licenses, etc. from the government for construction and operational activities;
b. Carry out regular field verification and review environmental compliances by Contractors, nursery operators, research centers, and matching grant's beneficiaries during project implementation, in coordination with the PIU consultants and the focal environmental staff;
c. With the support from the PIU consultants, provide and record environmental observations during any site-visits that may include, but not limited to, excessive dust, loud noises, improper disposal of wastes, chemical/oil spills, camp hygiene, and health and safety;
d. guide beneficiaries on environment safeguards activities, plans and monitoring;
e. With the support from consultants, conduct training and workshops on environmental management, and site induction of all staff and workers[46] involved in the project implementation;
f. Participate and/or lead public consultations and grievance redress mechanism processes; and
g. If there are any unanticipated environment impacts during project implementation, the CPMU, with support from the PISC, will update IEE and EMP, or prepare environmental due diligence report.

266. **Contractor.** The Contractor is the principal agent to implement the EMP and environmental quality monitoring during the pre- and construction stages. Specifically, the Contractor will:

a. Appoint the contractor's environment, health and safety focal person;
b. Obtain necessary environmental license(s), permits etc. from relevant agencies prior to commencement of works;
c. Implement, document and report to PIUs all mitigation measures in the EMP and environmental quality monitoring plan;
d. Ensure that workers and site supervisors participate in all environmental safeguard related training events by the PMU and PIUs;
e. Ensure compliance with environmental statutory requirements and contractual obligations;
f. Participate in resolving issues and complaints from affected people; and

[46] The staff and workers will include all engineers, and staff and laborers of contractors.

g. Implement environmental corrective actions or additional environmental mitigation measures as necessary.

267. ADB is responsible for the following:

a. Review environmental monitoring reports, and disclose the final reports on ADB's website;
b. Explain policy requirements and safeguard covenants in the loan and project agreements to CPMU and PIUs;
c. Monitor implementation of the EMP through due diligence missions;
d. Assist CPMU, if required, in carrying out its responsibilities and in building capacity for safeguard compliance;
e. Monitor overall compliance of the projects to this PAM; and
f. If necessary, provide further guidance to CPMU on the format, content, and scope of the periodic monitoring reports for submission to ADB.

**Table 36. EMP for orchard and vegetable areas development**

| Environmental Components | Potential Impacts | Mitigation measures | Implementation Responsibility | Monitoring Responsibility | Cost |
|---|---|---|---|---|---|
| **Physical Environment** | | | | | |
| Land use | Change in (i) land use at target site and (ii) topography/ terrain | Use screening checklist to identify the orchards that will be planted with fruits and nuts varieties. | Beneficiaries | PIU and PISC | No costing for the mitigation measures.<br><br>To be part of project's safeguard practices. |
| | | No forest areas designated by the government of Nepal will be developed as orchards. | Beneficiaries | | |
| | | Preparing orchard establishment and management plan before land clearing and preparation. | PIU (with PISC) | | |
| | | Consult and seek agreement with local communities on the locations for any temporary nursery in the district or locality. | PIU (with PISC) and beneficiaries | | |
| | | Planting of fruits and nuts will be limited within the farmlands identified for orchard development. | Beneficiaries | | |
| | | During detailed orchard site surveys, identify presence of any unstable land, steep slopes, etc. | PIU (with PISC) and beneficiaries | | |
| | | Planting of nut and fruits will avoid any unstable land | Beneficiaries | | |

| Environmental Components | Potential Impacts | Mitigation measures | Implementation Responsibility | Monitoring Responsibility | Cost |
|---|---|---|---|---|---|
| | | and/or steep slopes. | | | |
| | | Natural slope disturbances will be minimized, as much as possible, during land preparation and site clearing. | Beneficiaries | | |
| | | Limit use of heavy equipment and machineries to minimize further impact on the landscape. Manual labors would be promoted. | Beneficiaries | | |
| | | On the completion of planting nuts and fruits, planting suitable intercrops to minimize land erosion. | Beneficiaries | | |
| | | Schedule land preparation and clearing, and planting of horticulture crops based on the local activities surrounding the target site to avoid disturbance of other farmlands activities. | Beneficiaries | | |
| | | Restore temporarily used sites to at least their pre-project condition following works. | Beneficiaries | | |
| | | Orchard development will | Beneficiaries | | |

| Environmental Components | Potential Impacts | Mitigation measures | Implementation Responsibility | Monitoring Responsibility | Cost |
|---|---|---|---|---|---|
| | | reduce the risk of damage to roads, utilities, structures, drains etc. by minimizing the use of heavy machineries.<br><br>Locate stockpiles away from properties and only in designated areas where no access will be blocked.<br><br>On completion of works restore all temporarily used sites to at least their pre-project condition following works. This will involve cleaning site of any debris or wastes, left over material and soil/rocks/sand | <br><br>Beneficiaries<br><br>Beneficiaries | | |
| Water quantity of surface and groundwater | Decline on the available local water resources | Identify presence of any suitable water sources and confirm if any are used by local communities.<br><br>Seek agreement with local communities to use any community resources (i.e. water supplies) for the drip irrigation.<br><br>Ensure compliance with government policies on the use of water for drip irrigation | PIU and beneficiaries<br><br>PIU and beneficiaries<br><br>PIU and beneficiaries | PIU and PISC | No costing for the mitigation measures.<br><br>To be part of project's safeguard practices. |

| Environmental Components | Potential Impacts | Mitigation measures | Implementation Responsibility | Monitoring Responsibility | Cost |
|---|---|---|---|---|---|
| | | systems in the targeted orchard areas.<br><br>Report any leaks or damage on the drip irrigation to PIU.<br><br>Perform periodic monitoring and maintenance of the drip irrigation system and immediately fix any damage in the water supply. | <br><br>Beneficiaries<br><br>PIU | | |
| Water quality of surface and groundwater | Decline in quality of water or proximate waterbodies | As far as practical, earthworks will be done during the dry season to minimize exposed areas subject to erosion by surface water runoff.<br><br>Promote intercropping to reduce the erosion from exposed lands to elements.<br><br>Maintaining vegetative cover, as much as possible, to minimize direct impacts of raindrops and to impede surface flow.<br><br>Improving soil physical conditions through light and infrequent tillage to prevent crusting and | Beneficiaries<br><br>Beneficiaries<br><br>Beneficiaries<br><br>Beneficiaries | PIU and PISC | No costing for the mitigation measures.<br><br>To be part of project's safeguard practices. |

| Environmental Components | Potential Impacts | Mitigation measures | Implementation Responsibility | Monitoring Responsibility | Cost |
|---|---|---|---|---|---|
| | | increase infiltration and reduce surface runoff. | | | |
| | | Following agricultural practices such as terracing so as to reduce slope length. | Beneficiaries | | |
| | | Management of soil erosion can be done through agronomic/soil management and mechanical measures | Beneficiaries and PIU | | |
| | | Use of mulch to help improve the soil's structure, drainage, and nutrient-holding capacity as they decompose. | Beneficiaries | | |
| | | Periodic application of compost, manure, and some other organic materials to improve the water-infiltration capacity of soils. | Beneficiaries | | |
| | | All orchard development will be done across the contour of the sloping field rather than up and down the slope. | PIU (with PISC) | | |
| | | Provide soil and water management periodic orientations to | | | |

| Environmental Components | Potential Impacts | Mitigation measures | Implementation Responsibility | Monitoring Responsibility | Cost |
|---|---|---|---|---|---|
| | | beneficiaries of the project. | | | |
| Water quality of surface and groundwater | Pollution due to use of chemicals for fertilizer and insecticides | Provide orientations to orchard beneficiaries in adopting nutrient management techniques by applying nutrients (fertilizer and manure) in the right amount, at the right time of year, and with the right method .<br><br>Practice conservation drainage practices to manage water movement on and soils through the guidance from PIU.<br><br>Ensure year-round ground cover to prevent periods of bare ground on farm fields when the soil and nutrients it contains are most susceptible to erosion and loss into waterways.<br><br>Planting of shrubs and grasses along the edges of fields to minimize nutrient loss from fields by absorbing or filtering out nutrients before they reach a water body. | PIU (with PISC)<br><br>PIU (with PISC) and beneficiaries<br><br>Beneficiaries<br><br>Beneficiaries | PIU and PISC | No costing for the mitigation measures.<br><br>To be part of project's safeguard practices. |

| Environmental Components | Potential Impacts | Mitigation measures | Implementation Responsibility | Monitoring Responsibility | Cost |
|---|---|---|---|---|---|
| | | Reduce frequency and intensity of tilling. | Beneficiaries | | |
| **Biological Environment** | | | | | |
| Flora and Fauna | Loss of Vegetation | Cutting trees at the proposed sites will be kept to an absolute minimum and only be permitted when it is obstruction in the planting design and laying of drip irrigation pipes.<br><br>Ensure clear demarcation of the orchard area to avoid encroachment outside the agreed corridor of impact.<br><br>Tree cutting permit is obtained prior to the start of land clearing works where cutting tree cannot be avoided.<br><br>Verify with authorities for any presence of any wildlife of concern within the target areas.<br><br>Before land clearing and/or site preparation, perform a survey of the number and species of trees in order to calculate the compensatory tree replacement. | Beneficiaries<br><br>Beneficiaries<br><br>Beneficiaries<br><br>PIU (with PISC)<br><br>PIU (with PISC) and beneficiaries | PIU and PISC | No costing for the mitigation measures.<br><br>To be part of project's safeguard practices. |

| Environmental Components | Potential Impacts | Mitigation measures | Implementation Responsibility | Monitoring Responsibility | Cost |
|---|---|---|---|---|---|
| | | Trees to be selectively felled are to be identified, species and location confirmed, counted, marked, and harvested manually (i.e. with hand-held equipment) using appropriate forestry techniques to minimize impacts. Details to be reported in periodic monitoring reports.<br><br>Important tree species to be retained as identified by District Forest Office will be marked separately and protected.<br><br>Felled trees recovered after cutting will be handed over for use according to the national laws and regulations. | PIU (with PISC) and beneficiaries<br><br>Beneficiaries<br><br>Beneficiaries | | |
| Flora and Fauna | Disturbance to terrestrial fauna and wildlife conflict | Cutting trees at the proposed sites will be kept to an absolute minimum and only be permitted when it is obstruction in the planting design and laying of drip irrigation pipes. | Beneficiaries | PIU and PISC | No costing for the mitigation measures.<br><br>To be part of project's safeguard practices. |

| Environmental Components | Potential Impacts | Mitigation measures | Implementation Responsibility | Monitoring Responsibility | Cost |
|---|---|---|---|---|---|
| | | Ensure clear demarcation of the orchard area to avoid encroachment outside the agreed corridor of impact. | Beneficiaries | | |
| | | Tree cutting permit is obtained prior to the start of land clearing works where cutting tree cannot be avoided. | Beneficiaries | | |
| | | Verify with authorities for any presence of any wildlife of concern within the target areas. | PIU (with PISC) | | |
| | | Before land clearing and/or site preparation, perform a survey of the number and species of trees in order to calculate the compensatory tree replacement. | PIU (with PISC) and beneficiaries | | |
| | | Trees to be selectively felled are to be identified, species and location confirmed, counted, marked, and harvested manually (i.e. with hand-held equipment) using appropriate forestry techniques to minimize impacts. Details | PIU (with PISC) and beneficiaries | | |

| Environmental Components | Potential Impacts | Mitigation measures | Implementation Responsibility | Monitoring Responsibility | Cost |
|---|---|---|---|---|---|
| | | to be reported in periodic monitoring reports. | | | |
| | | Important tree species to be retained as identified by District Forest Office will be marked separately and protected. | Beneficiaries | | |
| | | Felled trees recovered after cutting will be handed over for use according to the national laws and regulations. | Beneficiaries | | |
| | | Fencing of orchards wherever there is expected animal movement | Beneficiaries | | |
| | | A record of wildlife sighting shall be kept. | Beneficiaries | | |
| | | In case there are wildlife conflict in the area, the farmers will inform immediately the PIU on such occurrence. | Beneficiaries | | |
| | | With the help of local forest department, the PIU will provide awareness on wildlife and habitat protection to farmers. | PIU (with PISC) | | |

| Environmental Components | Potential Impacts | Mitigation measures | Implementation Responsibility | Monitoring Responsibility | Cost |
|---|---|---|---|---|---|
| Flora and Fauna | Disturbance to protected areas | No orchard will be developed without compliance with the requirement of Ministry of Forest and Environment.<br><br>Orchard beneficiaries will comply with the conditions set by Ministry of Forest and Environment.<br><br>Only existing private farmland will be supported for orchards in Annapurna Conservation Area (ACA).<br><br>Ensure that no forest areas and wildlife corridors will be converted into orchard.<br><br>No tree cutting should be done for the orchard development.<br><br>Each of the orchards in the ACA will prepare environment code and approved by the PMU<br><br>Identify any permits and mitigation measures through consultation with ACA and beneficiaries<br>Ensure not to disturb the | Beneficiaries<br><br>Beneficiaries<br><br>Beneficiaries<br><br>PIU (with PISC)<br><br>Beneficiaries<br><br>PIU (with PISC) and beneficiaries<br><br>PIU (with PISC) and beneficiaries | PIU and PISC | No costing for the mitigation measures.<br><br>To be part of project's safeguard practices. |

| Environmental Components | Potential Impacts | Mitigation measures | Implementation Responsibility | Monitoring Responsibility | Cost |
|---|---|---|---|---|---|
| | | movement of wildlife by construction of the movement corridor.<br><br>The registration and consent from the local management committee should be attained prior to development of orchards.<br><br>Monitor orchard development and operations in line with the requirement of the government. | Beneficiaries<br><br>PIU (with PISC) and beneficiaries<br><br>PIU (with PISC) | | |
| **Social Environment** | | | | | |
| Workers | Health and safety risks | Utilize PPE as much as possible.<br><br>Ensure all workers have received appropriate occupational health and safety trainings. | Beneficiaries<br><br>PIU (with PISC) and beneficiaries | PIU and PISC | No costing for the mitigation measures.<br><br>To be part of project's safeguard practices. |
| | COVID-19 Health and Safety Risks | Implement COVID-19 Health and Safety actions such as: physical distancing and hand washing, disinfection<br><br>Ensure all equipment and vehicles used are routinely disinfected.<br><br>Provide briefing on controlling COVID-19. | Beneficiaries<br><br>Beneficiaries<br><br>PIU (with PISC) | PIU and PISC | No costing for the mitigation measures.<br><br>To be part of project's safeguard practices. |

| Environmental Components | Potential Impacts | Mitigation measures | Implementation Responsibility | Monitoring Responsibility | Cost |
|---|---|---|---|---|---|
| | | Conduct awareness on safety to nearby settlements before the start of planting activities.<br><br>Inform the nearby settlements (if needed) on the schedule of planting activities that may pose risks to public safety. | PIU (with PISC)<br><br>PIU (with PISC) | | |

**Table 37. EMP for Drip Irrigation**

| Environmental Components | Potential Impacts | Mitigation measures | Implementation Responsibility | Monitoring Responsibility | Cost |
|---|---|---|---|---|---|
| **Physical Environment** | | | | | |
| Water resources: quantity of surface and groundwater | Decline on the available local water resources | Identify presence of any suitable water sources and confirm if any are used by local communities.<br><br>Seek agreement with local communities to use any community resources (i.e. water supplies) for the drip irrigation.<br><br>Ensure compliance with government policies on the use of water for drip irrigation systems in the targeted orchard areas.<br><br>Report any leaks or damage on the drip irrigation to PIU.<br><br>Perform periodic monitoring and maintenance of the drip irrigation system and immediately fix any damage in the water supply. | PIU (with PISC)<br><br>PIU (with PISC)<br><br>PIU (with PISC) and beneficiaries<br><br>Beneficiaries<br><br>PIU (with PISC) | PIU and PISC | No costing for the mitigation measures.<br><br>To be part of project's safeguard practices. |
| **Biological Environment** | | | | | |
| Flora and fauna | Disturbance to terrestrial fauna | During installation, record of wildlife sighting shall be kept. Any purchase of wildlife parts will be restricted.<br><br>In case there are wildlife conflict in | PIU (with PISC)<br><br>Beneficiaries | PIU and PISC | No costing for the mitigation measures.<br><br>To be part of project's safeguard practices. |

| Environmental Components | Potential Impacts | Mitigation measures | Implementation Responsibility | Monitoring Responsibility | Cost |
|---|---|---|---|---|---|
| | | the area, beneficiaries will inform immediately the PIU on such occurrence.<br><br>With the help of local forest department, the PIU will provide awareness on wildlife and habitat protection to farmers. | <br><br>PIU (with PISC) | | |
| **Social Environment** | | | | | |
| Workers | Health and safety risks | Provide worker training on health and safety.<br><br>PPE to be provided for all workers.<br><br>Ensure all workers have received appropriate occupational health and safety trainings. | PIU (with PISC)<br><br>PIU<br><br>PIU (with PISC) | PIU and PISC | NRs 100,000 |
| Workers | COVID-19 Health and Safety Risks | *Implement a comprehensive COVID-19 Health and Safety protocols such as wearing masks and PPE, physical distancing, hand washing, disinfection, and awareness.<br><br>All equipment and vehicles used are routinely disinfected.<br><br>Provide briefing/training on preventive | Contractor<br><br>Contractor<br><br>Contractor | PIU and PISC | *NRS 400,000 |

| Environmental Components | Potential Impacts | Mitigation measures | Implementation Responsibility | Monitoring Responsibility | Cost |
|---|---|---|---|---|---|
| | | requirements to workers.<br><br>Conduct awareness on safety to nearby settlements before the start of works.<br><br>Inform the nearby settlements (if needed) on the schedule of works that may pose risks to public safety.<br><br>*Provide clear and visible warning and danger signs at and around the work sites. | PIU (with PISC)<br><br>PIU (with PISC)<br><br>Contractor | | *NRs 25,000 |

