

# WORKPLAN FOR THE NETHERLANDS CLIMATE ASSISTANCE PROGRAMME - MONGOLIA

## CLIMATE CHANGE and sustainable Livelihood of RURAL PEOPLE IN MONGOLIA

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### Project Introduction

Climate change has already caused significant damage and threatens to bring even more serious consequences in the future. Changes in the biosphere, biodiversity, and natural resources as a whole unfavorably affects human health and quality of life, even further increasing the problem of poverty. Because of its climate and socio-economic specific features, Mongolia will face with more serious problems related to climate change in the future.

For Mongolia the risk of climate change or even prolonged extreme climatic events could have dramatic impacts on its economy and natural systems, with the potential in some cases for irreversible damages to ecosystems. Agriculture, including crop and livestock production, water and forest resources, as well as biodiversity, is among the most vulnerable systems.

Mongolia is a agricultural country where half of the population is living in rural areas, maintaining the traditional extensive livestock lifestyle, which is the main source of wealth and the rural herder households are living in harmony with the nature, thus means they receive direct impacts from climate change.

Main **goal** of this project is to assess the potential impacts of climate change on natural grassland condition and its productivity, water availability and water quality, impacts of extreme climatic events and on economic and social aspects in relation to the livelihood and food security of rural herder households, and to design possible adaptation options and necessary measures against climate change impacts for these households, which comprise about half of the country's population. The project has 4 immediate Objectives e.i. assessments and analyses will be made in these areas, as following:

1. Assessment of Climate Change Impacts on Natural Pastureland and Evaluation of Adaptation Measures
2. Vulnerability and Adaptation Analyses of Water Resources in Rural Areas of Mongolia
3. Vulnerability of Rural People to Extreme Climate Events (Droughts and Dzud)
4. Comprehensive Analyses of Climate Change Impacts on Food Security and Sustainable Livelihood of Rural people

In addition Public Awareness Raising Activities will be organized in the course of the project implementation period.

It should be underlined here that numerous studies and research works have been done in climate change sector in Mongolia since 1990s and within framework of this project, focus will be assessments and analyses of related studies and research works done so far under Objectives given above and in case of necessity some research works will be carried out for the goal of this project. For the Food Security issues, no studies and researches have been done yet in relation to climate change impacts. With this project, list of indicators will be formulated for identifying impacts of climate change on food security of rural herders and the team of project experts is willing to integrate their work outcomes to the food security of rural herder households and develop related adaptation measures.

Also, this project will assist the Government of Mongolia in renewing its policy framework in the area of adaptation to climate change, with a specific focus on examining the consequences of climate change on food security and livelihood systems of rural people. As a proceeding of the project recommendations will be prepared for decision-makers and local governments.

The project seeks to establish links with other implemented and proposed projects by the GEF implementing agencies (UNDP, UNEP, ADB, etc.) and other bilateral and multilateral organizations. This will help to keep duplication of research to a minimum and ensure optimum use of the limited resources available to climate change related issues. Particular attention will be focused on the dissemination of results and outputs of this project among all agencies involved in climate change activities.

On the completion of this project, Mongolia will have a considerably improved understanding about the linkages between climate change and poverty, and the policy framework of food security and sustainable livelihood of rural people in the changed climate and environment condition.

### **Main Methodologies/Tools to be Used**

The project will employ the use of main methodologies such as the Integrated Assessment (IAM) hence within the framework of the project we must combine, at least rudimentary form, knowledge about the following factors; the ecological, economic, and social processes that link climate change impacts that people or societies care about, and the processes by which such valuations are made.

Current practice in IA can be categorized through many types of exercises. Some of these are include analogue, education, expert judgment, themes and places, as well as

the use of non-model exercises to combine information, and it is perceived as more accessible method to stakeholders.

Expert systems have been developed as a tool that incorporates expert judgment, and the Environmental Assessment (EA) processes and its computer software. The climate change impacts must also be determined (e.g., direct/indirect, short/long term, reversible/ irreversible), as well as estimates of the magnitude, likelihood, and temporal and spatial distribution of potential impacts from the climate change. The main classes of impact-identification techniques exist: ad hoc methods, checklists, matrices, networks, and map-overlays, and other cross disciplinary exercises.

Analytical tools and methods used for estimation of potential impacts of climate change on agriculture activities such as animal husbandry and arable farming, consequently on livelihood of rural people should be examined before making an analysis and synthesis of outputs of the available studies. If it is necessary, in some cases potential additional impact and vulnerability analyses in certain areas will be conducted using analytical tools, mathematical models and approaches available.

Set of analytical tool include macro-economic models, multi-criteria decision models, etc. Also, it is requested a reference manuals for these tools. Please find below some of the tools to be used in the project:

#### Software Tool RClimDex

RClimDex software tool is designed to provide a user friendly interface to compute indices of climate extremes. It computes all 27 core indices recommended by the CCI/CLIVAR Expert Team for Climate Change Detection Monitoring and Indices (ETCCDMI) as well as some other temperature and precipitation indices with user defined thresholds. The 27 core indices include almost all the indices calculated by RClimDex (Version 1.3). This version of RClimDex has been developed under R 1.84. A main objective of constructing climate extremes indices is to use for climate change monitoring and detection studies. This requires that the indices be homogenized. Current RClimDex only includes a simple data quality control procedure that was provided in ClimDex. As in ClimDex, we require that data are quality controlled before the indices can be computed.

