Kingdom of Cambodia

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TA-8179 CAM MAINSTREAMING CLIMATE RESILIENCE INTO DEVELOPMENT PLANNING – PACAKGE A (45283-001)

Training Workshop on GIS Climate Change Downscaling

Date of training: December 16, 2016
Date of this record: December 16, 2016
Location: Phnom Penh, Cambodia

Prepared for: Asian Development Bank
Prepared by: Climate Change Department, NCSD
Technical supported by: ICEM

TA 8179-CAM Mainstreaming Climate Resilience into Development Planning – Package 1

TRAINING WORKSHOP REPORT

Dates of mission: 16 December 2016	**Date of this record:** 16 December 2016
Locations: Phnom Penh, Cambodia	**Prepared by:** Ministry of Environment **Technical supported by**: ICEM
Topic: Training Workshop on GIS Climate Change Downscaling	

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SUMMARY

On 16 December, 2016 the TA held a one-day workshop to present a newly developed GIS Climate Change Toolbox at the Himawari Hotel in Phnom Penh, Cambodia. The workshop was organized under TA 8179-CAM: Mainstreaming Climate Resilience into Development Planning, which is being executed by Cambodia's Ministry of Environment with assistance from the International Centre for Environmental Management (ICEM). The workshop included 38 participants from various organizations, including: MAFF, MoWA, MPWT, MRD, NCDDs/MoI, MoE, MoWRAM, MoP, NGOs Forum, and CDC (participants detailed in Appendix 1).

The toolbox presented at the workshop is a web-based climate change projection interface which provides projections for numerous climate change parameters at the national, provincial, and local level throughout Cambodia. The tool is intended for use by infrastructure and development planners to facilitate inclusion of climate change in project design and management in a way which is consistent across all arms of government.

Once finalised, the tool will be hosted on MoE's website and can be used by all sectors of the Cambodian Government in their development planning and management. It will allow sector experts to shift from the current project-by-project and ad hoc seeking of climate change data and GIS analysis to a more systematic approach founded on a single information base. As the tool is still in the developmental phase, the workshop was designed both to share the tool and begin to train participants on its use, and to receive feedback as how to improve the tool.

The tool garnered very positive reviews from the workshop participants in its ability to communicate climate change information to its users. Participants at the workshop also had ample opportunity to provide their feedback on the tool and have provided valuable suggestions that will be taken into account as the tool continues to be developed.

Figure 1.1: Group photo of workshop participants

1 INTRODUCTION

1.1 Project overview

The Ministry of Environment (MOE) is the executing agency of TA 8179-CAM: Mainstreaming Climate Resilience into Development Planning. The Technical Assistance (TA) is aimed at enhanced resilience to climate change in Cambodia through strengthening institutional and technical capacity of the government to mainstream climate resilience into development planning, as well as improving coordination among various sectoral line ministries, sub-national agencies, non-government organizations (NGOs) and the private sector.

The TA has four outputs: (i) SPCR coordination, technical support and capacity to mainstream climate resilience into development planning strengthened; (ii) detailed feasibility studies for selected National Adaptation Program of Action (NAPA) projects conducted; (iii) civil society support mechanism established and capacity of NGOs and civil society organisations (CSOs) to mainstream adaptation and disaster risk reduction (DRR) into their operations strengthened; and (iv) climate change adaptation knowledge products developed and disseminated. ICEM - International Centre for Environmental Management was contracted in February 2015 to support MOE for Package 1 of this TA, covering outputs (i), (ii) and (iv).

The TA Package 1 undertaken by ICEM, directly supports technical capacities of government staffs to mainstream climate resilience into development planning and implementation of concerned ministries. Capacity building in vulnerability assessment and adaptation planning is one of the main objectives of this TA leading to improved resilience in development projects. This workshop assisted in this capacity building process through demonstrating to participants the capabilities of the toolbox to produce climate change projections throughout Cambodia and the methods for interpreting the threats from those climate change projections. The workshop also provided participants with an active role in the development of the toolbox, as participants provided suggestions for the toolbox based on their active participation in the working group session.

The training workshop was presided over by H.E. Prof Dr Sabo Ojano, Secretary of State, MoE and Program Coordinator of SPCR; and H.E. Chub Paris, Deputy Secretary General, NCSD.

1.2 Workshop purpose

Specifically, the objectives of this workshop were:

1. To present and discuss the national web-based GIS-based climate change decision-support tool and its application.
2. To conduct a trial of the tool to test and fine tune its uses.
3. To receive feedback to improve the tool and to develop a user manual.

The agenda of the workshop is presented in Appendix 2.

2 WORSKHOP PROCEEDINGS

2.1 Introductions

H.E. Dr. Sabo Ojano, Secretary of State of MoE and SPCR Program Coordinator welcomed the participants to the workshop and expressed excitement at the potential of the climate change toolbox to mainstrain climate change information in development planning in Cambodia.

Dr. Lay Chanthy, National Adaptation Project Development Specialist, introduced participants to the workshop objectives and the program outline.

Dr. Jeremy Carew-Reid introduced the new GIS Climate Change Toolbox. He provided an overview of the climate change threats to Cambodia, and demonstrated examples of how the toolbox is used to communicate those threats. This included opening the web-based toolbox and showing participants the how to navigate the user interface to find desired climate change information. He emphasized the importance of integrating a results based toolbox as a decision-support tool in climate change planning.

Figure 2.1: H.E. Chub Paris, H.E. Dr. Sabo Ojano, and Dr. Jeremy Carew-Reid introduce the workshop proceedings and objectives.

2.2 Plenary Discussion

Following the initial toolbox introduction presentation given by Dr. Carew-Reid, the toolbox received an immediate positive response. H.E. Chub Paris, Deputy Secretary General of NCSD said that he was very excited about participants having an available tool to harmonize climate change projections in Cambodia and that he would make a point to "stay all day" to learn how to use to tool and continue to be involved in the discussion of the development of the tool.

A discussion was raised regarding concern about the reliability of the downscaled climate change results in Cambodia. Consensus was reached that the toolbox has been developed with the best information available, and that although there will always be limitations to use modelled results, it is best to move forward and continue to develop the tool using updated climate information as it becomes available.

An additional concern was raised that members of various ministries would be intimidated to use the tool because of the technical nature of the results that it presents. Participants discussed that it would be useful to have more workshops as the tool is further developed to ensure that the information in the tool is easily interpretable by a range of users. This will include providing accessible user guides and communicative methods in the toolbox, as well as continuing to develop the toolbox interface in a user-friendly manner. The TA is confident that the excitement generated around the toolbox at this first workshop will encourage ministries to use the tool once it is released on the MoE website and to continue to be involved in the development of the tool.

A representative from the Ministry of Agriculture, Forest, & Fisheries stated that he is very interested in the toolbox and that it can be combined with data from the Ministry of Water Resources to optimize its usefulness moving forward. He mentioned that currently many planners are unaware of methods or tools to predict climate change information, and this tool will thus fill a useful void in being a reliable method of integrating climate change information to development planning.

Figure 2.2: Workshop participants participate in the initial plenary discussion following Dr. Carew Reid's presentation of the current toolbox capabilities. The discussion gave participants an opportunity to provide their initial comments on the toolbox and to raise any questions and/or concerns.

2.3 Working Group Session

The workshop participants were split into four groups to trial the toolbox with a specific development project case study. The trial was designed to allow the participants to explore the various functions of the toolkit in providing climate change projections and to provide feedback as to the ease of use of the tool and suggestions for the further development of the tool. Each working group used the tool to develop a climate change threat profile for their case study province. The threat profile was used by the groups to think about climate change implications for the case study project. Finally, each group had an opportunity to propose their suggestive feedback for the further development of the tool. Each working group developed their threat profile together and presented the threat profile and suggestive feedback to the rest of the workshop participants. The toolbox development feedback of the four groups is provided below.

Figure 2.3: Workshop participants collaborate to develop a climate change threat profile for the Kampong Chnnang province during the working group session.

2.3.1 *Group 1 – Battambang canal and drainage system rehabilitation*

Group 1 suggested that the toolbox developers should provide a set of instructions that detail how to use the information from the toolbox for conducting vulnerability assessments and for conducting climate change adaptation and resilience planning.

2.3.2 *Group 2 – Sihanoukville port and access road development*

Group 2 suggested that the toolbox should include flood data. This was a common recommendation amongst the workshop participants. The group additionally recommended that the toolbox should include land use and land cover data (forests, rivers, canals, lakes, ponds), agricultural land use data, population density data, as well as available resettlement areas. Finally, the group suggested that the toolbox should include a Khmer version.