**Table 38. EMP for horticulture centers upgrading and for infrastructures identified in the matching grant.**

| Environmental Components | Potential Impacts | Mitigation measures | Implementation Responsibility | Monitoring Responsibility | Cost |
|---|---|---|---|---|---|
| **Physical Environment** | | | | | |
| Decline of Ambient Air Quality | Decline of Ambient Air Quality | Vehicles delivering loose and fine materials like sand and aggregates shall be covered.<br><br>*Dust suppression measures like water sprinkling, will be applied in all dust prone locations such as unpaved haulage roads, earthworks and stockpiles.<br><br>Material storage areas shall also be located downwind of the habitation area.<br><br>*Construction vehicles and machineries will be periodically maintained.<br><br>Require construction equipment and vehicles to meet national emissions standards.<br><br>*Regular checks, and maintenance of construction equipment and vehicles to keep them in good working order to meet emission standards.<br>*Cover stockpiles with tarpaulin.<br><br>Locate stockpiles at least 500m from residential property to avoid inconvenience from fugitive dust and ensure they are enclosed by a fence or similar to minimize windblown dust.<br><br>Position any stationary emission sources (e.g. diesel generators, compressors, etc.) as far as practical from sensitive receptors | Contractor (through environment, health and safety officer) | PIU and PISC | *NRs 1,000,000<br><br>*NRs 250,000<br><br>*NRs 250,000<br><br>*NRs 100,000 |

| Environmental Components | Potential Impacts | Mitigation measures | Implementation Responsibility | Monitoring Responsibility | Cost |
|---|---|---|---|---|---|
| | | (houses, schools, clinics, temples, etc.).<br><br>Impose speed limits on construction vehicles to minimize exhaust and dust emissions along areas where sensitive receptors are located (houses, schools, clinics, temples, etc.).<br><br>Trucks importing fill material must be covered.<br><br>Strictly prohibit the burning of wastes generated by project-related activities.<br><br>Ensure workers working in close proximity to or having long exposure to vehicle exhausts and earthworks are provided with clean N95 dust masks to minimize inhalation of particulate matter and other pollutants.<br><br>*Construction air quality monitoring will be carried out per the EMoP | | | *NRs 200,000 |
| Ambient noise and vibration | Increase of ambient noise and vibration levels | Limit the duration of noisy construction activities to daylight hours, whenever possible, in the vicinity of sensitive receptors.<br><br>Workers exposed to high noise levels will be provided with ear plugs.<br><br>The contractors will provide prior notification to the community on the schedule of construction activities.<br><br>Whenever possible, noisy equipment will be completely enclosed which can significantly reduce noise levels. | Contractor (through environment, health and safety officer) | PIU and PISC | No costing for the mitigation measures.<br><br>To be part of project's safeguard practices and construction activities. |

| Environmental Components | Potential Impacts | Mitigation measures | Implementation Responsibility | Monitoring Responsibility | Cost |
|---|---|---|---|---|---|
| | | Any stationary equipment that produce high noise levels (e.g., portable diesel generators, compressors, etc.) will be positioned as far as is practical from sensitive receptors.<br><br>Construction traffic routes will be defined in cooperation with local communities and traffic police to minimize noise and nuisance.<br><br>Vehicle speeds will be reduced around sensitive receptors.<br><br>Temporary noise barriers will be installed along the edge of the road, as necessary, in front of sensitive receptors facing heavy construction activities. | | | |
| Water resources: quantity of surface and groundwater | Decline on the available local water resources | Acquire or ensure validity of permit for the use of water for their operations and comply with the conditions of the government.<br><br>Display information on water management highlighting the practices in use at the facility at places in a highly visible area. | Contractor | PIU and PISC | No costing for the mitigation measures.<br><br>To be part of project's safeguard practices and construction activities. |
| Water resources: quality of surface and groundwater | Decline in quality of water or proximate waterbodies | As far as practical, earthworks during the dry season to minimize exposed areas subject to erosion by surface water runoff.<br><br>*If any surface waterbodies or groundwater sources within 100m, undertake a baseline water quality to confirm the current water quality status at least one week prior to the commencement of any actively on-site. | Contractor | PIU and PISC | *NRS 10,000 |

| Environmental Components | Potential Impacts | Mitigation measures | Implementation Responsibility | Monitoring Responsibility | Cost |
|---|---|---|---|---|---|
| | | Establish dedicated fuel, oil, and chemicals stores on impermeable bunded area to avoid spills and leaks contaminating soil and affecting water quality.<br><br>Avoid storage of fuel, oil, and chemicals in areas ideally within 500m to water sources (surface water and groundwater wells, springs etc.) to avoid direct contamination or contamination through run off, if this is not possible minimum distance is to be 100m.<br><br>Undertake refueling only on areas of hard protected soil, preferably bunded, ideally 500m from water sources (surface water and groundwater wells, springs etc.) but if this is not possible minimum distance to be 100m, with all drainage directed through oil interceptors.<br><br>Undertake construction during the dry season as much as possible to minimize exposed areas subject to erosion by surface water runoff.<br><br>Works over or near watercourses will adopt protection measures to guard against loss of soil that would result in the turbidity of water.<br><br>Minimize soil erosion and surface water runoff by reducing the extent of earthworks, and covering storages of sand and spoil with tarpaulin.<br><br>Do not allow washing of equipment or vehicles near surface water and | | | |

| Environmental Components | Potential Impacts | Mitigation measures | Implementation Responsibility | Monitoring Responsibility | Cost |
|---|---|---|---|---|---|
| | | ensure all washing water is discharged to sedimentation basin and oil interceptor instead of directly to surface water.<br><br>Cement will be stored in rented private storage facilities; enclosed and not exposed to the elements.<br><br>Do not undertake any concrete mixing ideally within 500m of surface water, if this is not possible minimum distance is to be 100m.<br><br>*Provide portable sanitary facilities/toilets and washing facilities for construction workers, so as to avoid surface and ground water pollution. Locate these at least 500m away from surface waterbodies including rivers/ponds and groundwater sources including springs/wells/pumps, away from waterlogged land and shallow groundwater.<br><br>Strict prohibition on open defecation and urination by construction workers; use of pit latrines or toilets for worker camps.<br><br>*Toilets and washing facilities to be connected to existing sewerage system, septic tank (with soak pit) or as portable self-contained units for disposal of wastewater off site to sewage treatment works.<br><br>No untreated wastewater is to be discharged direct to | | | *NRs 200,000<br><br>*NRs 1,000,000 |

| Environmental Components | Potential Impacts | Mitigation measures | Implementation Responsibility | Monitoring Responsibility | Cost |
|---|---|---|---|---|---|
| | | surface water or onto the ground. Water will be treated through available facility such as soak pits or municipal sewage system. | | | |
| Water resources: quality of surface and groundwater | Pollution due to use of chemicals for fertilizer and insecticides | Effluents containing chemicals are not directly discharged into lands and water bodies.<br><br>Use only registered fertilizers and chemicals from government approved sources.<br><br>Laboratory generated hazardous wastes shall be properly treated before its disposal. | Contractor | PIU and PISC | No costing for the mitigation measures.<br><br>To be part of project's safeguard practices and construction activities. |
| Waste management | Generation and inappropriate disposal of inert spoil, solid and hazardous wastes from construction sites and domestic sources | Reuse spoil and other materials for construction purposes.<br><br>Maintain proper material storage system and ensure to control littering of construction materials outside the designated places.<br><br>Stockpiling site of construction materials will be designated at demarcated place.<br><br>*Provide solid waste container inside the construction site.<br><br>Ensure that the labour camps have proper facilities for waste segregation and even for composting of the biodegradable waste.<br><br>Give health, hygiene and sanitation training to workers.<br><br>Provide temporary prefabricated mobile toilets in the construction sites. | Contractor | PIU and PISC | *NRs 50,000 |

| Environmental Components | Potential Impacts | Mitigation measures | Implementation Responsibility | Monitoring Responsibility | Cost |
|---|---|---|---|---|---|
| | | *Separate provision for collection and disposal of hazardous waste, if any, as prescribed by government rule and regulations. | | | *NRs 250,000 |
| Waste management | Generation solid and hazardous wastes from operations | Mandatory separation of organic and non-organic wastes at source<br><br>Apply decomposition methods of organic waste within site<br><br>Recycle non-degradable wastes as far as possible<br><br>Prohibit total disposal along river banks. If landfill site is available, follow all rules and regulations to use them, without causing environmental impacts | Beneficiaries | PIU and PISC | No costing for the mitigation measures.<br><br>To be part of project's safeguard practices and construction activities. |
| **Social Environment** | | | | | |
| Workers | Health and safety risks | Undertake a health and safety risk assessment through a facilitated workshop during the pre-construction survey. The health and safety risk assessment to consider both occupational and community health safety.<br><br>Through the health and safety risk assessment, prepare a Construction Health and Safety Management Plan (CHSMP) including site-specific measures as needed for each construction site addressing both occupational and community health and safety.<br><br>Keep CHSMP as a living document, to be updated as required and re-approved by PIU if any changes in construction methods, | Contractor | PIU and PISC | NRs 2500,000 for measures against health and safety risks |

| Environmental Components | Potential Impacts | Mitigation measures | Implementation Responsibility | Monitoring Responsibility | Cost |
|---|---|---|---|---|---|
| | | site conditions, in response to accident, near miss etc.<br><br>Provide worker training on health and safety and daily/weekly briefings led by site-appointed Health and Safety Officer.<br><br>PPE to be provided for all workers.<br>Ensure all workers have received appropriate occupational health and safety trainings.<br><br>Ensure good housekeeping in the premises at all times, including on construction site, workers camps, storage areas, etc.<br><br>Project area is to be kept neat and tidy, with no trip hazards on the ground e.g. open channels, materials, equipment, trash laying around.<br><br>*Provide clear and visible warning and danger signs at and around the construction and/or planting site.<br><br>*Information board displaying the activities proposed, duration of construction, name and contact number of environmental safety officer of contractor.<br><br>*On completion of works restore all temporarily used sites to at least their pre-project condition following works. This will involve cleaning site of any debris or wastes, left over material and soil/rocks/sand. | | | *NRs 100,000<br><br>*NRs 50,000<br><br>*NRs 300,000 |

| Environmental Components | Potential Impacts | Mitigation measures | Implementation Responsibility | Monitoring Responsibility | Cost |
|---|---|---|---|---|---|
| | COVID-19 Health and Safety Risks | Prepare and implement a comprehensive COVID-19 Health and Safety Guidance Plan following i) following national regulations and health advice, and (ii) international good practice recommendations (see Annex 4 of the NEP:NAFHA Project's IEE).<br><br>The protocols should include requirements on wearing masks and PPE, physical distancing, hand washing, disinfection, checking body temperature, ventilation, management of waste, awareness, and morning briefings.<br><br>Ensure all equipment and vehicles used are routinely disinfected.<br><br>Provide thermometer, soap, sanitizer, disinfectant, PPE at worksite/camp.<br><br>Place adequate washbasins, disinfectant tub, dispenser for sanitizer.<br><br>Provide regular briefing/training on preventive requirements to the workers and post enough COVID-19 awareness posters throughout the worksites.<br><br>Maintain COVID-19 weekly monitoring and reporting mechanism at the worksite, including any necessary actions to be taken. | Contractor | PIU and PISC | NRs 2500,000 for measures against COVID-19 health and safety risks |

## C. Environmental Monitoring Plan for Civil Works

268. Environmental monitoring is an essential component of the implementation of EMP. The environmental monitoring plan (EMoP) is prepared to monitor the implementation performance of EMP. An environmental monitoring plan is focused on the following objectives:

a. Ensure that impacts do not exceed the established legal standards;

b. Review the implementation of mitigation measures in the manner described in the IEE report;

c. Monitor implementation of the EMP;

d. Provide an early warning of potential environmental damage;

e. Check whether the proposed mitigation measures have achieved the intended results, and or/ other environmental impacts occurred

269. Table below presents the recommended environmental monitoring measures for the nursery expansion and horticulture centers enhancement, which includes relevant environmental parameters, with a description of the sampling stations, frequency of monitoring, applicable standards, and responsible agencies. This will be updated during detailed design to ensure EMP and monitoring program is commensurate to the impacts of the contract packages.

**Table 39. Environmental Monitoring Plan for the horticulture center upgrading, nursery expansion and proposed civil works under matching grants.**

| S.N | Field | Stage | Parameters | Location | Frequency | Standards | Responsibility |
|---|---|---|---|---|---|---|---|
| 1 | Air quality | Prior to construction to establish baseline<br><br>Construction phase | $PM_{2.5}$ $PM_{10}$ $SO_2$ $NO_x$ | Work sites | Once in pre-construction<br><br>Once in a season (except monsoons) for the construction period | National Ambient Air Quality Standards, 2003 and WHO standards | Contractor |
| 2 | Noise levels | Prior to construction to establish baseline<br><br>Construction phase | Equivalent day and night time noise levels | Work sites | Once in pre-construction<br><br>Once in a season (except monsoons) for the construction period | National Noise Standard Guidelines, 2012 and WHO standards | Contractor |
| 3 | Water quality | Prior to construction to establish baseline<br><br>Construction phase | TDS,TSS, pH, Hardness, BOD, total coliform, E-coli, total nitrogen, total | Only applicable for construction sites that are nearby water body | Twice a year<br><br>(pre monsoon and post-monsoon) for the | National Drinking Water Quality Standards, 2005 | Contractor |

| S.N | Field | Stage | Parameters | Location | Frequency | Standards | Responsibility |
|---|---|---|---|---|---|---|---|
| | | | phosphorus, heavy metals, temperature, DO, hydrocarbons, mineral oils, phenols cyanide, temperature, | | entire construction period | | |
| 4 | Community and occupational health and safety | Construction phase | Incidence and types of health and safety issues | Work sites | Monthly | Injuries, loss time incidence and fatalities | Contractor |

BOD = Biochemical Oxygen Demand, DO = Dissolved Oxygen, km = kilometer, NOx = nitrogen oxide, PM10 = particles equal to or smaller than 10 microns, PTWs = permit to work, pH = potential of hydrogen, SO2 = Sulphur Dioxide, TDS = total dissolved solids, TSS = total suspended solids.

[a] Depending on what parameters laboratories in Nepal can test or analyze.

## D. Environmental Monitoring Scheme for Orchard and Vegetable Areas Development and Drip Irrigation

270. Self-monitoring checklists will be used for orchard and vegetable areas development and drip irrigation components. The beneficiaries of the orchard development, with support from PISC, will use checklists to document and check the implementation of EMP within the development area during establishment and operation/maintenance phases. The beneficiaries will prepare the checklists with the support from PISC.

271. The first checklist (Annex 5.1) will be prepared only once when the orchard and vegetable areas and drip irrigation are already established in the target sites. For the second checklist (Annex 5.2), it should be prepared every year (within the month of October) that will start from maintenance stage of the orchard and operation of drip irrigation.

## E. Capacity Building

272. Enable the local peoples, farmers and other project staff on Environmental safeguard implementation there may require various measures of capacity building. One of the main activities may be the training and orientation. The trainings, workshop and orientation may be on various forms. The next measure may be the exposure field visit to the area where such project are successfully in operation.

**Table 40. Suggested capacity building for farmers and beneficiaries.**

| Capacity Building Activity | Frequency | Who will be trained |
|---|---|---|
| Training on the Orchard Development and Health and Safety | Twice in a year | Farmers |
| Integrated Pest Management | Once | Farmers |
| Environment and Social Safeguarding Training | Twice in a year | Workers of orchards, CPMU and PIU staff |
| COVID-19 protection and Precautions | Twice in a year | Workers and Farmers |

| Capacity Building Activity | Frequency | Who will be trained |
|---|---|---|
| Multipurpose Nursery Management | Once | Farmers |
| Field Visit of selected Farmers to the successful areas | Once in a year | Farmers |
| Field Visit to the Project related Government staffs | Twice in whole project period. | Management officials |

### F. EMP Budgetary Requirement

273. The following are the activities which are not included in the constructions costs but included in the commitment of the contractor. These costs are for the implementation of the EMP for different components of NAFHA Project.

**Table 41. EMP budget for orchard development**

| Item | Amount (NRs) |
|---|---|
| Endemic Nursery establishment and distribution of Plants | 1,000,000 |
| **Sub Total** | **1,000,000** |

**Table 42. Budget for identified measures for the drip irrigation EMP**

| Item | Amount(NRs) |
|---|---|
| Visible warning and danger signs | 25,000 |
| COVID-19 management | 400,000 |
| PPE | 100,000 |
| **Sub Total** | **525,000** |

**Table 43. EMP for the Research Center Upgrading and Nursery Development Activities.**

| Item | Amount(NRs) |
|---|---|
| COVID-19 Health and Safety | 2500,000 |
| Construction Health and Safety Management Plan (CHSMP) | 2500,000 |
| Collection and disposal of hazardous waste, | 250,000 |
| Provide solid waste container inside the construction site. | 50,000 |
| Excess Water Flow Management | 100,000 |
| Nursery management and shrub plantation | 1000,000 |
| Washing facilities for workers | 1000,000 |
| Toilets and soaked pit | 2000,000 |
| Water quality check | 10,000 |
| Environmental monitoring | 2000,000 |
| Stock piling of the materials | 100,000 |
| Vehicle maintenance and periodically maintenance | 500,000 |
| Dust management through various measures | 1000,000 |
| Display Board | 50,000 |

| | |
|---|---|
| Restoration of sites | 300,000 |
| **Sub-total** | **13,360,000** |

**Table 44. Total EMP Cost**

| **Components** | **Amount (NRs)** |
|---|---|
| EMP for Orchard Development | 1000000 |
| EMP for Drip Irrigation | 525,000 |
| EMP for Resource Center and Nursery Development | 13,360,000 |
| **Sub-total** | 14,885,000 |

## 9. INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

274. The overall findings from key informant interviews (KIIs) reveal that more women than men are working in agriculture, mostly in vegetable farming and most of them are engaged in subsistence farming selling only what is remaining after self-consumption except in Mustang as they have commercial apple faming and have apple block, zone and super zone, while Solukhumbu Solu Dudhkunda has now been declared potato zone.

275. Due to COVID-19 pandemic, more men seem to have taken up farming who were otherwise engaged more in other sectors (tourism, foreign employment, etc.). There are unequal wages between men and women, but this has been attributed to different kinds of agriculture work that men and women do (NPR 100 wage difference as men do heavy in mustang). Women generally do not own land in their own names except in Khotang where Janajati women have land holdings in their name. However, most land holding is less than 4 Ropani. The Thakali community of Mustang are matriarchal society so although land is in son's name there is equal say in decision making.

276. In other districts only some women have land in their own names and even within that it is usually plotted land for housing (Ghaderi). Women are mostly affiliated to cooperatives and are more actively engaged in agriculture. While more men tend to do heavy and less time taking work related to agriculture such as plough the land, use heavy machinery such as hand tractor, spraying chemical fertilizers, while more women do lighter but tedious and time taking work such as weeding, caring for plants/crops, adding fertilizers, obtaining seeds and inputs for farming form cooperatives.