#### Regional Climate Model (RCM) PRECIS

Timely access to detailed climate change scenarios is particularly vital in developing countries, where economic stresses are likely to increase vulnerability to potentially damaging impacts of climate change. In order to help address this need the Hadley Centre, UK has developed PRECIS, a regional climate modelling system which can be run on a cheap, easily available personal computer (PC). The aim of PRECIS (Providing REgional Climates for Impacts Studies) is to allow developing countries, or groups of developing countries, to generate their own national scenarios of climate change for use in impacts studies.

RCM allows the dynamical downscaling of GCM output to the higher spatial resolutions which are more appropriate for the construction of scenarios of climate extremes.

#### Gris Analysis Display System (Grads)

The Grid Analysis and Display System (GrADS) is an interactive desktop tool that is currently in use worldwide for the analysis and display of earth science data. GrADS provides an integrated environment for access, manipulation, and display of earth science data. GrADS implements a 4-Dimensional data model, where the dimensions are usually latitude, longitude, level, and time.

#### Mapping and overlaying tools

Arcview Geographical Information System (GIS) will be used in producing and overlaying maps in order to be established most vulnerable area due to extreme climate phenomena on food supply and livelihood system of rural people.

### **Specific Methods and Tools to be used for Each Objectives**

***Vulnerability of Water Resources in Rural Areas of Mongolia*** Using hydrological models and assessment approaches, impacts of climate change on water resources (drought and flood) will be assessed. Based on the results of these studies vulnerability of drinking water of rural people and watering of animals to climate change will be analyzed.

***Vulnerability of Rural People to Extreme Climate Events*** (Hot wave, wind storms, Droughts and Dzud) should be analyzed using different indexes and parameters. Dzud is a country specific weather-economic phenomenon occurred in winter season in Mongolia.

***Assessment of Climate Change Impacts on Natural Pastureland*** will be assessed using tools and models for productivity of domestic animals and yields of crop, agricultural field and rangelands depending climate conditions. All data will be integrated in GIS, and overlaying/scoring/ weighed multi factors analyses system, mathematical/statistical analyses using STAGRAPH, time series analyses and Integrated assessment method will be used.

### **STAKEHOLDERS**

The project will be executed and implemented using the following national institutions and bodies:

#### ***Ministry of Nature and the Environment***

The Ministry will be the executing agency of this project and will supervise the project execution and implementation and provide the project implementing agency with general policy guidance to implement the project.

### ***National Agency for Meteorology, Hydrology and Environment Monitoring***

The Agency have been designated by the government resolution as the lead agency for climate change issues in the country. This agency will be responsible for execution and implementation of the project. The Agency will involve experts and consultants from other related ministries and agencies, research institutions in the studies and technical issues.

### ***National Climate Committee***

The National Climate Committee is a policy making body that will be charged with oversight and advising project execution. Membership of the committee is drawn from the following governmental, non-governmental, and academic organizations.

### ***National Project Coordinator/Director***

The National Project Director (NPD) will be nominated by the Minister of Nature and Environment and will coordinate the project execution among the different branches of government and NGO's. The NPD will be responsible for coordination all the activities listed in the project document.

### ***Technical Experts Team/Project Unit***

The Technical Expert Team (TET) will be established, including experts from key relevant sectors including government agencies, academic institutions, NGOs as needed (mainly from the institutions mentioned above). The TET will carry out overall day-to-day execution of the project and enable project management to maintain contact with relevant constituencies and be a technical advisory body to the NPD.

### ***Collaborating organizations:***

- Institute of Meteorology and Hydrology, NAMHEM
- Ministry of Social Welfare and Labor
- Ministry of Food and Agriculture
- University of Agriculture (UA),
- NGOs
- Rural Community Representatives

**Table 1. Logical Framework Matrix**

<b>Project Description</b>	<b>Indicators</b>	<b>Means of Verification</b>	<b>Assumptions</b>
<b>Goal:</b> To assess the potential impacts of climate change on food security and sustainable livelihood of rural herder households and to evaluate adaptation options	Considerably improved understanding about the linkages between climate change and poverty, and the policy framework of food security and sustainable livelihood of rural people in the changing climate and environment condition.	Recommendations to central and local governments with suggestion of potential adaptation options and measures	As suggested by NCAP, the project will target on entire rural herder households, but not only on poor households as the understanding of poor herder household is quite specific in Mongolian condition.
<b>Purpose:</b> This project will assist the Mongolian government in renewing its policy framework in the area of adaptation to climate change, with a specific focus on examining the consequences of climate change on the livelihood systems of rural people.	Policy framework and recommendations to the central and local Governments on the consequences of climate change on food security and sustainable livelihood of rural people.	Project reports and recommendations on adaptation	Project team in collaboration with researchers can formulate recommendations and identify suitable adaptation options
<b>Objective 1:</b> Assessment of Climate Change Impacts on Natural Pastureland and Evaluation of Adaptation Measures	Compilation of all related research works	Consolidated report on impacts and adaptation options	All data will be integrated in GIS; Overlaying/scoring/ weighed multi factors analysis system; Mathematical/statistical analysis, using STAGRAPH; Time