2.3.3 *Group 3 – Kampong Chnnang – Kampong Leng port, road, and flood protection project*

Group 3 suggested that the tool needs more detailed flood and drought information (at the province, district, and commune levels). Again, the suggestion for the toolbox to include more detailed flooding information was a common piece of feedback from the participants. The group additionally suggested that the information in the toolbox should be scaled down to the commune level. Finally, the group suggested that the toolbox should include more geographical information (elevation, land type, etc).

2.3.4 *Group 4 – Modulkiri upland agriculture and biodiversity corridor development project*

Group 4 had suggestions for a range of additional data that they would like to see included in the toolbox (wind, soil quality/moisture, water quantity and quality, water velocity, flash flood, drought, soil elevation). At future workshops, the TA will work to communicate better that some of this information is already being integrated into the land cover monitoring system tool developed by the Department of GIS, MoE.

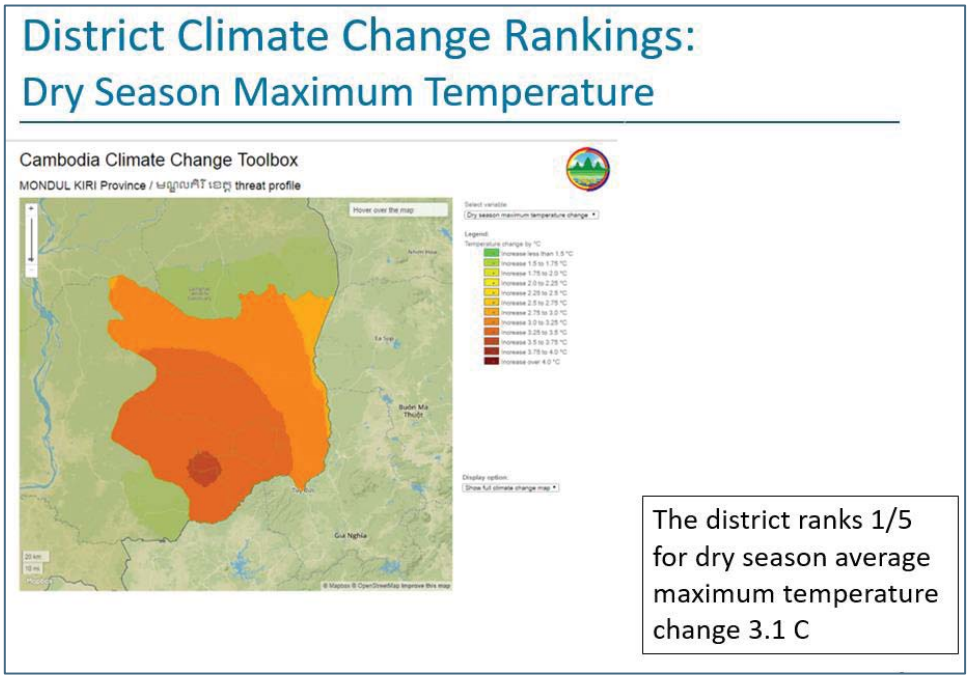

Figure 2.4: An example slide from a working group developed climate change threat profile detailing dry season average maximum temperature change in the Mondulkiri province.

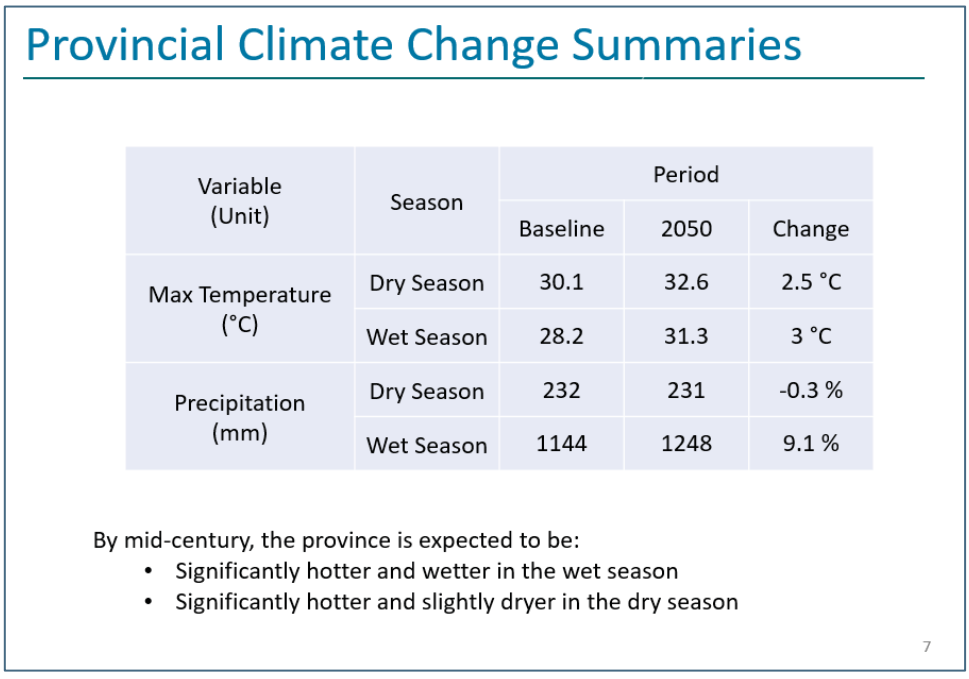

Figure 2.5: An example slide from a working group developed climate change threat profile detailing a provincial climate change projection summary and threats for the Kampong Chnnang province.

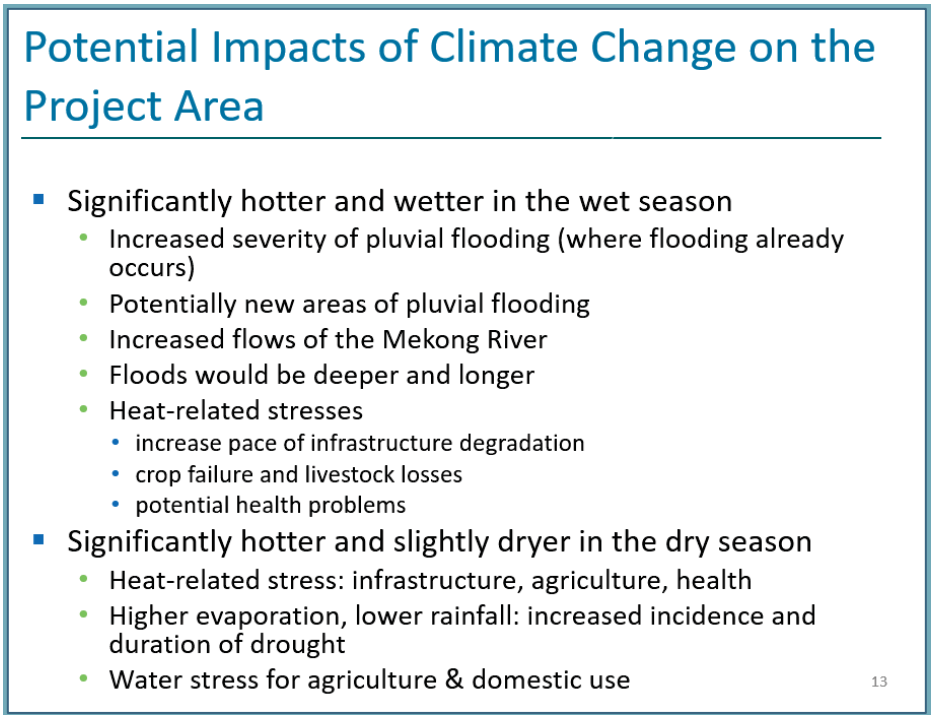

Figure 2.6: An example slide from a working group developed climate change threat profile detailing potential impacts of climate change to the proposed project area for the Kampong Chnnang province.

2.4 Workshop Evaluations

The workshop participants conducted two sets of evaluations – one set which allowed them to write out their overall comments regarding the workshop, the GIS toolbox, and recommendations for future workshops, and another evaluation which they answered specific questions as to their satisfaction with the current state of the toolbox and quality of the working group session. Overall, there was a great sense of excitement throughout the workshop as the applicability of the tool and the desire to have the tool further developed following the recommendations of the participants. Participants also demonstrated interest in being involved in future workshops for the toolbox and expanding the range of future workshops to include additional stakeholders.