277. Mostly women farmers from Dhading, Khotang, Sindhupalchowk, Syangja and Mustang also go to market to sell their produce, whereas lesser women from far west went to sell their produce (women involved in cooperatives sold themselves) and market linkages were cited as men's work, while women do the production related work. In Achhameven today, women do not use ox-plough to till the land as it is socially not acceptable, but men do it and women can till the land usinghand tools such as kodalo.

### A. Consultation Findings on Farming

278. Most key informants interviewed have said that they have water and irrigation problem in their areas and also linkage to market especially in monsoon. Although the cooperatives are supporting farmers with inputs supplies and encourage farmers to sell their produce, majority of them are farming and selling individually. The women's cooperatives has made farmers to perform group farming and are also linked to market in Syanja.

279. Based on the consultations, the municipality of Solu Dudhkunda in Province 1 has only a single farming season, while Thulung Dudhkoshi has 3 seasons and have more land than those in Solu Dudhkunda. Syanja women farmers are interested in commercial farming, however they do not have funds to invest, and they also need cold storage to prevent fruits from rotting as at present their produce is going to waste due to lack of cold storage facility.

280. There is problem in market linkages, as accessibility is a major problem especially during monsoon for those municipalities which are farther from main market area. Even within the same municipalities, the access to market is different, while different municipalities have different access. For example, the Solukhumbu Thulung and Mapya have problem in accessing market as they are remote and known as the Karnali of Solukhumbu (takes days to walk to district

headquarters) while Solu dudhkunda is near the market and comparatively easily accessible. Simialry Chapakot in Synaja also has problem in accessing market and due to lack of cold storage facilities there produce (fruits) went to waste. Mustang also faced similar problem due to COVID -19 lockdowns that resulted to lack of buyers and inability to store produces due to lack of cold storage facilities.

### B. Consultation Findings on Gender

281. Women have problems in assessing marketplaces if it is far away- women can easily go to market if it is nearby within 15-20 minutes. While negotiating prices, due to gendered norms prevalent in society, women are unable to get good price for the crops/produce and end up taking whatever prices are offered by the shopkeepers. In addition, women have problem also managing time after all household chores. Women are unable to benefit from improved technology such as hand tractor and machinery to spray fertilizers- as those being heavy women are unable to use it and mostly men use it. Women have used some technology like corn-sheller (Makai choadaune) but women end up using the traditional tools and doing the tedious agriculture work which is time taking.

282. There are two types of women headed households (WHHs) – one is under vulnerable while the other is not. WHHs in a chham, Syangja and Dhading are mostly single women or wives of migrant workers, who are not in decision making provisions and are struggling to provide for their farming. Such women households do not have much land and work as daily wage laborers and also produce some vegetables in the spaces around their house to cover their food requirement by producing vegetables. The other types are WHHs of matriarchal societies of the indigenous people in Sindhupalchowk, Mustang and Solukhumu. Such WHHs are empowered and have the authority to make decisions, have property and assets in their name or even if in their son's name- they have decision making abilities.

### C. Consultation Findings on Dalit Caste

283. Dalit's caste groups, as a community in far west, are mostly in settlement of their own. Often the land areas given to them for settlements are less fertile and with no irrigation facility compared to land held by other higher caste groups. While they face water shortages for farming, their settlements are mostly in areas which are prone to flooding during monsoon leading to high risks of landside. Often, Dalits have been found to be use barren land to till and make these areas productive. Once the land starts to give good yield and become fertile from barren after few years, the landlords have ended their lease to Dalit farmers and given to other farmers who can pay higher prices for the lease. Instances have also been given where once dalits start to make profit and do well in leased land, landowners often terminate lease and start their own production. Thus, dalits need special safeguard to be able to benefit from the project

### D. Consultation Findings on Farming Practices and Agricultural Inputs

284. KIIs were national farmers associations, such as Dhading farmer association, National Farmer Group Federation (NGFG), Dalit farmer association and women farmer cooperative representatives have all highlighted that there is need to invest in education of farmers through technical support and inputs and financial support at the beginning. Also, ensure that the seeds and agricultural inputs such as fertilizers are not chemical-based, and promote local traditional making of fertilizers that are cheaper and organic[47]. While NFGF strongly advocated the need for

[47] Easily available in the villages as most farmers have livestock and can get livestock manure as source for fertilizer

locally produced tools, to promote traditional farming tool making by Dalits. Instead of importing to improve livelihood, this will reduce foreign dependency. Others advocated for use of organic manure along with pesticides, given increasing crop damage by insects and pests.

### E. Summary of Findings from Household survey

285. A total of 247 households (HHs) interviewed include 232 farmer HHs and 15 non-farmer HHs. The overall findings revealed that most respondents self-produce and buy from markets to meet food requirement. Majority of them are engaged in individual farming, with some proportion also engaged in informal community farming.

286. There are only several respondents who are currently engaged in commercial fruits and nuts farming, and most are on farming for self-consumption and only selling surplus harvests. Almost 70% of the people interviewed are from the fruit farming. The remaining 30% have no experience on nut and fruits farming activities. Majority of the correspondents are interested to be involved with the project. Through the NEP:NAFHA Project, they will be able to acquire high quality and yielding planting stocks. The project will be able to address the concerns on horticultural production by improving planting materials in the hilly areas and providing skills development among the beneficiaries.

287. The respondents who have less than 1 hectare of land plots have expressed that they can combine land with others farm to make a 1 hectare plot to be eligible for the project. About 84% of the total respondents are willing to cluster their land with other to form an area eligible for the project. Summary of the household interviews are shown in the tables below:

**Table 45. Summary results for the source of income among HH interviewed.**

| *Is your household a farmer household and is agriculture main source of household income?* | | | |
|---|---|---|---|
| **Districts** | **NO** | **YES** | **Grand Total** |
| Achham | 2 | 25 | 27 |
| Bajhang | 3 | 21 | 24 |
| Dhading | 1 | 27 | 28 |
| Humla | 1 | 27 | 28 |
| Khotang | | 26 | 26 |
| Mustang | 5 | 20 | 25 |
| Rukum | 1 | 22 | 23 |
| Sindhupalchowk | 1 | 28 | 29 |
| Solukhumbu | | 8 | 8 |
| Syangja | 1 | 28 | 29 |
| **Grand Total** | **15** | **232** | **247** |

**Table 46. Summary results for the engagement on farming survey.**

| *Are you currently engaged in fruit and nuts farming?* | *Caste/ Ethnicity (# of Respondents)* | | | | |
|---|---|---|---|---|---|
| | *BCT* | *Janajati* | *Dalit* | *Dasnami* [48] | *Grand Total* |
| a. Yes | 70 | 51 | 26 | 2 | 149 |
| b. No | 46 | 28 | 22 | 2 | 98 |
| **Grand Total** | **116** | **79** | **48** | **4** | **247** |

[48] *Giri, Puri and Sanyasi*

**Table 47. Summary results for sources of food for HH survey.**

| *What does your main food contain and how is it being managed?* | *Caste/ Ethnicity (# of Respondents)* | | | | |
|---|---|---|---|---|---|
| | *BCT* | *Janajati* | *Dalit* | *Dasnami* | *Grand Total* |
| a. Mix of grain and vegetables produced in own land | 27 | 14 | 5 | 3 | 49 |
| b. Combination of own produced and bought from market | 84 | 65 | 43 | 1 | 193 |
| f. only rely on market bought | 5 | | | | 5 |
| **Grand Total** | **116** | **79** | **48** | **4** | **247** |

**Table 48. Summary results for the growing crops survey.**

| *How do you grow agri-products? choose one - most common method* | *Caste/ Ethnicity (# of Respondents)* | | | | |
|---|---|---|---|---|---|
| | *BCT* | *Janajati* | *Dalit* | *Dasnami* | *Grand Total* |
| a. Individual household basis | 100 | 57 | 40 | 3 | 200 |
| b. Jointly with community members with informal arrangement. | 12 | 22 | 8 | 1 | 43 |
| d. others | 4 | | | | 4 |
| **Grand Total** | **116** | **79** | **48** | **4** | **247** |

**Table 49. Summary results for the fruits and nuts production of HH survey**

| *Does your household plant or produce Nuts and Fruits?* | *Caste/ Ethnicity (# of Respondents)* | | | | |
|---|---|---|---|---|---|
| | *BCT* | *Janajati* | *Dalit* | *Dasnami* | *Grand Total* |
| **a. Yes** | **72** | **46** | **21** | **2** | **141** |
| a. Only for household consumption | 21 | 18 | 13 | | 52 |
| b. Only for sell | 11 | 12 | 2 | 1 | 26 |
| c. Sell only if there is surplus | 38 | 8 | 6 | 1 | 53 |
| d. others | 2 | 8 | | | 10 |
| **b. No** | **44** | **33** | **27** | **2** | **106** |
| (blank) | 44 | 33 | 27 | 2 | 106 |
| **Grand Total** | **116** | **79** | **48** | **4** | **247** |

**Table 50. Summary results for the location of planting areas of HH.**

| *Where are the land parcel geographically?* | *Caste/ Ethnicity (# of Respondents)* | | | | |
|---|---|---|---|---|---|
| | *BCT* | *Janajati* | *Dalit* | *Dasnami* | *Grand Total* |
| i. adjacent to each other in one location | 34 | 24 | 23 | 1 | 82 |
| ii. scattered in different places | 77 | 49 | 20 | 3 | 149 |
| iii. others- specify | 4 | 3 | 5 | | 12 |
| (blank) | | | | | |
| **Grand Total** | **115** | **76** | **48** | **4** | **243** |

**Table 51. Summary results for the survey on possibility of clustering lands for crop production.**

| *Is it possible to geographically cluster your land with others' land plot to make at least 1 hectare plot for group horticulture farming (bagaicha)?* | *Caste/ Ethnicity (# of Respondents)* | | | | |
|---|---|---|---|---|---|
| | *BCT* | *Janajati* | *Dalit* | *Dasnami* | *Grand Total* |
| **No** | **19** | **14** | **4** | **2** | **39** |
| man | 11 | 7 | 2 | | 20 |
| woman | 8 | 7 | 2 | 2 | 19 |
| **Yes** | **97** | **65** | **44** | **2** | **208** |
| man | 81 | 34 | 30 | 1 | 146 |
| woman | 16 | 31 | 14 | 1 | 62 |
| **Grand Total** | **116** | **79** | **48** | **4** | **247** |

## F. Information Disclosure

288. As per the provision of Nepal's Environment Protection Rules, orchard development in the hilly areas will be required to disclose the IEE in Nepali language after the approval of Terms of Reference (ToR) from the MoALD. The consultation meetings will be held with the local stakeholders, and the minutes of meetings are the prerequisites for the approval of ToR. The IEE will be disclose in each of the municipality under the project in Nepali language.

289. Due to potential government restrictions and COVID-19 risks, adaptive mechanisms can be used to address limitations on public consultations. Surveys and data collection will be conducted through adaptive mechanisms, such as use of online platforms, brochures, questionnaires, and other forms of media as applicable to provide information and receive feedback from the people, beneficiaries, government agencies and other stakeholders. Health and safety may be triggered directly and/or indirectly due to project implementation. Depending on the status of COVID-19, the PMU will put in place measures to manage risks in line with national health protocols as well as the international guidelines.

## 10. GRIEVANCE REDRESS MECHANISM

290. The CPMU will establish and maintain a grievance redress mechanism (GRM) to support the social and environmental safeguards of the project. The GRM will receive, evaluate, and facilitate the resolution of impacted people's feedback, including concerns, complaints, and grievances about the social and environmental performance at the level of the Project. The GRM will aim to provide a time-bound and transparent mechanism to voice suggestions and appreciations and to resolve social and environmental concerns linked to the project. The project specific GRM is not intended to bypass the government's own redress process, rather it is intended to address stakeholders' concerns and complaints promptly, making it readily accessible to all segments of the community, and is scaled to the risks and impacts of the project. Complainant may access the formal legal system at any time.

291. A dedicated multi-tier GRM will be established to receive, evaluate, and facilitate the concerns and complaints of the affected people if any about the social and environmental performance at the project level. The GRM will aim to provide a time bound and transparent mechanism to voice and resolve social and environmental concerns linked with the project.

292. The GRM shall aim to ensure:

(i) The basic rights and interests of every person affected by poor environmental or social performance of the project are protected; and
(ii) Concerns arising from the poor environmental or social performance of the project during the conduct of pre-construction, construction and operation activities are effectively and timely addressed.
(iii) There is zero tolerance on sexual harassment, exploitation, and abuse (SHEA) during all stage of the project.

293. GRM is proposed to be simple, transparent, and responsive. GRM will address only the concerns arising due to the project implementation activities. At the PMU, a centralized control and monitoring system will be established to provide adequate platform for the GRM, and address issues of all the relevant stakeholders of the project (i.e., farmers, local community, contractors, and other members in the value chain). The GRM will ensure that all grievances of all stakeholders, including from women and disadvantaged groups, are addressed within a time-bound and effective manner. The GRM will include service standards and an implementation modality by assigning Grievance Redressal Officer (GRO) at each PIU, and IAs to handle specific matters related to public grievances / complaints flagged to their respective offices.

294. The GRM will establish multiple channels by which grievances can be received by the PMU. These can be broadly classified as – online-services (e.g., Toll-Free Helpline for verbal complaint registration via phone[49] and via the Project web-platform, email) and offline/manual (e.g., mail and drop boxes which are located at all ward and municipality offices in project site, all 6 PIUs and CPMU). For all grievances submitted through online mode, PMU will review for sensitivity and confidentiality, before such complaints will be channelled to the GRO at the PIU and IA levels. All grievances submitted manually at drop box and mailed should be channelled through social safeguard specialist and GESI specialists and must be recorded by them into the GRM online system. In the processing of all grievances, GRO, PIUs, and IAs will follow best practices such as adoption of necessary procedures including acknowledging all grievances and complaints and assigning a central tracking number or ID for all grievances alongside basic

[49] The online toll-free helpline should have recording facility, so affected population can call and record their grievance anytime.

service standards for the response. GRM will also cover handling of unresolved grievances and complaints through a process of escalation. The unresolved grievances will be transmitted to the next higher level – to PMU and then ADB. The PMU will aggregate all grievances to a single consolidated database to monitor the performance of PIUs and IAs and generate aggregate statistics on performance to be publicly disclosed on the project's web-platform. Awareness of grievance redress procedures will be created through the public awareness campaign, with the help of print and electronic media and radio. Redress through the GRM does not impede access to the country's judicial or administrative remedies.

295. To ensure the GRM is in line with the SPS, the GRM will be culturally appropriate and gender responsive, equipped to receive and facilitate resolution of the Indigenous Peoples' concerns. This will be supported through: (i) membership of the indigenous peoples or their representative at the first tier GRM at field/village level; (ii) availability of the GRM form in local/indigenous dialect; (iii) installation of grievance box at all project locations; (iv) and installation of project billboard in the villages with grievance focal person's contact details and procedure on how to file a complaint, including in local or indigenous dialect. The GRM and its objective and functioning will be explained and shared during the initial project information dissemination to all community people, as part of stakeholder communication strategy, which will be continued to be disseminated in the form of public service announcement (PSA) through local radio/FM stations during all phases of the project (Year 1-7).

296. During project preparation, information regarding the GRM will be disclosed as part of the public consultation process. Feedbacks related to the implementation of the project will be acknowledged, evaluated, and responded to the complainant with corrective action proposed. The outcome shall also form part of the semi-annual monitoring report that will be submitted to ADB.

### A. GRM Principles

297. *Based on Stakeholder Rights*. Project stakeholders are those likely to be directly or indirectly affected, positively or negatively, by project activities. Stakeholders have the following rights under the project:

(i) Right to information;
(ii) Right against inappropriate intervention by an outside party;
(iii) Right to a project free of fraud and corruption.

298. *Open and Inclusive.* Any stakeholders (including villagers, contractors, project staff, authorities, and other involved parties) may file a feedback and/or a grievance if s/he believes his/her rights, or if any of the project's principles and procedures, has been violated. Anyone may give comments or suggestions about any aspect of the project. Comments, suggestions, appreciation, or questions should be recorded and submitted to the feedback handling focal points at community, district, and state level.

299. *Transparency.* Information about the GRM, including contact details, will be distributed to all participating communities, at public meetings, through brochures/pamphlets in local languages, posted at ward/municipality boards and, to the extent possible, advertised on local radio and FM stations.

300. *Accessibility.* Different channels can be used for filing feedback, including by letter (using locked mailboxes and drop boxes with signboards in each project community), by phone (toll free hotline), email, social media, project website. Community members and stakeholders themselves

decide on the best ways to file complaints.

301. *Free.* There is no charge for filing an inquiry and/or a feedback.

302. *Anonymity, Confidentiality, and Security.* All feedback, and especially grievances, are treated confidentially. Feedback is disclosed publicly, but the identity of the feedback giver is treated as confidential and is withheld unless they self-identify. Feedback focal points, and members violating this confidentiality are subject to sanctions. All feedback collected via drop box and mail must be opened and recorded by either the GESI specialist/social safeguard specialist with support from feedback handling focal persons at each level (ward/municipality, PIUs & CPMUs)**.**

303. *Quick Action.* A grievance is answered within 15 days from the time the feedback is received. Grievances should be resolved within 60 days of receipt.

304. *Subsidiarity.* Any feedbacks and grievances are addressed and resolved locally, and at the lowest level, if possible. If a grievance cannot be resolved locally, it is sent to a higher level, within 15 days of receipt.

305. *Objective and Independent.* The grievance focal point assigned to handle feedback or resolve a grievance interviews the person who filed the feedback or grievance, documents the actions taken at the location where the complaint originated, and discloses the response or the resolution taken for the case. Serious feedback and grievances, including any allegations related to the misuse of funds, must be reported to the province-level GRM immediately. Designated PMU staff enter agreed feedback action in the project management information system (MIS), and when and by whom action to resolve any grievance was taken. The province-level feedback committee reviews the feedback MIS data monthly.

**B. Process**

306. A GRM will be established with the formation of Grievance Redress Committees (GRC) at three levels: i.e., ward/municipality level, province level and CPMU level.

