

«Climate Change Risk Assessment»

Final Report –(Evidence Report)

ΣΥΜΒΑΣΗ 22/2014



ΥΠΟΥΡΓΕΙΟ ΓΕΩΡΓΙΑΣ, ΑΓΡΟΤΙΚΗΣ
ΑΝΑΠΤΥΞΗΣ
ΚΑΙ ΠΕΡΙΒΑΛΛΟΝΤΟΣ

ADVANCED ENVIRONMENTAL STUDIES S.A.



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6 Οκτωβρίου 2016

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- Η Μελέτη Εκτίμησης Κινδύνου συγχρηματοδοτήθηκε από το Ταμείο Συνοχής

Ταμείο Συνοχής της προγραμματικής περιόδου 2014-2020

Άξονας Προτεραιότητας: Μείωση Εκπομπών Διοξειδίου του Άνθρακα και Προσαρμογή στην Κλιματική Αλλαγή

Επενδυτική Προτεραιότητα: Προώθηση επενδύσεων για την προσαρμογή στην κλιματική αλλαγή,

Ειδικός Στόχος: Περιορισμός των επιπτώσεων που συνεπάγεται η κλιματική αλλαγή, μέσω επενδύσεων για την πρόληψη και αποφυγή κινδύνων.

Scope 1:

To prepare a Report to be used by the DoE for the preparation of the 2016 Evidence Report

to address the following issues:

1. Assess climate risks
2. Assess of how climate interacts with socio-economic factors and how these drivers of risk might change in the future
3. Assess of how the effects of adaptation actions alter risk levels
4. Assess the magnitude of impact and the urgency of action
5. Developing an understanding of the possible net effect of different risks acting together
6. Assess the uncertainties, limitations and confidence in the underlying evidence and analysis for different risks

Scope 2:

To Implement 1313/2013/EU Decision “*on a Union Civil Protection Mechanism*”

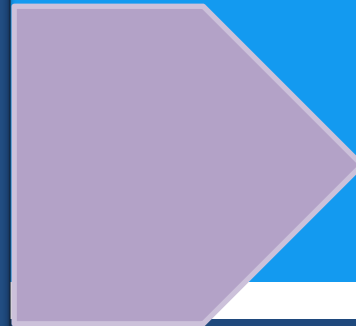
1. Develop risk assessments (up to 22 /12/2015 and every 3 years thereafter)
2. Develop and refine disaster risk management planning
3. Make available to the Commission the assessment of their risk management capability and
4. Participate, on a voluntary basis, in peer reviews on the assessment of risk management capability.

Project Deliverables

1. COMMENCEMENT REPORT
2. APPROACH REPORT
3. 1ST PROGRESS REPORT
4. 2ND PROGRESS REPORT
5. FINAL REPORT (EVIDENCE REPORT)

SECTORS AND THEMES

1. Biodiversity & Ecosystem Services
2. Agriculture
3. Forestry
4. Water
5. Marine & Fisheries (Fisheries & Aquaculture+ Coastal Zones)
6. Floods & Coastal Erosion
7. Built Environment (Infrastructure)
8. Energy
9. Transport
10. Health
10. Business, Industry & Services
11. Tourism
12. Soil Resources



1. Rural Economy & Natural Environment
2. Infrastructure
3. People and Built Environment
4. Business & Industry

The Cyprus Evidence Report

CHAPTER 1- EXECUTIVE SUMMARY/ INTRODUCTION

CHAPTER 2- CHARACTERISING THE FUTURE (UPDATE ON CLIMATE SCIENCE, SETTING OUT SOCIO-ECONOMIC SCENARIOS, APPROACH TO ANALYSIS/UNDERSTANDING RISK)

CHAPTER 3- THE RURAL ECONOMY AND NATURAL ENVIRONMENT (LAND USE IN RURAL AREAS- AGRICULTURE, FORESTRY, NATURAL & MARINE HABITATS]

CHAPTER 4- INFRASTRUCTURE (TRANSPORT, WATER/SEA LEVEL RISE, WASTE, ENERGY/ELECTRICITY)

CHAPTER 5- PEOPLE AND THE BUILT ENVIRONMENT (HEALTH IMPACTS, PRESSURE GRADIENT WINDS, THUNDERSTORMS, DROUGHTS, DUST IN THE LOWER ATMOSPHERE, EARTHQUAKES/Tsunami, FLOOD RISK, WATER AVAILABILITY AND QUALITY, ANALYSIS OF THE EFFECTS ON VULNERABLE GROUPS, ON WELLBEING, RISKS/ADAPTATION THROUGH BLUE AND GREEN INFRASTRUCTURE)

