



# **CLIMATE CHANGE ADAPTATION**

for water management  
in a green economy

Discussion Paper

ESCAP is the regional development arm of the United Nations and serves as the main economic and social development centre for the United Nations in Asia and the Pacific. Its mandate is to foster cooperation between its 53 members and 9 associate members. ESCAP provides the strategic link between global and country-level programmes and issues. It supports Governments of the region in consolidating regional positions and advocates regional approaches to meeting the region's unique soci-economic challenges in a globalizing world, The ESCAP office is located in Bangkok, Thailand. Please visit our website at [www.unescap.org](http://www.unescap.org) for further information.



*The shaded areas of the map are ESCAP Members and Associate members*

*Cover design, layout and images: Warren Field*

*Front Cover image: © Dreamstime.com*

*Back over image: © Christian Noval / Dreamstime.com*

# CLIMATE CHANGE ADAPTATION FOR WATER MANAGEMENT IN A GREEN ECONOMY

Discussion Paper

# Climate Change Adaptation for Water Management in a Green Economy

United Nations publication  
Copyright United Nations 2012  
All rights reserved  
Manufactured in Thailand

For further information on this publication, please contact:

Mr Rae Kwon Chung  
Director  
Environment and Development Division  
ESCAP  
Rajadamnern Nok Avenue  
Bangkok 10200, Thailand  
  
Tell No: +66-2288 1234  
Fax no: +66-2288 1048/1059  
email: [escap-esdd-ers@un.org](mailto:escap-esdd-ers@un.org)

All material including information, data, figures and graphic presented do not imply the expressions of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory, city or area or its authorities or concerning the delimitation of its frontiers.

References to dollars (\$) denote United States dollars unless otherwise noted.

Mention of firm names and commercial products does not imply the endorsement of the United Nations.

The opinions, figures, estimates set forth in this publication are the responsibility of the consultant who was responsible for the contents of the publication and, hence, should not necessarily be considered as reflecting the views or carrying the endorsement of the United Nations.

This publication may be reproduced in whole or in part for educational non-profit purposes without special permission from the copyright holder, provided that the source is acknowledged. The ESCAP publications office would appreciate receiving a copy of any publication that uses this publication as a source.

No use may be made of the publication for resale or any other commercial purpose whatsoever without prior permission. Application for such permission, with a statement of the purpose and extent of reproduction, should be addressed to the secretary of the Publication Board, United Nations, New York.

This publication was prepared, under the guidance of Hongpeng Liu, Chief of Energy Security and Water Resources Section, by a team of writers, contributors and editors namely, Salmah Zakaria (Environment and Development Division, EDD), Felix Seebacher, Rusyan Mammit, Damien Mourey, Teresa Kersting, Emily Briggs and Helina Wright, working at various times in Energy Security and Water Resources Section.

# Foreword

While efforts to mitigate climate change continues by reducing greenhouse gases (GHG), the impacts of climate change has resulted in changes to the hydro-meteorological events of floods and droughts, translated in more extreme case of events. Climate Change has also increase the melting of the polar ice and the water towers of the Himalaya's Hindu Kush, and threaten coastal settlements with sea-level rise. All this will have significant impact on developing countries of Asia and the Pacific region particularly of the least develop countries and small island states in the Pacific and Indian Oceans.

More than 90% of impacts of climate change are related to water issues. These impacts are not only on water supply for household, industries and agriculture, but also on disasters and hazards during heavy rainfall, with flooded areas and landslides. During droughts, forest fires and haze have become the norm. The spread of poor quality water during floods and concentration of toxic water during drier months are an added health hazards. As such water security has become a truly global challenge.

ESCAP in its *"Low Carbon Green Growth Roadmap for Asia Pacific"* publication has articulated on, *"Turning resource constraints and the climate crisis into economic growth opportunities."* This current publication looks at the detail challenges of water resources management from the perspective of green economy. It complemented the works in managing the multitude of water challenges facing the vast Asia and the Pacific region as climate change impact is expected to further exacerbate these challenges.

This publication is prepared to provide guidance in discussions for adaptation to climate change through integrated water resources management and green growth to achieve green economy and sustainable development.