2.4.1 *Overall Comments*

- Participants thought that it was a great training workshop and opportunity to be exposed to the climate change downscaling toolbox and its ability to generate climate change related information for Cambodia
- All participants stated that this is a useful toolbox and that the information it provides will help support project planning decisions and implementation in the face of climate change.
- Participants were happy to test the toolbox and learn how to generate information from the toolbox, which provides them with a new knowledge source.
- Participants reported that they gained knowledge regarding climate change projections and potential climate change impacts.
- Participants suggested having a follow up workshop next year, as it will allow for additional participants from various ministries/institutions/academia and the private sector to understand the upgraded toolbox as well as how to interpret the data it generates for their research, planning, and interventions. They also suggested adding data for the commune level into the toolbox.

- Participants agreed to form a working group to work on and finalize the toolbox.
- MoE participants stated that the toolbox eventually will be officially uploaded to the MoE website for public use.
- Participants stated that the workshop organization, facilitators, and speakers were effective and allowed enough time for participants to raise questions.

2.4.2 *Working Group Session Questions*

Below are the evaluation questions and responses provided by working group session participants:

1. The Cambodia Climate Change Toolbox is a potentially important tool in mainstreaming climate change in development

Response	Percent
Strongly Agree	23 %
Agree	46 %
Undecided	0 %
Disagree	8 %
Strongly Disagree	23%

2. The workshop provided adequate opportunity to understand the objectives and functions of the climate change toolbox

Response	Percent
Strongly Agree	15 %
Agree	54 %
Undecided	0 %
Disagree	8 %
Strongly Disagree	23 %

3. The workshop provided adequate opportunity to suggest improvements to the climate change toolbox

Response	Percent
Strongly Agree	46 %
Agree	23 %
Undecided	8 %
Disagree	8 %
Strongly Disagree	15 %

4. The working group session provided opportunity for applying the toolbox to a development project scenario

Response	Percent
Strongly Agree	23 %
Agree	46 %
Undecided	0 %
Disagree	1 %
Strongly Disagree	23%

5. The workshop participants adequately reflected the range of government specialists that should be involved in using the toolbox (if not, please suggest additional target groups for future training)

Response	Percent
Strongly Agree	23 %
Agree	46 %
Undecided	0 %
Disagree	1 %
Strongly Disagree	23%

6. I wish to take part in future workshops to refine and use the toolbox

Response	Percent
Strongly Agree	23 %
Agree	46 %
Undecided	0 %
Disagree	1 %
Strongly Disagree	23%

3 CONCLUSIONS AND NEXT STEPS

3.1 Conclusions

The GIS Climate Change Toolbox received a very positive response from the workshop participants. Participants saw the benefit of having a reliable climate change projection toolkit to mainstream climate change threats into development planning. Currently, planners in Cambodia often do not know where to search for climate change information. This toolbox has the potential to fill that void as being the accepted destination to receive information about climate change data and threats throughout Cambodia.

H.E. Chub Paris, Deputy Secretary General, NCSD was particularly excited about the potential of the toolbox. He stated that the toolbox will eventually be linked to the MoE website and thus be the official climate change information source for Cambodia development planning. He suggested that as the toolbox continues to be developed, future workshops should be larger with more stakeholders involved, including university students.

The workshop included a working group session in which participants were divided into four groups to use the toolbox to develop climate change threat profiles for specific province case studies. Participants reported that the working group session provided a useful opportunity to explore the various functions of the toolbox and to better understand climate change threats throughout Cambodia. The working group session also provided a chance for participants to provide feedback on the toolbox. Participants mostly expressed interest in having flooding information included in the toolbox as it continues to be developed. There was a strong consensus that future workshops should continue to promote the toolbox as it is further developed, include more stakeholders, and should also focus on using the toolbox to distinguish between climate change threats and the impacts of those threats.

3.2 Next steps

The TA will continue to develop the toolbox, integrating the various suggestions provided by the workshop participants. The TA will develop a more comprehensive user guide, along with a guide for interpreting the climate change threats posed by the toolbox.

Once the suggestions from the workshop have been included into the toolbox, the TA will organize a second workshop to demonstrate the updated capabilities of the toolbox and to train participants in using the toolbox for development planning.

APPENDIX 1. PARTICIPANT LIST

TA 8179-CAM: Mainstreaming Climate Resilience into Development Planning

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Training Workshop on " GIS Climate Change Downscaling"

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Himawari Hotel, Phnom Penh on 16 December 2016

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16	SOK KIMSAN			Reporter	TVS	0998917834	KimSanSok6@gm…	
17	Long Viseth			Deputy unit	NCDDs			
18	Keo Prepey			Chief office	— " —	099787007		
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	Kotane PHURIK-CALLEBAUT			Director	EUROCHAM			

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Himawari Hotel, Phnom Penh on 16 December 2016

ATTENDANCE LIST

ល.រ Name	ឈ្មោះ Name	ឈ្មោះជាអក្សរឡាតាំង Name in Latin	ភេទ Gender	ងារ: Position	ក្រសួង ស្ថាប័ន Organization	ទូរស័ព្ទ Phone-Number	អ៊ីមែល E-mail	ហត្ថលេខា Signature
1	[illegible]	Sim Touch	ប	[illegible]	MOE	012425346		[signature]
2	[illegible]	LAY CHANTHY	ប	ADAPTATION	ICEM/MOE	089793347	-	[signature]
3	[illegible]	Yon Pormy	ស	KM officer	ICEM	012612092		[signature]
4	[illegible]	Nop Navy	N	[illegible]		077221161	navy.ts1001@gmail...	[signature]
5	[illegible]	THAI VATHANA	M	NIIS	ICEM	[illegible]		[signature]
6	[illegible]	unphannatt	—	CTN.TV		093402991		[signature]
7	[illegible]	TA SOVANNARY	F	[illegible]	MOP	089237623	sovannary_ta@yahoo.com	[signature]

ADB | Climate Investment Funds | icem

TA 8179-CAM: Mainstreaming Climate Resilience into Development Planning

សិក្ខាសាលាបណ្តុះបណ្តាល ស្តីពី «ការបង្រួមមាត្រដ្ឋានប្រព័ន្ធព័ត៌មានភូមិសាស្ត្រសម្រាប់ការប្រែប្រួលអាកាសធាតុ»

Training Workshop on " GIS Climate Change Downscaling"

សណ្ឋាគារហ៊ីម៉ាវ៉ារី រាជធានីភ្នំពេញ ថ្ងៃទី១៦ ខែធ្នូ ឆ្នាំ២០១៦

Himawari Hotel, Phnom Penh on 16 December 2016

ATTENDANCE LIST

ល.រ Name	ឈ្មោះ Name	ឈ្មោះជាអក្សរឡាតាំង Name in Latin	ភេទ Gender	ងារ: Position	ក្រសួង ស្ថាប័ន Organization	ទូរស័ព្ទ Phone-Number	អ៊ីម៉ែល E-mail	ហត្ថលេខា Signature
28	Jeanne EVERETT		F	TL	Plan Int'l	012333278	everett.jeanne@plan-international.org	[signature]
29	Jeremy Carew-Reid		M	Climate Change Advisor	ICEM		jecr@icem.com.au	[signature]
30	[illegible]	Sabo Ojano	M	Secretary of State	MoE			[signature]

APPENDIX 2. AGENDA

Time/Session	Presentation/training activity	Presenter	Facilitator
Session 1: Opening and Introduction			
7:40-8:00	Registration	PMU Staff	
8:00-8:30	Welcome statements (TW/MCRDP/DOC1)	H.E. Prof. Dr. Sabo Ojano, MOE Secretary of State	
8:30-8.45	Introduction to workshop objectives and program (TW/MCRDP/DOC2)	Dr Lay Chanthy, National Adaptation Project Development Specialist	
Session 2 – Introducing the new GIS tool			
8:45-9:30	Introduction to the new GIS-based climate change decision-support tool (TW/MCRDP/DOC3)	Dr. Jeremy Carew-Reid	HE Prof Dr. Sabo Ojano, Secretary of State, MoE and SPCR Program Coordinator Dr. Jeremy Carew-Reid H.E Chub Paris, Deputy Secretary General, NCSD
9:30-10:00	Plenary discussion of the decision-support tool	Facilitated by Dr. Jeremy Carew-Reid	
10:00-10:15	**Coffee break**		
Session 3 – Climate change data needs for SPCR investment projects			
10:15-10:30	GIS climate change data needs and sources of data for MOE (TW/MCRDP/DOC4)	Mr. Touch Vina, Director, Dept. of GIS, MOE	HE Prof Dr. Sabo Ojano, Secretary of State, MoE and SPCR Program Coordinator Dr. Jeremy Carew-Reid H.E Chub Paris, Deputy Secretary General, NCSD
10:30-10:50	GIS climate change data needs and sources of data for investment projects in Cambodia – four presentations by SPCR project teams (10 min for each PPT) (TW/MCRDP/DOC5)	SPCR investment project representatives for projects: MOWRAM representative	
10:50-12:00	Plenary discussion	Facilitated by Jeremy Carew-Reid	