CHAPTER 6- BUSINESS AND INDUSTRY (FINANCE, INSURANCE, BUSINESSES, SUPPLY CHAINS)

CHAPTER 7- GLOBAL SECURITY

(FOOD SECURITY, CONFLICT, OR MIGRATION THAT COULD AFFECT CYPRUS)

CHAPTER 8- CROSS-CUTTING ISSUES

(INTERDEPENDENCIES, SOCIAL VULNERABILITY, LEVEL OF RESILIENCE TO EXTREME EVENTS WITH MULTIPLE KNOCK-ON IMPACTS SUCH AS A MAJOR DROUGHT, EARTHQUAKE/Tsunami, FLOOD, HEATWAVE)

CHAPTER 9- CONCLUSIONS

Basic Principles

Evidence report will be based on **available evidence, ~~commissioning of significant new research~~**

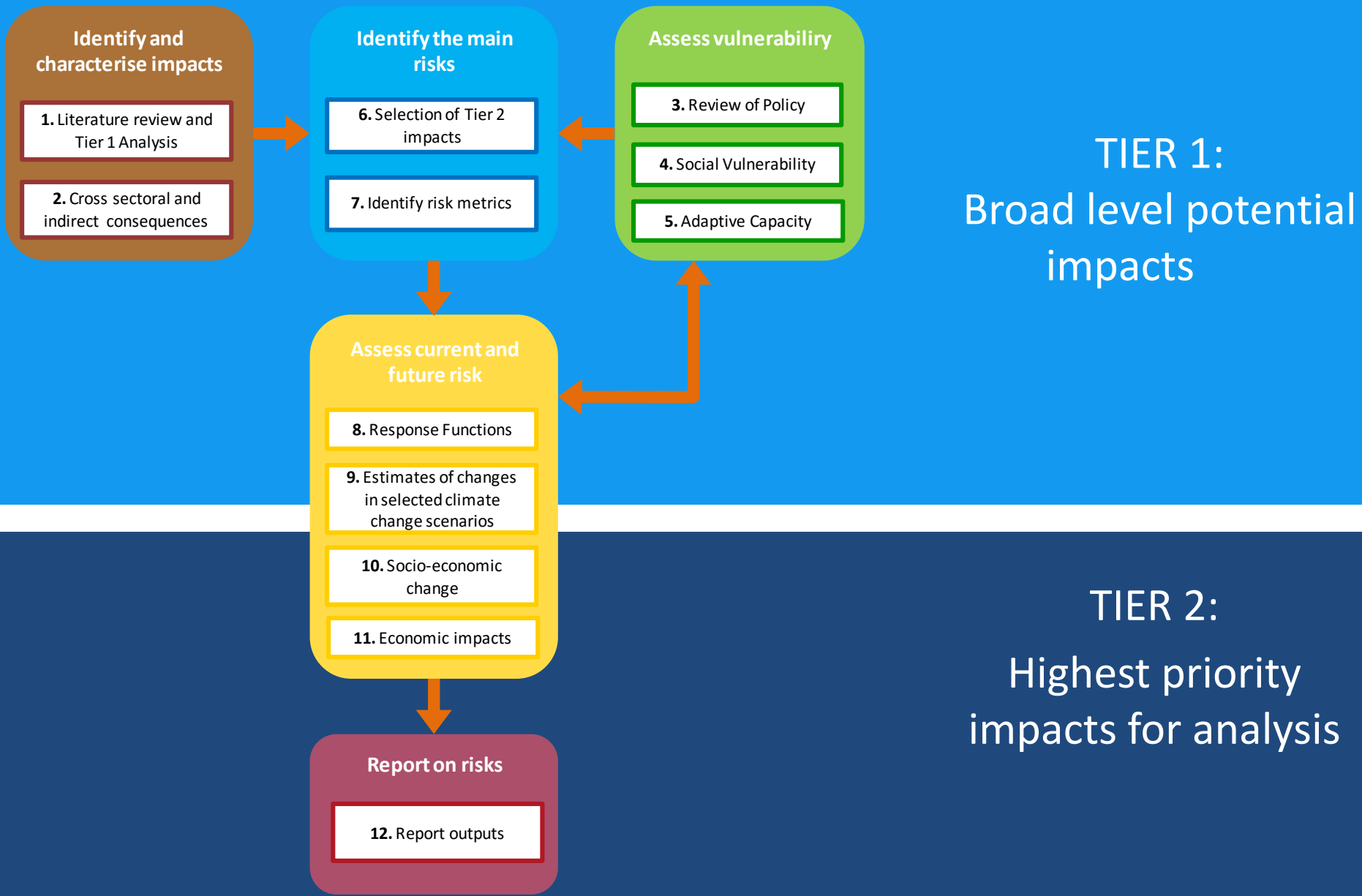
Baseline period	1991-2010
Time Periods	2050 & 2080
Geographical coverage	Cyprus
Socio-economic change	Consistent set of socio-economic scenarios for population, economic growth

