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MINISTRY OF RURAL DEVELOPMENT
CAMBODIA

FINAL REPORT

STRATEGIC PLAN OF RURAL DEVELOPMENT FOR CLIMATE CHANGE ADAPTATION IN CAMBODIA

Phnom Penh, September 2012

Acronyms and Abbreviations

ADB	-	Asian Development Bank
CCCA	-	Cambodia Climate Change Alliance
CCTT	-	Climate Change Technical Team
CCWC	-	Commune Committee for Women and Children
CMDG	-	Cambodia Millennium Development Goal
D&D	-	Decentralization and Deconcentration
GDP	-	Gross Domestic Product
IPCC	-	International Panel on Climate Change
MoEF	-	Ministry of Economy and Finance
MRD	-	Ministry of Rural Development
NDC	-	National Development Council
NPRS	-	National Poverty Reduction Strategy
PDRD	-	Provincial Department of Rural Development
PLAU	-	Provincial Local Administration Unit
RGC	-	Royal Government of Cambodia
RWSSH	-	Rural Water Supply, Sanitation and Hygiene
TWG-RWSSH	-	Technical Working Group for Rural Water Supply, Sanitation and Hygiene
WHO	-	World Health Organization

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Executive Summary

The speed and intensity of climate change are outpacing the ability of poor rural people and societies to cope with its impacts. Many areas the Ministry of Rural Development (MRD) investigated are already reporting impacts on key ecosystems and biodiversity, as well as physical and social infrastructure that sustain agricultural production, rural infrastructure, market opportunities and rural livelihoods. The MRD's response will impact whether smallholders will benefit from the delivery of strong rural infrastructure, building capacity for adaptation and mitigation, and whether additional public climate financing will reach poor rural people, so they can create alternative livelihood businesses and become resilient to the impacts of flood and drought.

MRD is already acting on climate change at the sub-national level, but it can do more, with cooperation from donors and line institutions such as the Cambodia Climate Change Alliance (CCCA) and the Ministry of Environment (MoE). The main strategy output is the strengthening of rural roads and water supplies, where climate change – along with other risks, opportunities and themes – is systematically integrated into current core programs, policies and activities. Project safeguards will be integrated into planning and programming of rural roads and water supply; this has already been done in rural road improvements, construction projects, and Tonle Sap water supply and sanitation projects. This means incorporating safeguards into the toolkit at the early stages of program and project design, and during implementation. Regarding knowledge, innovation and advocacy, MRD will explore new arrangements for sourcing climate-related expertise in rural infrastructure, share ground-level experiences to ensure their application throughout MRD's programs, and continue working to shape the global dialogue on climate change for smallholders. As policy instruments and quality improvements for rural infrastructure to become resilient to climate change are lacking, the MRD has produced a 10-year strategy (2013-2022) of actions on climate change impacts and adaptation, covering four main priority areas.

MRD is enhancing its approach and strategy to rural development in the context of increasing environmental threats, including climate change. MRD's program will continue to reflect the complex reality of poor people, where issues are not contained neatly in boxes labeled according to global issues. MRD addresses four priority areas to help rural poor who are restrained by the impacts of climate change. Those priority areas are; (1) Development of policies and regulations which relate to upgrading rural infrastructure quality and rural adaptation, (2) Creation of rural business opportunities for savings and improved rural livelihoods, (3) Provision of upgraded rural infrastructure projects as demonstrated in some areas, and (4) Provision of capacity building on climate change adaptation and rural health care awareness to communities.

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1. Introduction

The Intergovernmental Panel on Climate Change (IPCC) predicts that global temperatures will rise between 1.8°C and 4.0°C by the last decade of the 21st Century. The impacts of global warming on climate change, however, will vary in different regions of the world (CCSAP, 2008).

Our planet is very close to reaching a tipping point, where climate change and global warming will become irreversible. Many scientists believe that this decade may be our last chance to do something effective against climate change. The tipping point represents a global temperature increase of two degrees Celsius. This increase in the global temperature will, among other things, lead to melting of polar ice sheets and massive loss of rainforests. What countries need is a new international climate deal, but this does not appear likely in the near future, as there are still major differences between the developed world and the developing world in proposed **decreases**. Rainforests are becoming drier and oceans are becoming increasingly acidic, all due to increased climate change impacts. Extreme weather events such as hurricanes are becoming more frequent and there is a danger of new diseases (Tailor and Francis, 2009).

The only solution to climate change is to significantly reduce greenhouse gas emissions, which can only be done by shutting down fossil fuel fired power plants and switching to clean, renewable energy sources. Developing countries such as Cambodia should address their national strategic plans on possible mitigation, adaptation and resilience to climate change, where possible. Therefore, all activities, projects and programs carried out by institutions must take a climate change perspective into consideration in their work plans (**Ali, A., Lebel, T.** and Amani A., 2008).

After the 1993 Cambodian General Election and the establishment of the Kingdom of Cambodia, the Royal Government of Cambodia (RGC) established the Ministry of Rural Development (MRD). The creation of the MRD demonstrates the Government's dedication to improving living standards and alleviating the poverty of rural people. MRD has focused on three main themes:

- To improve the quality of life of rural people by encouraging and facilitating economic self-sufficiency and an active social awareness, rather than people relying on central government or aid agencies to assist them. Encouraging communities to solve their problems independently increases their satisfaction at making progress.
- To encourage and assist rural communities to participate more directly in improving farm production, rural-based industry and marketing their products. The successful development of these aims would make a significant contribution to strengthening the national economy.

- To seek, by all sensible means, to discourage the current movement of individuals and families from the countryside to towns. Urban congestion represents an increasingly serious problem in Cambodia. Improving the rural economy as a matter of priority could, to some extent, help reverse the present trend by restoring confidence in rural life, and encourage community developments that would raise rural living standards.

Organizationally, MRD has three general departments: Administration and Finance, Technical Affairs, and the General Inspectorate. The General Department of Administration and Finance has control over the Department of Administration and Personnel Affairs, the Department of Procurement and Finance, and the Department of Planning and Public Relations. The General Department of Technical Affairs plays an important technical role for the Ministry. It controls the Department of Rural Roads, the Department of Rural Water Supply, the Department of Rural Health Care, the Department of Community Development and the Department of Rural Economic Development. The department of internal audit is under the direct control of the ministerial office. The MRD has 17 fields of activities, listed below:

- Border development
- Rural infrastructure
- Rural water supply
- Rural sanitation
- Ethnic development
- Community development
- Rural economic development
- Training and research
- Administration and personnel
- Internal audit
- Planning and public relations
- Supply and finance
- General inspection
- International cooperation
- NGO management
- Gender
- Provincial department

A series of policies has emerged as current mandates of the MRD, such as the Policy of Indigenous People, the Policy of Rural Road Improvement, the Policy of Rural Development and the Policy of Rural Water Supply. These policies are being implemented through the projects and programs of:

- Provincial and rural infrastructure project
- Food for work project
- Rural water supply and sanitation project
- Tertiary road improvement project
- Tonle Sap rural water supply and sanitation sector
- Second rural water supply and sanitation sector project
- Financial management for rural development program
- Border development program
- School and community water sanitation and hygiene
- Ketsana emergency reconstruction and rehabilitation project
- Rural road improvement project

Activities in the rural development sector will need to interface with the full perspectives of the climate change mitigation planning process, the adaptation planning process and the **resilience design to climate change impacts**. Therefore, projects and programs of MRD will specify climate change mitigation, adaptation and resilience in their planning activities, as a priority. This report describes the strategic activities planned for the current further mandate of the MRD, linking with climate change actions and perspectives in all rural development. These activities for improving the livelihoods of rural people must be carried out in the right way, and in the correct social, economic and environmental contexts.

2. Sector-Related Profiles

Under the fourth legislative term of the National Assembly, the RGC continues to consider the need for rapid poverty reduction as a top priority, through a rural development approach. The role of rural development is indispensable to poverty reduction; as well as rural resources contributing to the national economy, 85% of Cambodia's poor live in rural areas. The RGC continues its interventions to implement integrated rural development approaches that focus on positive impacts for rural poor people. These approaches include the strengthening of institutional capacity at national and sub-national administration levels, human security, implementation of an integrated sub-national plan, improvement and construction of rural roads, provision of rural water supply, primary health care and rural sanitation, and community and rural economic development to enhance rural living standards and to contribute to the regional and national growth process. Encouraging rural development plays an essential role and has a positive impact on the National Poverty Reduction Strategy (NPRS) (RWSS, 2010).

The NPRS was adopted in 2002. Further to the Millennium Declaration of the United Nations Summit in 2000, a set of Cambodia Millennium Development Goals (CMDG) was prepared in 2003, through an intensive and inclusive consultative process. The very first major decision of the RGC, in the third term of 2004, was to adopt a holistic and comprehensive Rectangular Strategy for addressing governance and socioeconomic development issues and

efforts. Currently, Cambodia has approximately 14 million people, of which 87% live in rural areas. Cambodia has achieved impressive economic growth, with gross domestic product (GDP) averaging an increase of 10% per annum during the 2004–2010 period. Despite its declining GDP share from 46% in the 1990s to 34% in 2010, agriculture in rural areas, especially in remote communities, remains an important sector in the national economy, as it is the primary source of livelihoods for 85% of the population (NIS, 2010).

The MRD is a multi-disciplinary intervention institution, working in the areas of social and rural infrastructure in rural areas of Cambodia. MRD's organizational structure is shown in Figure 1. The main activities of the rural infrastructure sector are rural road improvement, irrigation rehabilitation and water well construction. The social infrastructure sector comprises sanitation and hygiene, community development and capacity building, micro-credit provision, gender protection and indigenous population protection. Given its significant share of the national GDP, social and rural infrastructure development continue to play a crucial role in enhancing macro-economic stability in the rural area, long-term food security and poverty reduction. Rural development, however, must be aligned with consideration to climate change impacts and these impacts must be addressed during the planning process, the implementation process, and the post-project implementation period. The rural sector can contribute significantly to the attainment of the targets of the RGC to sustain an annual GDP growth rate of 7% and a poverty reduction rate of 1% from 2009 onwards. To realize this potential, the rice value chain system must be strengthened by the removal of constraints that hinder the efficient flow from farmers' fields to the ultimate consumers.