Time/Session	Presentation/training activity	Presenter	Facilitator
12:00 – 13:30	**Lunch**		
Session 4 – Trailing the new GIS tool			
13:30-14:00	Instructions to the break-out group exercise 'Using the climate GIS tool for province-specific case studies' (TW/MCRDP/DOC6)	TA team	HE Prof Dr. Sabo Ojano, Secretary of State, MoE and SPCR Program Coordinator Dr. Jeremy Carew-Reid H.E Chub Paris, Deputy Secretary General, NCSD
14:00-14:45	Break-out group exercise (three groups)	Facilitated by the TA team	
14:45-15:45	Break-out groups report back and provide feedback (TW/MCRDP/DOC7)	Break-out group representatives	
15:45-16:00	**Coffee break**		
16:00-16:30	Next steps for finalising the decision-support tool (TW/MCRDP/DOC8)	Dr. Jeremy Carew-Reid	
16:30-16:45	Concluding remarks	H.E. Prof. Dr. Sabo Ojano, MOE Secretary of State	

APPENDIX 3. PRESENTATION

Strategic Program for Climate Resilience

Mainstreaming Climate Resilience into Development Planning (TA 8179) ***(September 2013-April 2019)***

Training Workshop on GIS Climate Change Downscaling

Objectives and Program of the Workshop

Dr. Lay Chanthy
Climate Change Adaptation Expert
ICEM / MOE
16 December 2016

TW/MCRDP/DOC 2

Background

- GIS-based climate change decision is an essential support tool for climate change planning.
- The TA team and MOE's Climate Change Department (CCD) are currently developing a web-based Climate Change Toolkit which provides projections for numerous climate parameters in Cambodia at the provincial, district and local levels.
- The tool is intended for use by infrastructure and development planners to facilitate inclusion of climate change in project design and management in a way which is consistent across all arms of government.
- Today workshop discusses on the developed web-based Climate Change Toolkit for improvement.

Objectives of the Workshop

- To present and discuss the national web-based GIS-based climate change decision-support tool and its application.
- To conduct a trial of the tool to test and fine tune its uses.
- To receive feedback to improve the tool and to develop a user manual.

Participants of the Workshop

No.	Description	No. of participants
1	Representatives from MoE CCD	6
2	AWG Representatives from MOWRAM, MAFF, MPWT, MRD	14
3	Representatives from development partners (UNDP, GIZ, CCCA)	3
4	NGO representatives (Plan International, NGO Forum)	4
5	Representatives from SPCR investment projects	10
6	ADB representatives	1
7	TA team members	8
8	Others: 1 interpreter	1
Total		46

Program of the Workshop

Time/Session	Presentation/training activity	Presenter	Facilitator
Session 1: Opening and Introduction			
7:40-8:00	Registration	PMU Staff	
8:00-8:30	Welcome statements	H.E. Prof. Dr. Sabo Ojano, MOE Secretary of State	
8:30-8.45	Introduction to workshop objectives and program	Dr. Seak Sophat	
Session 2 – Introducing the new GIS tool			
8:45-9:30	Introduction to the new GIS-based climate change decision-support tool	Dr. Jeremy Carew-Reid	HE Prof Dr. Sabo Ojano, Secretary of State, MoE and SPCR Program Coordinator Dr. Jeremy Carew-Reid H.E Chub Paris, Deputy Secretary General, NCSD
9:30-10:00	Plenary discussion of the decision-support tool	Facilitated by Dr. Jeremy Carew-Reid	
10:00-10:15	**Coffee break**		

Program of the Workshop

Session 3 – Climate change data needs for SPCR investment projects			
10:15-10:30	GIS climate change data needs and sources of data for MOE	Mr. Touch Vina, Director, Dept. of GIS, MOE	HE Prof Dr. Sabo Ojano, Secretary of State, MoE and SPCR Program Coordinator Dr. Jeremy Carew-Reid H.E Chub Paris, Deputy Secretary General, NCSD
10:30-11:30	GIS climate change data needs and sources of data for investment projects in Cambodia – four presentations by SPCR project teams (10 min for each PPT)	SPCR investment project representatives for projects involving MPWT, MAFF, MRD and MOWRAM	
11:30-12:00	Plenary discussion	Facilitated by Jeremy Carew-Reid	
12:00 – 13:30	**Lunch**		

Program of the Workshop

Session 4 – Trialling the new GIS tool			
13:30-14:00	Instructions to the break-out group exercise 'Using the climate GIS tool for province-specific case studies'	TA team	HE Prof Dr. Sabo Ojano, Secretary of State, MoE and SPCR Program Coordinator Dr. Jeremy Carew-Reid H.E Chub Paris, Deputy Secretary General, NCSD
14:00-14:45	Break-out group exercise (three groups)	Facilitated by the TA team	
14:45-15:45	Break-out groups report back and provide feedback	Break-out group representatives	
15:45-16:00	**Coffee break**		
16:00-16:30	Next steps for finalising the decision-support tool	Dr. Jeremy Carew-Reid	
16:30-16:45	Concluding remarks	H.E. Prof. Dr. Sabo Ojano, MOE Secretary of State	

Thank you for Attention!

Strategic Program for Climate Resilience (SPCR)

Technical Assistance 8179: Mainstreaming Climate Resilience into Development Planning (MCRDP)

Training Workshop on " GIS Climate Change Downscaling''

Presenter's Name: **Jeremy Carew-Reid**
Position: Climate change advisor
Ministry/Institution: ICEM

Date: 16 December 2016

TW/MCRDP/DOC 3

Vulnerability assessment and adaptation process

1. Vulnerability assessment

- Assessing the impact of climate change threats on infrastructure, areas, species and ecosystems

2. Adaptation planning

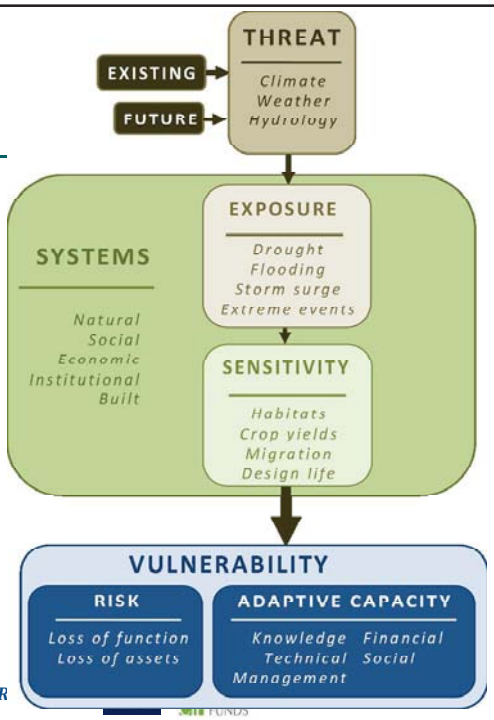
- Defining adaptaiton priorities and plans for the most vulnerable assets

3. Adaptation implementation

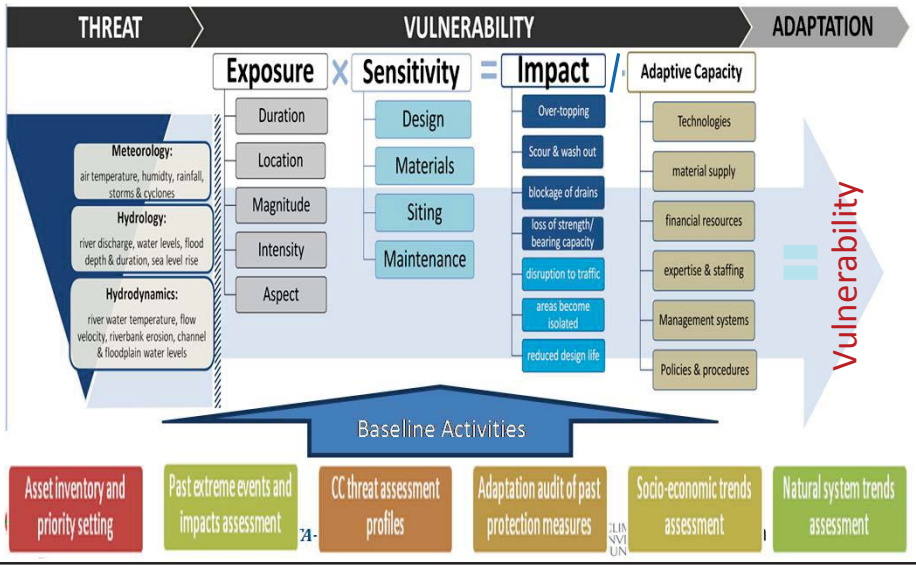
- Implementing the adaptation measures and adjusting over time based on experience and new information