			series analyses; and Integrated assessment method
<b>Output 1.1:</b> Collection of data, publications and reports related to climate change impacts on pasture 2500	Database consisting of following dataset Livestock Population Wells Pasture yield Pasture species Climate data  List of existing publications	Database will be developed on ARCVIEW	Database will be created at national scale
<b>Activity 1.1.1:</b> Collect all source data needed for climate change and pasture			
<b>Activity 1.1.2:</b> Collect related existing reports and publications			
<b>Output 1.2:</b> Analyses of the information and assessment of natural pasture state	<ul style="list-style-type: none"> <li>• Set of pasture indicators as yield, species</li> <li>• Developed method for carrying capacity estimation</li> <li>▪ Pasture resources and carrying capacity map at national scale</li> <li>▪ Statistics on livestock and family and well distribution</li> </ul>	<p>For carrying capacity assessment will be used the following formula  <math>CC=f(DI, W, Y, G, D)</math>  Where,  DI - coefficient of meteorological condition  W - ratio of edible /non-edible species  Y - long term average yield, kg/hect  G - consumed grass by sheep, kg  D - suitable days for grazing  Livestock number will be converted to unit of sheep.</p>	<p>In this study fodder is considered as variable, percentage of non-edible grasses should be excluded from coal biomass.  RS tool is more convenient tool for pasture monitoring</p>
<b>Activity 1.2.1:</b> Set pasture indicators for climate change impact assessment			
<b>Activity 1.2.2:</b> Select more appropriate methodology and calculate for carrying capacity. Develop method to define biomass by RS data as NOAA-NDVI, SPOT Vegetation			
<b>Activity 1.2.3:</b> Define pasture resources by each natural zone and administrative units			

<p><b>Activity 1.2.4:</b> Analyze water supplement of pasture</p>		<p>Allowed number according to pasture resources will be compared against real number of livestock. GIS analyses tools, STAT/Graph functions widely will be used</p>	
<p><b>Output 1.3:</b> Pasture monitoring</p>	<ul style="list-style-type: none"> <li>• Time series analyses result on temperature, precipitation, drought and biomass</li> <li>• Pasture degradation map by natural factors and anthropogenic factors. <ul style="list-style-type: none"> <li>▪ List of soums with more carrying capacity exceeding</li> <li>▪ Pasture degradation vulnerability map</li> </ul> </li> </ul>	<p>Data will be analysed since 1980.</p> <p>To clarify human and natural factors have to compare biomass data measured in grazing affected (open) and not affected area (fenced). Biomass data measured at agro-meteorological stations will be time serially analysed in parallel with field survey and RS data.</p> <p>Pasture changes, its trend will be analysed by natural (temperature, precipitation, drought) desertification, fire, insect distribution) factors. Pasture degradation will be compared against livestock number density.</p> <p>For drought impact on pasture will be assessed.</p> <p>Relationship between the atmospheric and agricultural drought will be investigated.</p>	
<p><b>Activity 1.3.1:</b> Analyze Pasture biomass, growing length, phenology changes by ground and RS data</p>			
<p><b>Activity 1.3.2:</b> Compare pasture degradation against climate changes</p>			
<p><b>Activity 1.3.3:</b> Clarify the natural(drought, fire, insect) and human induced factors (overgrazing, mining)</p>			
<p><b>Activity 1.3.4:</b> Monitor livestock number and kind composition changes</p>			
<p><b>Activity 1.3.5:</b> Pasture monitoring by RS Data</p>			

<b>Output 1.4:</b> Development of adaptation measures for pasture	Papers of Recommendations for adaptation measures <ul style="list-style-type: none"> <li>▪ for local peoples</li> <li>▪ decision makers</li> </ul>	Information is available via other pasture related project, field visit to selected area and interview with local peoples. Pasture rehabilitation and conservation practices will be studied. Adaptation options and measures should be agreed within project framework.	Adaptation options and measures will be discussed with principal stakeholders, herders
<b>Activity 1.4.1:</b> Describe advantage and disadvantages of existing options and measures in Mongolia			
<b>Activity 1.4.2:</b> Learning best practices of adaptation options and measures used in other country similar to Mongolia			
<b>Activity 1.4.3:</b> Formulate more appropriate options and measures to reduce pasture impact			
<b>Activity 1.4.4:</b> Make risk analyses and economic assessment of suggested options and measures			
<b>Activity 1.4.4:</b> Harmonize options and measures with general development policy and water resources, extreme climate condition related adaptation options			
<b>Objective 2:</b> Vulnerability and Adaptation Analyses of Water Resources in Rural Areas of Mongolia (drought and flood)	<ul style="list-style-type: none"> <li>▪ Report on summary and review of previously implemented CC project, research studies, public responses with recommendation and suggestion to policy-makers</li> </ul>	-IPCC Seven step method, integrated impact assessment method etc. - Reports of projects, research studies conducted in Mongolia and for Mongolia, International experiences, are main sources	<ul style="list-style-type: none"> <li>▪ Specification, spatial scale</li> <li>▪ Need of additional studies</li> </ul>