307. The ward/municipality(community) level GRC will comprise of the:
- (i) Ward chairperson and municipality [50] (Joint chairpersons);
- (ii) ward/municipality feedback handling focal persons (elected by respective groups);
- (iii) Representatives of women and disadvantaged groups including IPs;
- (iv) A selected representative from the affected community;
- (v) A representative from local CBO/NGO or locally elected representative from DAG group (e.g., women dalit member of the ward office);
- (vi) PIU GESI focal person/ Specialist (PIU Feedback handling focal point).

308. The Province level GRC will comprise of the:
- (i) Secretary of MOLMAC/PA and NCFD (PIU)
- (ii) Representative of Ministry of Social Development
- (iii) PIU GESI Specialist (PIU Feedback handling focal point)
- (iv) A representative from local NGOs or a local person of repute and standing in the
- (v) Society or an elected representative.

[50] One representatives of both the ward/municipality will be a woman.

(vi) A selected representative from the affected community.

309. The CPMU level GRC will comprise of the:
(i) Project Director, -Secretary MOALD;
(ii) Secretary, MOF;
(iii) Chief of NCFD;
(iv) CPMU Level Environmental Officer;
(v) CPMU Social Safeguards Officer (CPMU Feedback handling focal point);
(vi) CPMU GESI specialist.

310. All persons involved in project implementation will be trained on how to receive and handle feedback, and how to keep it confidential

311. The grievance handling process will involve five steps: (1) intake; (2) sorting; (3) verification; (4) action; and (5) follow-up and monitoring.

312. *Step 1: Intake.* A grievance can be filed by anyone, and through different means:
(i) Verbal communication to a ward/municipality feedback focal point, and/or designated and trained block or district DOH and DIPH feedback handling officers.
(ii) Using a feedback envelope and the suggestion box placed at each ward/municipality meeting place/office. The elected ward/municipality feedback handling focal person open the feedback box at least every week and send the report to GESI focal person. Each box is equipped with two locks, with one key each held by the ward/municipality.
(iii) Feedback handling officers and with GESI specialist/focal person respectively. Feedback/grievance envelopes from the box must be opened in front of at least two people – e.g., ward/municipality grievance redress officers and Secretaries/ PIU GESI specialists / FP.
(iv) Letters to the MOALD at federal and MOLMAC at province level, ward and municipality offices, and the CPMU at province level.
(v) At meetings and monitoring visits.
(vi) E-mails to dedicated e-mail addresses of the MOALD, MOLMAC and the CPMU and PUIs;
(vii) A dedicated phone line for CPMU and PIUs;
(viii) On each province and municipality government website they must conduct ‘’social accountability" that enables a citizen to lodge a complaint through the feedback form under contact section.
(ix) A dedicated section for grievance handling on project website, also linked to MOALD, MOLMAC and ADB sites

313. Feedback or complaints can be sent at any time to any level (e.g., a grievance can be directed to the ward/municipality, province and central level). If a grievance is related to a community, the complaint is encouraged to report to the province level. If a grievance is related province, it is suggested to report to the CPMU level.

314. At the community level, the elected ward/municipality feedback handling focal persons[51] are the regular primary contact for anyone who wishes to file a feedback/grievance. If an individual prefers, feedback or grievances can be sent to others involved in the project implementation, such as PIU GESI focal person/ specialists or CPMU social safeguard/ GESI specialist.

[51] Elected annually by the members of the respective associations

315. Any staff receiving grievances must complete the project grievance form and submit it without delay to the assigned province feedback handling focal point.

316. At the federal level MOALD, MOF or CPMU staff receiving grievances must complete the project grievance form and submit it without delay to the grievance-handling officer of the PMU.

317. *Step 2: Sorting.* The CPMU Monitoring and Evaluation (M&E) officer will maintain a feedback recording system in the project Management Information System (MIS). Feedback will be divided into eight categories:

- Category 1: General inquiries
- Category 2: Feedback regarding violations of policies, guidelines and procedures
- Category 3: Feedback regarding contract violations/breach of contract
- Category 4: Feedback regarding the misuse of project funds
- Category 5: Feedback regarding abuse of power/intervention
- Category 6: complaints against Sexual harassment, exploitation and abuse
- Category 7: Reports of force majeure
- Category 8: Suggestion
- Category 9: Appreciation

318. The CPMU Social Safeguards specialist will be responsible for categorizing feedback received at the federal level and entering it into the project MIS. The municipality level feedback focal points will categorize feedback received at the ward/municipality level and any feedback referred upwards by ward/municipality chairpersons and enter it into the project MIS. Feedback received at ward/municipality level that can be managed locally will be maintained in ward/municipality records and periodically entered into the MIS by the PMU M&E team.

319. Once a grievance has been received, the relevant feedback handling focal points decide how to handle it, including the timeframe within which the case should be resolved, with a timeframe not exceeding 60 days. Feedback relating to:

(i) a community issue will be handled by the ward/municipality chairpersons. To the extent possible, community feedback/complaints should be addressed at the ward/municipality GRC level, however, the community FHC chairpersons can refer grievances upward to the province GRC;
(ii) a block issue will be handled by the district feedback focal points;
(iii) a province issue will be handled by PIU feedback focal point; and
(iv) Grievances that are of a serious nature (e.g., all allegations of fraud or corruption, and potentially any grievance in categories 2 through 5), the province feedback focal point consult with the CPMU feedback focal point for advice on the appropriate action.

320. If the person filing the grievance is known, the relevant feedback focal point communicates the timeframe and course of action to the complainant within one week of receipt of the grievance.

321. *Step 3: Verification.* The responsible feedback focal point(s) handling the grievance gather facts and clarify information to generate a clear picture of the circumstances surrounding the grievance. At community level, ward/municipality chairpersons, deputy chairpersons or secretaries will assist their respective focal points to verify grievances. Verification normally includes site visits, a review of documents, a meeting with the complainant (if known and willing to engage), ward/municipality Committee members, and meetings with those who could resolve

the issue (including formal and informal community leaders). Feedback related to the misuse of funds may also require meetings with suppliers and contractors and will need to be posted in municipality sites as part of their social accountability process and public hearing/audit.

322. For serious grievances received at the federal level by phone or letter, the CPMU GRC decides whether (i) to launch its own investigation; or (ii) instruct the province and municipal/ward feedback focal points to conduct an initial investigation at the location where the grievance/problem occurred. If the district-level feedback focal points cannot resolve the grievance, it will, within 15 days, be reported back to the CPMU GRC for further action.

323. Within the allotted period, the results of the verification are presented by the respective feedback focal points to the respective GRCs (dependent on the nature of the complaint) for action.

324. At federal and province level, the respective grievance handler fills in the grievance form and submits it to the CPMU M&E officer who enters it into the project MIS.

325. *Step 4: Action.* Feedback from the community level should be handled and recorded in the wards, if possible. For issues that cannot be resolved within 21 days at the community level, the municipality GRC's review these grievances and the results of the verification and determine the action to be taken. If referred to province level, once the needed action(s) are carried out, the province grievance handler fills in a grievance report and enters it into the MIS.

326. If the actions cannot be carried out, or the grievance cannot be satisfactorily resolved in a reasonable period of time (less than 30 days), the province GRC refers the matter back to the CPMU feedback focal point (Social Safeguards specialist) to review the case and determine the action to be taken.

327. If the complainant is known, the feedback focal point with whom the grievance was filed communicates the action to the complainant. The feedback focal point must seek feedback from the complainant as to whether the action(s) are deemed to be satisfactory. If the action is considered unsatisfactory, the complainant may file a new grievance. A new grievance on an existing case is handled at the next higher level from the initial case.

328. The ward/municipality GRC communicates the action taken as a result of a grievance, to community people at the next ward/municipality meeting.

329. *Step 5: Follow-up and Monitoring.* In its regular supervision visits, the CPMU assess the functioning of the province and ward/municipality GRMs and undertakes spot checks.

330. The CPMU uses the MIS to provide a monthly snapshot of the GRM (number and category of comments received, and grievances/suggestions resolved), including any suggestions received and acted on.

331. The CPMU uses the MIS to report on grievances and FHM feedback in its quarterly implementation progress reports, safeguard monitoring reports, and its annual reports. Reports include information on grievance resolution and trends (number of grievances received, cause of grievance, number resolved, average time taken to resolve a grievance, percentage of individuals having filed a grievance who are satisfied with the action taken, number of grievances resolved at the lowest applicable level, etc.).

332. The CPMU and the ADB review grievance monitoring data as part of regular implementation support missions.

333. A review of the grievance handling system (including the grievance of those who have used it) is undertaken during every second year to assess the efficacy of the mechanism and introduce improvements.

334. The decision of the GRCs is binding, unless vacated by the court of law. The affected person, however, is free to access the country's legal system at any time and stage although the project GRM is the preferred route. The GRC will continue to function, for the benefit of the stakeholders, during the entire life of the project.

335. The affected people can also register their grievances on the Government website (province and municipality) under the social accountability section that enables a citizen to lodge a complaint. The project GRM would be supported through this existing government feedback mechanism. However, since these are general feedback sites, the feedback received for this project should be extracted and forwarded to the province GESI specialist for its update into the GRM MIS.

336. People who are, or may in the future be, adversely affected by the project may submit complaints to ADB's Accountability Mechanism. The Accountability Mechanism provides an independent forum and process whereby people adversely affected by ADB-assisted projects can voice, and seek a resolution of their problems, as well as report alleged violations of ADB's operational policies and procedures. Before submitting a complaint to the Accountability Mechanism, affected people should make a good faith effort to solve their problems by working with the concerned ADB operations department. Only after doing that, and if they are still dissatisfied, should they approach the Accountability Mechanism.[52]

[52] For further information see: http://www.adb.org/Accountability-Mechanism/default.asp

## 11. CONCLUSION AND RECOMMENDATIONS

337. Field study and analysis of the environmental aspects of the proposed project shows that the proposed project is not an environmentally critical intervention. The IEE shows that:

(i) The proposed NEP:NAFHA Project and its components are not within environmentally sensitive area. Although the project area lies in Annapurna Conservation Area of Manang and Mustang District, there is the potential impacts are site specific or local in nature where the private land only is the project area, there is no significant risk to the Conservation area due to project activities. However, the project will follow the provisions and requirements not to disturb any environmentally sensitive areas or aspects in its vicinity;

(ii) There will be some negative impacts however the extent of these impacts is expected to be local, confined within the projects' main areas of influence. With the EMP in place, the potential impacts will either be eliminated or minimized to insignificant levels;

(iii) The significance of impacts during construction will be temporary and short-termed (i.e. most likely to occur only during peak construction periods). These will not be sufficient to threaten or weaken the surrounding resources;

(iv) During operation, the orchard and vegetable area management with drip irrigations, nursery seedling productions, research center operation and matching grant components may create minor impacts which can be mitigated through EMP implementation, and good operation and maintenance;

(v) The proposed project will bring: (a) climate resilient fruit and nut production; (b) production and promotion of fruits and nuts in Hilly area; (c) improve the health and hygiene of the farmers (d) enhance the economic condition of the farmers (e) maintain the greenery of the area with environmental benefits;

(vi) Based on the above findings, the classification of NAFHA project as Category B is confirmed. IEE is sufficient for the project.

(vii) IEE will be updated when unanticipated impacts occur during the project implementation. The EMPs will be updated based on the specific condition of the area when the beneficiaries and actual sites are defined.

(viii) Throughout the implementation, environmental safeguard requirements of ADB SPS (2009) and government will be complied by the project through the CPMU and PIU with the support from PISC.

(ix) Environmental clearance under EPA and EPR should be attained prior to farm development.

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# 13. ANNEXES

**Annex 1. Existing orchards in the hilly areas in Nepal.**

Few Snaps of Existing Orchards from Nepal

## Annex 2. List of municipalities and corresponding potential crops.

**Annex 2 - Table 1. Potential area (ha) and top fruits and nuts commodities per municipality in Province 1.**

| District | Municipality | Agricultural Area (Ha) | Top 3 Commodity | Potential Area (Ha) |
|---|---|---|---|---|
| Panchthar | Hilihang | 10,284 | Avocado | 4,621 |
| | | | Orange | 3,159 |
| | | | Lime | 1,742 |
| | Phidim | 8,752 | Avocado | 2,595 |
| | | | Orange | 2,473 |
| | | | Lime | 599 |
| | | | Kiwi | 324 |
| Terhathum | Aathrai | 11,188 | Avocado | 6,035 |
| | | | Orange | 4,482 |
| | | | Lime | 2,050 |
| | Laligurans | 3,628 | Avocado | 1,099 |
| | | | Orange | 233 |
| | | | Lime | 100 |
| | Myanglung | 6,344 | Avocado | 2,890 |
| | | | Orange | 1,621 |
| | | | Lime | 775 |
| | Phedap | 5,898 | Avocado | 2,741 |
| | | | Orange | 2,270 |
| | | | Lime | 802 |
| Dhankuta | Chhathar Jorpati | 6,842 | Avocado | 3,361 |
| | | | Lime | 640 |
| | | | Orange | 185 |
| | | | Walnut | 167 |
| | Dhankuta | 8,096 | Avocado | 4,231 |
| | | | Lime | 801 |
| | | | Walnut | 72 |
| | | | Orange | 127 |
| | Mahalaxmi | 8,960 | Avocado | 3,819 |
| | | | Almond | 695 |
| | | | Orange | 274 |
| | Pakhribas | 10,624 | Avocado | 4,546 |
| | | | Pecan | 1,448 |
| | | | Almond | 1,439 |
| | | | Walnut | 149 |
| Bhojpur | Arun | 12,831 | Avocado | 5,866 |

| District | Municipality | Agricultural Area (Ha) | Top 3 Commodity | Potential Area (Ha) |
|---|---|---|---|---|
| | | | Lime | 28 |
| | | | Orange | 1,488 |
| | Bhojpur | 7,112 | Avocado | 2,510 |
| | | | Orange | 1,601 |
| | | | Lime | 42 |
| | Pauwadungma | 10,005 | Avocado | 4,894 |
| | | | Orange | 1,457 |
| | | | Walnut | 66 |
| Khotang | Halesi Tuwachung | 22,523 | Avocado | 13,850 |
| | | | Orange | 7,142 |
| | | | Lime | 2,243 |
| | | | Kiwi | 200 |
| | Rawa Besi | 6,586 | Avocado | 2,901 |
| | | | Orange | 2,070 |
| | | | Lime | 986 |
| | Diktel Rupakot Majhuwagadhi | 10,451 | Orange | 3,054 |
| | | | Avocado | 2,865 |
| | | | Lime | 532 |
| Okhaldhunga | Champadevi | 6,606 | Avocado | 1,691 |
| | | | Orange | 1,659 |
| | | | Lime | 537 |
| | Manebhanjyang | 9,955 | Avocado | 4,058 |
| | | | Orange | 2,694 |
| | | | Lime | 695 |
| | | | Walnut | 106 |
| | Sunkoshi | 9,983 | Avocado | 2,834 |
| | | | Orange | 1,815 |
| | | | Lime | 658 |
| | | | Walnut | 99 |
| Solukhumbu | Solududhkunda | 6,711 | Kiwi | 237 |
| | | | Apple | 100 |
| | | | Walnut | 100 |
| | Thulung Dudhkoshi | 6,623 | Kiwi | 1,589 |
| | | | Orange | 1,142 |
| | | | Lime | 233 |
| | | | Walnut | 150 |
| | Mapye Dudhkoshi | 4,060 | Kiwi | 1,449 |
| | | | Orange | 298 |

**Annex 2 - Table 2. Potential area (ha) and top fruits and nuts commodities per municipality in Bagmagti.**

| District | Municipality | Agricultural Area (Ha) | Top 3 Commodity | Potential Area (Ha) |
|---|---|---|---|---|
| Sindhupalchok | Chautara Sangachok Gadhi | 12,173 | Orange | 4,918 |
| | | | Lime | 595 |
| | Indrawati | 7,231 | Orange | 3,323 |
| | | | Macadamia | 744 |
| | | | Lime | 508 |
| | Melamchi | 11,635 | Orange | 4,585 |
| | | | Macadamia | 1,493 |
| | | | Lime | 151 |
| Nuwakot | Likhu | 3,876 | Avocado | 2,322 |
| | | | Macadamia | 2,216 |
| | | | Lime | 1,561 |
| | Tadi | 5,147 | Avocado | 2,435 |
| | | | Macadamia | 1,500 |
| | | | Walnut | 200 |
| | Shivapuri | 6,591 | Orange | 2,089 |
| | | | Avocado | 1,785 |
| | | | Macadamia | 853 |
| Dhading | Netrawati Dabjong | 3,951 | Orange | 1,909 |
| | | | Avocado | 1,548 |
| | | | Lime | 203 |
| | Tripura Sundari | 6,366 | Macadamia | 3,315 |
| | | | Avocado | 2,475 |
| | | | Orange | 1,553 |
| | | | Lime | 1,047 |
| | Gajuri | 6,589 | Avocado | 3,015 |
| | | | Macadamia | 2,832 |
| | | | Lime | 1,711 |