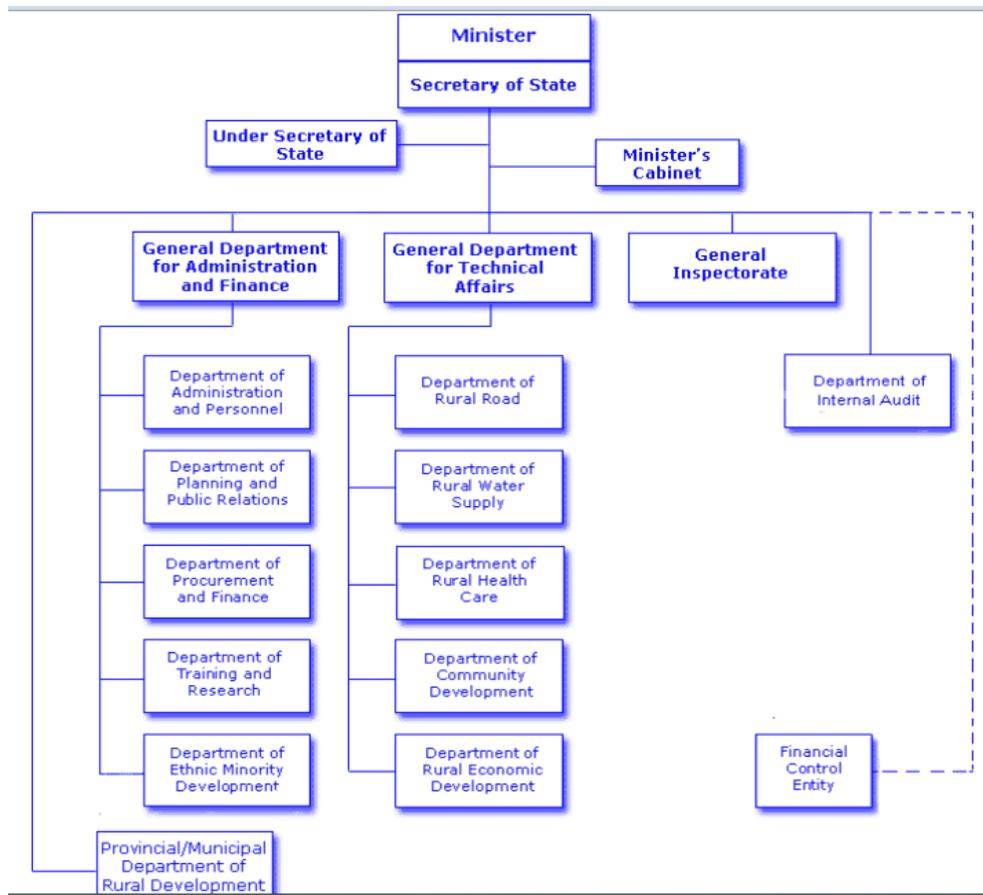


Figure 1: Organizational Structure of MRD

2.1 Rural Water Supply Sector

The MRD has overall responsibility for the strategy and implementation of rural water supply under the guidance of the Technical Working Group for Rural Water Supply, Sanitation and Hygiene (TWG-RWSSH). The intended users of the strategy are relevant institutions at all levels, including national institutions, sub-national institutions, development partners, national and international NGOs, and the private sector. A summary version and information brochure will be available for sub-national institutions (RWSS, 2010).

With regard to rural water supply service and rural sanitation, there is an urgent need to safeguard and enhance rural people’s health and livelihoods and to improve the economic conditions of the rural poor. The CMDGs stated that by 2015 “50 per cent of the people living in rural areas will have access to water supply and 30 per cent of the people living in the rural areas will have access to improved sanitation services.” (RWSS, 2010)

Responding to this basic need, the working group for rural water supply and sanitation and hygiene – under the full coordination of MRD – developed the national strategy on rural water

supply, sanitation and hygiene, for implementation over a 15-year period, starting in 2011. The strategy identified measures including: strengthening institutions; determining responsibilities of relevant agencies – both at national and sub-national levels; enhancement of participation of communities that are beneficiaries of improved water supply services and sanitation; strengthening service quality; involvement of the private sector; and encouraging local communities to become owners of the program or project after completion.

The sector aligns with the principle of Decentralization and Deconcentration (D&D) guidance. In accordance with the D&D principle, the sector operates at a number of different levels: household and community, commune, district, province and national. At each of these levels, there are several different actors, stakeholders and individuals, each of whom has different views and ideas. All of these factors add up to a complex sector in terms of shared values, understanding the challenges, systems and procedures, and the means to address the overall challenge of enabling rural people to have sustainable access to water supply and sanitation services. The strategy to address all these challenges is similarly complex. There needs to be a range of strategic and detailed actions to address the individual challenges, and all these actions need to be coordinated to achieve the overall purpose. (RWSS, 2010).

The sector adopted a participatory approach to developing the strategy by commissioning a specialist consultant to lead the process and establishing a core group comprising directors of relevant departments and representatives of development partners – especially NGOs who work in the area of water and sanitation. The consultation included field work in some provinces and situational analysis workshops that included representatives of commune councils, the Commune Committee for Women and Children (CCWC), district governors, the Provincial Department of Rural Development (PDRD), Provincial Local Administration Units (PLAU), line ministries, development partners, NGOs and the private sector. It included workshops to address specific technical issues with key specialists in rural water supply, sanitation and hygiene, and briefings to the TWG-RWSSH.

The sector vision is that every person in a rural community will have sustained access to safe water supply and sanitation services and will live in a hygienic environment by 2025. This strategy defines the water supply, sanitation and hygiene services to be made available to people living in rural areas and identifies the institutional arrangements and the financial, human and other resources needed to provide these services. *The main project profiles related to the rural water supply sector still lack some insights into climate change impacts. These impacts should be integrated in the implementation.* The current profiles are emphasized below.

(1) Continuing on from the first rural water supply project, the Second Rural Water Supply and Sanitation Project (the project) is designed to expand access to improved rural water supply and sanitation (RWSS) and to better the health of rural residents in six provinces around the

Tonle Sap Basin in Cambodia (ADB, 2010). It will contribute to the Government's efforts to achieve its MDG targets of improved rural water supply coverage to 50% and improved rural sanitation coverage to 30% by 2015, and its long-term sector targets of 100% improved water supply and sanitation coverage by 2025.

The project will support current institutional reform for improved service delivery in the sector, including project management, through: (i) a sub-national administration capacity development program, and (ii) an enhanced partnership between the PDRDs and NGOs. It will also link to public financial management activities for rural development. The project will support the provision of improved RWSS services for some 377,000 residents, of which 290,000 will benefit from improved sanitation facilities in 400 villages in 40 communes. The 40 communes are located in 16 districts in the six provinces of Banteay Meanchey, Battambang, Kampong Chhnang, Kampong Thom, Pursat and Siem Reap. The project will cover 100% of all villages in each commune and will aim to achieve 100% water supply and 75% physical sanitation coverage in each commune. It is a sector investment project with the following outputs: (i) improved community health and hygiene practices through community mobilization and action; (ii) rehabilitated, upgraded and developed water supply facilities in 40 communes; (iii) improved public and household sanitation facilities; (iv) a stronger and more sustainable RWSS sector, through support to private sector development and improved monitoring of RWSS coverage; and, (v) improved capacity for project implementation.

The project will improve the quality of life and health of rural Cambodian people through improved access to safe drinking water and sanitation based on community demand and needs. Improved water supply, sanitation and hygiene practices are expected to enhance health and productivity. The project particularly improves the capacity among young government institutions and communities to plan, construct, manage, operate and maintain village water and sanitation infrastructure. Better quality water and improved hygiene have reduced the prevalence and severity of water-borne and water-related diseases affecting young children and the elderly, leading to a reduction in sick days and health expenditure. This has improved social welfare and facilitated efforts to improve the economic welfare of beneficiaries. Reliable access to safe water and sanitation reduces the time and effort currently required to obtain clean water, increasing the time and capacity available for income-generating activities. Given the high proportion of poor households in rural areas of the participating provinces, and the proposed targeting on the poorest communes within these provinces, poverty incidence among project beneficiaries is estimated at 50–70%. The active participation of the rural communities in selecting, planning, co-financing, implementing, operating and maintaining investments has strengthened communities' ownership of their own developments.

The project assists the Government in preparing a RWSS strategy and guidelines, as well as improved coordination and partnerships nationally and locally, which will lead to improved knowledge sharing, avoid duplications of effort and better facilitate sector planning.

The project emphasizes an integrated approach to rural water supply, sanitation and hygiene awareness, applying a commune-based approach to project implementation. Full benefits of household access to improved water cannot be realized unless water is managed properly – both between the source and the home, and within the home. Sanitation cannot be achieved without access to water for hand and body washing and latrine flushing. Hygiene awareness is the activity that effectively links water and sanitation and maximizes project benefits.

Rural infrastructure is one of the core community-driven development sectors. The project supports three hallmarks of the community-driven development approach: (i) Local capacity development; (ii) Participatory decision making (in site selection, technology choices, and operation and maintenance (O&M) of community infrastructure); and, (iii) Community control of resources through an innovative community-managed procurement system for sanitation. Support to community-driven development also includes developing community group capacity; supporting an enabling environment through policy and institutional reform; and strengthening local governance relationships, for example, by strengthening links between community organizations and local government. By promoting community participation and ownership, and engaging commune councils, the project will strengthen the institutional arrangements for planning, financing and managing RWSS investments, and will make services more responsive and accountable to the poor in the Tonle Sap Basin.

To encourage greater stakeholder participation, transparency and accountability, the project will: (i) Strengthen capacity within MRD to comply with the project administration manual; (ii) Establish a project website to disclose information about project-related issues, including procurement (e.g. contracts, bidding procedures, contract awards and lists of goods and services to be procured) and grievance redress procedures; (iii) Establish or use the existing system on information disclosure at commune council offices (e.g. notice boards that display information on contracts, list of participating bidders, name of the winning bidder, basic details on bidding procedures, contract awards and lists of goods and services to be procured); (iv) Notify communities of the date and location of selected events in the procurement process (e.g. public bid openings, progress reviews and handover ceremonies); and, (v) Establish a grievance redress mechanism at the **PCU** and PDRD project team levels in each project province to receive complaints from communities or contractors. The PCU or PDRD project team will provide a formal reply within 20 working days, and report all grievances in their progress reports to the Government and the Asian Development Bank (ADB). The project will also encourage the equality of gender in all phases. Women will have the highest priority in participation, especially in promoting them to be heads of water user groups after project completion.

(2) In 2005, the International Monetary Fund (IMF) Board completed an assessment of the first group of eligible countries for the multilateral debt relief initiative (MDRI). The amount of debt relief granted to Cambodia was \$82million, which became effective on 5 January, 2006; of

which \$18.6 million was used for the implementation of the Rural Water Supply and Sanitation Project. The Rural Water Supply and Sanitation Project is being implemented using a village engagement process to provide water and sanitation infrastructure to vulnerable people in rural communities. The objective of the project is to support government efforts to reduce poverty by improving the health and living conditions of low-income communities in rural areas, through greater access to sustainable safe drinking water and improved sanitation.