Level of spatial disaggregation	The whole of Cyprus or lower levels of spatial detail for different risks
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Level of temporal disaggregation	Depending on lead times for adaptation
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Focus on cross-sectoral interactions

Outline of Risk Assessment Process



Identify and characterise the impacts

Step 1 – Literature review and Tier 1 analysis

Existing evidence (e.g CYPADAPT) findings from literature reviews, ~~stakeholder participation, correspondence with wider stakeholders and~~ soliciting expert opinion.

Step 2 – Cross sectoral and indirect consequences

The Tier 1 lists for the 12 sectors in CCRA were compared and developed further to include cross-sectoral and indirect impacts.

Assess vulnerability

Step 3– Review of policy

How risks that are influenced by climate relate to existing policies?



URGENCY

Step 4– Social Vulnerability

The vulnerability of different groups in society to the climate change risks for each sector

This step is different from step 10, which considers how changes in society may affect the risks.

Step 5– Adaptive capacity

The ability of the sector, to devise and implement effective adaptation strategies

Identify the main risks

Step 6 – Selection of Tier 2 impacts

SIMPLE MULTI-CRITERIA ASSESSMENT BASED ON :

MAGNITUDE – The social, economic and environmental magnitude of consequences;

LIKELIHOOD – The perceived likelihood of the impact (or its consequences)

URGENCY – The urgency with which adaptation decisions need to be taken.

Criteria	Score	Weight
Magnitude / economic	High = 3; Medium = 2; Low = 1	$1/3 \times 1/3 = 1/9$
Magnitude / social	High = 3; Medium = 2; Low = 1	$1/3 \times 1/3 = 1/9$
Magnitude / environmental	High = 3; Medium = 2; Low = 1	$1/3 \times 1/3 = 1/9$
Likelihood	High = 3; Medium = 2; Low = 1	$1/3$
Urgency	High = 3; Medium = 2; Low = 1	$1/3$

Step 6 - Identify the main risks - Magnitude

Class	Economic	Environmental	Social
High	<p>Major damage to property & infrastructure</p> <p>Major cons. on regional & national economy</p> <p>Major cross-sector consequences</p> <p>Major disruption/loss of transport links</p> <p>Major loss/gain of employment</p> <p>~ £100 million ~ €1 million per a single event or per year</p>	<p>Major loss or longterm decline in quality of valued species/habitat/landscape</p> <p>-in status/condition of significant sites</p> <p>Widespread Failure of ecosystem function /services</p> <p>Widespread decline in land/water/air quality</p> <p>Major cross-sector consequences</p> <p>~ 5000 ha ~ 100 ha lost/gained</p> <p>~ 10000 km ~ 100 km river quality affected</p>	<p>Potential for many fatalities/serious harm</p> <p>Loss or major disruption to utilities</p> <p>Major cons. on vulnerable groups</p> <p>Increase in national health burden</p> <p>Large reduction in community services</p> <p>Major damage /loss of cultural assets</p> <p>Major role for emergency services</p> <p>Major impacts on personal security</p> <p>~million ~15.000 affected</p> <p>~1000s ~150 -harmed</p> <p>~100 ~10 fatalities</p>
Medium	<p>Moderate above</p> <p>~ £10 million</p> <p>~ €100.000</p>	<p>Medium and regional consequences above</p> <p>~ 500 ha ~ 10 ha</p> <p>~ 1000 km ~ 10 km</p>	<p>Moderate consequences above</p> <p>~100s thousands ~1.500 affected,</p> <p>~100s ~30 harmed,</p> <p>~10 ~1 fatalities</p>
Low	<p>Minor above</p> <p>~£1 million</p> <p>~ €10.000</p>	<p>Minor, short term, localized</p> <p>~ 50 ha ~ 1 ha</p> <p>damaged/improved</p>	<p>Small , within coping range</p> <p>10s thousands ~150 affected</p> <p>10 ~5 harmed</p>

Step 6 - Identify the main risks -Likelihood

Class	Likelihood
High	Likely that consequences will occur within the next century <i>(i) High confidence - about 7 out of 10 chance or greater</i>
Medium	About as likely or not to occur in the next century <i>(i) Medium confidence - between 3 and 6 out of 10 chance</i>
Low	Unlikely that consequences will occur within the next century <i>(i) Low confidence - less than 3 out of 10 chance</i>