**Annex 2 - Table 3. Potential area (ha) and top fruits and nuts commodities per municipality in Gandaki.**

| District | Municipality | Agricultural Area (Ha) | Top 3 Commodity | Potential Area (Ha) |
|---|---|---|---|---|
| Gorkha | Aarughat | 7,979 | Avocado | 3,638 |
| | | | Orange | 3,363 |
| | | | Macadamia | 3,198 |
| | | | Lime | 764 |
| | Palungtar | 12,038 | Macadamia | 8,631 |
| | | | Avocado | 4,702 |
| | | | Lime | 1,903 |
| | | | Orange | 1,881 |
| | Siranchok | 8,549 | Macadamia | 3,709 |
| | | | Orange | 2,817 |
| | | | Avocado | 2,762 |
| | | | Lime | 484 |
| Lamjung | Besishahar | 6,271 | Orange | 2,830 |
| | | | Macadamia | 2,370 |
| | | | Kiwi | 121 |
| | Madhya Nepal | 7,026 | Macadamia | 4,470 |
| | | | Orange | 2,251 |
| | | | Lime | 100 |
| | Rainas | 5,375 | Macadamia | 2,988 |
| | | | Orange | 1,329 |
| | | | Avocado | 981 |
| | | | Lime | 65 |
| | Sundarbazar | 4,872 | Macadamia | 2,867 |
| | | | Orange | 2,033 |
| | | | Avocado | 84 |
| | | | Lime | 5 |
| Tanahu | Myagde | 4,956 | Macadamia | 3,468 |
| | | | Avocado | 1,714 |
| | | | Lime | 1,173 |
| | | | Orange | 545 |
| | Rhishing | 8,556 | Macadamia | 5,912 |
| | | | Avocado | 5,526 |
| | | | Lime | 3,057 |
| | | | Orange | 1,973 |
| Kaski | Annapurna | 5,774 | Orange | 1,148 |
| | | | Kiwi | 561 |
| | | | Avocado | 433 |

| District | Municipality | Agricultural Area (Ha) | Top 3 Commodity | Potential Area (Ha) |
|---|---|---|---|---|
| | | | Macadamia | 79 |
| | Madi | 7,165 | Orange | 3,577 |
| | | | Macadamia | 2,250 |
| | | | Lime | 100 |
| | | | Avocado | 100 |
| | Pokhara Lekhnath | 27,480 | Orange | 11,305 |
| | | | Macadamia | 10,423 |
| | | | Avocado | 734 |
| | | | Lime | 141 |
| Syangja | Biruwa | 6,287 | Macadamia | 3,171 |
| | | | Orange | 3,104 |
| | | | Avocado | 2,495 |
| | | | Lime | 884 |
| | Chapakot | 8,034 | Macadamia | 5,874 |
| | | | Avocado | 5,300 |
| | | | Lime | 2,680 |
| | | | Orange | 1,558 |
| | Galyang | 9,883 | Avocado | 6,400 |
| | | | Macadamia | 6,112 |
| | | | Lime | 3,478 |
| | | | Orange | 2,797 |
| Parbat | Jaljala | 5,495 | Orange | 1,233 |
| | | | Avocado | 917 |
| | | | Walnut | 214 |
| | | | Lime | 92 |
| | Kushma | 7,098 | Orange | 2,834 |
| | | | Avocado | 2,577 |
| | | | Lime | 299 |
| | | | Walnut | 100 |
| | Modi | 6,531 | Orange | 1,648 |
| | | | Macadamia | 434 |
| | | | Walnut | 162 |
| | | | Lime | 25 |
| | Phalebas | 5,323 | Orange | 2,014 |
| | | | Macadamia | 1,300 |
| | | | Lime | 395 |
| | | | Walnut | 100 |
| Mustang | Barhagaun Muktikhetra | 789 | Apple | 517 |

| District | Municipality | Agricultural Area (Ha) | Top 3 Commodity | Potential Area (Ha) |
|---|---|---|---|---|
| | Dalome | 777 | Apple | 546 |
| | Gharapjhong | 385 | Apple | 220 |
| | Thasang | 163 | Apple | 429 |
| | | | Almond | 35 |
| | | | Walnut | 100 |
| Manang | Nashong | 272 | Apple | 137 |
| | | | Walnut | 54 |
| | | | Almond | 42 |
| Myagdi | Annapurna | 4,490 | Kiwi | 769 |
| | | | Walnut | 366 |
| | | | Orange | 177 |
| | | | Apple | 169 |
| | Beni | 5,527 | Orange | 1,693 |
| | | | Avocado | 1,209 |
| | | | Kiwi | 1,182 |
| | | | Walnut | 100 |
| Baglung | Badigad | 8,534 | Orange | 1,406 |
| | | | Kiwi | 1,076 |
| | | | Walnut | 206 |
| | | | Apple | 201 |
| | Dhorpatan | 6,800 | Pecan | 483 |
| | | | Orange | 460 |
| | | | Walnut | 353 |
| | | | Almond | 228 |
| | Galkot | 7,932 | Kiwi | 1,287 |
| | | | Orange | 1,266 |
| | | | Apple | 141 |
| | | | Walnut | 136 |
| | Jaimuni | 8,853 | Orange | 2,963 |
| | | | Macadamia | 1,723 |
| | | | Lime | 616 |
| | Kanthekhola | 6,376 | Kiwi | 1,462 |
| | | | Orange | 630 |
| | | | Walnut | 106 |
| | | | Macadamia | 100 |
| | Nisikhola | 7,498 | Walnut | 760 |
| | | | Orange | 234 |
| | | | Apple | 157 |

**Annex 2 - Table 4. Potential area (ha) and top fruits and nuts commodities per municipality in Karnali.**

| District | Municipality | Agricultural Area (Ha) | Commodity | Potential Area (Ha) |
|---|---|---|---|---|
| Rukum West | Banfikot | 7,922 | Pecan | 2,520 |
| | | | Almond | 1,583 |
| | | | Walnut | 1,487 |
| | | | Orange | 1,379 |
| | Musikot | 5,501 | Pecan | 3,073 |
| | | | Orange | 1,118 |
| | | | Almond | 905 |
| | | | Walnut | 906 |
| | Sani Bheri | 6,000 | Orange | 1,723 |
| | | | Pecan | 1,701 |
| | | | Almond | 706 |
| | | | Walnut | 630 |
| Salyan | Dhorchaur | 6,340 | Pecan | 4,835 |
| | | | Almond | 3,914 |
| | | | Walnut | 1,116 |
| | | | Orange | 1,054 |
| | Sharada | 13,764 | Pecan | 9,135 |
| | | | Almond | 8,015 |
| | | | Orange | 2,538 |
| | | | Walnut | 1,476 |
| Jajarkot | Chhedagad | 16,235 | Pecan | 7,828 |
| | | | Almond | 6,462 |
| | | | Walnut | 3,670 |
| | | | Orange | 3,115 |
| | Junichande | 10,271 | Almond | 5,523 |
| | | | Pecan | 4,610 |
| | | | Walnut | 3,979 |
| | | | Apple | 1,193 |
| Dailekh | Aathabis | 11,652 | Orange | 2,571 |
| | | | Almond | 2,322 |
| | | | Walnut | 1,115 |
| | | | Lime | 213 |
| | Narayan | 7,435 | Orange | 3,315 |
| | | | Almond | 1,683 |
| | | | Walnut | 535 |
| | | | Lime | 261 |
| | Chamunda Bindrasaini | 6,573 | Orange | 3,008 |

| District | Municipality | Agricultural Area (Ha) | Commodity | Potential Area (Ha) |
|---|---|---|---|---|
| | | | Almond | 545 |
| | | | Lime | 148 |
| | | | Walnut | 146 |
| Kalikot | Kalika | 4,012 | Almond | 1,896 |
| | | | Walnut | 1,467 |
| | | | Pecan | 1,220 |
| | Naraharinath | 5,911 | Almond | 2,908 |
| | | | Walnut | 2,144 |
| | | | Pecan | 1,922 |
| | | | Apple | 316 |
| Jumla | Hima | 2,946 | Walnut | 2,208 |
| | | | Almond | 1,604 |
| | | | Apple | 2,206 |
| | Sinja | 2,205 | Walnut | 1,831 |
| | | | Almond | 1,212 |
| | | | Apple | 1,835 |
| | Kanakasundari | 1,518 | Walnut | 895 |
| | | | Apple | 920 |
| | | | Almond | 458 |
| Mugu | Khatyad | 9,266 | Almond | 3,727 |
| | | | Walnut | 3,382 |
| | | | Apple | 3,487 |
| | Soru | 11,334 | Almond | 3,117 |
| | | | Apple | 2,653 |
| | | | Walnut | 1,513 |
| | | | Pecan | 1,593 |
| Humla | Tanjakot | 5,200 | Almond | 2,415 |
| | | | Pecan | 1,597 |
| | | | Apple | 1,771 |
| | | | Walnut | 1,270 |
| | Adanchuli | 6,787 | Almond | 2,485 |
| | | | Apple | 2,476 |
| | | | Pecan | 1,242 |
| | | | Walnut | 1,333 |
| Dolpa | Mudkechula | 3,445 | Almond | 936 |
| | | | Walnut | 821 |
| | | | Pecan | 821 |
| | | | Apple | 537 |

**Annex 2 - Table 5. Potential area (ha) and top fruits and nuts commodities per municipality in Sudurpacschim.**

| District | Municipality | Agricultural Area (Ha) | Top Commodity | Potential Area (Ha) |
|---|---|---|---|---|
| Achham | Bannigadhi Jayagadh | 3,537 | Orange | 1,501 |
| | | | Almond | 805 |
| | | | Lime | 219 |
| | | | Walnut | 216 |
| | Kamalbazar | 7,597 | Pecan | 4,061 |
| | | | Almond | 3,340 |
| | | | Orange | 1,433 |
| | | | Walnut | 1,201 |
| | Mangalsen | 9,718 | Pecan | 2,681 |
| | | | Almond | 2,363 |
| | | | Walnut | 572 |
| | | | Lime | 464 |
| | Panchadewal Binayak | 7,966 | Pecan | 3,032 |
| | | | Almond | 2,877 |
| | | | Orange | 2,274 |
| | | | Walnut | 2,196 |
| | Sanphebagar | 7,138 | Orange | 2,297 |
| | | | Pecan | 2,286 |
| | | | Lime | 1,050 |
| | | | Walnut | 543 |
| | Turmakhad | 9,503 | Orange | 3,188 |
| | | | Pecan | 2,345 |
| | | | Almond | 911 |
| | | | Walnut | 594 |
| Bajura | Budhinanda | 7,448 | Almond | 3,119 |
| | | | Walnut | 2,548 |
| | | | Pecan | 1,683 |
| | | | Apple | 2,063 |
| | Pandav Gupha | 3,871 | Almond | 1,213 |
| | | | Walnut | 1,009 |
| | | | Pecan | 632 |
| | | | Apple | 746 |
| | Swami Kartik | 5,292 | Almond | 2,380 |
| | | | Pecan | 1,801 |
| | | | Walnut | 1,626 |
| | | | Apple | 1,253 |

| District | Municipality | Agricultural Area (Ha) | Top Commodity | Potential Area (Ha) |
|---|---|---|---|---|
| Baitadi | Dasharathchanda | 7,109 | Pecan | 2,962 |
| | | | Almond | 2,802 |
| | | | Walnut | 2,097 |
| | | | Orange | 713 |
| | Patan | 18,669 | Pecan | 10,102 |
| | | | Almond | 8,533 |
| | | | Walnut | 5,643 |
| | | | Orange | 1,445 |
| Bajhang | Chabispathivera | 5,202 | Almond | 2,867 |
| | | | Walnut | 2,847 |
| | | | Pecan | 1,969 |
| | | | Orange | 244 |
| | Masta | 4,372 | Almond | 2,970 |
| | | | Walnut | 2,434 |
| | | | Pecan | 1,559 |
| | Jaya Prithivi | 7,926 | Almond | 3,782 |
| | | | Pecan | 3,177 |
| | | | Walnut | 2,660 |
| | | | Orange | 560 |
| Darchula | Shailyashikhar | 8,467 | Orange | 2,674 |
| | | | Pecan | 1,580 |
| | | | Almond | 420 |
| | | | Walnut | 376 |
| | Lekam | 6,950 | Orange | 2,659 |
| | | | Lime | 851 |
| | | | Pecan | 624 |

**Annex 3. Screening checklist for proposed subprojects to be funded under matching grant**

| Environmental Aspect | Construction phase (Check if True) | During operations (Check if True) | Remarks |
|---|---|---|---|
| **A. Land** | | | |
| Construction/development – Will the construction/development activities cause disturbance to natural habitat? | I | I | |
| Soil Erosion – Will the activity / facility cause direct and massive soil erosion? Will it lead to soil erosion subsequently? | I | I | |
| Land degradation – Will the subproject cause degradation through use of chemicals, overuse of water, removal of top soil etc.? | I | I | |
| Solid waste – Will the subproject generate substantial non-biodegradable solid wastes? | I | I | |
| Toxic wastes – Will the subproject generate any toxic wastes? | I | I | |
| Presence of Eco-sensitive zone – Will the subproject cause loss of habitat to the natural surrounding? Is it located in vicinity of protected and sensitive areas? | I | I | |
| **B. Water** | | | |
| Water Usage –Will it cause water scarcity in adjacent areas? | I | I | |
| Surface Water quality – Will it generate wastes that will deteriorate the surface water quality? Does it involve discharge of pollutants to surface water sources? | I | I | |
| Ground Water quality – Will the project cause seepage of toxic chemicals and wastes into the ground? | I | I | |
| Biodiversity loss – will the project cause deterioration of water sources to the extent of adversely affecting the | I | I | |

| | | | |
|---|---|---|---|
| biodiversity of the adjoining water sources? | | | |
| **C. Air** | | | |
| Emission – Will the project involve emission of GHGs, particularly $CO_2$ and $NO_X$, particulate matter etc.? | I | I | |
| Usage of chemicals – Will the project use chemicals such as refrigerants which cause global warming? | I | I | |
| **D. Flora and Fauna** | | | |
| Will the project lead to loss of any flora – felling of tree, land clearing vegetation? | I | I | |
| If yes, is/ are the specie(s) of flora being endangered, vulnerable or threatened species | I | I | |
| Are there any presence of endangered, vulnerable or threatened species of flora/ fauna? | I | I | |
| Are there any notified Protected Areas, National Parks and Wildlife Sanctuaries? | I | I | |
| Are there any migratory routes of animals and or bird within the project influence zone (500mts)? | I | I | |
| Is there any forest (reserved/ protected/ community forest) area within the project influence zone? | I | I | |
| **E. Climate Vulnerability** | | | |
| Is the project located in drought or flood prone areas? | I | I | |
| Is the project located within critical watershed? | I | I | |
| Will the project be exposed to high temperature increase (including heat-wave)? | I | I | |
| Will the project be exposed to highly intensive rainfall? | I | I | |
| **F. Socio-economic factors** | | | |

| | | | |
|---|---|---|---|
| Does the subproject involve occupational health safety issues? | | | |
| Does the subproject involve health hazards? | | | |
| Does the subproject involve land acquisition? | | | |
| Does the subproject involve loss of the access to sources of income? | | | |
| Does the subproject involve disturbance of residents living near the project area? | | | |
| Does the subproject likely to disturb any physical cultural/ religious resources such as place of worship, sacred grove (sacred tree), graveyards, tribal land, etc.? | | | |
| Does the following receptors come within the subproject influence area – school, hospital, health clinic, market area, etc.? | | | |

**Annex 4. Proposed standard operating procedure for managing COVID-19 Risk at Workplaces prepared by ADB Nepal Resident Mission.**

# Standard Operating Procedure
## for COVID-19 Risk Management at Workplace

Table of Content



**PURPOSE**

The purpose of this SOP is to lay down a clear and systematic prevention, detection, and emergency procedure against COVID-19 viral infection to be followed by the staff and worker of the contractor in the work area including office, worksites, and camps. The procedure is a combination of action, communication, and human behavior and is prepared by following the government guidelines and advice of international agencies such as the world health organization.

**DECLARATION**

This SOP is a supplemental document to the existing environmental management plan and occupational health & safety plan, and in no way is a replacement of the guidelines and requirements laid down by the government authorities. This document is not intended to replace any formalized procedures currently in place for the Contractor. The SOP will comply with all the prevailing legal provisions of the government, authorized international agencies (WHO) and development partner (where applicable).

## I. BACKGROUND

### A. INTRODUCTION

The COVID-19 viral global pandemic started since the beginning of the year 2020. Nepal since 24 March 2020 observed nationwide lockdown to contain the spread of the virus. Although, they decided on 2 April 2020 to progressively resume construction work in important projects by ascertaining a list of mandatory preventive measures in order to protect health and safety of the workers from COVID infection (**Annex 1**).

In order to ensure full compliance with the required preventive and emergency measures, this ***Standard Operating Procedure*** (SOP) for COVID-19 risk management is prepared as a part of the occupational health and safety (OHS) plan of the project by the XXXX (contractor) for implementing construction work in package no. XXX of the XXXX project.

# II. OPENING OF CONTRACTOR'S OFFICE

## A. CLEANING AND DISINFECTING BEFORE OPENING OFFICE

- Designate office cleaning and disinfecting team and schedule
- Supply spraying gun and disinfectant
- Prepare a schedule for disinfection and recording mechanism
- Clean and disinfect workplace, common areas and meeting areas, washrooms / toilets, and frequently touched surfaces
- Set up Hand Washing/Sanitizing Stations
- E al ventilation and sunlight
- Paste awareness notice and signages at all common areas

## B. STAFF MANAGEMENT


- Arrange for health screening of all staff at entrance
- Maintain a folder on personal and medical history of each staff (**Annex 2**)
- Arrange workstation by maintaining physical distancing
- Stagger entry time and work hour
- Minimize face to face meetings, and go for digital solution
- Keep enough waste bins and a collector bin with daily waste disposal arrangements
- Keep informative posters at all suitable places tto keep he staff alert

## C. STAFF BEHAVIOR

### a. *Physical Distancing*


- Avoid handshakes while exchanging greetings
- Maintain at least 1 m physical distance while working, meeting, eating, in lift or in queue
- Follow floor mark to maintain physical distancing
- Adopt digital meeting to the extent possible

### b. *Personal Hygiene*

- Wash hands frequently with soap and water or use 70% alcohol-based hand sanitizer
- Always use facemask in office premises

- Cover mouth with tissue or elbow while coughing or sneezing and dispose in personal waste bin
- Do not spit openly
- Avoid touching eyes, nose, mouth with hands
- Do not share water bottle, dining plate, bowl, spoon, glass and coffee mug
- Regularly disinfect personal items like keys, mobile, keyboards, mouse etc.
- Bring cooked food from home or eat cooked food in office
- Disallow food from outside supplier
- Take food at workstation
- Avoid gathering and social functions


### *c. Meeting Etiquette*

- Avoid face-to-face meetings to the extent possible and use virtual media
- If unavoidable, minimize attendees and maintain physical distancing
- Screen attendees for fever and make use of face mask mandatory
- Disinfect the meeting rooms after and before the meeting
- Keep hot water vending machine with tea bags, sugar and milk powder in sachet, mixing stick and paper cup (all use and throw type)

### *d. Visiting Site or Client's Office*

- Prefer virtual meeting or telephonic call
- Wear facemask and gloves
- Use disinfected company vehicle with sanitized cabins driven by driver wearing PPE
- Use only 40% of the capacity of a vehicle for maintaining physical distancing
- Maintain physical distancing during site observation and inspection
- Use open space to address workers maintaining physical distancing

- **Droplets –**
  - Droplets can be produced during coughing, sneezing or talking.
  - Droplets can travel about 1 m.