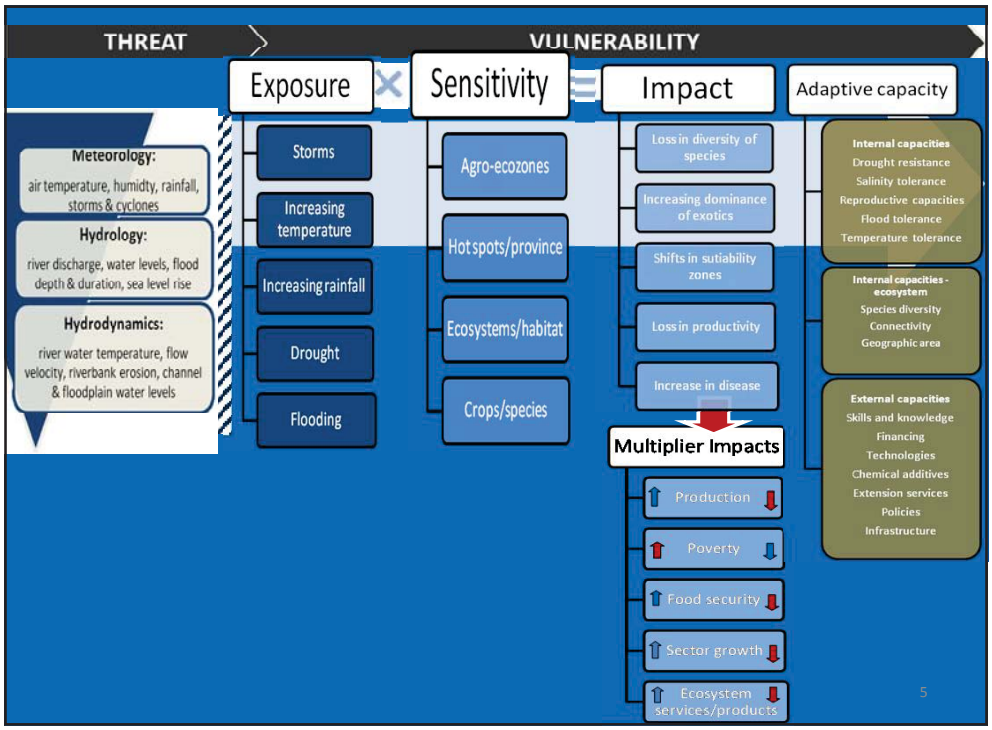
Assessing vulnerability

- Exposure x sensitivity = impact
- Impact/adaptive capacity = vulnerability



Vulnerability assessment steps





Identifying the main climate change *threats* for the area/sector

Climate & hydrological system

- Temperature
- Rainfall
- Wind
- humidity
- Infiltration/runoff
- Groundwater levels
- Surface hydrology
- Storms
- Sea level rise

Flash floods -More frequent, wide spread and high intensity

Large scale extreme flooding More frequent and severe

Extreme drought

Land slides-More frequent, wide spread and severe

Saline intrusion

- Other threats include for example: changing duration of rainfall event, length of wet season, shifts in onset, increased mean and maximum temperature, depth and duration of flooding, intensity of flow.
- The expression of "threats" will vary from one sector and area to the next

Baseline assessment - Linking climate changes to threats for infrastructure

Climate & hydrological system

- Temperature
- Wind
- humidity
- Rainfall
- Infiltration/runoff
- Groundwater
- Surface hydrology
- Storms

Past experience

Modeling the future

Sectors

- Roads & bridges
- Drainage
- Water supply
- Sanitation
- Watershed management
- Power supply
- Health facilities

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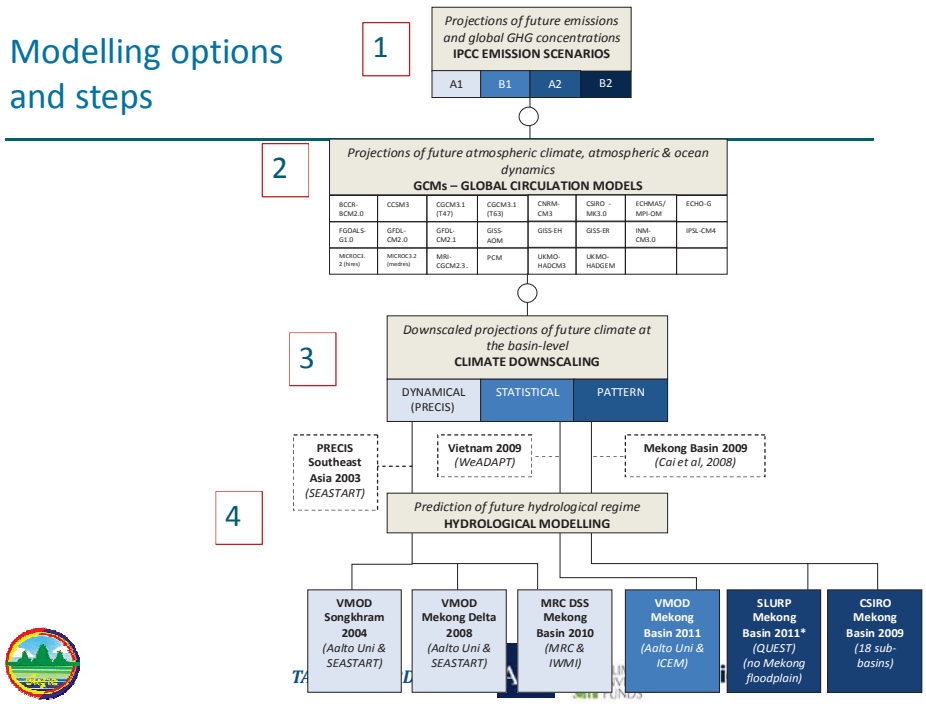
Modelling options and steps



Steps in the climate change threat projection process

1. Selection of appropriate IPPC scenarios (A1B)
2. Selection of appropriate GCMs (6 out of 24)
3. Downscaling projections to the Mekong Basin (VMOD) - **Purpose:** *reduce the geographical scope so that resolution can be improved (1km2)*
4. Modeling future changes in hydrology and flooding

Climate model	CO2 Scenario	Abbreviation	Data period	Model resolution (degrees)
CCCMA_CGCM3.1	A1b, B1	ccA, ccB	1850-2300	3.75° x 3.75°
CNRM_CM3	A1b, B1	cnA, cnB	1860-2299	2.8° x 2.8°
GISS_AOM	A1b, B1	giA, giB	1850-2100	3° x 4°
MIROC3.2Hires	A1b, B1	miA, miB	1900-2100	1.1° x 1.1°
MPI_ECHAM5	A1b, B1	mpA, mpB	1860-2200	1.9° x 1.9°
NCAR_CCSM3	A1b, B1	ncA, ncB	1870-2099	1.4° x 1.4°

Source: CSIRO, 2009

Introduction to the GIS climate change tools box for Cambodia

- Current situation – all sectors and development project teams use different threat information on an ad hoc basis.
- This leads to uncertainty and make reform to design standards and cc mainstreaming difficult
- The challenge – the need for a consistent and easily accessible source of climate change information for all development sectors
- The solution – an open source web based tool which provides the latest data supported by extensive GIS maps and other products – but which can be updated and added to as further information becomes available
- [presentation of web based GIS climate change tool for discussion and improvement]

Working group activities

1. Project description
2. Provincial rankings by climate change parameters
3. Provincial climate changes
4. Rankings of districts by climate change
5. Climate changes for precise coordinates of project
6. Summary threat profile
7. Some impacts of cc on the project area
8. Some initial thoughts on implications for project design
9. Suggestions for improving the tool box