2.2 Rural Road Construction Sector

In the last two parliamentary mandates of the RGC, Cambodia has made significant advances in rural transport network development, particularly during this mandate. The rural economy grows significantly at a satisfactory level, thereby generating a strong and growing demand for rural transport services. To meet this demand, MRD undertook investments in rural transport infrastructure, rising from about \$10 million in 2009, to \$15 million in 2012 (DRR, 2012). Currently, total rural public investment is on rural road improvement and construction.

Generally, rural road construction programs in Cambodia are supported by loans and grants from the ADB, the World Bank (WB) and other foreign aid institutions. In particular, rural improvement projects were designed to promote the RGC's national program of poverty reduction through: increasing rural food production and incomes; promoting a regional balance in socioeconomic development by establishing growth poles away from the country's capital and cities (in rural areas); and expanding industrial production for domestic and foreign markets. It is widely believed that rural road improvements will bring multiple socioeconomic benefits that will form a strong economic base for the nation (ADB, 2010).

In the theoretical framework of rural road planning, rural transport models generally comprise classic models, agricultural models, linear programming models, general equilibrium models and land-transport interaction models. The MRD considered classic models as the most appropriate application in rural areas of Cambodia. In particular, the choice of a classic model is the consumer surplus and producer surplus model. This model helps rural people strongly adapt to natural disasters that damage their assets seasonally, as by lowering traffic costs, rural people can increase their savings and generate other off-farm businesses, compensating losses caused by climate change. This model has a strong link to responding to climate change in rural areas of Cambodia.

Currently, MRD is implementing climate change adaptation component activities. Those activities are: (i) Improved planning for rural road infrastructure development to accommodate climate change, and (ii) Increased resilience of road infrastructure to climate change through the planning process and identification of adaptation options. These activities receive support from international loans and grants by the ADB and the WB.

2.3 Rural Socioeconomic and Community Development Sector

The Department of Rural Socioeconomic Development is currently collaborating with the private sector to work on loan provision to poor families in some provinces. There are several activities under this initiative; one of which, soft grant provision, has successfully achieved growth of household incomes from agricultural activities under loans and from family businesses locally.

The Department of Rural Community is one of MRD's technical departments and is responsible for formulating guidelines and regulations for community development. This department has engaged in activities to mobilize communities and provided them with vocational training to improve livelihoods.

2.4 Women's Role in Climate Change in MRD

There are important gender perspectives in all aspects of climate change. Gender inequalities in access to resources, including credit, extension services, information and technology, must be taken into account in developing mitigation activities. Adaptation efforts should systematically and effectively address gender-specific impacts of climate change in the areas of energy, water, food security, agriculture and fisheries, biodiversity and ecosystem services, health, industry, human settlements, disaster management, and conflict and security (UNDP, 2007).

In every rural society, women and men have different roles inside and outside the household, and different resources to deliver them. In the rural communities of Cambodia, men's roles typically focus on earning cash by growing food, trading, or selling their labour. But it is largely the role of women to provide the food, fuel, water and care that the family needs (all for no pay), in addition to earning some cash. In such communities, women are likely to have:

- Greater reliance on natural resources such as rivers, wells, reliable rainfall and forests;
- Fewer physical resources such as land, fertilizer or irrigation, and fewer assets (like machinery, or a bicycle) to use to make money, or to sell as a last resort;
- Fewer financial resources, little cash, savings, or access to credit, and less access to markets that give a good price for their goods;
- Less powerful social resources, due to social and cultural norms that limit their mobility and their voice in decision making, reinforce traditional roles, and put them at risk of violence;
- Fewer human resources, due to having less education, fewer opportunities for training, and less access to official information, especially regarding climate change information.

Therefore, women in rural Cambodian society have suffered more from disasters than men. The goal of climate change adaptation is to create conditions whereby women become increasingly able to make informed and appropriate decisions about their lives and livelihoods in

a changing climate, when men are away from home. The ability to thrive despite a changing climate leads MRD to decide its frameworks within the following points:

1. Communities are at the centre of MRD's approach to climate change adaptation, however enabling them to adapt requires working across multiple levels, from household to national.
2. To build adaptive capacity, factors across all levels that limit adaptive capacity must be addressed, alongside actions that actively build capacity to adapt to climate change, especially building the adaptive capacity of women in rural development.
3. Central interventions are required which span the range of what is known and unknown about climate change in a specific location. This range starts by addressing current hazards, increased variability, and emerging trends, and extends through to managing the rise and uncertainty of impacts, where the direction and scale are uncertain.

In this strategic plan, MRD will consider the following questions, which may serve as a non-exhaustive discussion guide to stimulate sharing national-level experiences, strategies and good practices:

- What steps are being taken/could be taken to mainstream gender perspectives into climate change efforts at the national and local levels of rural development – including in policies, strategies, action plans and programs? What good practice examples can be provided?
- What steps are being taken/could be taken to reduce the vulnerability of women and to reduce the negative impacts of climate change, particularly in relation to their critical roles in rural areas in provision of water, food and energy? What good practice examples can be provided?
- What steps are being taken/could be taken to increase the participation of women in decision-making on climate change at different levels? What good practice examples can be provided?
- What are the major contributions of women as agents of change in mitigation and adaptation to climate change at local levels? What good practice examples exist, and how can these be made more visible and more effectively utilized?
- What are the critical issues for women in relation to technology and finance in addressing climate change at national and local levels?
- What are the major achievements, gaps and challenges in ensuring adequate attention to gender perspectives in climate change efforts, for example in relation to specific issues/contexts, including, but not limited to natural disasters such as floods, drought, desertification and deforestation.

The current structure of gender in MRD allows for messages on climate change and climate hazards to be communicated to communities. MRD must create a curriculum for local training programs and should strengthen women's and children's understanding of adaptation, prevention and resilience to natural disasters. MRD will be able to provide regular and periodic gender workshops at sub-national level, especially to women and children in the most vulnerable areas. These will be extended to other vulnerable areas in the next three years, until all women and children are more resilient to the challenges of disasters, such as flood and drought. MRD will implement capacity building of women and children on climate change and climate hazards, which are considered fundamental to the rural development of Cambodia. MRD will continue its work on the two main components of climate change response: mitigation and adaptation.

Mitigation refers to interventions that either reduce sources of greenhouse gases or remove greenhouse gases from the atmosphere. When developing mitigation policies, MRD will take into account gender inequalities, which can be found in access to resources such as capital, natural resources, credit, extension services, information and technology. Adaptation refers to interventions that aim to help people and environments adjust to and cope with the impacts of climate change. When developing adaptation activities, MRD will systematically and effectively address gender-specific impacts of climate change in several key areas. These areas in the rural development context are: small-scale energy, water supply, food security, community development, socioeconomic development, rural health care services, rural road construction, and research and extension. Some concrete actions with regard to both mitigation and adaptation include:

- 1) Collect more data: MRD needs more gender-disaggregated data and research to form a solid base for its climate change response.
- 2) Involve women as agents of change: Women are not only victims of climate change, but also effective agents of change in relation to both mitigation and adaptation. Women have a strong body of knowledge and expertise that can be used in climate change mitigation, disaster reduction and adaptation strategies. Women's responsibilities in households and communities as stewards of natural resources have positioned them well for livelihood strategies adapted to changing environments.
- 3) Empower women in policy-making processes in rural communities: Women are still vulnerable. MRD needs to find ways in which adaptation activities could target and build on women's ability to adapt, and at the same time strengthen their resilience to climate change.

3. Climate Impacts and Climate Risk Profiles

Cambodia is one of the most climate vulnerable countries in the world and will become even more so as a result of further climate change. Floods, tropical storm surges and droughts are likely to become more frequent and severe in the coming years. These changes will threaten the

significant achievements that Cambodia has made over the last 10 years under the strong Third and Fourth parliamentary mandate of the RGC, in increasing incomes and reducing poverty, and will also make it more difficult to achieve the CMDGs. Over the last 10 years, the Government, with support of development partners, has invested large funds to make the country less vulnerable to natural disasters. These investments include flood management schemes (flood control), awareness raising, storm and flood shelters (Ketsana, 2011) and the raising of rural roads, dams, and reservoir dykes above flood levels. Climate resilient varieties of rice and other crops have also been developed. The challenge Cambodia now faces is to scale up these investments to create a suitable environment for the economic and social development of the country, and to secure the well-being of its people, especially the rural poor and most vulnerable rural groups, including women and children. The RGC's plan is to eradicate poverty and achieve economic, social and environmentally friendly results. It is essential that Cambodia now prepares to adapt to climate change (rural adaptation as a priority) and to safeguard the future well-being of its people. Four sectors in rural adaptation preparedness are: rural road construction and improvement; rural water supply construction and improvement; rural socioeconomic development and community development; and primary health care. These four sectors have been strongly affected by climate change.

With Cambodia's current forward-thinking prime minister, the RGC's vision is therefore, to eradicate poverty and to achieve economic and social well-being for all people, especially rural people. This will be achieved through a pro-poor **climate change strategy by sector**, which prioritizes adaptation and disaster risk reduction, and also addresses climate change awareness development, mitigation, technology transfer, and the provision of adequate finance to sub-national levels. However, there is a need to clearly know to what extent climate change impacts have been experienced by various sectors of rural development. These can be addressed as follows:

3.1 Impacts on the Rural Water Supply Sector

The MRD, especially its climate change team, has conducted a rapid study on several water points and small-scale irrigation, which included domestic water supply, by both combined wells and deep wells. The team used multi-disciplinary skills for both physical and social conditions, which are thought to be affected by climate change. Those small-scale irrigation schemes include Tram Pluk, Krang Ponley and Chrey Bak. The conclusions have been drawn as follows:

3.1.1 Climate Change Impacts on Small-Scale Irrigation

Impacts of climate change on small-scale irrigation water supply schemes were similar across the board. The rural small-scale irrigation water supply schemes provide stock water to small holders of farmland. The water demand for these schemes is much lower than for small-scale irrigation schemes, and very much lower on a per hectare basis. Given the priority accorded to domestic and stock water, future restrictions on supply are unlikely for the projected climate

changes of the study. The impacts will be on scheme operations and service levels, given increased stock water requirements with increasing temperatures, the effect on peak demand of higher maximum temperatures, and the number of very hot days during summer months.