	<ul style="list-style-type: none"> <li>▪ Workshop and Training for education and public awareness</li> </ul>		
<b>Output 2.1:</b> Impacts of climate change on Water Resources	Summary, comparison and recommendation of quantitative and qualitative analysis on water resources and regime in terms temporal and spatial distribution	Volumes of Mongolia's Country Studies Reports on Climate Change, Climate change studies in Mongolia. Project report of Netherlands Climate Change Assistance Programme (NCCSAP), Potential Impacts of Climate Change and Vulnerability and Adaptation Assessment for Grassland Ecosystem and Livestock Sector in Mongolia. Assessment of Impacts and Adaptations to Climate Change (AIACC) report. 2004, 2005. IPCC Special Report on the Regional Impacts of Climate Change An Assessment of Vulnerability, Climate Change and Human Health, Risks and responses, WHO, WMO, UNEP, Geneva	<ul style="list-style-type: none"> <li>- Spatial scale <ul style="list-style-type: none"> <li>▪ Lack of studies for detailed studies in terms of sectoral approach,</li> <li>▪ Need of some additional and confirmation studies</li> </ul> </li> </ul>
<b>Activity 2.1.1:</b> Collect all related information and reports <i>National and international project reports</i> <i>Research papers, report, books</i> <i>Public publications, interview</i> <i>Personal meeting, attendance</i> <i>different events- seminar workshop,</i>	<ul style="list-style-type: none"> <li>- Systemized list of collected materials</li> <li>- Notes, review, Summary, key-point, findings for discussion roundtable discussions, workshop, training etc</li> <li>- Minutes of meeting, visits, presentation</li> </ul>	Volumes of Mongolia's Country Studies Reports on Climate Change, Climate change studies in Mongolia. Project report of Netherlands Climate Change Assistance Programme (NCCSAP), Regional Hydrological Impacts of Climate Change-Impact Assessment	<p>Within the available information</p> <p>Information from neighboring counties in terms of similarity of climate, geography, socio-economic,</p>

<i>visits to related organizations</i>		and Decision Making, IHAS, Publication, 2005	livelihood etc
<b>Activity 2.1.2:</b> Analysing and systematizing the information <i>Different climate change scenarios</i> <i>Low flow analysis (additional study)</i> <i>Analysis on Surface water inventory results</i> <i>Flow regime change (additional study)</i> <i>Change of ground surface (additional study)</i> <i>Glacier retreat and effect of glacier melting river and lake regime, consequences (additional study)</i>	<ul style="list-style-type: none"> <li>- Comparison and summary table between different scenarios</li> <li>- Trend of Low flow change</li> <li>- Integrated indicator of ground surface-runoff coefficient change's spatial and temporal distribution, trend, cause reveal <ul style="list-style-type: none"> <li>▪ Mapping of glacier retreat, correlation relationship</li> <li>▪ Scientific paper</li> <li>▪ Materials for public media</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>- Cross impact analysis for scenarios, flow regime change <ul style="list-style-type: none"> <li>▪ Low flow frequency analysis</li> <li>▪ Mass-balance method on glacier studies, satellite, topo and aero-photo data, direct measurement data</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>▪ Additional studies</li> <li>▪ Field survey</li> <li>▪ Additional research and monitoring data collection</li> </ul>
<b>Output 2.2:</b> Vulnerability of Drinking Water and Agriculture water use in rural people to climate change	<ul style="list-style-type: none"> <li>- Identification of most vulnerable regions in terms of surface and groundwater</li> <li>- Surface water density change</li> <li>- Groundwater table drop mapping</li> </ul>	Access to water and sanitation services in Mongolia, Climate Change and Human Health, Risks and responses, WHO, WMO, UNEP, Geneva	Such studies depending on timing and availability of data may represent at some selected sites
<b>Activity 2.2.1:</b> Collect all related information <i>National and international project reports</i> <i>Research papers, report, books</i> <i>Public publications, interview</i> <i>Personal meeting, attendance</i> <i>different events- seminar workshop, visits to related organizations</i>	<ul style="list-style-type: none"> <li>- Systemized list of collected materials</li> <li>- Notes, review, Summary, key-point, findings for discussion roundtable discussions, workshop, training etc</li> <li>- Minutes of meeting with stakeholders visits and presentation</li> </ul>	Access to water and sanitation services in Mongolia, Climate Change and Human Health, Risks and responses, WHO, WMO, UNEP, Geneva, - Related materials will be gained from different libraries, internet, materials provided from project support unit, some international	Within the available information  Information from neighboring counties in terms of similarity of climate, geography, socio-economic, livelihood etc