Battambang Core Group conducting vulnerability assessments
THANK YOU

ទិន្នន័យព័ត៌មានភូមិសាស្ត្រអំពី

ការប្រែប្រួលអាកាសធាតុ

សណ្ឋាគារហ៊ីម៉ាវ៉ារី, ថ្ងៃទី១៦ ខែធ្នូ ឆ្នាំ២០១៦

ដោយលោក ទូច វីណា

មាតិកា

1. តួនាទីនិងភារកិច្ចរបស់នាយកដ្ឋាន
2. តម្រូវការទិន្នន័យសម្រាប់កិច្ចការនាយកដ្ឋាន
3. ប្រភពទិន្នន័យ និង GIS Tools

តួនាទី និងភារកិច្ច

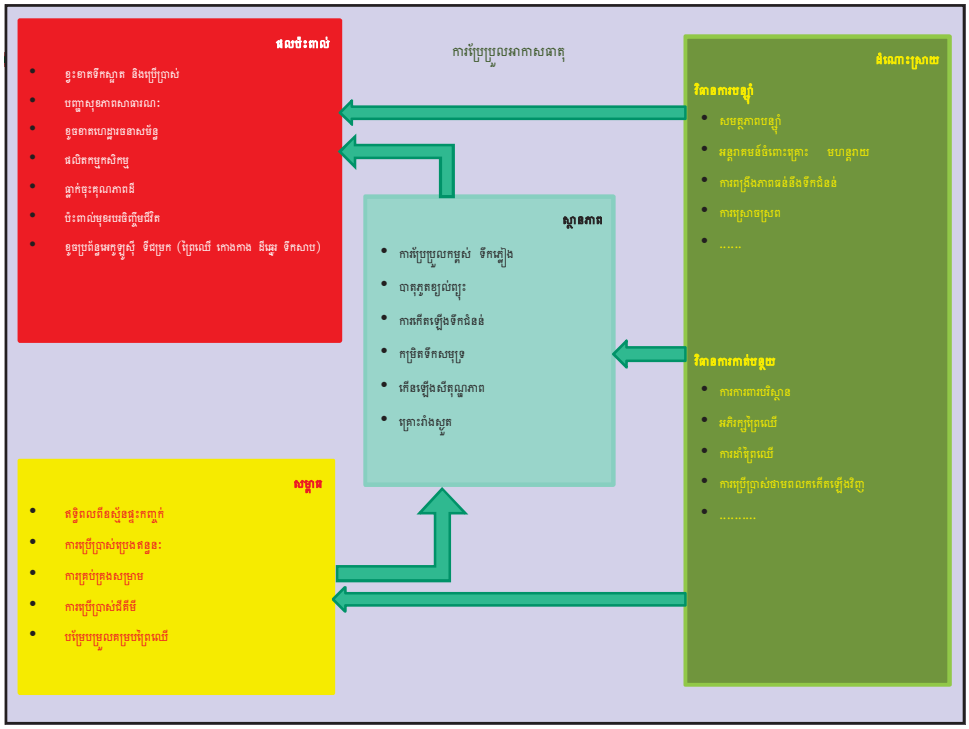
- នាយកដ្ឋានសៀវភៅព័ត៌មានភូមិសាស្ត្រ (GIS) (*អនុក្រឹតលេខ១៣៥ អនក្រ.បកស្តីពីការរៀបចំ និងការប្រព្រឹត្តទៅរបស់ក្រសួងបរិស្ថាន*)
- តួនាទីនិងភារកិច្ច (បច្ចេកទេសសំខាន់ៗ) របស់នាយកដ្ឋាន៖
  - ប្រមូល រិភាគ ចងក្រង និងគ្រប់គ្រងប្រព័ន្ធព័ត៌មានភូមិសាស្ត្រ និងទិន្នន័យពាក់ព័ន្ធកិច្ចគាំពារបរិស្ថាន ការគ្រប់គ្រងធនធានធម្មជាតិ ការអភិរក្សជីវៈចម្រុះ និងការអភិវឌ្ឍដោយចិរភាព
  - ផ្តល់សៀវភៅព័ត៌មានភូមិសាស្ត្រ និងផែនទីគាំទ្រ កិច្ចការពាក់ព័ន្ធខាងលើ និងការសិក្សាស្រាវជ្រាវផ្សេងៗ
  - ចងក្រងសូចនាករបរិស្ថានស្តីពីធនធានធម្មជាតិ ជីវៈចម្រុះ និងគុណភាពបរិស្ថាន និងកសាងរបាយការណ៍ស្តីពីស្ថានភាពបរិស្ថានទៀងទាត់ (៥ឆ្នាំម្តង)

មាតិកាទិន្នន័យបរិស្ថាន (Data Content)

- សូចនាករ/ស្ថិតិបរិស្ថាន (ENVIR. INDICATORS)
- ផែនទី (MAPS: publication & interactive)
- ឧបករណ៍ផែនទី (MAP-TOOLS)

ជំពូកទិន្នន័យ (Themes)

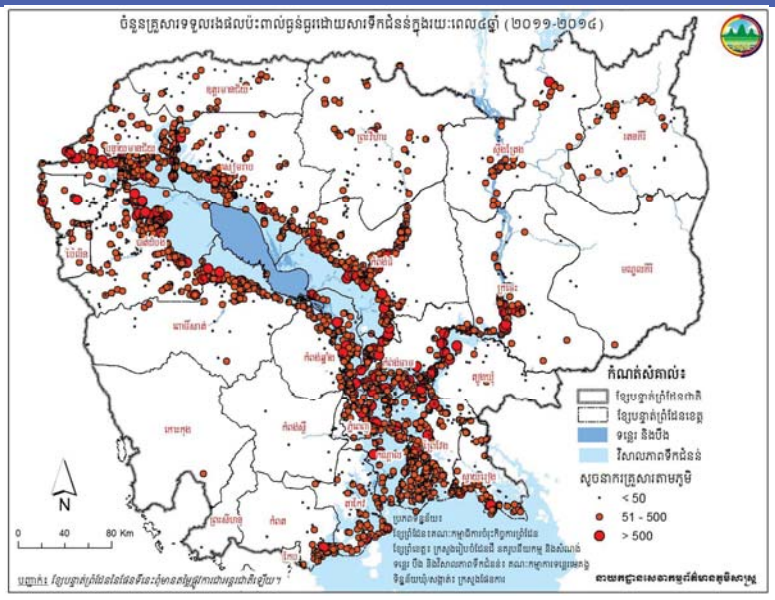
- បរិស្ថាន (Environment)
- បរិស្ថានទីក្រុង (Urban environment)
- ជីវៈចម្រុះ (Biodiversity)
- ធនធានធម្មជាតិ និងតំបន់ទេសភាព (Natural resources and landscape)
- ធនធានឆ្នេរ និងសមុទ្រ (Marine and coastal resources)
- តំបន់ការពារធម្មជាតិ (Protected area)
- សហគមន៍តំបន់ការពារធម្មជាតិ (Community protected area)
- ការប្រែប្រួលអាកាសធាតុ (Climate change)
- .....



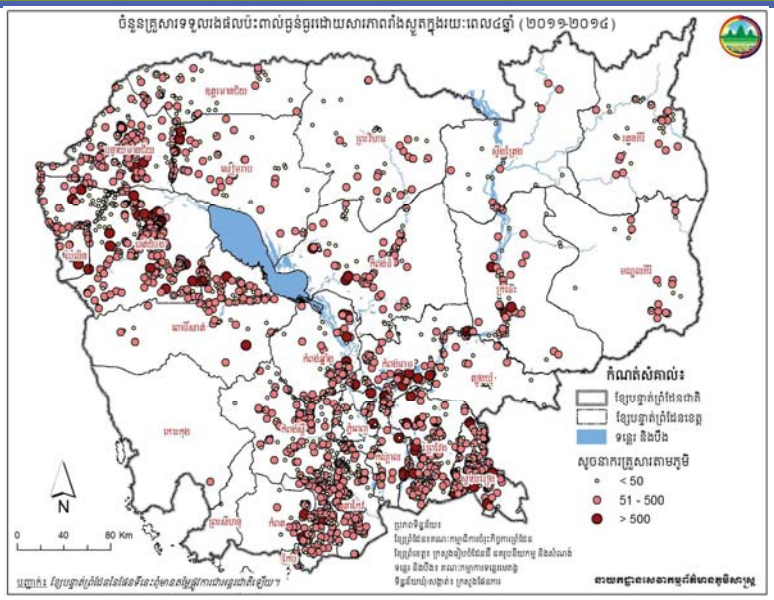
តម្រូវការទិន្នន័យ(Data Needs)