Schemes with direct stream intakes and screens would be affected in the same way as small-scale irrigation schemes with direct intakes. Given the low water intakes of rural water supply schemes, many intakes are indirect, through infiltration galleries or bores beside the stream or canal. These intakes and ground water supplies will be little affected, if at all, by changes in river or stream water flows or quality. The schemes are generally flow-restricted, with a continuous and constant flow to each property. The peak demand on farms is managed through on-farm small scale storage reservoirs. If peak stock water demand increases, both on-farm and off-farm infrastructure would have to be upgraded. Most of the schemes have a pumped supply to storage reservoirs, and the distribution network is fully piped. Thus, additional flow could be delivered by adding extra pump and reservoir storage capacity. This additional capacity could be installed as add-ons, and would only have a small area footprint within the rural landscape (TSRWSSS, 2010).

The importance of storage water for animal purposes makes several small-scale irrigation scheme upgrades a likely response, following episodes of high stock stress due to prolonged droughts, or a period of very hot days. The schemes would face the same organizational issues as irrigation schemes, with respect to community agreement about **upgrade options** and **financing**. Consent variations may also be required, depending on the **type of upgrade**.

Economic evaluations carried out at the time of scheme approval have been obtained for three of the case study schemes (Tram Pluk, Krang Ponley and Chrey Bak). These evaluations were based on benefits from increases in stock-carrying capacity, improved stock performance, and hence productivity, and saved costs of pre-existing supplies, mostly for on-farm dams. The estimated increases in stock numbers were around 10 to 15% of farm carrying capacity, while improved stock performance (over all farm stock) could be 50 to 100% of the benefits from greater stock numbers.

The increase in stock numbers was due to better grazing management, from more water points and subdivision fencing, while the more accessible and better quality water improved stock health and performance. For the projected climate changes, the grazing management benefits of the schemes, which include on-farm reticulation and subdivision fencing, would probably not be much affected. The installed infrastructure remains in place and continues to provide this benefit, albeit with higher stock watering demands.

Climate change may affect stock-carrying capacity for reasons other than water supply, in terms of the amount of water available to stock and the number of or proximity to watering places. The more severe the extremes of temperature and dryness, the greater the pressure on stock in terms of both feed and water.

A sufficient supply of water is critical to keeping stock healthy and maintaining sufficient conditions to minimize longer-term effects. The additional stock performance and stock numbers resulting from the scheme, could be affected by the impacts of the projected climate changes. This would reduce farm production and hence, economic returns. However, the overall impact on farm economics is likely to be relatively marginal, with other impacts and market changes in produce price and farm costs being more significant.

The **likely responses to climate change** would be a combination of **scheme upgrades** and reduced stock numbers, where the supply constraints of the existing schemes were having significant impacts. The small irrigation scheme infrastructure, both off- and on-farm, could be significantly impacted by an increase in the intensity of storm events, or the frequency of high rainfall events. The infrastructure of these rural water supply schemes is vulnerable to erosion and surface damage. Many of the canal distribution networks pass through steep and erosion-prone land, while small-scale irrigation storage reservoirs and pump stations may also be at relatively high risk from these hazards. Operation and maintenance costs could then be affected, however these additional costs are not predictable.

The rural water supply schemes would be less affected by impacts on river flows and quality than irrigation schemes, given their low per-hectare demands for water, and generally less exposed and at-risk intake systems. The water demand of stock is related to plant watering requirements (of dryness and water deficits), but is not the same, and the effects on stock of water restrictions have not been well researched.

Having sufficient water for stock through dry periods is critical for stock health and condition, while the relatively low flow rates and canal reticulation of the schemes makes add-on upgrading more practical. These upgrades would increase operational costs, such as power charges, as well as the capital investment required. At the same time, there could be some increase in operational costs as intakes, although probably relatively small. Costs could increase for other reasons, for example, from more erosion and slope damage.

The rural irrigation water supply schemes provide a critical service to farms; they will provide significant advantages to communities within the scheme areas, in terms of water security and management flexibility.

3.1.2 Climate Change Impacts on Wells

Annually, the Department of Rural Water Supply has constructed at least 2,000 to 3,000 wells (combined wells, deep wells and open wells). The implementation of rural water supply (by well construction), faces challenges of climate change impacts on the water points, especially during droughts and floods. Predicting the effects of climate change on rural water wells in Cambodia is difficult, not least because of the considerable uncertainty in climate change predictions, and the even greater uncertainty within derived hydrological models. There are also large data and knowledge gaps in existing run-off and recharge processes within Cambodia's

watersheds. To help deal with this level of uncertainty in climate science, it is useful to adopt a three-sided approach to examine how climate change is likely to affect rural water supplies, particularly regarding wells, focusing on water availability, water use and the ability to access available water. Ultimately, it is the interplay between these three factors which will determine future water security in rural Cambodia.

Within a warmer climate, there will be a higher evaporative demand, and higher sea- and land-surface temperatures. Consequently, existing climatic variability in Cambodia will be intensified, so that rainfall will occur in more intense events of higher spatial and temporal variability, and dry periods will be both more prolonged and more frequent. While this climate change is highly likely, how it will translate to changes in effective rainfall, and the partitioning of this effective rainfall between different water resources through altered patterns of surface run-off, soil moisture and ground water recharge, is unclear. Collectively, there are too many uncertainties, and the processes and feedback processes involved are too complex for the effect of climate change on hydrological systems to be modelled adequately at present. It is, therefore, very difficult to predict the likely impacts of climate change on rural well water points from climate model projections. However, examining how the different water resources in Cambodia respond to existing climatic variability can provide an insight into the likely effects of climate change. Improved supplies generally rely on ground water resources, while for unimproved supplies, surface water and very shallow, perched ground water (<10 m deep) resources are important. The impacts of climate change, which will be encountered by the water supply sector of the MRD, are addressed in the following points:

Ground water resources - Most improved water supplies in rural areas depend on ground water in dry periods. As rainfall and surface waters become less reliable in the dry season, the demand on ground water-based supplies is likely to increase from year to year and from one community to another. Unlike surface water, ground water is less responsive to short-term climatic variability and will be buffered against the effects of climate change in the near-term, as a result of the storage capacity of the aquifer. The potential long-term impact of climate change on the availability of ground water is, however, largely unknown, not least because of the complexity of recharge processes in rural areas, which are poorly constrained at present, even without the complications of climate change.

Recharge - Climate change is likely to modify ground water recharge patterns, as changes in precipitation and evaporation translate directly to shifts in soil moisture deficit and surface water run-off. Increases in rainfall intensity and evaporative demand will likely result in increased irregularity of ground water recharge. There is no simple, direct relationship between rainfall and recharge; recharge patterns will also be affected by soil degradation and vegetation changes that are likely with increased climatic variability. Even though rainfall intensity is likely to increase in the future, soil degradation and vegetation changes might in fact mean that more rainfall becomes surface run-off, so that recharge amounts may decrease. There is still, therefore,

a large degree of uncertainty as to what the final effect of climate change will be on recharge patterns, particularly within upper regions of the country, as a result of the complexity of the process.

Aquifer storage - Recent studies of rural water supply by JICA, and ground water supplies, have indicated that, even with reduced and more irregular recharge patterns, ground water resources at depth (probably deeper than 10–20 m) in many aquifers will generally be of sufficient storage capacity to remain a secure water resource for the domestic water need in rural areas. Ground water-based domestic supplies require little recharge (<10 mm), as rural domestic water use is low (average hand pump yield is 5–10 m³d⁻¹, JICA, 2010). It is only *improved* water supplies which access deeper, more sustainable ground water resources; instead, the majority of the rural population relies on unimproved supplies which use shallow ground water sources within deep soils. This ground water is often ephemeral and the soil layers are of much lower storage capacity than aquifers at depth; the shallow ground water relies on frequent and regular recharge for the resource to be sustainable. During extended dry seasons, under existing climatic variability, shallow ground water resources often dry up. Increased rainfall variability predicted with climate change is likely to mean that unimproved water supplies in low storage regolith (weathered soil material) aquifers could fail more often.

Expected climate change in rural areas exacerbates these existing water quality issues, so that the quality of surface water and shallow ground water may be further impacted. Increased flooding of latrines and unimproved sources could lead to a rise in diarrheal disease and infant mortality, and warmer water temperatures could lead to greater transmission of disease among rural families. Reduced functioning of water supplies during extended droughts could increase the burden of disease. In regions where surface water and ground water recharge are projected to decrease, general inorganic water quality may decrease due to the lower dilution capacity of the water resources. However, predictions of how, and by how much, future water quantities will change are so uncertain that the potential for dilution of the contaminant loading – if water quantities were to increase – cannot be relied upon to counter the flushing effect of more intense rainfall.

3.2 Impacts on the Rural Road Sector

The previous report of climate change impacts on rural roads, which was undertaken during a fact-finding mission in October 2009, highlighted two major concerns related to current and future climate changes. Specifically, there appears to be an overall increase in average total annual rainfall, which is poorly distributed over the seasons, resulting in increased floods during the wet season and increased drought during the dry season. Droughts are significant, especially for unpaved roads as dust levels increase, reducing visibility and creating poor local air quality. Flooding and soil moisture content is a primary concern for protecting investments in road works and should be addressed as a priority in the adaptation strategy (ADB, 2009). Another aspect was found in 2010 during a donor visit. Three potential priority road concerns were identified

because of their apparent vulnerability and historical damage from climatological and hydrological events. The damage by climate impacts was recorded as:

- Existing damage to the road, including washouts, is primarily due to flooding from typhoon Ketsana in September 2009, though they were in poor condition prior to the typhoon. Today, segments of the road are impassable. During the dry season, dust from road traffic on unpaved rural roads is observed and could worsen if warming continues and droughts deepen, which current projections seem to suggest. Together with diarrhea, acute respiratory infections are the top reasons for infant mortality, and managing dust levels can reduce respiratory illness. Poor environmental management, such as slash and burn, increases vulnerability of the area as well. The main project will be paving this road segment, which will reduce dust in dry months, but could increase runoff to surrounding areas during rainy seasons. Managing the increased runoff, especially with increased peak rainfall events and storms, will be part of the adaptation measures. This implies building additional risk assumptions into the engineering design, which carries an important cost, and has been incorporated into the project design already.
- Segments of the road impacted by climate change in Kampong Speu Province appear to be eroded – possibly from flash flooding. Unlike other parts of the project road, there is no irrigation and there is only wet season rice farming and livestock grazing. Vegetative covers are extremely low, and slash and burn agriculture appears to be practiced. High levels of environmental degradation make this area particularly exposed to climate changes.
- Embankment erosion is evident and a small river may be eroding sections of the road in some segments. This may in part be due to improper floodwater release timing from an upstream dam which is sending large volumes of water downstream. The level of the road is very low and may flood during the rainy season. Current drainage capacity is poor, though a new irrigation project is underway which should assist in better management of water resources. Increased coordination with the Ministry of Water Resources and Meteorology on the timing of water releases is important.