		organizations such as IAHS publication, personal contact and archive etc.	
<p><b>Activity 2.2.2:</b> Analyses and systematize the collected information <i>Groundwater regime (water table, yield) change, trend in wells in rural area (additional study)</i> <i>GW and surface water relationship (additional study)</i> <i>Identification of vulnerable geographical area, administrative units</i> <i>Drinking water quality and health aspects</i> <i>Analyses on CC on intensive agriculture (irrigation scheme, crop types, pasture etc)</i> <i>Analysis of Availability, demand, water use, accessibility of water, use rate under CC</i></p>	<ul style="list-style-type: none"> <li>- GW table drop trend, magnitude</li> <li>- GW and surface water inter-correlation presentation under CC</li> <li>- Scientific paper</li> <li>- Materials for public media</li> <li>- Training materials</li> <li>- Report <ul style="list-style-type: none"> <li>▪ List of stakeholders, stake holders specification</li> <li>▪ Exposure units identification</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>▪ Magnitude difference by selected time of period</li> <li>▪ Available GW and surface water regime data from official monitoring network data will be used</li> <li>▪ International experiences study</li> <li>▪ Scientific papers</li> </ul> <p>Checklist for vegetative, period, crop type, pasture biomass under CC</p> <ul style="list-style-type: none"> <li>▪ <i>Sectoral approach</i></li> </ul>	<ul style="list-style-type: none"> <li>▪ Collection of additional data</li> <li>▪ Additional studies</li> <li>▪ Concerning of some site selection</li> <li>▪ lack of case studies</li> <li>▪ International experiences are important</li> </ul>
<p><b>Output 2.3:</b> Adaptation Policy and Measures for Protection of Water Resources</p>	<p>Sufficient amount of information will be consolidated and systemized, as well as appropriate adaptation policy and measures will be determined</p>	<p>Mongolia National Action Program on Climate Change, IPCC Special Report on the Regional Impacts of Climate Change An Assessment of Vulnerability</p>	<p>Overall research works have been conducted in the field and the project team can integrate important documents</p>
<p><b>Activity 2.3.1:</b> Collect all developed options for adaptation <i>National and international project</i></p>	<ul style="list-style-type: none"> <li>- List of collected materials</li> <li>- Notes, review</li> <li>- Summary, key-point, findings</li> </ul>	<p>Regional Hydrological Impacts of Climate Change-Impact Assessment and Decision Making, IHAS,</p>	<p>Within the available information</p>

<i>reports</i> <i>Research papers, report, books</i> <i>Public publications, interview</i> <i>Personal meeting, attendance</i> <i>different events- seminar workshop,</i> <i>visits to related organizations</i> <i>Legislative documents, Government</i> <i>Programmes</i> <i>Socio-economic projects report</i>	<ul style="list-style-type: none"> <li>- Minutes of meeting, visits</li> </ul>	<p>Publication, 2005,  Mongolia national action programme  on Climate Change,</p> <p>IPCC Seven step method (steps 6 and  7)</p>	<p>Information from  neighboring counties in  terms of similarity of  climate, geography,  socio-economic,  livelihood etc</p>
<p><b>Activity 2.3.2:</b> Analyses and  systematize the collected information  <i>Analysis on existing legislative</i>  <i>documents</i>  <i>International experiences</i>  <i>Evaluation adaptive responses</i></p>	<ul style="list-style-type: none"> <li>- Comparison analysis</li> <li>- Identification of adaptive options</li> <li>- Recommendation and suggestion</li> <li>- Report</li> </ul>	<p>Mongolia national action programme  on Climate Change,  Regional Hydrological Impacts of  Climate Change-Impact Assessment  and Decision Making, IHAS,  Publication, 2005,  IPCC Seven step method (steps 6 and  7)</p>	<ul style="list-style-type: none"> <li>▪ Local and  international  short training or  visits</li> <li>▪ International and  local consultation</li> </ul>
<p><b>Activity 2.3.3:</b> Develop new policy  and measures for adaptation, basing  on the old versions/or newly  Analysis on:  Appropriate and re-use  water saving policy  pricing policy  Principle of IRBM  Protection and conservation policy  Public awareness, education, training  Law enforcement</p>	<p>Adaptation policy and measures will  be designed in consultation with  principal stakeholders</p> <ul style="list-style-type: none"> <li>- Summary and review</li> <li>- Recommendation and suggestion</li> <li>- Publication for media</li> <li>- Training and information set  materials</li> <li>- Report</li> </ul>	<p>Regional Hydrological Impacts of  Climate Change-Impact Assessment  and Decision Making, IHAS,  Publication, 2005,  Mongolia national action programme  on Climate Change,</p> <ul style="list-style-type: none"> <li>- Adaptation checklist <ul style="list-style-type: none"> <li>▪ Pilot Model of IRBM</li> <li>▪ Specification analysis by  sectors</li> </ul> </li> </ul>	<p>Extension and  continuous of studies to  implement  recommendation and  suggestions</p>