ការប្រែប្រួលអាកាសធាតុ	ប្រភពទិន្នន័យ
ការប្រែប្រួលកម្ពស់ទឹកភ្លៀង	MOWRAM
ការកើនឡើងទឹកជំនន់ (%គ្របដណ្តប់ទូទាំងប្រទេស)	Global image/data
ចំនួនគ្រួសាររងផលប៉ះពាល់ទឹកជំនន់	NCDM/CDB
ផ្ទៃដីកសិកម្មរងការខូចខាតទឹកជំនន់	MAFF/CDB
ការខូចខាតសរុបគិតជាតម្លៃសេដ្ឋកិច្ចទឹកជំនន់	NCDM
ការប្រែប្រួលសីតុណ្ហភាព (%គ្របដណ្តប់ទូទាំងប្រទេស)	MOWRAM
ចំនួនគ្រួសាររងផលប៉ះពាល់រាំងស្ងួត	NCDM/CDB
ផ្ទៃដីកសិកម្មខូចខាតរាំងស្ងួត	MAFF/CDB
ការខូចខាតសរុបគិតជាតម្លៃសេដ្ឋកិច្ចរាំងស្ងួត	NCDM
ចំនួនគ្រួសាររងផលប៉ះពាល់ (ខ្យល់ព្យុះ ខ្យល់កន្ត្រាក់)	NCDM/CDB
ការខូចខាតសរុបគិតជាតម្លៃសេដ្ឋកិច្ច (ខ្យល់ព្យុះ ខ្យល់កន្ត្រាក់)	NCDM
ការប្រើប្រាស់ប្រេងឥន្ធនៈ	? MOC
ការនាំប្រេងឥន្ធនៈចូលប្រចាំឆ្នាំសរុប	MOC
សារពើភ័ណ្ឌឧស្ម័នផ្ទះកញ្ចក់	NSDC
ការប្រើប្រាស់ថាមពលកើតឡើងវិញ	? MME

Source of Commune Database

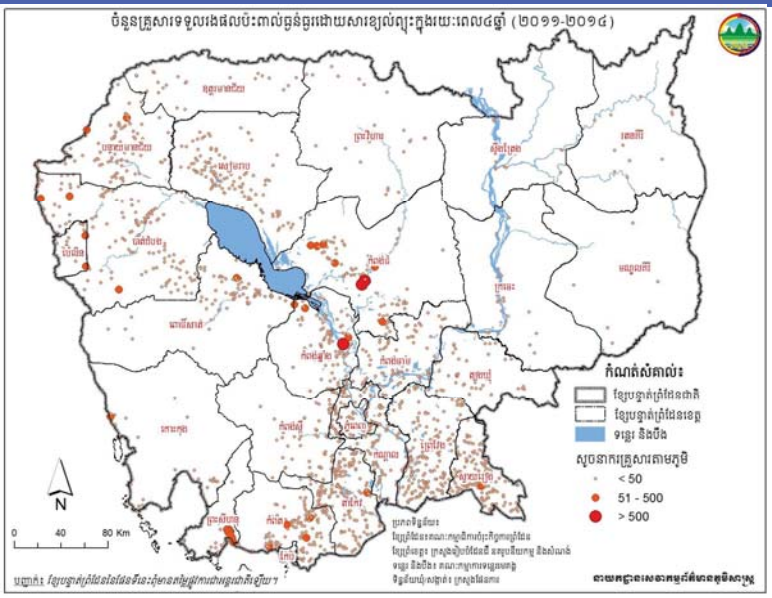


Source of Commune Database



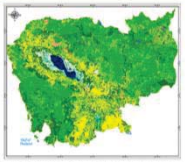
9

Source of Commune Database



10

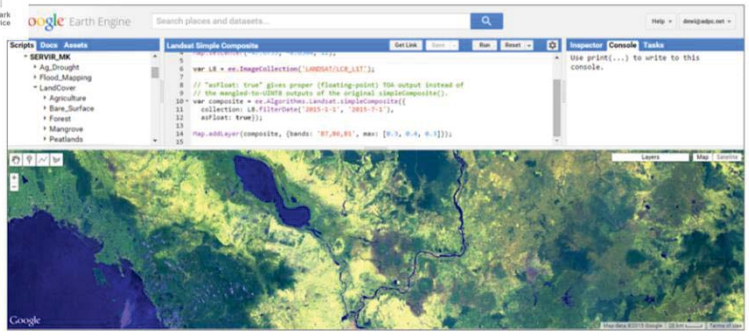
Land Cover Monitoring System



Cambodia example: Forest is dark green, water is dark blue, urban is purple, shrubland is light green, rice field is yellow.

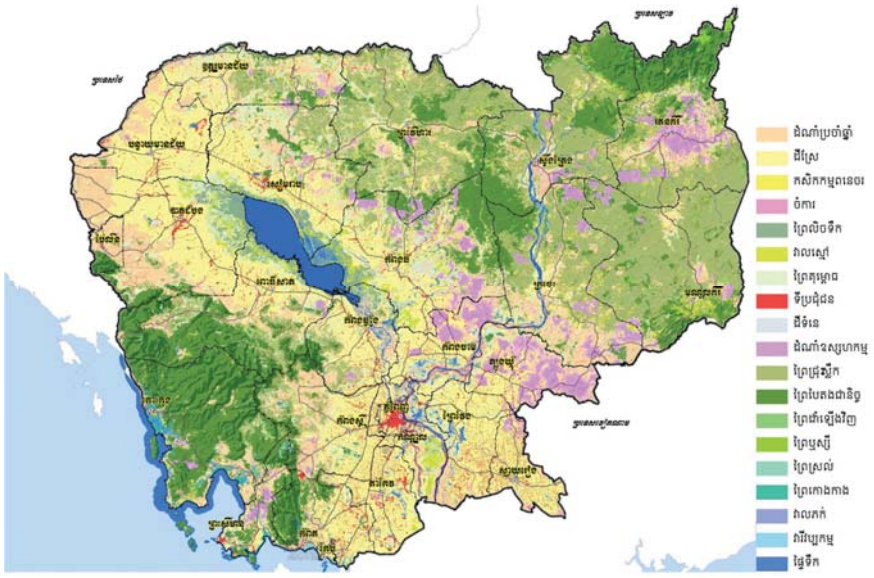
Integrate algorithms into the land cover tool to derive regional LC maps. The tool consists of two components:

- (1) a Google Earth Engine (GEE) application that performs image analysis

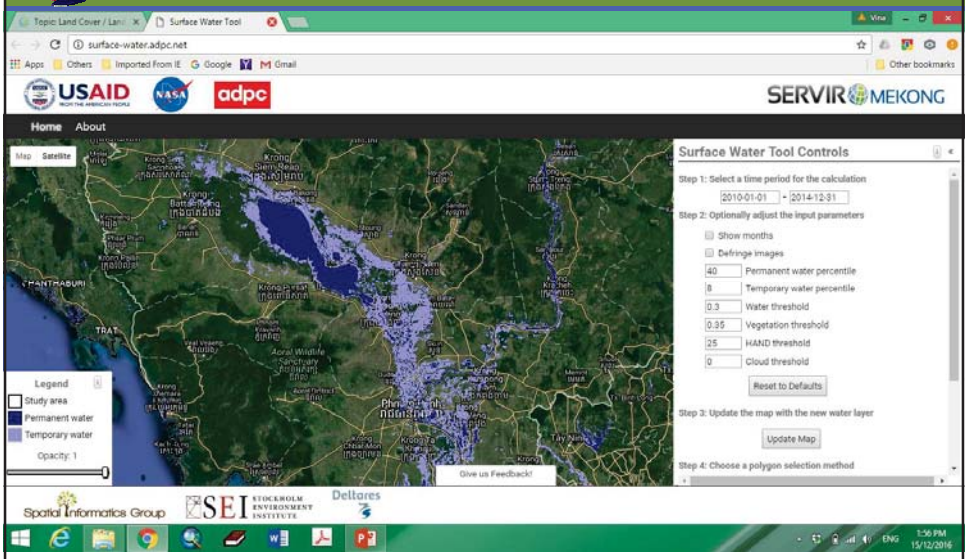


- (2) a user-friendly site/app using Google's appspot.com that exposes the application to the users.