The proposed response strategy, in the form of climate adaptation, must include a combination of engineering, non-engineering and planning activities to manage the changes observed and predicted in the rural infrastructure of Cambodia.

3.3 Impacts on the Rural Socioeconomic and Health Sector

Climate change impacts on the rural socioeconomic development sector are serious. Floods destroyed farming systems and homesteads in 2011, resulting in a loss of some \$500 million of socioeconomic gain made pre-disaster (NDC, 2012). Farmers have regularly faced no water for rice crops due to droughts, which seriously downscales socioeconomic gain. Provision of loans to farmers at these times is important. Savings, by not spending income from their businesses,

(made possible by the loans) can compensate for losses incurred by climate change impacts (such as flood and drought).

The long-term good health of populations depends on the continued stability and functioning of the biosphere's ecological and physical systems, often referred to as life-support systems. We ignore this long-established historical truth at our peril: yet it is all too easy to overlook this dependency, particularly at a time when the human species is becoming increasingly urbanized and distanced from these natural systems. The world's climate system is an integral part of this complex life-supporting process, one of many large natural systems that are now coming under pressure from the increasing weight of human numbers and economic activities (WHO, 2011).

Change in the world's climate would influence the functioning of many ecosystems in Cambodia, and the biological health of plants and creatures. Likewise, there have been health impacts on rural human populations, some of which were beneficial. For example, milder winters in December and January would reduce the seasonal winter-time peak in deaths that occurs in rural areas of Cambodia, while in currently hot vulnerable areas, a further increase in temperatures would reduce the viability of disease-transmitting mosquitoes. However, many studies consider that most of the health impacts of climate change would be adverse anyway, and produce negative rather than positive impacts.

Rural populations, as with individuals, vary in their vulnerability to certain health outcomes. A population's vulnerability is a joint function of: the extent to which a particular health outcome is sensitive to climate change; and the population's capacity to adapt to new climatic conditions. The vulnerability of a population depends on factors such as population density, level of economic development, food availability, income level and distribution, local environmental conditions, pre-existing health status, and the quality and availability of rural public health care.

Adaptation refers to actions taken to lessen the impact of (anticipated) climate change. There is a hierarchy of control strategies that can help protect a population's health. These strategies are categorized as: administrative or legislative, engineering and personal-behavioral. Legislative or regulatory action can be taken by the government, requiring compliance by all, or designated classes of persons. Alternatively, adaptive action may be encouraged on a voluntary basis via advocacy, or by education or economic incentives. The former type of action would normally be taken at a supranational, national or community level; the latter would range from supranational to individual levels. Adaptation strategies may be reactive, in response to climate impacts.

4. Current Policy Response to Climate Change

Policy refers to those **plans, positions and guidelines of development projects/programs** which influence decisions by government (e.g. policies in support of sustainable economic

development, policies to enhance access to government services by persons with disabilities, and policies in support of quality scaled-up infrastructure). The activity of policy development generally involves research, analysis, consultation and synthesis of information to produce recommendations. Similarly, policy development in response to climate change in the sector of social and rural irrigation involves problem identification, improvement of structures, management and operation of projects, provision of awareness, etc.

Given the strong impacts of climate change on rural rice production, we need to find ways to increase yields and ensure sustainable rural development. We also need to estimate the role of different inputs and government policy options in rice production and climate change adaptation. In this respect, rural irrigation infrastructure policy will need to be formulated in practical terms and realistically.

Given the impact of climate change on rural society, we need to find ways to accommodate all social issues, including social conflicts of interest, social and political beliefs, and assurance of rural social equity and gender involvement.

Regarding the impacts of climate change on rural poor socioeconomics, we need to find ways to increase families' savings, to ensure food security during periods of natural disasters. That may require the intervention of rural micro-credit schemes for the opening of rural off-farm and on-farm business opportunities. Socioeconomic policies need to be created that will both help and be accessible to the poor. There also needs to be a policy of rural transport and road construction for sustainable development (Bingxin and Tingju, 2010).

Among the rural infrastructure variables to enhance rural socioeconomic development and agricultural yield, the quality of roads, small-scale irrigation and the distance to rural markets are all significant factors. A study by Bingxin and Tingju in 2010 showed that a 1% increase in rural road and small-scale irrigation construction investment, that is resilient to climate change, increases the output of rural social transformation (economy, society and environment) by 2%. Investment in transportation is an effective way to improve yields. Thus, improved infrastructure brings out the yield potential among rice farmers. Investment in irrigation facilities at the commune level will boost rice yield. Other studies have indicated that: "The yield function approach identified small scale irrigation as one of the most important means to improve rice productivity and to adapt to climate change. Substantial regional variations are observed, requiring localized policy packages to achieve food security **and income generation**".

Many policies and strategies are not currently in place, and MRD, in its mandate, commits strongly to working on the establishment of social and rural infrastructure policies. So far, MRD has developed the policy of community development, but has not yet fully completed it. It will be improved so that it can respond to climate change impacts. The MRD is in the process of establishing a strong road maintenance policy linked to climate change resilience.

The MRD currently has a policy of rural water supply that both responds to climate change impacts and seeks poverty reduction. The vision of rural water supply is that: “Every person in a rural community will have sustained access to safe water supply and sanitation services and will live in a hygienic environment by 2025”. The policy declares where the sector is headed in future and formulates a picture of what the future will be. The policy sets a 25-year development goal (vision) for the RWSS sector. It also outlines the roles, rules and approaches that will need to be adhered to in order to achieve the goal. Therefore, the means by which policy is carried out (the bridge between policy goals and detailed actions) comprises a set of medium- to long-term objectives and associated components to support achieving the goal, and to implement the policy.

5. Proposed Possible Actions on Climate Change for Rural Infrastructure

5.1 Vision of MRD on Climate Change

Most current rural infrastructure facilities have not been designed or constructed to be resilient to climate change impacts (particularly concerning floods and droughts), with rural roads and water supplies among the lowest nationally. Likewise, there is a low proportion of irrigated land, and communities often lack reliable and convenient access to water. Local market structures tend to be poorly sited and constructed. In addition, where there is infrastructure, it is typically either of poor quality or in a poor state of repair.

In response to the RGC's national strategy on poverty reduction, MRD contributes efforts and urges all governmental and non-governmental institutions to eradicate rural poverty, and to achieve economic and social well-being for all Cambodians. This is expected to be achieved through a pro-poor, climate-resilient and low-carbon development strategy, as formulated here. This strategy will be based on four building blocks: (1) Adaptation to climate change in rural areas; (2) Mitigation in the best possible ways; (3) Technology transfer and design adequacy; and (4) Timely flow of funds for investment within a framework of rural infrastructure, social infrastructure, primary health care and community development. The four prioritized areas are all aimed at creating: **“Climate risk-resilient rural areas of Cambodia with healthy, safe, prosperous and self-reliant rural communities, and a thriving and productive rural development situation”**.

This will be achieved by implementing this action plan, which will have the following pillars: (1) A quality upgrade of rural infrastructure design and construction; (2) Provision of access to safe rural water supply; (3) Provision of awareness on climate change; (4) A build-up of community resilience to climate change; (5) Provision of action on primary health care resilient to climate change; (6) Elaboration of environmental and social safeguard procedures in the rural infrastructure planning process; and (7) Ongoing rural climate change research. The action plan will be an integral part of national development policies, plans and programs of the CCCA.

5.2 Mission of MRD on Climate Change

Cambodia's topography and exposure to monsoons make it highly prone to climate-related disasters. The impacts of climate-related disasters are high and increasing due to a series of ecological and socioeconomic factors that increase vulnerability, as well as due to climate change itself. The increase in extreme events that is expected under climate change predictions will lead to damaged rural infrastructure. All lowland provinces already experience a large number of climate-related challenges. The most notable of these are:

- Increasingly intensive and increasingly regular flash floods leading to damage to rural public and private property, and danger to lives. These are typically caused by either the heavy lengthy monsoon rains, or the passage of tropical storms;
- Increasingly intensive and regular runoff leading to damage to rural infrastructure, in particular to cutting off roads, also caused by monsoon rains and the passage of tropical storms; and,
- Localized droughts leading to water shortages for rural agriculture and domestic consumption.

The MRD is a key public agency providing good services protecting all vulnerable rural infrastructure facilities from climate change impacts. The MRD is formulating this five-year strategy to cope with these challenges to improve local living standards. The strategy to address climate change impacts means physical infrastructure intervention, through increasing quality and formulating policies for climate change adaptation options. The output will emerge during the first five years of the project implementation.

5.3 Goals and Objectives

“To build the adaptive capacity of rural vulnerable communities (knowledge, primary health care, infrastructure and socioeconomics) and to increase the resilience of rural and social infrastructure to climate change, and optimize mitigation opportunities for sustainable development”.

The first five years of the strategy will be used to increase resilience to, and reduce vulnerability of, local critical economic infrastructure in vulnerable rural areas of Cambodia, to the adverse impacts of climate change, focusing on physical conditions of all rural infrastructure facilities. It will support a policy framework conducive to promoting resilient rural area development.

5.4 Strategy Frameworks

The capacity to adapt to climate change is determined by factors such **as rural economic resources and other assets, rural technology and information accessibility, rural infrastructure, and stable and effective management.** Since many communities in rural areas of Cambodia are poorly endowed with these attributes, and are consequently highly vulnerable to climate change, the enhancement of their adaptive capacity is therefore likely to both reduce vulnerability to climate change and promote sustainable development. Therefore, three important sectors (rural water supply, road construction and socioeconomic development) play essential roles in responding to climate change for the enhancement of rural sustainable development.

Adverse effects on rural infrastructure in rural economic sectors will affect poor people hardest. Climate change could cause many complex alterations: a shift in temperature caused by climate change could lead to reservoir depletions, depletion of ground water tables, insufficient

potable water for humans and animals, depletion of aquatic animals and plants, and changes in socio-ecological conditions. In many rural locations where the warm seasons will become dryer, many areas will be at risk of land degradation, drought and desertification. MRD, together with the Department of Rural Water Supply, must take strong action in response to these phenomena in the context of climate change adaptation.