Rae Kwon Chung  
Director, Environment Development Division  
ESCAP

## List of Abbreviations and Acronyms

AWM	Agriculture Water Management
Ar	Argon
APWF	Asia Pacific Water Forum
CO	Carbon Monoxide
CO <sub>2</sub>	Carbon Dioxide
ESCAP	United Nations Economic and Social Commission for Asia and the Pacific
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GHG	Green House Gases
GLOF	Glacial Lake Outburst Floods
GWP	Global Water Partnership
ICIMOD	International Centre for Integrated Mountain Development
IGSD	Institute of Governance and Sustainable Development
IPCC	Intergovernmental Panel on Climate Change
IRBM	Integrated River Basin Management
IWMI	International Water Management Institute
IWRM	Integrated Water Resources Management
Kg	kilogram
M <sup>3</sup>	meter cube
MAR	Managed Aquifer Recharge
MEAB	Millennium Ecosystem Assessment Board
N <sub>2</sub>	Nitrogen
N <sub>2</sub> O	Nitrous Oxide
NAPA	National Adaptation Program for Action
NH <sub>4</sub>	Methane
O <sub>2</sub>	Oxygen
O <sub>3</sub>	Ozone
PES	Payment for Ecosystem Services
PWS	Payment for Watershed Services
SCP	Sustainable Consumption and Production
SRES	Special Report on Emissions Scenarios
UFW	Unaccounted For Water
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNICEF	United Nations Children's Fund
WHO	World Health Organization



# TABLE of CONTENTS

Executive Summary .....	4
-------------------------	---

<b>1</b>	<b>PURPOSE and OVERVIEW .....</b>	<b>6</b>
----------	-----------------------------------	----------

<b>2</b>	<b>CLIMATE CHANGE and water .....</b>	<b>7</b>
----------	---------------------------------------	----------

<b>2.1</b>	Introduction .....	7
------------	--------------------	---

<b>2.2</b>	Carbon Dioxide (CO <sub>2</sub> ) levels and other Green House Gases (GHG) .....	7
------------	--	---

2.2.1	Carbon Dioxide (CO <sub>2</sub> ) and Green House Gases (GHG) and its effect on surface temperature .....	8
-------	--	---

2.2.2	Carbon Dioxide CO <sub>2</sub> emissions and its regional distribution .....	10
-------	--	----

2.2.3	Effects of climate change .....	10
-------	---------------------------------	----

<b>2.3</b>	Impact of Climate Change on Water .....	11
------------	---	----

2.3.1	Global Water Balance .....	12
-------	----------------------------	----

2.3.2	Available Freshwater Resources in the Region .....	12
-------	--	----

2.3.3	Rising Ocean Levels .....	13
-------	---------------------------	----

2.3.4	Food Security .....	13
-------	---------------------	----

<b>2.4</b>	Climate Change Mitigation .....	14
------------	---------------------------------	----

<b>2.5</b>	Climate Change Adaptation .....	14
------------	---------------------------------	----

<b>3</b>	<b>Climate change: how it is affecting the region .....</b>	<b>16</b>
----------	---	-----------

<b>3.1</b>	Communities in Mountain Valleys .....	16
------------	---------------------------------------	----

3.1.1	Impacts of climate change on glaciers .....	16
-------	---	----

3.1.2	Socio-economic and environmental consequences .....	18
-------	---	----

<b>3.2</b>	Riparian population .....	20
------------	---------------------------	----

3.2.1	Effects of climate change in river plains .....	20
-------	---	----

3.2.2	Consequences for riparian societies .....	20
-------	---	----

<b>3.3</b>	Dwellers in coastal areas .....	22
------------	---------------------------------	----

3.3.1	Demographics and main characteristics .....	22
-------	---	----

3.3.2	Impacts of climate change on coastal areas .....	22
-------	--	----

3.3.3	Socio-economic and environmental consequences .....	23
-------	---	----

<b>3.4</b>	An Islander's Perspective .....	24
------------	---------------------------------	----

3.4.1	Demographics and main characteristics .....	24
-------	---	----

3.4.2	Impacts of climate change on small islands .....	24
3.4.3	Socio-economic consequences .....	25
3.4.4	Health and Security across the region .....	26
3.5	Asia Pacific Geographical Complexities .....	27

## 4 GREEN GROWTH and ADAPTATION.....28

4.1	Introduction to Green Growth and the Ecological Based Approach.....	28
4.1.1	Green Growth and Water.....	28
4.1.2	Natural Capital.....	29
4.2	Economic Instruments .....	31
4.3	Demand Management .....	33
4.4	Sustainable Consumption and Production (SCP) .....	34

## 5 Improved Water Governance to cope with challenges from increasing uncertainties arising from climate change .....36

5.1	Adopting Principles of Integrated Water Resource Management (IWRM) .....	36
5.2	Integrated River Basin Management (IRBM) .....	38
5.3	Flood Management .....	39
5.4	Agricultural Water Management (AWM) .....	40
5.5	Water Supply and Sanitation .....	43
5.6	Options for increasing storage capacity .....	43

预览已结束，完整报告链接和二维码如下：

[https://www.yunbaogao.cn/report/index/report?reportId=5\\_7800](https://www.yunbaogao.cn/report/index/report?reportId=5_7800)