- **Direct Contact–**
  - Hugging, shaking hands and then touch eyes, nose or mouth

- **Indirect Contact–**
  - Touch infected door knob, desks, tables, telephones, computers etc.
  - Touch eyes, nose or mouth by infected hand

# III. COMMENCEMENT OF WORK IN CONSTRUCTION SITES

## A. PROCEDURES AT THE ENTRY GATES

- Properly fence the worksite and camp area and guard at all time
- Guards wear prescribed PPEs all the time to prevent from infection
- Guards regularly disinfect themselves by hand washing and sanitizing
- No entry to staff without identification card and the non-essential visitors
- Maintain record of all personnel, visitors and vehicles entering or leaving the site
- Ensure all entering person have measured temperature, washed hands and wore face mask before entry
- Ensure all filled self-declaration form on COVID-19 fitness
- Allow all intermittent/additional workers to enter the site only after showing medical certificate from authorized government hospital issued within the last 7 days
- Maintain physical distancing in queue
- Follow emergency procedure and immediately contact medical center in the camp for any symptomatic case


## B. PREPARATION BEFORE WORK

- Establish medical center with basic facilities and a fulltime health worker near the entrance
- Prepare to conduct daily medical screening (thermal check and symptoms assessment) for all workers
- Issue Photo Identity Card to all workers with unique identification number


- Maintain labor register with personal, health, address and contact number. Prepare a detailed profile of each worker- assigned work, schedule, contract duration
- Establish required number of quarantine and isolation rooms with required facility for emergency situation
- Designate specific worksite (different from regular workers) to intermittent or additional workers for a minimum of 14 days. Supply cooked food to such workers in their cabin to minimize contact
- Insure all workers for COVID-19 test

- Arrange work-shifts in order to avoid crowding of workers
- Prohibit consumption of liquor and chewable like Khaini, Surti, Paan those generate urge frequent spitting inside office and work sites
- Instruct to practice respiratory etiquette, do not spit in open
- Arrange group of cleaning and waste management team working with full use of PPEs

## C. MINIMIZE WORKERS MOVEMENT OUTSIDE THE CAMP

- Discourage workers staying outside camp and take all measures to minimize movement of workers in and out of construction site
- Arrange pick-up and drop-off facility to workers who have to stay outside camp
- Lengthen the term of existing contract to keep workers at site for longer period
- Restrict the resident workers from leaving camp for non-essential purposes
- Avoid workers meeting their family and friends while staying in camp
- Restrict mixing of local labors with resident labors by work distribution and restriction on gathering
- Supply all required groceries, vegetables, food items, medicine and other essentials for workers at the labor camps. Do not allow workers to move out of their camp or work site for any nonessential purposes
- Arrange recreation facility within camp

## D. CHECK THE WORK SITE AND DISINFECT PLANT AND MACHINERIES

- Employer validates the site-specific SOP arrangements prior to start of work
- Segregate construction site for different team of workers for physical distancing
- Prepare disinfecting plan for work area, tools and equipment, plant and machineries
- Disinfect door handles, railings, ladders, switches, controls, shared tools and equipment, taps, toilets, and personal work areas at least twice a day based on established schedule
- Install disinfection tunnel, if possible and rational, and disinfect all plant & machineries, vehicles and tools before use, upon change of user, and regularly as per the schedule
- Keep record of the schedule of cleaning and disinfecting
- Provide regular orientation to workers on disinfection procedure and importance
- Place awareness materials on COVID-19 safety and guidelines for personal behaviors at work area

Individual flyers describing SOP for implementing specific type of work can be added here as 2 C. 1.; 2 C. 2. and so on. Such work may include trenching and pipe laying in high density area, work in tunnel, work at sewerage area, quarry site, crusher and batching plant, transmission line, major construction sites, survey and community consultation.

## E. MANAGE DELIVERY ZONES

- Organize separate team of skilled staff to support in material load/unload in delivery zones
- Admit incoming vehicles and material in the project site after disinfection such as spraying or passing through disinfecting tunnel, as appropriate and effective
- Park delivery vehicle at designated safe and separate delivery zones with limited access to others
- Disinfect the material with 1% sodium hypochlorite solution before handling
- Keep disinfected materials untouched for at least 24 hours before handling
- Ensure drivers wash hand before entry, wear mask and remain inside vehicle
- Ensure workers use full set of PPEs while handling material
- Ensure workers wash their hands before and after work
- Do not exchange anything between the deliverer and the receiver, including documents for signing. Use own pen for signature

## F. PERSONAL PROTECTIVE EQUIPMENT

- Supply PPE to all worker based on type of work
- PPEs may include face mask, gloves, hard hat, safety boot, eye protection, face shield and body cover, as required based on nature of work
- Do not share PPEs, mobile, keys, utensils and working tools with fellow workers
- Wash PPEs left behind by out-going workers by soaking them in detergent for 24 hours and kept dry for at least a week before re-use
- Assign group of workers responsible for washing and disinfecting PPEs

## G. MANAGE WORKERS ACCOMMODATION

### *a. Camp Arrangement*

- Fully secure labor camp by fencing and guarding
- Provide required number of entrance and exit to avoid congregation
- Arrange enough quarantine and temporary isolation tent in the camp away from regular workers cabins
- Construct the line of shelters within camp area by maintaining 4m distance
- Keep accommodation area clean, well-drained, dry and hygienic
- Regularly wash clothes, bed sheets, pillowcases, garments of the workers using detergent if possible in warm water (arranging solar or electric heater) and dry in direct sun light
- Ventilate each room in the camp for at least 3 hours a day
- Do not accommodate more than 4 persons in a room by maintaining minimum 2m distance between beds
- Avoid bunk beds and maintain at least 1-2 meter for sleeping arrangement
- Disinfect the camp area twice a day and rooms once before worker enters after work
- Keep record of the schedule of cleaning and disinfecting
- Advise workers to keep their waste in personal waste bin and dispose in a common collector for removal by garbage truck without entering camp area
- Keep awareness posters and notices around camp

### b. *Kitchen and Dinning*

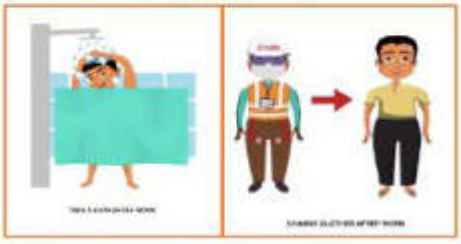
- Arrange dedicated kitchen and dining area with impervious and raised floor, drained, well ventilated, clean and dry
- Disinfect and clean the kitchen and dining at the end of each break and shift
- Arrange daily screening and health check of the cooks and helpers
- Cooks and helpers shall wear masks and hand gloves, and maintain physical distancing while cooking and serving food
- Arrange dining tables and chairs at proper physical distancing and limit number of persons eating at a time to maximum 10
- Clean the dining tables and disinfect between each use
- Arrange chairs not facing each other
- Supply all food and provisions in the camp
- Keep hand washing facilities or hand sanitizer at the entrance of dining
- Keep automated water taps in the dining room and disinfected regularly
- Encourage workers to keep personal set of eating cutlery
- Put all waste in a waste bin with lid and do not leave for someone to clean
- Conduct regular inspection of the kitchen/dining area and take corrective measures

### c. *Toilets*

- Give special attention to washrooms/toilets by routine cleaning, swabbing, disinfecting, and keeping them dry at least twice daily
- Place soap solutions/ hand sanitizers/ paper towels and replenish regularly
- Promote using automatic soap dispenser and hand dryer
- Disinfect walls/ doors/ windows and all fittings in washrooms and clean thoroughly each time while disinfecting
- Keep automatic taps with sensor or automated using a foot pedal


source of photo: businessinsider.com

- Place enough garbage bins with regular removal and disposal arrangement
- Inspect and verify the entries in the cleaning & sanitization register by EHSO
- Keep sign boards for DO's and DON'T's in hand washing and sanitizing area



### d. *Changing Facilities and Showers*

- Establish a system for workers to change into standard working attire at the time of commencement of duty and change back to regular clothes after taking shower when duty ends
- Arrange clean changing and shower area
- Keep the area disinfected before and after use

# IV. EMERGENCY PROTOCOL

## A. PREPAREDNESS FOR EMERGENCY

- Establish a *Medical Center* near the entrance with a fulltime service of a Health Worker also trained in handling COVID-19 patients
- Supply medical PPEs to the health worker, guard at entrance, and waste handling staff
- Establish sufficient number of Quarantine (10% of total number of workers) within camp at sufficient distance from the regular shelters in the camp
- Establish few temporary *Isolation Tents* at required distance from the Quarantine Area for emergency use
- Keep an ambulance/dedicated vehicle standby with partition between driver and passengers seats and driver wearing full set of medical PPE
- Keep list of government accredited hospitals for COVID treatment along with doctor's name and contact number at visible locations such as entry/exit points of work sites/office and the camps
- Establish a system of mandatory health screening of all staff, workers and visitors at the entrance
- Do not allow person with COVID-19 Symptoms to enter the worksite and advise to urgently seek medical attention
- Conduct periodic mock drill of activating emergency protocol

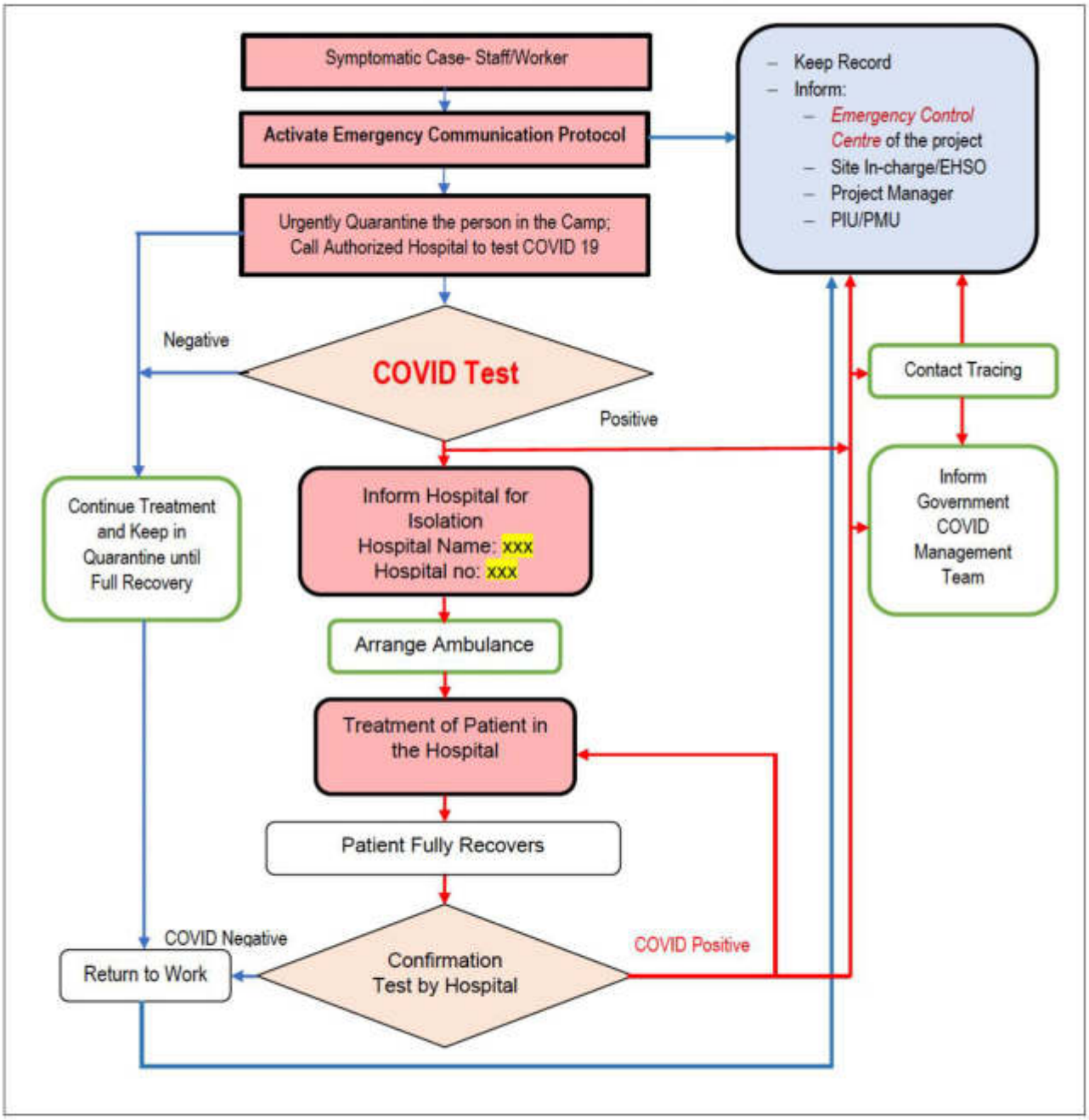
## B. EMERGENCY PROTOCOL FOR SYSMPTOMATIC CASE

Establish an emergency protocol to manage symptomatic case (**Figure 1**):

- A staff or worker should immediately contact the Medical Center in case of following symptoms:
  - *Fever more than 100.4 Degree Fahrenheit*
  - *Cough, runny nose, sore throat*
  - *Shortness of breath*
  - *Weakness, body ache*
  - *Headache*

- The Health Worker provides treatment if the symptoms are not of COVID-19 infection, and informs *COVID Marshal* to keep the worker under close observation
- *COVID Marshal* will monitor the health condition of the person and inform EHSO and Medical Center if the condition of the person does not improve within a given time
- The Health Worker will urgently inform EHSO if condition of a person does not improve
- The symptomatic person is transferred temporarily to the Isolation Area
- The COVID Rapid Response Team will call the designated hospital for COVID test and start treatment under doctor's guidance in the Isolation Area

**Figure 1. Emergency Protocol**




- Trace all persons who came in contact with the sick person and keep them in quarantine for at least 14 days

- Move the person and others back to camp if the test result of the symptomatic person is found negative
- If the test result is fond positive, use project ambulance to transfer the person to the designated hospital for treatment
- Ensure ambulance is disinfected before and after every use and driver and helpers use full set of medical PPE
- Disinfect the isolation area used by the infected person
- Conduct COVID test for all persons having contact with the infected person
- Allow the person to return to work only after S/he is confirmed to be COVID free by the hospital

## C. MANAGEMENT OF QUARANTINE IN THE CAMP

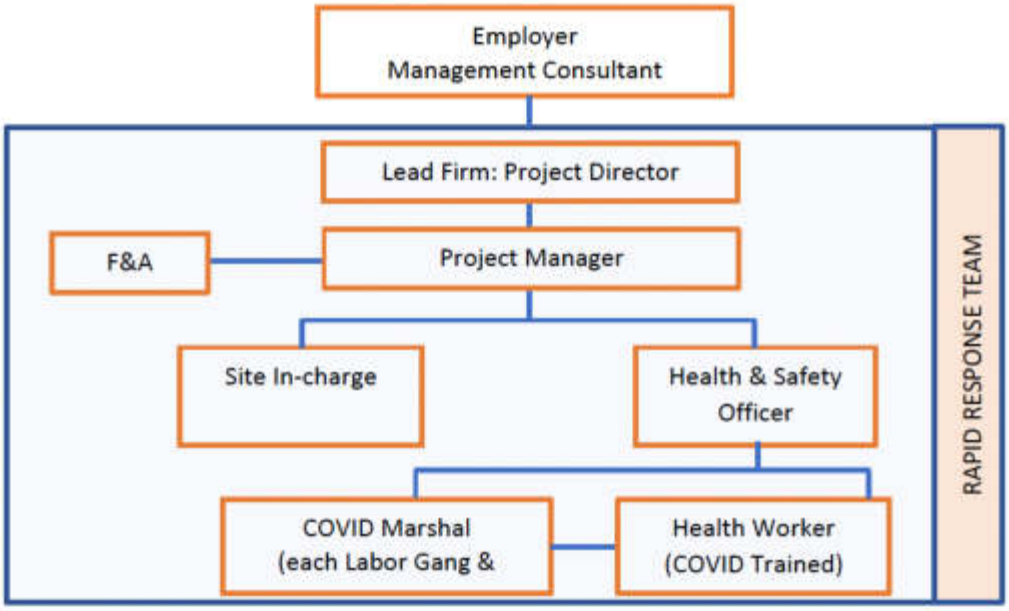
- Follow government issued quarantine management guidelines
- Arrange sufficient and separate gender friendly quarantine area with separate toilet for men and women
- Maintain the room well ventilated with enough sunlight
- Do not allow the quarantined person to go out of the designated area
- Provide nutritious diet and warm water to the quarantined persons
- Do not share items used by the quarantined person with other workers
- Self-disinfection of all used items in the quarantine at least three times a day
- The caretaker will compulsorily wear full set of PPEs while taking care of the quarantine and isolation area
- Regularly check temperature (at least thrice a day) and keep record of the quarantined person's health condition by the health worker
- The patient's kin should be immediately informed if the patient experiences breathing difficulty, chest pain or face & lips turning blue
- Seek support of hospital for periodic inspection of arrangements and validate if the arrangements in the workplaces and camp are sufficient to manage COVID risks

# V. SOP IMPLEMENTATION, MONITORING AND REPORTING

## A. SOP IMPLEMENTATION ARRANGEMENT

Following institutional arrangement will be established for implementation of SOP:

**Fig. 2. Contractor's Institutional Arrangement for Implementing SOP**




- **EHSO:** Contractor will assign an Environment and Health & Safety Officer (EHSO) with clear authority and access to resources. The EHSO shall be accredited in occupational health and safety or have at least 5 years of equivalent experience in implementing and monitoring OHS in construction projects

- **COVID Marshal:** A lead worker in each labor gang and camp assigned to coordinate and report any potential symptomatic case

- **Health Worker:** A fulltime certified Health Worker (HW) assigned at Medical Center. The HW will be trained in COVID case handling procedure

## B. SOP MONITORING AND REPORTING

- Prepare standard SOP compliance monitoring checklist and health screening register
- Prepare a simple template for bi-weekly SOP reporting (**Annex 3**)
- Develop automated COVID Compliance Management Information System (if possible)
- Maintain digital record of all COVID-19 management and SOP compliance activities

- F&A, site engineer and EHSO regularly inspect, check the register, verify compliance, ensure sufficient stock of supplies of PPE and disinfectants, and take corrective measures
- Ensure employees strictly follow SOP compliance requirements
- Zero tolerance to casual attitudes by workers (in terms of maintaining distance, wearing masks, maintaining hygiene and overall SOP implementation measures)
- Take disciplinary actions on the worker and employees who willfully violate the prevention and precautionary norms by issuing warning and financial penalty
- Remove the worker from work if they continue to violate rules even after second warning
- Check option of installing CCTV cameras in key work locations for distant monitoring
- Prepare and submit bi-weekly COVID-19 SOP implementation report in the agreed format (**Annex 3**)
- Periodically brief the local government and government health agencies, as needed on SOP implementation