Changes in temperature and precipitation are also likely to increase the geographic range of vector-borne diseases such as malaria, dengue fever, cholera and diarrhea. The loss of low-lying landmass in coastal areas, which could be ravaged by severe storms and increased sea-level rises, is likely to lead to displacement of populations, loss of life and damage to rural infrastructure (cutting rural roads and overflows onto rural roads, irrigation channels and culverts). To address the challenge of climate change, the PDRD's central administration must ensure that rural communities can adapt to these changes and mitigate the causes. Concerns will be: maintaining rural road traffic flows, providing safe water in both seasons and protecting rural household incomes (perhaps by compensation during drought and flood periods). Some of these adaptation goals involve: improving the design of rural infrastructure and increasing long-term investments, especially social services (such as provision of micro-credit to open up business opportunities); increasing the flexibility of vulnerable systems (e.g. changing activity or location); and improving the preparedness and awareness of rural society (dissemination of the concept of agricultural practices being able to adapt to climate change).

Adaptation refers to the adjustment in natural and human systems in response to actual or expected climate stimuli or their effects, which moderates harm or exploits beneficial opportunities. The world's concerns on climate change and sustainable development highlight the importance of adaptation as "a high priority for all countries". With the physical and socioeconomic characteristics of rural areas of Cambodia, more emphasis must be given to adaptation, to risks associated with current climate variability and extremes, and especially to the impacts on rural and social infrastructures.

The ADB has been developing a number of rural infrastructure pilot projects in developing member countries to develop knowledge and replicable models, on how to climate-proof transport projects and programs. This project in Cambodia represents one of those case studies and is the only one in Southeast Asia. The aim has been to incorporate concerns about climate change impacts into project design to reduce the damage caused to planned and existing transport infrastructure and affected areas. Overall methodology and lessons learned are being incorporated into the development of guidelines which can be replicated elsewhere. This intervention can be supportive to MRD's current proposed possible response to climate change on some levels of action. The MRD continues its role to further design and consider other important options with other innovation methods towards rural sustainable development. The levels of intervention to climate change through rural transport projects must therefore include:

(i) Engineering or structural adjustments. This shall include provision of appropriate drainage to expected levels of climate impacts. This option will focus on subsurface conditions for road and irrigation schemes, material specifications, hydrological investigation, cross section and standard dimensions, drainage and erosion, and protective engineering structures.

(ii) Integration of social and environmental safeguards into the planning process on the basis of ecosystem-based approaches in rural areas. This shall include local improved natural flood management, re-alignment of roads and irrigated canal networks. A combination of these types of options are ideal as part of a comprehensive climate-proofing adaptation strategy. In addition, policy-level reforms for rural infrastructure are needed, such as prioritizing activities in particularly vulnerable areas, reviewing alignments to avoid flood prone areas, and introducing screening criteria to include climate change. The MRD will need to use the environmental safeguards checklist of the EIA during screening processes to ensure that projects will comply with climate change resilience.

(iii) This adaptation option is also to ensure that vulnerable families' savings remain secure during periods of seasonal disasters (flood and drought). MRD will propose the intervention of socioeconomic development action, of which the vulnerable rural poor will be a priority in receiving credit loans for opening off-farm businesses to protect savings, and to provide compensation for any loss of assets due to climate change impacts.

(iv) Increasing rural awareness on the concepts of climate-related issues, such as in primary community health care, hygiene, research results of rural energy consumption, and best climate change-agriculture practices, will be also be options for rural adaptation.

Taking part in climate change mitigation, MRD has been working on the field of changing behavior of rural people on the use of biogas instead of firewood and other materials that produce carbon in the atmosphere. Since 1993, MRD has run a project of biogas for rural livelihoods. MRD continues its efforts to change rural behaviors in this field in order to contribute to low-carbon development.

5.5 Strategic Priorities

The overall objective of this strategy is to implement rural development projects with strong consideration of the challenges posed by climate change facing communities and other stakeholders, in particular by supporting them during the planning process, the implementation process, and during post-project evaluation. During the feasibility study stage, the planning process will focus on environmental impact assessment. The implementation stage needs to provide adequately designed rural infrastructures with full response to climate change. Post-project evaluation will help communities work on best agricultural practices and other businesses (scheduling crop patterns, preparation of post-harvest activities and family income saving). In the implementation of this strategy, MRD will be guided by principles such as the contribution to the over-reaching objective of poverty reduction as stated in national programs, development

policies and MDGs. Policy coherence and cooperation between rural communities and government is also vital. On the basis of these principles, MRD proposes that resilience to climate change requires that rural development, particularly rural infrastructure development, should focus on following FOUR STRATEGIC PRIORITIES:

❖ **Strategic Priority #1:** Creating policies and study profiles makes rural infrastructure development (roads, irrigation schemes, wells, ponds and bridges) resilient to climate change. (*Policy design for quality-based rural infrastructures against climate extreme events.*)

❖ **Strategic Priority #2:** Support for adaptation to climate change through creating local business opportunities that focus on micro-credit provision for socioeconomic development. The increase of families' income from local businesses will create preparedness to compensate for the loss of income during flood and drought periods. (*Policy design and project implementation.*)

❖ **Strategic Priority #3:** Support for resilience to climate change through strengthening the quality of rural infrastructures (roads, irrigation, wells and culverts) to be resilient to flood and drought. (*Pilot project implementation.*)

❖ **Strategic Priority #4:** Support for adaptation to climate change through increasing rural awareness about the concepts of climate change and response options. To provide capacity development to village development committee members on climate change adaptation and mitigation options, and to use other scientific knowledge which can be adapted for use by local people. (*Primary health care, water sanitation, research results dissemination and community development.*)

In response to each of the Strategic Priorities listed above, MRD needs international funding support to develop a number of necessary policies which will ensure an appropriate response to climate change, thereby creating climate change resilience and improving rural socioeconomics.

Strategic Priority #1:

Responding to climate change adaptation and mitigation, MRD addresses its core activities in the 10-year program under the priority area #1 which focus on policy development as below:

- Identification of climate change vulnerable areas, groups and individuals in all provinces
- Identification of adaptation options in the respective vulnerable areas
- Policy on rural road construction (project implementation manual, technical manual and procurement process, involvement of public-private partnership)

- Policy on maintenance of local road network
 - Raise awareness locally and regionally of where the roads networks are
 - Set up appropriate technical groups who benefit from the roads
 - Establish a human resources development process
 - Establish a decentralized planning process
 - Ensure uniformity in the planning process
 - Ensure a needs-based budget
 - Establish a district-wide standard implementation process
 - Establish an operation and maintenance mechanism
 - Establish effective monitoring and evaluation at commune and district levels
 - Communicate with supporting donors

- Policy on rural road safeguards (social and environmental safeguard mechanisms, EIA)
- Standardized quality design, resilient to climate change (scale-up quality, quantity)
- Expansion of bitumen-covered rural roads
- Small-scale irrigation (technical standards, water user groups, maintenance and planning)
- Scale-up rural socioeconomic development through micro- and macro- credit provision
- Rural water supply (well construction, rain water harvesting, small-scale energy, irrigation and water quality)
- Women's participation in rural development projects
- Capacity building (dissemination of information and awareness rising)
- Primary health care
- Master plan formulation on rural roads maintenance, elaborating all concepts of climate change resilience
- Formulation of maintenance guidelines for rural roads, elaborating on all concepts of climate change resilience, especially social and environmental safeguard mechanisms
- Reformulation of existing guidelines of technical standards to align with climate change resilience
- Reformulation of existing guidelines of M&E mechanisms
- Formulate concrete guidelines for road user groups to scale up the resilience to climate change
- Set up guidelines of rural road numbers
- Formulate guidelines for public-private partnerships to mobilize all non-government and government sectors for rural road maintenance
- Community Development
 - Enable rural people to bring about their own development by working to improve production. They will have increased income, which will enable communities to build a better life through self-reliance, especially to climate change, and the use of locally available resources

- Enable rural people to use their wealth to improve their welfare and bring about social and economic development
- Enable the majority of rural people to enter into an economic system in which they can exchange their goods for money and use the money to pay for goods and services that will raise their standard of living
- Enable rural poor to enter into a budget system, spend their income carefully, and develop the habit of placing their savings in rural credit services
- Enable rural people to join together in groups and increase their commitment to self-development that is resilient to climate change
- Continue to implement integrated strategic plans, which can complement each other among rural sectors. These include helping the poor with road access, safe water access, credit, small-scale irrigation, community health care and literacy education. It is important to address these integrated strategic plans on the concept of climate change impacts through community-based mentor training and consultation.

Strategic Priority #2

- Cooperate with existing micro-finance agencies to continue providing soft loans to 30% of the vulnerable groups of people in the first three years. This increases to 50% of vulnerable groups in the following three years, providing 100% at Year 10
- Loan provision will comply with project implementation guidelines and financial procedures
- Loans will be accompanied by exact agricultural plans to ensure that the return will be safe and savings of local businesses will compensate any loss of property during disasters.

Strategic Priority #3

- Protecting road infrastructure from climate change impacts through an improved planning process and consideration of environmental and social safeguards points:
 - Preparation of climate change vulnerability maps for rural roads to improve planning for climate change, including potential climate change downscaling
 - Identify potential adaptation options for rural road construction, and prioritize them using tools of economic analysis and climate-proofing measures, including engineering and non-engineering adjustments, to support the decision making process
 - Review sustainability and capacity of current engineering designs, standards and guidelines to withstand climate changes
 - Develop and implement training and curricula for MRD, and at university level, for engineering students

- Provide training on climate change to MRD staff and key professionals in rural road construction
- MRD continues to improve existing laterite rural roads to bitumen for climate change impact resilience and sustainability. In addition, MRD focuses on expanding new bitumen rural road networks to ensure better transport of goods and services
- Repair and rehabilitate existing laterite rural roads in the best way to be resilient to climate change
- MRD continues to construct concrete bridges in the best method to be resilient to climate change. Increasing bridge spans will be based on long-term hydrology data and will be done considering extreme events of climate change
- MRD continues to design and construct all kinds of spillways and weirs to respond to the extreme events of climate change
- MRD continues to mobilize community-based road maintenance groups, and to provide them with the concept of climate change resilience in their road maintenance measures
- Identify busy rural road networks for routine and periodic maintenance
- Identify strategic road networks connecting with main roads for routine and periodic maintenance. These include bordering roads and access roads to cultural sites and indigenous people.
- Ensuring that increased resilience of road infrastructure does not increase the vulnerability of the surrounding area to climate change through :
 - Green planning: design and implement ecosystem-based adaptation strategies focusing on environmental/green planning for road projects to improve flood and drought management
 - Develop and test a pilot local early warning system and a pilot program for emergency management planning for rural roads. This will be a fully equipped emergency management center (including a back-up mobile unit) with early warning systems installed in key locations, and with emergency management systems in place, with appropriate communication, emergency and rescue equipment and vehicles, and trained personnel to manage the center (response teams, medical teams, etc.).
- Design and develop rainwater harvesting systems, such as tanks, to build reserves for the drought period. There will be 3,500 water storage tanks provided for vulnerable rural schools and communities over five years. There will be construction of tanks, wells and small-scale reservoirs in northern border areas of Preah Vihear Province. Drinking water will be provided for vulnerable households continuously, from Year 1 until Year 5 of the plan. The water tanks have a 2,500 liter capacity for households, and a 50,000 liter capacity for community use. All schools in the northern border areas will be provided

with a roof catchment tank of 50 m³ when installed, with a capacity of 50,000 liters when full.