Land Cover

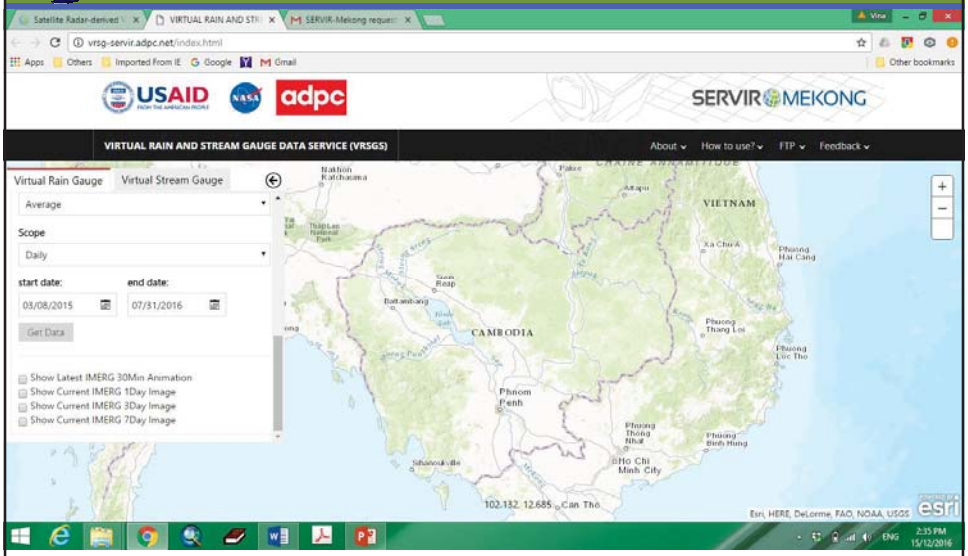


Surface Water Tool (SERVIR-Mekong)



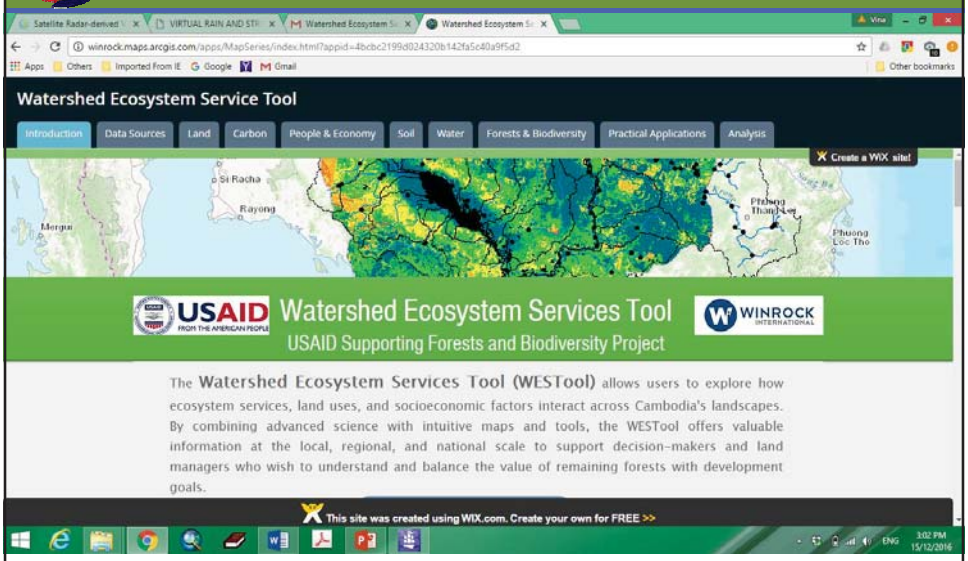
13

Virtual Rain and Stream Gauge Data Service



14

Watershed Ecosystem Service Tool



សូមអរគុណ!

Strategic Program for Climate Resilience

Mainstreaming Climate Resilience into Development Planning (TA 8179) ***(September 2013-April 2019)***

Workshop on GIS Climate Change Downscaling

Damnak Chheukram Irrigation Scheme extension in Pursat Province.

Presented by: Mr. Sek Hieng

Position: Technical Officer for GMS-FDRMMP.

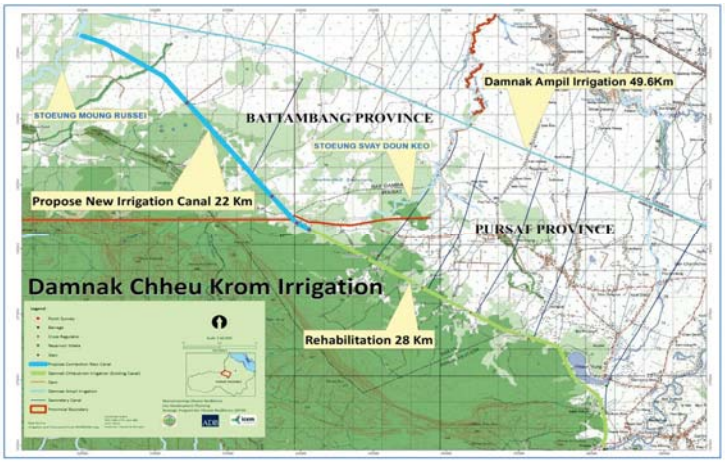
Ministry: Ministry of Water Resources and Meteorology

16 December 2016

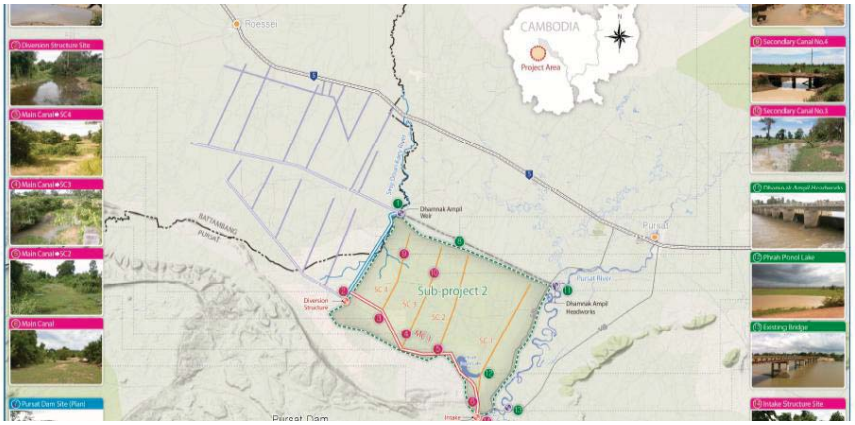
Development of a climate change threat profile for the geographic areas and infrastructure systems

- Flood management: it will divert flash flood from Pursat river, and regulate flood water in barrages of Svay Daunkeo and Moung Russey rivers with anticipated climate change;
- Shortage of water in dry season, natural reservoirs are dried out. Portable water is available from deep well with about nearly 100 m depth

Proposed extension map



Proposed extension map



Existing climate hazards and extreme events – floods, flash floods, drought that have affected the project area in the past

- Big flood occurred in 1996 and 2002, over 2 to 3 m height of flood, for about 1 week duration
- Medium floods occurred in 2011, 2013, but about 2-3 days period
- Big droughts occurred in 2013, 2014, 2015: very serious one in 2015 destroying almost wet season rice production. Some 40% of villagers get fever.
- In dry season, people are heavily reliant on water from deep wells (Bakan, Rukhakiri, Moung Russey along Damnak Chheukrom canal). Natural ponds dry out.

Methods of data processing and analysis: Proposed of Project Activity

- Survey and design of rehabilitated main canal and its irrigation system components, including of barrages in Svay Daunkeo and Moung Russey Rivers, and traditional water storage reservoirs in Rukhakiri and Moung Russey district of Battambang province;
- Rehabilitated main canal and its irrigation system components, barrages in Svay Daunkeo and Moung Russey Rivers, and traditional water storage reservoirs;

Continue of Previous Project : Rehabilitation and Development of Damnak Chheukrom Irrigation System Phase II

- We have the firm working in previous project:
- C P M U (Central Project Management Unit)
- P I C (Project Implementation)
- DDCS (Details Design Construction Supervision)
- CBDRM (**Community Based Disaster Risk Management)**
- NFFC (**National Flood Forecasting Center)**

Challenges to obtain data, and analysis:

- Equipment
- Technology

Recommendation for improvement

After project complete:

- Considering community level for maintenance the infrastructure
- The technique should applied to community level
- A framework of water resources management in river basin level has been developed, in which the development of water resources policies and strategies should be based on physical conditions, social-economiccultural conditions, and institutional arrangements in each river basin.

Thank you for Attention