# VI. AWARENESS AND TRAINING

## A. WORKERS AWARENESS

- The HSO shall meet at least twice a week with Engineer to share latest developments, and weekly discuss with the workers about the prevalent situation in the construction site, potential risks and corrective actions to be taken
- Provide information on how camp facilities shall be kept free of contamination
- Seek suggestion from staff and workers and try to remove misinformation, not to panic and not to believe or spread rumors
- Organize monthly COVID prevention awareness program and drill at work places
- Place pandemic prevention brochure, banner and digital boards in the camp and work sites preferably in local language
- Dedicate 10 minutes for pandemic prevention and control awareness during daily-toolbox-talk before start of work.
- Workers are informed to urgently report to their COVID Marshal if they feel sick
- Do not stigmatize workers in quarantine, COVID infection or recovered persons. Establish system of zero tolerance for this by any other workers or management

## B. PUBLIC AWARENESS

- Organize monthly pandemic prevention awareness program to the community of work sites using various means of distant communication
- Distribute pandemic prevention brochure and posters in the community

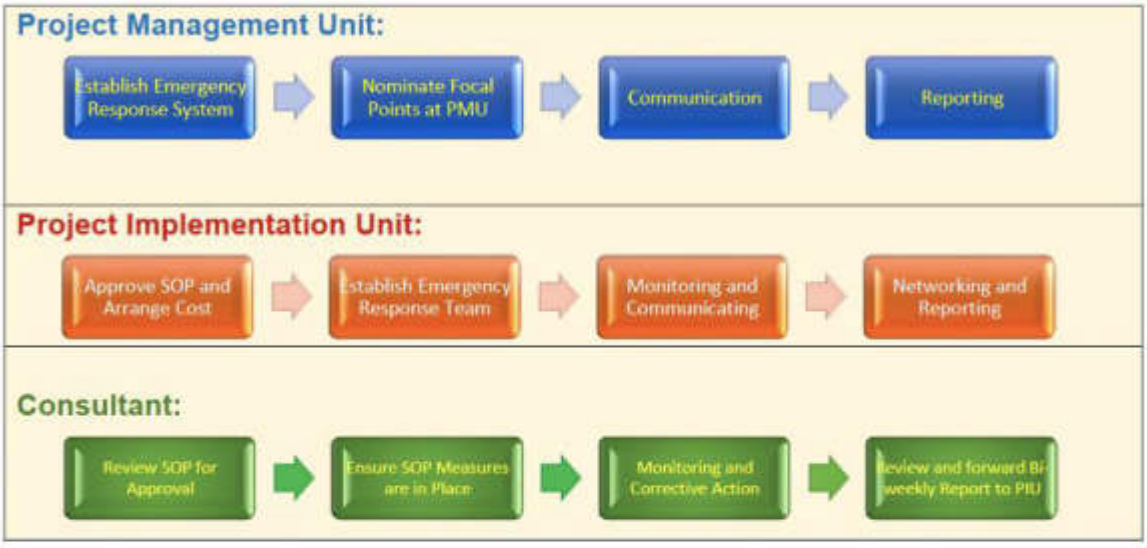
## C. TRAINING

Targeted training for emergency response team, staff, frontline supervisors will be provided on COVID-19 risks and control measures. Type, number and duration of training will be defined during preparing project-specific SOP.

- Strategy adopted for COVID-19 risk management
- Isolation, containment, treatment of symptomatic worker
- Emergency procedure to follow during suspected cases of COVID-19
- Updates released by government and other international agencies like WHO
- Handling myths, misconceptions, misinformation and rumors related to COVID19
- Specific roles & responsibilities related to COVID-19 response
- Promoting self-hygiene & respiratory hygiene
- Specific roles & responsibilities related to trigger COVID-19 emergency procedure

# VII. ROLE AND RESPONSIBILITY

## A. EMPLOYER




## B. CONTRACTOR

**Management of the Lead Firm:**

- Take full ownership to implement the SOP
- Arrange necessary resources in agreement with Employer

**Project Manager:**

- Finalize SOP with staff, material and budget for implementation and seek PIU approval
- Establish communication with the local hospital serving COVID patients
- Collect field monitoring information and submit bi-weekly report to PIU

**Site In-charge:**

- Ensure all SOP requirements are fully followed by workers
- Give daily tool-box-talk to workers also informing COVID prevention and emergency procedure
- Ensure workers are using PPEs and maintaining required behavioral practices for COVID prevention
- Undertake emergency protocol on any suspect case
- Fill SOP compliance checklist for bi-weekly monitoring report and submit to PM

### Health and Safety Officer (EHSO):

- Maintain daily labor register on health screening and personal information collected at entrance and medical center
- Prepare SOP monitoring checklists and help project manager establish safety protocol
- Maintain medical and travel history of staff and worker
- Orient staff and workers on COVID-19 risk management and SOP requirements regularly
- Ensure sufficient stock of PPEs and stand-by ambulance at site
- Ensure quarantine and isolation area within camp are always in ready condition
- Prepare bi-weekly report of SOP implementation

### COVID Marshal (1 worker in a gang of maximum 25 persons working at a time):

- Daily monitor workers' health status and monitor workers use PPEs as required
- Monitor workplace frequently to ensure physical distancing is maintained at work
- Daily report to Site In-charge

### Finance and Administration Section (F&A):

- Manage regular housekeeping, sanitization, and fumigation of office, camps and other work premises
- Supply essential PPEs, sanitizers, water and soap, ration, medicines and other basic daily need items to the camp and offices

## VIII. COST OF SOP IMPLEMENTATION

The Employer shall discuss implementation of the SOP for the COVID-19 risk prevention, control and mitigation at worksites with the contractor on the basis of the provisions of the contract agreement. They will agree which activities will be inlcuded under unanticipated impacts and borne by contractor and which activites will be reimbursed by the Employer. No costs related to or incidental to COVID-19 prevention shall be charged to the workers. All staff and workers shall be insured for medical needs including COVID-19 treatment.

**Agree with Employer on the cost of test required for the COVID-19 test on workers**

## REFERENCE

We acknowledge the following documents, which were referred and information transferred while preparing this SOP.

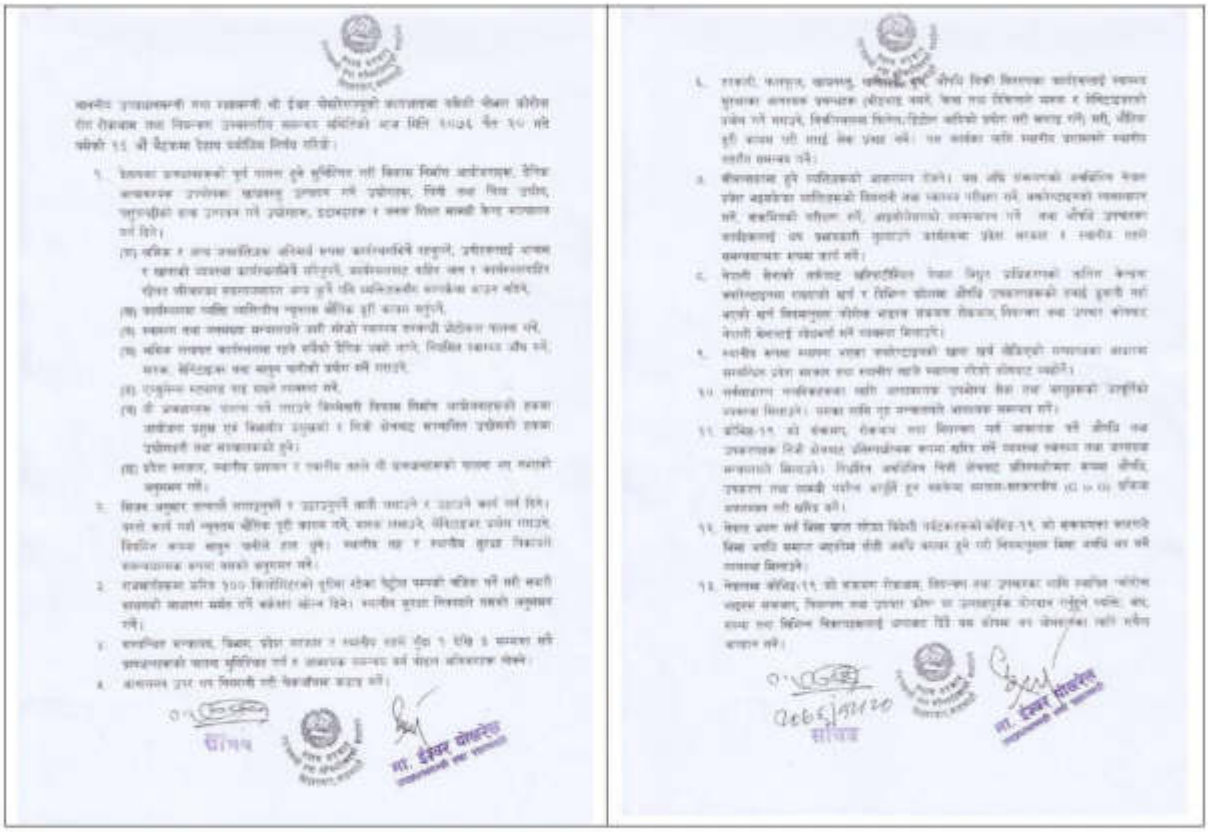
### A. Guidelines/Guidance Note/Instructions:


1. Guidelines & Standard Operating Procedure (SOP) for Resumption of Regular Works at various NCRTC site offices and construction sites after and during COVID-19 in Delhi-Meerut Rail Project, NCRTC, India, 23 April 2020
2. Getting your workplace ready for COVID-19, World Health Organization, 19 March 2020
3. SAUW, ADB Guidance on Working Safely from Infectious Diseases (COVID-19)
4. MHURD, China- Notice for quality and safety management on COVID-19
5. Health and Safety Guidelines for Sri Lankan Construction Sites to be adopted during COVID 19 outbreak, Construction Industry Development Authority, Ministry of Urban Development, Water Supply and Housing Facilities, Government of Sri Lanka, 29 April 2020
6. ESF/Safeguards Interim Note: Covid-19 Considerations in Construction/Civil Works Projects, The World Bank, 7 April 2020


### B. Standard Operating Procedure for COVID-19 Risk Management


1. KUKL PID, COVID-19: Standard Operating Procedure (SOP), June 2020
2. Standard Operating Procedure (SOP) for Execution of Works During Lockdown Period, Bangalore Metrorail Corporation, India
3. KEC/RPG, Post Lockdown Start Up Procedure for Covid-19, Tanahu Hydropower Project, 15 April 2020
4. Energy China, COVID-19 Site Specific Management Plan, Moragolle Hydropower Project, Sri Lanka, 4 May 2020
5. Post Health Hygiene and Safety Plan, Sinohydro Corporation, Tanahu Hydropower Project
6. COVID-19 Response: Health and Safety Protocol for Labour Remobilization, Health and Safety Protocol for Labor Remobilization Phuncholing-Chamkuna Road, SASEC Transport, Trade Facilitation and Logistics Project, Dainichi Consultant Inc/PRSC, The Royal Government of Bhutan, 1 May 2020
7. Eastern Dedicated Freight Corridor –CP 303: Standard Operating Procedure Managing Risks from COVID 19 & Restarting Operations After Lockdown, Larsen& Toubro/SYSTRA, India
8. Health and Safety Plan (H&SP) – Taking Maximum Precaution during COVID-19, Karnataka Urban Infrastructure Development and Finance Corporation Limited (KUIDFC), Bengaluru, India, 14 April 2020
9. COVID 19 OUTBREAK – Submission of SOP for Approval to Resume Project Work, New Gravity Sewers, Force Mains and Pump Stations for Kirulapone Catchment Area, Colombo, Sri Lanka, 28 April 2020
10. SOP and Guidelines for Construction Sites for COVID-19 Outbreak, Laying Bulk Distribution System and Service Reservoirs, Package 1 under PID, JITF Water Infrastructure Limited, India
11. Preparedness and Contingency Plan for COVID-19- Report (Jan-Mar 2020), 118 MW Nikachhu Hydro Power Project, Bhutan

## Annex 1: High-level Novel Coronavirus Disease Prevention and Control Coordination Committee Decision of 2 April 2020



Un-official Translation of 2 April 2020 Government Instruction:

The following decision has been taken by the 16th meeting of High-Level Coordination Committee for the Prevention and Control of COVID-19 chaired by Deputy Prime Minister and Defense Minister Ishwar Pokharel.

1. Ensuring the compliance of following provisions, allow to operate development projects, industries related to daily essential consumable goods, sugar and tea industries, feed industries, brick industries and Janak Education Material Center.
    a) Labor and other personnel must remain inside workplace, accommodation and meals for them to be arranged in the workplace; do not allow to go out from the workplace and have contact with anyone outside workplace including family members.
    b) Maintain minimum physical distance in the workplace.
    c) Comply with protocol related to health issued by the Ministry of Health and Population.
    d) Temperature/fever check of labors and other personnel on daily basis, regular health check and use of mask, sanitizer and sop water (for hand washing).
    e) Arrangement of standby ambulance.
    f) The responsibility for compliance of these provisions is of project chief and concerned department chief for development projects and of industry owners and board of directors for industries being operated by private sector.
    g) Province, local administration and local level government will monitor if these provisions have been followed.
2. Concerned ministries, departments, provincial governments and local governments to appoint nodal officer to coordinate and ensure the implementation of decision 1…..

Ishwar Pokharel, Dy. Prime Minister and Defense Minister

**Annex 2: Sample Health Checklist 1: COVID-19 Surveillance Checklist for Workers**

Date:
Name:
_____
Home Address:
_____
Current/planned residence:
(Please check one) Camp: ☐
Rent: ☐
Phone No:
_____

**Temperature:**

Sex: _____ Age: _____

**If official, fill-in company details below**

| | | Yes | No |
|---|---|---|---|
| 1. Are you experiencing: | a. Sore Throat | ☐ | ☐ |
| | b. Body Pains | ☐ | ☐ |
| | C. Headache | ☐ | ☐ |
| | d. Fever for the past few days | ☐ | ☐ |
| 2. Have you worked together or stayed in the same close environment of a confirmed COVID-19 case? | | ☐ | ☐ |
| 3. Have you had any contact with anyone with fever, cough, colds and sore throat in the past 2 weeks? | | ☐ | ☐ |
| 4. Have you travelled outside of the country in the last 14 days? | | ☐ | ☐ |
| 5. Have you travelled to any city within the country? Specify: _____ | | ☐ | ☐ |

I hereby authorize [name of establishment], to collect and process data indicated herein for the purpose of effecting control of the COVID-19 infection. I understand that my personal information is protected by the law and I am required to provide truthful information.

| | |
|---|---|
| Name and Signature | |
| Date Signed | |
| Noted by: | |

## Annex 3: Sample Structure for Bi-weekly Report

1.0 Reporting period

2.0 Implementation of SOP

- 2.1 Formation of emergency response team and communication protocol
- 2.2 Total number of staff in office and their health status
- 2.3 Total number of workers in construction and their health status
- 2.4 Camp size and facilities including quarantine and isolation rooms and their quality
- 2.5 Distribution of disinfectant and PPEs to staff and workers and stock available
- 2.6 Arrangement of food in camp and workplaces
- 2.7 Installation of handwashing and sanitization stations in the workplace
- 2.8 Construction matrials delivery and preventive measures taken
- 2.9 Number of working gang and any staggaring of shift

3.0 Summary of inspection carried out in overall and during monitoring period

4.0 Status of quarantine and isolation facility in the camp

5.0 Case of symptomatic person and emergency procedure followed

6.0 Meetings with employer, local authorities, community

7.0 Training and capacity building, toolbox talk on COVID-19

8.0 Information update and dissemination

9.0 Corrective Action Plan

10.0 Conclusion

Photograph

**Annex 4. Example of Responsibility and Accountability Matrix for Implementation of the SOP**

| SN | SOP Activities | Executing / Implementing Agency | | | | | Contractor | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | PMU/PD | F&A | PIU Chief | Site Engr | All Staff | PM | EHSO | ERT | Superv | Camp Man | Worker | Supplier |
| 1 | Conducting meeting to review preparation to resume work before starting work | A | R | R | R | | R | R | R | | | | |
| 2 | Prepare a site-specific action plan | R | | R | R | | A | R | R | | | | |
| 3 | Screening of staff and workers | | | | | | | | | | | | |
| 4 | Orientation on OHS and SOP | | | | | | | | | | | | |
| 5 | Access control measures | | | | | | | | | | | | |
| 6 | Disinfection | | | | | | | | | | | | |
| 7 | Risk control in lanor camp | | | | | | | | | | | | |
| | Labour register | | | | | | | | | | | | |
| 8 | Maintaining physical distancing in work area | | | | | | | | | | | | |
| 9 | Pre-start up check location wise | | | | | | | | | | | | |
| 10 | Promoting self hygiene and respiratory hygiene | | | | | | | | | | | | |
| 11 | Organizing resources for COVID-19 response | | | | | | | | | | | | |
| 12 | Management of awareness raising displays | | | | | | | | | | | | |
| | Public consultation | | | | | | | | | | | | |
| 13 | Monitoring of compliance | | | | | | | | | | | | |
| 14 | Reporting symptomatic case | | | | | | | | | | | | |
| 15 | Emergency procedure | | | | | | | | | | | | |
| 16 | Periodic review | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

**Note:** A = Accountable; R= Responsible

## Annex 5. List of Emergency Contact Person

| Name | Department | Position | Phone No. | Alternate Contact |
|---|---|---|---|---|
| | Safety | | | |
| | General Office | | | |
| | Clinic | | | |
| | Processing Dept. | | | |
| | Crusher and Batching Plant | | | |
| | Store | | | |
| | Workshop | | | |
| | Camp | | | |
| | Tunnel | | | |
| | Excavation | | | |
| | Tree cutting | | | |
| | Construction site | | | |