Meeting with stakeholders, seminar, workshop, local training		<ul style="list-style-type: none"> <li>▪ IPCC Seven step method (steps 6 and 7)</li> </ul>	
<b>Objective 3:</b> Vulnerability of Rural People to Extreme Climate Events (Droughts and Dzud)	Sufficient amount of information will be consolidated and systemized	Consolidated report on vulnerability	Analyses of indexes and parameters
<b>Output 3.1:</b> Trend Analysis of Extreme Climate Phenomena (Droughts and Dzud) in Mongolia	<ul style="list-style-type: none"> <li>-Present extreme climate indices including drought and dzud and their analysis since 1961-2004</li> <li>-Future extreme climate change scenarios</li> </ul>	<ul style="list-style-type: none"> <li>-Daily climate station data</li> <li>-Different Global Climate Model outputs</li> <li>-AIACC Project documents of Potential Impact of Climate Change and V&amp;A Assessment for the Livestock sector in Mongolia</li> </ul>	Last decade extreme climate event occurred as much as severe and extreme climate indices are not considered in previous climate change related project
<b>Activity 3.1.1:</b> Collect all related information and reports	Analyzing all of project documents and research study involving with how extreme climate phenomena impact to the rural people	-Main focus will be on implemented climate change project materials of Mongolia (See attached references)	Information available
<b>Activity 3.1.2:</b> Extreme climate indices analysis	<ul style="list-style-type: none"> <li>-27 core extreme climate indices including drought and dzud index will be calculated and analyzed since 1961-2004</li> <li>-During the calculation of the indices, simple quality control data will be done including 24 climate stations over Mongolia.</li> </ul>	<ul style="list-style-type: none"> <li>-Long term climate daily data is available in Institute of Meteorology and Hydrology (IMH),</li> <li>-RClimDex software package is main tool for indices estimation</li> </ul>	Indices recommended by the CCI/CLIVAR Expert Team for Climate Change Detection Monitoring and Indices.
<b>Activity 3.1.3:</b> Analyze future climate change scenarios of Mongolia using different GCM	Climate change scenarios including meteorological elements in 2020, 2050 and 2080	<ul style="list-style-type: none"> <li>-ECHAM and HadCM3 model monthly output</li> <li>-Grads software tools</li> </ul>	This case scenarios resolution might be coarse (200-250km) and

under SRES emissions			mostly will be used in term of global scale climate change
<b>Output 3.2:</b> Extreme climate change scenario regionalization	Core indices, drought and dzud indices will be analyzed in end of this century	-ECHAM and HadCM3 model output -PRECIS Regional Climate Model output	This case resolution is fine (50-60km) and detailed information will be available under A2 emission scenario
<b>Activity 3.2.1:</b> Calculation of core indices, drought and dzud indices	Changes of core indices, drought and dzud indices in 2071-2100 with respect to the baseline	-ECHAM and HadCM3 model output -PRECIS model -Baseline data 1961-1990	Rural people, especially herders are quiet dependent on drought and dzud in term of their sustainable livelihood. That is the reason why changes of extremes are important.
<b>Activity 3.2.2:</b> Define most vulnerable area due to extreme climate events	Map of the meteorological elements and indices and overlaying maps	-Present and future climate extreme indices results -Geographical Information System	Maps are also connected with other groups results
<b>Output 3.3:</b> Impacts of extreme climate phenomena (droughts, flood, dzud) on food supply and livelihood system of rural people	Information will be consolidated and systemized	Compiled documents	Information is available
<b>Activity 3.3.1:</b> Case studies of	-Define relationship loss of livestock	-Linear Regression Method	Most common case of

<p>Droughts and Dzuds observed in Mongolia during the last decades</p>	<p>number and pasture biomass due to drought and dzud</p> <p>-Evaluate drought and dzud indices during this period</p>	<p>-Research reports related to the drought and dzud</p> <p>-AIACC Project results of Potential Impact of Climate Change and V&amp;A Assessment for the Livestock sector in Mongolia</p>	<p>drought and dzud was occurred 1999-2002 and loss of livestock number has reached about 8 millions. This condition is dramatically affected to livelihood of rural people/herders</p>
<p><b>General Activity:</b> National Workshop for a wide group of stakeholders to disseminate knowledge and perspectives of Food Security and Sustainable Livelihood of Rural People</p>	<p>Sufficient consultations with key stakeholders and local community (herders, farmers, rural people, local Governor's Offices, Citizens Representatives Assembly).</p> <p>We supposed to organize it in the last half of the project period, as we will be completing the assessment and analyses works and start developing some adaptation options and measures. Experts can reflect stakeholders opinions into their work.</p>	<p>Consultation report, outcomes</p>	<p>The droughts and dzud in recent years gave some rudiment understanding to rural community on the climate change and thus we can collect opinions and ideas from them, even may be on the possible adaptation options, as the rural households live with the environment and struggle with the natural events. As we can gather good representatives together from local or rural community, then we can interact with them effectively and later we will disseminate relevant</p>