- For community water, it will be necessary to design climate proofing of pumping wells to adapt to climate change. There will be 5,000 wells treated over five years, in the most vulnerable communities.
- Assuring blue and green water for agriculture: Rainwater harvesting techniques are indispensable for supplying water to plants, as green water or as blue water. They enhance the efficiency of green water use, especially through taking care of the soil. This is done by transforming non-productive green water flow into productive green water through mulching, use of manure, direct planting and increased rainwater infiltration through contour planting, rainwater harvesting “in situ” and planting annual crops adapted to dry climates. Facilities will be designed and constructed in 10 places initially, in the northern border areas of Cambodia.
- Provide shallow wells to vulnerable communities based on groups of about 20 members, and supply freshwater to between 30 and 40 local households, with an average of eight family members.
- Provide deep wells and combined wells to vulnerable communities and households, which will total 500 new water points annually.
- Design and develop 50 small-scale irrigation schemes to ensure full complementary irrigation of wet season paddy rice, even though they meet serious droughts and drying-up of their reservoirs.
- Conduct ground water quality testing for arsenic and other parameters to ensure that drinking water in rural areas is safe and healthy.

The financial requirement for the activities under the four priority areas is estimated to be approximately \$323 million. The budget is proposed to any donors for their support over the five-year plan. This amount includes the contribution of 10% from the national budget on the government side. The budget will cover the period of five years commencing from 2013 (Table 1).

Table 1: Cost Estimation by Proposed Category of Strategic Priority, (in millions USD)

Strategic Priority	10-Year Budget Plan										Total Million USD
Strategic Priority #1:											29
Strategic Priority #2:		0	5								89
Strategic Priority #3:		6	6	6	6	6	6	6	6	6	152
Strategic Priority #4:											53
Total											323

10-Year Strategic Plan

Goal / Priority Area	Indicators	3-Year Target	6-Year Target	10-Year Target
<p>Goal: Support to CCCA through the development of related policies and regulations on rural and social infrastructure</p> <p>Priority Area: Create policies and study profiles, make rural infrastructure development (roads, irrigation schemes, wells, ponds and bridges) resilient to climate change. <i>(Policy design for quality-based rural infrastructures against climate extreme events.)</i></p>	<p>M&E framework review and establishment, recruitment and installation of human and logistic resources</p>	<p>Identification of indicators and people to consolidate data information</p> <p>Produce coherent M&E framework system</p> <p>Review M&E framework, 3-year program evaluation</p>	<p>Review M&E framework, 6-year program evaluation</p>	<p>Review M&E framework and final program evaluation</p>
	<p><u>Policy research and development:</u></p> <p>On roads, water supply, community health care, community socioeconomics, indigenous people</p> <p>Development of regulations, project guidelines, policies, consultation workshops</p>	<p>Policy research for revision, updating and dissemination to all vulnerable people in the areas targeted; about 30% of all</p> <p>3-year policy application evaluation</p>	<p>Policy research for revision, updating and dissemination to all vulnerable people in the areas targeted; about 50% of all</p> <p>6-year policy application evaluation</p>	<p>Policy research for revision, updating and dissemination to all vulnerable people targeted; about 100% of all people in the areas</p> <p>10-year policy application evaluation</p>
	<p>Identification of vulnerable project areas, preparation of standardized technical manuals and terms of rural infrastructure in response to climate change</p>	<p>Identification of vulnerable project areas at 30% of the whole country's total rural areas and people</p> <p>Preparation of standardized technical manuals and terms of rural infrastructure in response to climate change</p>	<p>Identification of vulnerable project areas at 50% of the whole country's total rural areas and people</p> <p>Dissemination of technical papers and regulations to 50% of vulnerable people</p>	<p>Identification of vulnerable project areas at 100% of the whole country's total rural areas and people</p> <p>Dissemination of technical papers and regulations to 100% of vulnerable people</p>

	<u>Socioeconomics and awareness of rural infrastructure resilient to climate change</u>	Develop baseline study on rural and social infrastructure in the context of climate resilience, adaptation and mitigation	Extend baseline to 50% of total vulnerable people and conduct 6-year impact assessment	Extend baseline to 100% of total vulnerable people and conduct 10-year impact assessment
	Rural and social infrastructure safeguard development (environment, social and indigenous people)	Conduct monitoring assessment on rural and social infrastructure safeguards, dissemination of safeguard tools at national level (project implementer)	Revision of the mechanism of social and environmental safeguards, and indigenous groups, and dissemination of tools to district and commune level in the whole vulnerable area	Revision of the mechanism of social and environmental safeguards, and indigenous groups, and dissemination of tools to household level in the whole vulnerable area
	Research to determine factors affecting rural development project and mainstreaming strategy into development project plan	<p>Conduct comprehensive research to determine factors affecting rural development project and program in different geographical settings (Tonle Sap, floodplain, coastal and mountainous)</p> <p>Formulate mainstreaming strategy of climate change adaptation</p> <p>Organize three consultative workshops at sub-national administration</p> <p>Organize national consultative workshop</p> <p>Provide revisions of the formulated mainstreaming strategy of climate change adaptation under the comments of national and sub-national workshops. Produce final mainstreaming strategy of climate change adaptation to be formally implemented at national level of MRD</p>	<p>Formulation of policies and strategic plan for rural infrastructure impacts</p> <p>Evaluation of the program</p>	
Goal: Damages by flood and drought will be compensated by the income of on-farm and off-farm	Soft loan provision for livelihoods improvement, to have savings income for	Provision of soft loans to vulnerable groups for improving on-farm	Provision of soft loans to vulnerable groups for improving on-farm businesses,	Provision of soft loans to vulnerable groups for improving on-farm

<p>businesses</p> <p>Priority Area #2: Support for adaptation to climate change through creating opportunities for local business, which focus on micro-credit provision for socioeconomic development. The increase of families' income from local business will create preparedness to compensate for the loss of income during flood and drought periods. <i>(Policy design and project implementation.)</i></p>	<p>compensating the damages incurred by climate change</p>	<p>businesses, such as agricultural production, livestock, fisheries, irrigation, water supply and off-farm business. 30% of total vulnerable people have been well adapted to flood and drought</p>	<p>such as agricultural production, livestock, fisheries, irrigation, water supply and off-farm business. 50% of total vulnerable people have been well adapted to flood and drought</p>	<p>businesses, such as agricultural production, livestock, fisheries, irrigation, water supply, and off-farm business. 100% of total vulnerable people have been well adapted to flood and drought</p>
<p>Goal: Build resilient rural infrastructure in all vulnerable areas</p> <p>Priority Area #3: Support for resilience to climate change through strengthening the quality of rural infrastructures (roads, irrigation, wells and culverts) resilient to flood and drought. <i>(Pilot project implementation.)</i></p>	<p>Feasibility study</p>	<p>Conduct feasibility studies for 75 km of bitumen and concrete road construction. Build up 10 irrigation schemes subjected to flood and drought, 100 water points, and 10 places of local market developments</p> <p>Apply functional design of flood control to build up 75 km of bitumen and concrete rural roads. Concrete irrigation schemes and water supply.</p> <p>75 km of resilient</p>	<p>Conduct feasibility studies for 150 km of bitumen and concrete road construction. Build up 15 irrigation schemes subjected to flood and drought, 500 water points, and 20 places of local market developments</p> <p>Apply functional design of flood control to build up 150 km of bitumen and concrete rural roads. Concrete irrigation schemes and water supply.</p> <p>150 km of resilient roads, 15 irrigation schemes,</p>	<p>Conduct feasibility studies for 300 km of bitumen and concrete road construction. Build up 30 irrigation schemes subjected to flood and drought, 700 water points, and 30 places of local market developments</p> <p>Apply functional design of flood control to build up 150 km of bitumen and concrete rural roads. Concrete irrigation schemes and water supply.</p> <p>150 km of resilient</p>

	<p>Planning & design of structures</p> <p>Pilot projects of rural road construction, small-scale irrigation, rural water supply and sanitation</p> <p>Pilot projects for green planting</p>	<p>roads, 10 irrigation schemes, 100 water points, and 10 rural markets</p> <p>Provision of green planting along the alignment of roads, irrigation and growing centers</p>	<p>500 water points, and 20 rural markets</p> <p>Provision of green planting along the alignment of roads, irrigation and growing centers</p>	<p>roads, 30 irrigation schemes, 700 water points, and 30 rural markets</p> <p>Provision of green planting along the alignment of roads, irrigation and growing centers.</p>
<p>Goal: Delivery of awareness campaign on climate change adaptation and mitigation to all communities in the</p>	<p>Policies and guidelines of rural infrastructure development</p>	<p>Coaching 30% of total vulnerable areas on developed policies and</p>	<p>Coaching 50% of total vulnerable areas on developed policies and guidelines</p>	<p>Coaching 100% of total vulnerable areas on developed policies and</p>

<p>vulnerable areas</p> <p>Strategic Priority #4: Support for adaptation to climate change through increasing rural awareness about the concepts of climate change and response options. To provide capacity development to village development committee members on climate change adaptation and mitigation options, and to use other scientific knowledge which can be adapted for use by local people. <i>(Primary health care, water sanitation, research results dissemination and community development.)</i></p>	<p>Training modules of climate change adaptation and mitigation</p> <p>Integration adaption and mitigation management into local planning process</p> <p>Organization of dissemination workshops on climate change in national and sub-national administration under MRD</p>	<p>guidelines</p> <p>Provision of training modules to 100 local focal points of the communities</p> <p>Design template to integrate adaptation and mitigation action plan in the local planning process of 30% of vulnerable communities</p> <p>Organize workshop to disseminate and mainstream the formulated strategy of climate change adaptation to all departments under the MRD</p> <p>Organize four workshops to disseminate and mainstream the formulated strategy of climate change adaptation to governmental officials at national and sub-national administration under MRD</p> <p>Provide findings of all workshops above at annual conference of the</p>	<p>Provision of training modules to 300 local focal points of the communities</p> <p>Design template to integrate adaptation and mitigation action plan in the local planning process of 50% vulnerable communities</p> <p>Implement the strategy of mainstreaming climate change adaptation in the project management plans and other relevant policy instruments of all developmental sectors under MRD</p> <p>Provide monthly, quarterly, semester and annual reports of monitoring and evaluation progress on the application of climate change adaptation strategy</p> <p>Submit the annual report of climate change adaptation strategy in the national annual conference of</p>	<p>guidelines</p> <p>Provision of training modules to 600 local focal points of the communities</p> <p>Design template to integrate adaptation and mitigation action plan in the local planning process of 100% vulnerable communities</p>
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		MRD at the end of 2012	MRD Implement mid-term review of application of climate change adaptation strategy under the MRD	
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5.6 Additional Priority Area for Rural Climate Change Adaptation

Long-term objective: To build the adaptive capacity of **rural and social infrastructures** and to increase the resilience of rural and social facilities to climate change.