## Annex 6: Personal Protective Equipment at the Store

### A. Disinfectants and Thermal Scanner

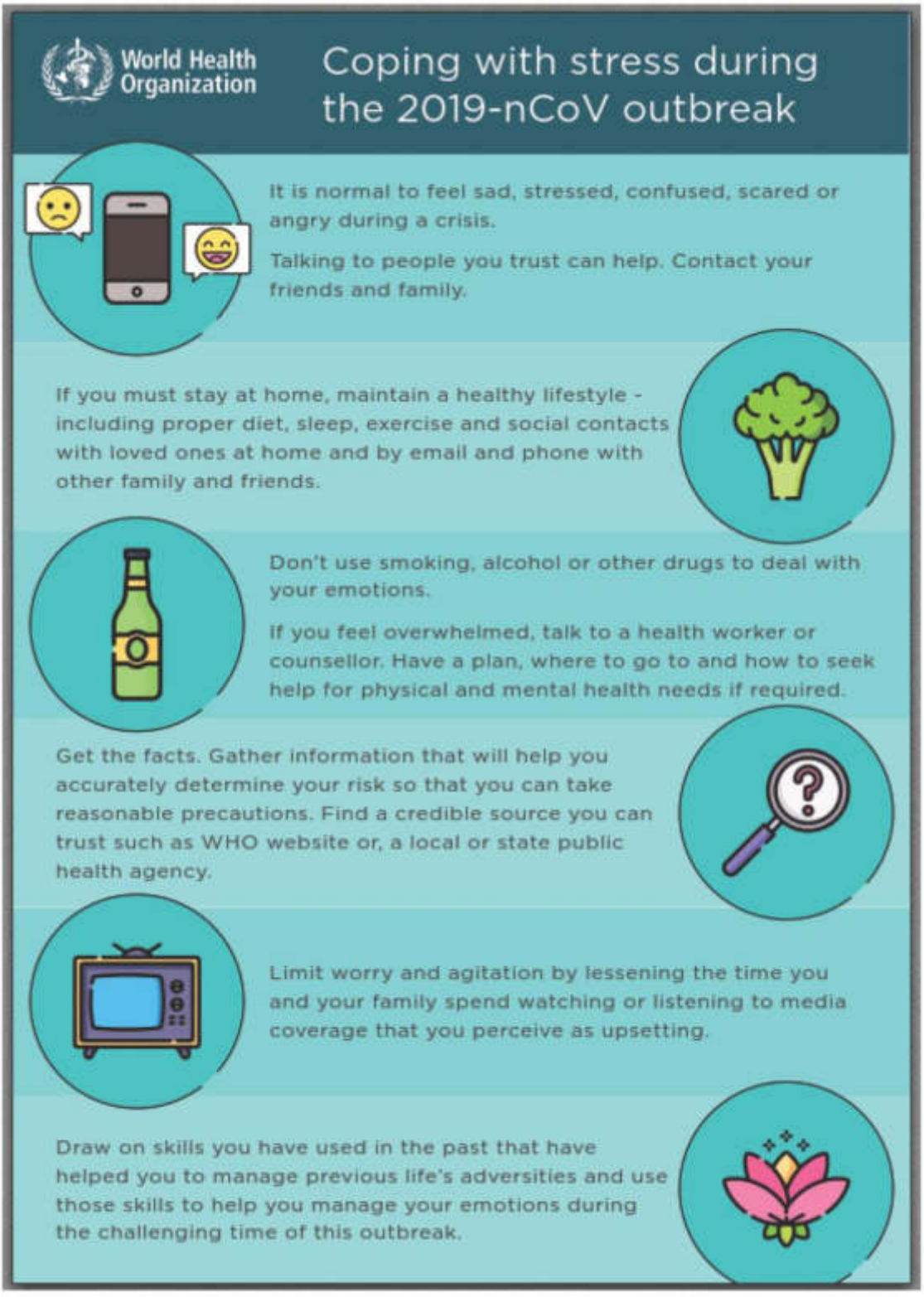
| S. No. | List of Items for Sanitization | At Stores | At Office | At Worksite and Labor Camp |
|---|---|---|---|---|
| 1 | Thermal scanner | 1 for use and 4 additional stock | 1 number | 3 numbers |
| 2 | Hand sanitizer (min 60% alcohol) | 1 bottle (500ml) at all entrances and to be refilled on regular basis | 1 bottle (500ml) at all entrances and to be refilled on regular basis | – 1 bottle (500ml) at all entrances and to be refilled on regular basis<br>– 1 bottle (500ml) at eating area<br>– 1 bottle (500ml) at each work sites |
| 3 | Alcohol based soap solution | At all suitable locations | At all suitable locations | 1 bottle (500ml) at all entrances of each camps, washrooms and other strategic location those are visible and easy to access and water for washing is arranged |
| 4 | Soap (100 gm) | At suitable and appropriate locations | At suitable and appropriate locations | 1 no. to be distributed to each worker once in a week or as and when required<br><br>Keep soap and water at each work area, camp, kitchen, office, store etc. |

### B. Personal Protective Equipments (PPEs)

| S No | List of items for PPEs | Scope |
|---|---|---|
| 1 | Hard Hat of different colors | For all staff and workers:<br>White- for visitors<br>Yellow- for workers<br>Blue- for staff<br>Red- for workers living in quarantine |
| 2 | Face mask and paper tissues. Use and throw type. | For all workers for at least three months |
| 3 | Face shield for specific works, Goggles | For workers involved in disinfection and sanitization activity. Face mask will be use and throw type, and face shield and goggles will be disinfected every hour during work. |
| 4 | Gloves (use and throw type) | For workers involved in disinfection and sanitization activity. Disposed daily. |
| 5 | Coverall/Gown | For COVID Marshal and worker involved in disinfection and sanitization activity. Wash them daily using detergent/soap and alcohol based solution after work. |

Note: PM shall ensure that all PPEs are available at site and the store is always having 20% additional stock.

Source: KEC/RPG, Tanahu Hydropower Project




Source: World Health Organization (Before using these materials, please refer to the most recent information or guidance from the WHO or national health agencies)

**Annex 5.1. Self-monitoring checklist during orchard establishment to be filled-up by beneficiaries.**

Beneficiary Name:
Municipality/District:
Orchard size:
Types of Crops:

*Checklist should be prepared only once at the end of establishing the orchard and vegetable areas, and drip irrigation.

| Types of crops (check (✓) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Almond | Apple | Avocado | Kiwi | Lime | Macadamia | Citrus | Pecan | Walnut | Others |
| | | | | | | | | | |

| **Environmental Components** | **Potential Impacts** | **Mitigation measures** | **Performed?** (Please check) | | |
|---|---|---|---|---|---|
| | | | **Y** | **N** | **NA** |
| **Physical Environment** | | | | | |
| Land use | Change in (i) land use at target site and (ii) topography/ terrain | No forest areas designated by the government of Nepal developed as orchards. | | | |
| | | Consulted and seek agreement with local communities on the locations for any temporary nursery in the district or locality. | | | |
| | | Planting of fruits and/or nuts limited within the farmlands identified for orchard development. | | | |
| | | Planting of nut and fruits avoided any unstable land and/or steep slopes. | | | |
| | | Natural slope disturbances minimized during land preparation and site clearing. | | | |
| | | Limit use of heavy equipment and machineries to minimize further impact on the landscape. Manual labors promoted. | | | |
| Water quality of surface and groundwater | Decline in quality of water or proximate waterbodies | Earthworks done during the dry season to minimize exposed areas subject to erosion by surface water runoff. | | | |

| | | | | | |
|---|---|---|---|---|---|
| Soil | Loss of topsoil and subsoils during land clearance, and earthworks | Maintaining vegetative cover, as much as possible, to minimize direct impacts of raindrops and to impede surface flow. | | | |
| | | Improving soil physical conditions through light and infrequent tillage. | | | |
| **Biological Environment** | | | | | |
| Flora and Fauna | Disturbance to terrestrial fauna and wildlife conflict | Clear demarcation of the orchard area. | | | |
| | | Tree cutting permit is obtained prior to the start of land clearing works where cutting tree cannot be avoided. | | | |
| | | Verify with authorities for any presence of any wildlife of concern within the target areas. | | | |
| | | Performed survey of the number and species of trees in order to calculate the compensatory tree replacement. | | | |
| | | Important tree species to be retained as identified by District Forest Office will be marked separately and protected. | | | |
| | | Felled trees recovered after cutting will be handed over for use according to the national laws and regulations. | | | |
| | | Fencing of orchards wherever there is expected animal movement | | | |
| | | A record of wildlife sighting is kept. | | | |
| | | In case there are wildlife conflict in the area, the farmers will inform immediately the PIU on such occurrence. | | | |
| Flora and Fauna | Disturbance to protected areas | No orchard will be developed without compliance with the requirement of Ministry of Forest and Environment. | | | |

| | | | | | |
|---|---|---|---|---|---|
| | | Ensure that no forest areas and wildlife corridors will be converted into orchard. | | | |
| | | No tree cutting should be done for the orchard development. | | | |
| | | Ensure not to disturb the movement of wildlife by construction of the movement corridor. | | | |
| | | The registration and consent from the local management committee should be attained prior to development of orchards. | | | |
| | | Farmlands must be owned by the private entity and no public land will be developed into orchard. | | | |
| **Social Environment** | | | | | |
| Workers | Health and safety risks | PPE to be utilized by all workers/farmers. | | | |
| | | Ensure all workers/farmers have received appropriate occupational health and safety trainings. | | | |
| | | Inform the nearby settlements (if needed) on the schedule of planting activities that may pose risks to public safety. | | | |
| | | Provide clear and visible warning and danger signs at and around the planting site. | | | |
| Workers | COVID-19 Health and Safety Risks | Implement COVID-19 Health and Safety actions such as: physical distancing and hand washing, disinfection | | | |
| | | Ensure all equipment and vehicles used are routinely disinfected. | | | |
| | | Received briefing on controlling COVID-19. | | | |

**Annex 5.2. Self-monitoring checklist during orchard operation (or maintenance) to be filled-up by beneficiaries.**

Beneficiary Name:
Municipality/District:
Orchard size:
Types of Crops:

*Checklist should be prepared every year (within the month of October) starting from maintenance of the orchard and vegetable areas, and operation of drip irrigation.

| Types of crops (check (✓) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Almond | Apple | Avocado | Kiwi | Lime | Macadamia | Citrus | Pecan | Walnut | Others |
| | | | | | | | | | |

| **Environmental Components** | **Potential Impacts** | **Mitigation measures** | **Performed?** (Please check) | | |
|---|---|---|---|---|---|
| | | | **Y** | **N** | **NA** |
| Land use | Change in (i) land use at target site and (ii) topography/ terrain | Limit use of heavy equipment and machineries to minimize further impact on the landscape. Manual labors would be promoted. | | | |
| | | On the completion of planting nuts, fruits and vegetable, planting suitable intercrops to minimize land erosion. | | | |
| | | Restore temporarily used sites to at least their pre-project condition following works. | | | |
| | | On completion of works restore all temporarily used sites to at least their pre-project condition following works. This will involve cleaning site of any debris or wastes, left over material and soil/rocks/sand | | | |
| Water quantity of surface and groundwater | Decline on the available local water resources | Report any leaks or damage on the drip irrigation to PIU. | | | |
| Water quality of surface and groundwater | Decline in quality of water or proximate waterbodies | Promote intercropping to reduce the erosion from exposed lands to elements. | | | |
| Water quality of surface and groundwater | Pollution due to use of chemicals for fertilizer and insecticides | Practice conservation drainage practices to manage water movement on and soils through the guidance from PIU. | | | |

| | | | | | |
|---|---|---|---|---|---|
| | | Ensure year-round ground cover to prevent periods of bare ground on farm fields when the soil and nutrients it contains are most susceptible to erosion and loss into waterways. | | | |
| Soil | Loss of topsoil and subsoils during land clearance, and earthworks | Maintaining vegetative cover, as much as possible, to minimize direct impacts of raindrops and to impede surface flow. | | | |
| Soil | Erosion during operation | Maintain orchard floor vegetation as much as possible that will protect soil from compaction to some extent. | | | |
| | | Practice intercropping in the orchard areas such as the use of high-residue crops. | | | |
| | | Use of mulch to help improve the soil's structure, drainage, and nutrient-holding capacity as they decompose. | | | |
| | | Periodic application of compost, manure, and some other organic materials to improve the water-infiltration capacity of soils. | | | |
| | | Light and infrequent tillage to disrupt surface crusts and enhance infiltration of water. | | | |
| **Biological Environment** | | | | | |
| Flora and Fauna | Disturbance to terrestrial fauna and wildlife conflict | A record of wildlife sighting shall be kept. | | | |
| | | In case there are wildlife conflict in the area, the farmers will inform immediately the PIU on such occurrence. | | | |
| Flora and Fauna | Disturbance to protected areas | Ensure not to disturb the movement of wildlife by construction of the movement corridor. | | | |
| **Social Environment** | | | | | |
| Workers | Health and safety risks | PPE to be utilized by all workers/farmers. | | | |
| | COVID-19 Health and Safety Risks | Implement COVID-19 Health and Safety actions such as: physical distancing and hand washing, disinfection | | | |
| | | Ensure all equipment and vehicles used are routinely disinfected. | | | |

## Annex 6. Watershed Management Guidelines of Nepal

Principles of Watershed Management

1. Watershed management is viewed not only as a product but also as a part of an ongoing process. As new information/issues are obtained, management strategies can be revisited and refined where necessary. The authorities, the concerned stakeholders including the local community leaders must be fully committed to sincerely introduce and execute programs that are directed towards the benefit of the people living in and around watersheds.

2. Although the integration of environmental and socio-economic issues was initiated more than a decade ago through Service Economy, Environment and Democracy (SEED) approach, the actual implementation, particularly in economy, environment and democracy sector has not been yet institutionalized in local level planning. Hence, development decisions are required to balance the distribution of socio-economic benefits while maintaining the integrity of the watershed ecosystem. Based on the fundamentals of development, watershed management should be guided by collaborative approach with active participation of upland and lowland communities.

3. Nation's knowledge and other local knowledge can be used in implementing the watershed management. This annex of the IEE holds key objectives, strategies and activities that can be performed for sustainable watershed management a the target areas.

Improved Environment for Forest Conservation and Rich Biodiversity and for Sediment and Solid Waste Management

*Objectives*

4. Develop and utilize forest both in municipal and VDCs areas in order to maintain ecosystem services for supporting, provisioning, regulating and fulfilling human needs (water and energy) and to maintain biological diversity and natural weather system; and

5. Minimize pollution and make waste management effective in order to maintain water quality.

*Strategies*

6. Mobilizing local people at community level for the development, management and protection of forest resources.

7. Maintaining win-win policy/scheme that encourage people living in lowlands and uplands to participate in the development, management and conservation of forest.

8. Decreasing community's dependency on forest products especially fuel wood and fodder by initiating programs like plantation of suitable species, silvi-cultural operation, alternative energy source, improved cooking stoves and livestock improvements to meet local people's need;

9. Avoiding intensive agriculture activities (cereal crops and chemical fertilizers uses) on slopes greater than 30% by providing alternatives for income generation.

10. Avoiding haphazard exploitation of sediment loads and pebbles, sands, gravel by strictly making the EIA (Environmental Impact Assessment) and (IEE) Initial Environmental Examination mandatory.

11. Discouraging human shelters inside the high flood risk zones and water source areas by massive plantation in flood zones and open lands and by conducting awareness programs on sensitive ecosystem and importance of watershed.

12. Encouraging non-consumptive use of forest resources like litters for alternative energy (e.g. making briquettes).

13. Encouraging ecotourism (trek track), NTFPs and agro-forestry in the slope lands.

14. Minimizing pollution and making waste management effective by promoting water recycle plants before discharging it into rivers.

15. Ensuring community forest's ability to increase the natural system to sequester carbon.

16. Maintaining habitat of birds by making nests in upstream and midstream forest zones.

*Activities*:

- Afforestation and dissemination of information about the benefits of medicinal plants;
- Promotion of nitrogen fixing plant;
- Silvi-cultural operations for tree improvement;
- Tree plantation for carbon sequestration
- Transition from food crop system to agro-forestry activities; both in private and community forest lands (fruit trees, timber trees, rubber tree, jatropphyte, tea etc); and
- Nests for bird's habitat establishment;
- Promote soil and water conservation techniques among smallholders. Some conservation techniques are: bench terrace, planting of fruit trees, fodders, bamboos, minimum tillage and mulching, grass strip cropping, Sloping Agriculture Land Technology (SALT), Natural Vegetative Strips (NVS) etc. Hydrological regime and quality promotion for co-beneficiaries of water and forest products needs to be developed;
- Massive plantation of native plants for protection against erosion Training on soil conservation practices and awareness activities for water conservation;
- Preparing climate induced disaster management plans; and
- Propagation of vegetation.

- Capacity Development Programme (Livelihood Enhancement Program Poverty Reduction - A Multi-pronged Approach)

*Policy Objectives*

17. Empower economically marginalized communities so that they could perceive the importance of the watershed.

18. Minimize discrimination between men and women in decision making process especially in lowland community by strengthening them about the importance of watershed management and their roles in conservation.

19. Reduce community's dependency on the forest products particularly fuel wood collection and stones crashing;

*Strategies*

20. Ensuring productivity in the watershed from horticulture, agro-forestry products and not cereal products.

21. Promoting the products that gives high value and yield by using compost fertilizers and off season crops priority.

22. Marketing the products through co-operative finance system at women group and farmers groups; and

23. Reducing poverty by using ecological services in a sustainable and integrated way.

*Activities*

- Horticulture promotion by integration of diversification, value addition, harmonization and strengthening community organization;
- Awareness creation on the issues of watershed on priority basis;
- Capacity buildings through trainings and micro-credit financing program including technical back-support;
- Professional skill development trainings for human resource development;
- Introduction of new technologies like micro-irrigation system, solar energy system, briquettes making, improving soils fertility, pest management and diseases controls techniques etc;
- Promotion of vegetable and herbal developments (provide subsidy for inputs, provide trainings on Green House Making-GHM etc);
- Integration of indigenous knowledge, gender equity and farmers decision making to promote small and marginal communities;
- Promotion of compost fertilizer (making compost pits in farmer's fields);
- Promotion of livestock through genetically improved goats, veterinary camps and stall feedings;
- Development of plant nurseries with collaboration with soil conservation government offices;
- Promotion of mushroom farming for both communities;
- Production of honey by providing trainings to farmers focusing mainly on women;
- Construction of public toilets;
- Promotion of bio-mass energy and other alternative energy sources;
- Plantation of bamboos and promotion of the products produced from them; and
- Promotion of off season vegetables.