			information and adaptation options through the rural areas.
<b>Objective 4:</b> Comprehensive Analyses of Climate Change Impacts on Food Security and Sustainable Livelihood of Rural people	<ul style="list-style-type: none"> <li>▪ Report on summary and review of previously implemented national socio-economic projects, research studies, public responses with recommendations and suggestion to policy-makers</li> <li>▪ Workshop and Training for education and public awareness</li> </ul>	<ul style="list-style-type: none"> <li>- integrated impact assessment method etc.</li> <li>- Reports of surveys conducted by National Statistical Office of Mongolia with support of the World bank and UNDP</li> <li>- Data of national programs: “Poverty Reduction in Mongolia” /1996-2002/, “Support the Livelihood Potential of Households in Mongolia”</li> <li>- Mongolian statistical yearbooks</li> </ul>	
<b>Output 4.1:</b> Formulation of food security and livelihoods indicators in context of climate change	Sufficient amount of information will be consolidated and systemized	Compiled documents	Information is available from relevant stakeholders
<b>Activity 4.1.1:</b> Collect socio-economic indicators on livelihood and poverty of rural herder households	<ul style="list-style-type: none"> <li>- Systemized list of collected materials</li> <li>- Notes, review, Summary, key-point, findings for discussion roundtable discussions, workshop, training etc</li> </ul>	<p>The indicators will be based on the national database on poverty which used following.</p> <ul style="list-style-type: none"> <li>- The 5 onse living standards measurement surveys which conducted National Statistical office of Mongolia;</li> <li>- final report of projects which implemented by “National</li> </ul>	

		<p>programme of poverty reduction in Mongolia”;</p> <ul style="list-style-type: none"> <li>- The results of projects which are doing “National programme of support the livelihood potential of households in Mongolia”</li> <li>- and other surveys</li> </ul>	
<b>Activity 4.1.2:</b> Define indicators for identifying food security and livelihood, in context of climate change impacts	Integrate results of Objective 1, 2, 3 and Activity 4.1.1	<ul style="list-style-type: none"> <li>- Detailed analysis of livelihood sources and vulnerability</li> <li>- Gross Impact analysis</li> <li>- Integrated Assessment</li> </ul>	Senior expert of the Project will work together
<b>Activity 4.1.3:</b> Make analyses and assessment using outcomes from Activity 4.1.2.	Defined indicators will be used for identifying impacts of climate change events on herder households	<ul style="list-style-type: none"> <li>- Analytical and statistical methods</li> <li>- Systemizing and analyzing</li> </ul>	Senior expert of the Project will work together
<b>Output 4.2:</b> Design appropriate adaptation options and measures for rural herder households	Outputs of all Objectives and activities will be used		The project team will work on this with concerted efforts
<b>Activity 4.2.1:</b> Analyses and assessment of previously developed options and measures for adaptation	Information will be collected on adaptation options	Analyses report	Information available
<b>Activity 4.2.2:</b> Develop appropriate options and measures	Report of working meetings with stakeholders	Statistical methods that used the collecting information	Integrated assessment method
<b>Output 4.3:</b> Recommendations to the Central and Local Governments to provide the Sustainable Livelihood of Rural People		Comments from participants	Project team, especially senior experts and coordinator of the project will work on this
<b>Activity 4.3.1:</b> Preparation of recommendations basing on outputs	Meeting report	Statistical methods and software tools	Draft of recommendation paper will be introduced

from each Objectives			and debated
<b>Activity 4.3.2:</b> Meeting with Parliamentary Standing Committee on Environment and Rural Development and introduce the recommendations		The decision-makers will make some decision on how to use the recommendations	The recommendations shall be debated at this Standing Committee first and then with approval from the members the document shall be introduced to the Parliamentary plenary session
<b>Objective 5:</b> Public Awareness Raising Activities	Current and future climate change and its potential impacts, possible adaptation options will be known by principal stakeholders and local community (herders, farmers, rural people, local Governor's Offices, Citizens Representatives Assembly etc)	Workshop report, decisions and recommendations	Principal stakeholders will be working together. Stakeholders and participants will be willing to share their views
<b>Output 5.1:</b> Stakeholders Consultations to conduct a self-assessment of the actual status of the objective	Meetings, consultations, seminars	Reports, outcomes, opinions, recommendations	Target towards rural participants and involvement of local stakeholders into the consultation
<b>Activity 5.1.1:</b> Collecting knowledge and information from rural people and introducing project progress	Try to collect opinions of rural people about climate change in their living environment and their experiences	Records of consultations and meetings	Target towards rural participants
<b>Output 5.2:</b> Information Materials	Broad understanding and key points	Information materials specifically	A set of information