To achieve this long-term objective, MRD would propose several projects for this five-year plan; some of those projects will be raised in this report, while others are as yet unidentified. The following KRAs, from which MRD and PDRD shall draw local action plans, are adopted. A list of strategic priorities is provided under each **KRA** to serve as an initial guide for action planning. This is also called: *Possible response of rural development to climate change*.

KRA#1

Theme	Capacity Building of Climate-Resilience for Rural Development
Project	Enhanced vulnerability adaptation assessments of rural poor people, with a focus on rural infrastructure.
Objective	Enhance the availability and quality of vulnerability and adaptation assessments to serve as the country's scientific basis for formulating appropriate climate change adaptation strategies for rural development.
Justification	<p>The development of a science-based approach to climate change adaptation requires the establishment of a comprehensive knowledge system which has, as its components, the rigorous collection, database maintenance and publishing of country-specific data towards the generation of methods, tools and assessments for better decision-making. Vulnerability assessment is the process of identifying, quantifying and prioritizing (or ranking) vulnerabilities in a system. It means assessing the threats from potential hazards to the population and to existing rural infrastructure.</p> <p>Vulnerability and adaptation assessments need to be generated to serve as the country's scientific basis towards quantifying and prioritizing climate-related vulnerabilities and refining adaptation strategies in both national and local settings. As a matter of principle, such assessments shall be iterative, as they will be subject to constant methodological and data enhancement.</p>
Actions	<ol style="list-style-type: none"> a. Ensure the formulation of effective and efficient vulnerability, impact and adaptation assessment tools that are relevant to target sectors and implementers. b. Improve mechanisms for addressing gaps and limitations of existing assessment and vulnerability approaches in relation to the

	needs and objectives of climate change plans.
	c. Increase access to climate change adaptation knowledge products and support services for the purpose of guaranteeing that the needs of the marginalized and vulnerable sectors are addressed.
Timeline	Medium to long term
Responsibility	Department of Research and Human Resource Development / Department of Community Development, MRD
Financing	International funding to be sought

KRA#2

Theme	A Climate-Responsive Rural Health Sector
Project	Rural people's health care provision
Objective	Manage rural health risks brought about by climate change
Justification	The global climate is now changing faster than at any point in human civilization, and one of its main impacts on human health is increased morbidity and mortality rates, especially due to vector-borne diseases. Climate change profoundly impacts communicable diseases as its vectors adapt, resulting in greater vulnerability of marginalized sectors. The health sector must formulate proper climate-sensitive interventions in ensuring a healthy rural people and a disease-resilient community.
Actions	<ul style="list-style-type: none"> a. Assessment of the vulnerability of the rural health care sector to climate change. b. Improvement of climate-sensitivity and increase in responsiveness of rural health care systems and service delivery mechanisms to climate change. c. Establishment of mechanisms to identify, monitor and control rural diseases brought about by climate change, and to improve rural surveillance and dissemination of possible responses to communicable diseases to the rural poor, especially climate-sensitive water-borne and vector-borne diseases.
Timeline	Medium to long term
Responsibility	Department of Community Health Care, MRD
Financing	International funding to be sought

KRA #3

Theme	Climate-proofing Infrastructure
Project	Standardized rural road design resilient to climate change impacts, and implementation of a number of pilot projects.
Objective	Improve the rural infrastructure sector's (roads, irrigation and water supply) resilience to the escalating impacts of climate change.
Justification	<p>The impacts could be severe in rural areas where infrastructures are not designed to fully cope with the effects of climate change. Thus, these impacts have potential implications for where we locate and how we build our new rural infrastructure (road network and canal system), as well as how we make existing infrastructure robust or resilient to the effects of climate change.</p> <p>Currently, infrastructure in rural areas has not kept pace with the requirements of a growing rural economy and the increase in rural population. Yet, in the rural areas of Cambodia, there is no infrastructure that is sufficient in quantity and quality to meet global economic challenges, as well as poverty reduction goals, under such international commitments as the MDGs. This will be further exacerbated by climate change, and the need for urgent adaptation action is increasing by the day. To cope with climate change impacts, rural road networks must play two functional roles – transportation and flood control. Thus, this project will need to design both rural roads and small-scale irrigation systems for transportation and flood control.</p>
Actions	<ol style="list-style-type: none">Establish baseline data and benchmarks for climate change as a basis for adaptation actions in the rural infrastructure sector.Collaborate and integrate climate change adaptation plans for rural infrastructure with other stakeholders.Rationalize climate change adaptation in infrastructure policy, planning and programming.
Timeline	Medium to long term
Responsibility	Department of Rural Roads/others, MRD
Financing	\$18 million, seeking international funding

KRA #4

Theme	Rural Food Security, Rural Social Protection and Rural Health Care
Project	Rural adaptation against drought
Objective	Develop drought management options for farmers
Justification	<p>Climate change is likely to result in increasingly erratic rainfall patterns and droughts.</p> <p>Traditionally, the main stable crop is rice, which is planted in the wet season and harvested early in the dry season, except in lower land areas where it is planted in the dry season using small scale reservoirs, or recession rice is planted. Rice currently accounts for over 50% of total agricultural land. Since paddy rice can suffer from drought stress, farmers developed indigenous methods of supplementary irrigation. Major irrigation projects in Cambodia were developed to provide supplementary irrigation in the worst affected parts of the country, especially at the end of wet periods.</p> <p>Farmers in these areas are currently reporting increasingly frequent droughts affecting the paddy rice, especially in Kampong Speu and Kampong Cham provinces. With climate change, these conditions are likely to be exacerbated. Appropriate adaptive measures, combining robust indigenous and new cultivation, new cropping systems and improved water management practices, need to be developed, tested and disseminated to farmers.</p>
Actions	<ol style="list-style-type: none">a. Prepare GIS maps of areas vulnerable to droughts.b. Develop and test adaptive measures in drought-prone areas by combining appropriate cultivars, cropping patterns and land and water management, through small-scale irrigation infrastructure design and effective dissemination to farmers.
Timeline	Short to medium term
Responsibility	Department of Rural Water Supply/PDRD/others, MRD
Financing	\$5 million, seeking international funding

5.7 M&E Framework

There is a needed to establish a M&E Unit for climate change in the MRD. M&E will provide comprehensive analysis and review of the implementation of activities under the four priority areas. This is a commitment to designing a system that will be used in management and decision-making, and not only as a reporting mechanism. To do this, it is necessary that a well-structured and dynamic M&E system be established with MRD's existing resources committed for its operation. In this way, the M&E unit will be able to monitor the ongoing activities of the four priority areas, make adjustments to the program in a transparent and responsive manner, and communicate to the CCCA on the impact of the program on the lives of rural poor people. The M&E framework used by the program will not only include measurement of both outputs and outcomes, but will help manage and improve programs and services. Thus it will serve two key purposes: providing accountability and improving programs and services so as to make them more effective.

5.7.1 M&E Framework Links to Priority Areas and M&E Objectives

The M&E Framework supports a dynamic process for refining and developing additional indicators as needed over the **five-year program implementation period (2013–2022)**. This framework will allow the MRD, PDRD, other stakeholders and development partners to monitor implementation of each program area over time, to assess whether the expected outcomes are being achieved, and to develop targeted policies and program interventions designed to address problem areas.

The Logical Framework sets out indicative outcomes that form the basis of the M&E framework. The outcome indicators specified in the Master Log Frame are the key set of indicators that will be tracked, and regularly reported on by MRD, as it monitors the impact and implementation of the five-year program.

5.7.2 Proposals for M&E Monitoring Activities

The MRD will use the following data sources for data collection:

- **Household survey:** Four stratified random household surveys will be conducted over the five years. The first, in 2013, will establish the baseline, and **three** additional follow-on surveys will be done every **three** years. The household survey will ask a randomly-chosen adult in a household questions about knowledge of climate change concepts, impacts of climate change on rural society, access to information on climate change, and the physical resilience of rural infrastructure to climate change impacts, socioeconomic gains and ecosystem changes over time. It will also obtain demographic information such as age, marital status, income and education, so that data can be analyzed by different respondent characteristics. While data will be

collected at the commune, district and provincial levels, it will be representative, and therefore not allow analysis of each individual commune, district or province.

- **Physical damage and improvement records:** The M&E team will create templates for regular physical recording of changes in rural infrastructure, against the variability of climate conditions over the program period.
- Data will be collected from each province under the program target by MRD staff from representative provincial offices. MRD staff in the provinces will include, for example, the finance and budget officer, human resource manager, etc., who will be requested to provide information on program-specific issues quarterly, biannually or annually, as needed.

6. Conclusion

In the rural areas of Cambodia, overall social, environmental and economic vulnerability increases the effects of droughts, floods and other climatic events. It shows that “many factors contribute to and compound the impact of current climatic variability in rural regions of Cambodia, and negatively affect the region’s ability to cope with climate change. These include poverty, illiteracy, inadequate skills, weak institutions, limited infrastructure, lack of technology and information, low levels of primary education and health care, poor access to resources, low management capabilities and competency of resources”.

It is evident that rural poverty in Cambodia is aggravated by climate change and variability. To address the challenge of rural development, investment in sustainable rural infrastructure project interventions is urgently needed, to ensure improved rural livelihoods while promoting integrated sectors, such as community awareness, community health care, socioeconomic development, water supply and sanitation, roads, and minimizing environmental degradation through rural adaptation to climate change.

Currently, increasing investment in rural development, especially rural and social infrastructure, is a promising climate change adaptation strategy for the rural poor. MRD can contribute to rural socioeconomic growth and reduce poverty through better application of this proposed 10-year strategic plan that will translate into intensification and diversification in developed land, expansion of irrigated areas, rural road improvement, rural water supply and sanitation, awareness raising, increases in food and feed production, and environmental conservation.

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