Step 6 - Identify the main risks -Urgency

Class	Urgency
<p>High</p> <p><i>ACT NOW</i></p>	<p>Major policy, investment or other decisions required before 2020. <i>There is low understanding of the risks and / or of the options to adapt to them.</i></p> <p>There is a significant shortfall in adaptive capacity with a likelihood of locked-in maladaptation unless action is taken to raise adaptive capacity very soon.</p>
<p>Medium</p> <p><i>WATCH CAREFULLY</i></p>	<p>Major policy, investment or other decisions will be taken before 2050.</p> <p>There is medium understanding of the risks and / or of the options to adapt to them.</p> <p>Decisions have some flexibility and there is some potential for incremental adaptation over the long term.</p>
<p>Low</p> <p><i>WAIT AND SEE</i></p>	<p>Major policy, investment or other decisions are not required before 2050.</p> <p>There is high understanding of the risks and / or of the options to adapt to them.</p> <p>Decisions have high flexibility with potential for incremental adaptation over time.</p>

Step 6 -Combining scores:

$$100 * \left(\frac{\text{Social} + \text{Environmental} + \text{Economic}}{9} \right) \left(\frac{\text{Likelihood}}{3} \right) \left(\frac{\text{Urgency}}{3} \right)$$

Over 100 impacts (Tier 2) out of a total of around 700 were selected.

Total Score > 30

The Tier 2 list of impacts was not based on the availability of data

For the **Biodiversity & Ecosystem Services sector** a slight adjustment was made

The consequences for biodiversity were used to **define the environmental criteria**,
whilst

The consequences for ecosystem services were used to jointly define the **social and economic criteria**

Step 7 - Identifying risk metrics

Risks metrics: A measure of the consequences of climate change

For each impact in the Tier 2 list, one or more risk metrics were identified.

The metrics have been referenced using the sector acronym and a number

Step 8 - Response functions

Connection of each risk metric varied with one or more climate variables using available data or previous modelling work

Step 9 – Estimates of changes in selected climate change scenarios

The response functions were used to assess the magnitude of consequences due to climate change by making use of

- 2 different climate projections: **RCP8.5 (MOST SEVERE)** 8,5 WM⁻² OF GLOBAL MEAN RADIATIVE FORCING BY 2100 RELATIVE TO THE PRE-INDUSTRIAL TIMES), AND **RCP4.5 (MEDIUM)**
- 2 future 30-year time periods 2041-2060 (2050) & 2071-2090 (2080)

Step 10 - Socio-economic change

Risk metrics are influenced by a wide range of drivers, not just by climate change. These drivers were used to adjust the magnitude of the risks estimated in Step 9 e.g

- **Population Growth / Needs**
- ~~Global stability (high/low)/ Distribution of wealth (even/uneven)~~
- ~~Consumer driver values and wealth (sustainable/unsustainable)/ Level of Government decision making (local/national)~~
- ~~Land use change/management (high/low Government input).~~

Step 11 – Monetization of impacts

Expression of the risks in monetary values (- OR +) .

Cost Ranking:

- Low (L) = €10.000 – 99.000 per annum;
- Medium (M) = €100.000 – 999.000 per annum;
- High (H) \geq €1m per annum
- Very High (VH) \geq €10m per annum (where possible to assess between H and VH)

Confidence

- *High: Significant confidence in the data, models and assumptions*
- *Medium: Some limitations regarding consistency & completeness of data, models and assumptions*
- *Low: Limited knowledge*

TECHNICAL EXPERTISE

1. BIODIVERSITY & ECOSYSTEM SERVICES	ADENS– N.CHRISTOPOULOU UoA
2. AGRICULTURE	AUA
3. FORESTRY	ADENS N. FYLLAS UoA
4. WATER	G.K KARAVOKYRHS
5. MARINE & FISHERIES	A. TOUMAZIS
6. FLOODS & COASTAL EROSION	A. TOUMAZIS
7. BUILT ENVIRONMENT (INFRASTRUCTURE)	ADENS E. GKOUVATSOU
8. ENERGY	ADENS
9. TRANSPORT	ADENS
10. HEALTH	ADENS UoA
11. BUSINESS, INDUSTRY & SERVICES -TOURISM	ADENS
12. SOIL RESOURCES	AUA

CHARACTERIZING THE FUTURE- CLIMATE CHANGE SCENARIOS

IMPERIAL COLLEGE LONDON
CYPRUS INSTITUTE
NATIONAL OBSERVATORY OF ATHENS

Ευχαριστώ για την προσοχή σας!!!