on Climate Change and Adaptation measures	of climate change issues on global and local background will be included	designated for general public and decision makers	materials can enhance awareness of public and decision makers
<b>Activity 5.2.1:</b> Prepare paper and video materials	The video can be a documentary, and a TV talk show or radio broadcast with experts etc.	A series of radio broadcasts has a vital importance of awareness raising, as the most common mean of information source for rural herder households is radio receiver	TV talk show can be organized with broad representation from relevant agencies, experts and members of Parliament and the Ministry
<b>Output 5.3:</b> Dissemination of Information Materials	The prepared information materials will be elaborated and disseminated through Environmental Offices, which operates in every aimag provinces, under the Ministry of Nature and Environment	Information set, video material	In addition, can be made through workshops and disseminated through media means like TV and radio
<b>General Activity:</b> National Workshop for a wide group of stakeholders	Project proceedings will be introduced with principal understanding on food security of rural herder households	Consultation report, outcomes	Try to receive as possible as more comments from stakeholders, including decision-makers, as recommendations and measures proceeded from the project is directed towards them
<b>General Activity: Workshop of Experts</b>	Will be organized before submission of each interim reports and represented by research workers from climate change sector	Will be organized 3 times	More representatives can be involved from relevant stakeholders

**Schedule of Activities – Objective 1**  
**Assessment of Climate Change Impacts on Natural Pastureland and Evaluation of Adaptation Measures**

		M O N T H S																			
	<b>Outputs</b>	<b>Activities</b>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
1	Collection of data, and publications related to climate change impacts on pasture	Collect all source data needed for pasture climate change impact study																			
2		Collect related existing reports and publications and review																			
3	Analyses of the information and assessment of Natural pasture state	Set pasture indicators to be used for climate change impact assessment																			
4		Calculate the carrying capacity and assess																			
5		Define pasture resources by each natural zones and administrative units																			
6		Analyze water supplement of pasture																			
7	Pasture monitoring	Analyze Pasture biomass, growing length, phenology changes .																			
8		Pasture monitoring by RS Data																			
9		Compare pasture degradation against climate changes																			
10		Clarify the natural and human induced factors causing pasture degradation																			
11	Development of adaptation measures for pasture	Describe advantage and disadvantages of existing options and measures in Mongolia																			
12		Learning best practices of adaptation options and measures used in other country similar to Mongolia																			
13		Formulate appropriate options and measures to reduce pasture impact																			
14	Workshops/ seminars																				
15	Progress report																				
16	Final report																				

**Schedule of activities – Objective 2**  
**Vulnerability and Adaptation Analyses of Water Resources in Rural Areas of Mongolia**

No.	Outputs	Activities	First six months						Second six months						Third six months						
			1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	
1	<b>2.1</b> Impacts of climate change on Water Resources	2.1.1 Collect all related information and reports																			
2		Analysis on different climate scenarios																			
3		Low flow analysis (additional studies) and surface water inventory results																			
4		Glacier and Climate change (additional studies)																			
5		Ground surface change																			
6		Report, Meeting, presentation, round table discussion																			
7	<b>2.2</b> Vulnerability of Drinking Water and Agricultural water use people to climate change	Collect all related information and reports																			
8		GW regime change, trends in wells in rural area and inter relation to surface water (additional studies)																			
9		Identification of vulnerable area, region, administrative units																			
10		Analysis on Drinking water quality, accessibility, health aspect																			
11		Analysis on Water use, demand in agriculture																			
12		Report, Meeting, presentation, round table discussion																			



**Schedule of activities – Objective 3**  
**Vulnerability of Rural People to Extreme Climate Events (Droughts and Dzud)**

	Outputs	Activities	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
1	Output 3.1: Trend Analysis of Extreme Climate Phenomena and its scenarios (Droughts and Dzud) in Mongolia	Collect all related information and reports																			
2		Extreme climate indices analysis																			
3		Analyze future climate change scenarios of Mongolia using different GCM under SRES emissions																			
4		Progress report, meeting, presentation, round table discussion, briefing																			
5	Output 3.2: Extreme climate change scenario regionalization	Calculation of core indices, drought and dzud indices change																			
6		Define most vulnerable area due to extreme climate events																			
7		Progress report, meeting, presentation, round table discussion, briefing																			
8	Output 3.3: Impact assessment of drought and dzud phenomena on food supply and livelihood system of rural people	Case studies of Droughts and Dzuds observed in Mongolia during the last decade																			
9		Impact, vulnerability assessment and adaptation options design																			
10		Progress report, meeting, presentation, round table discussion, briefing																			
11	Final discussion, presentation, meeting																				
12	Final report																				

**Schedule of Activities – Objective 4**  
**Food Security and Sustainable Livelihood of Rural people**

	Outputs	Activities	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	Formulation of food security and livelihoods indicators in context of climate change	Collect socio-economic indicators on livelihood and poverty of rural herder households																		
2		formulate indicators for identifying food security and livelihood, in context of climate change impacts																		
3		Make analyses and assessment using outcomes from Activity 4.1.2.																		
5	Design appropriate adaptation options and measures for rural herder households	Analyses and assessment of previously developed options and measures for adaptation																		
6		Analysing and systematizing the information																		
7		Meeting, presentation, round table discussion, briefing																		
8	Recommendations to the Central and Local Governments to provide the Sustainable Livelihood of Rural People	Preparation of recommendations basing on outputs from each Objectives																		
9		Meeting with Parliamentary Standing Committee on Environment and Rural Development and introduce the recommendations																		
10	Final report																			

