Baltic Environmental Forum
BEF GERMANY

Beratung des kroatischen Umweltministeriums bei der Ausarbeitung der nationalen Klimaanpassungsstrategie

Abschlussbericht

Beratungshilfe für den Umweltschutz in den Staaten Mittel- und Osteuropas, des Kaukasus und Zentralasiens

ein Programm des Bundesministeriums für Umwelt, Naturschutz, Bau und Reaktorsicherheit

Sachbericht zum Projektabschluss

Datum: 31.01.2014

I. Angaben zum Projekt

Projekttitel:	Beratung des kroatischen Umweltministeriums bei der Ausarbeitung der nationalen Klimaanpassungsstrategie
Land/Region:	Kroatien
Laufzeit (vom … bis….)	01.11.2013 – 31.01.2014 (3 Monate)
Adressat der Beratung (mit Kontaktdaten):	Ministerium für Umwelt- und Naturschutz der Republik Kroatien Ulica Republike Austrije 14, 10 000 Zagreb Tel.: +385 1 3717-111
Durchführende Organisation:	Balic Environmental Forum Deutschland e.V. (BEF e.V.) in Zusammenarbeit mit dem Regional Environmental Center for Central and Eastern Europe - Country Office Croatia (REC Croatia)
Projektnummer:	32 912

II. Angaben zum Berichterstatter

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Beratung des kroatischen Umweltministeriums bei der Ausarbeitung der nationalen Klimaanpassungsstrategie

Abschlussbericht

Julia Peleikis (Baltic Environmental Forum, Germany)

Baltic Environmental Forum, Hamburg, 2014
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Dieses Projekt wurde mit Mitteln des Beratungshilfeprogramms des Bundesumweltministeriums für den Umweltschutz in den Staaten Mittel- und Osteuropas, des Kaukasus und Zentralasiens gefördert und vom Umweltbundesamt fachlich begleitet. Die Verantwortung für den Inhalt dieser Veröffentlichung liegt bei den Autorinnen und Autoren.

CroAdapt

Umwelt Bundesamt

Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety

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Anhänge 7

1. Zusammenfassung der Ausgangssituation und des sich daraus ergebenden Beratungsbedarfs im Zielland, der ursprünglichen Projektziele, der geplanten Maßnahmen, der erwarteten Ergebnisse

Das Ministerium für Umwelt- und Naturschutz (Ministry of Environment and Nature Protection, MENP) der Republik Kroatien plant derzeit ebenso wie bereits 15 andere EU-Mitgliedsstaaten eine nationale Strategie zur Anpassung an den Klimawandel zu entwickeln. Damit folgt es den in der EU Anpassungsstrategie geäußerten Empfehlungen und handelt gemäß des 2011 verabschiedeten Gesetzes zum Schutz der Luftqualität, das dies bereits vorsieht. Anpassung an den Klimawandel ist jedoch sowohl für das Ministerium als auch für Stakeholder auf lokaler, regionaler und nationaler Ebene in Kroatien ein noch recht neues Thema, über das noch vergleichsweise wenig Bewusststein besteht und zu dem bisher kaum Maßnahmen ergriffen wurden.

Die Entwicklung der nationalen Anpassungsstrategie (NAS) selber soll im Rahmen eines Unterauftrags entwickelt werden. Das Ministerium für Umwelt- und Naturschutz möchte jedoch von Anfang an einen Mehrebenenansatz verfolgen und Wissen und Bewusstsein lokaler und regionaler Akteure zu Klimawandelauswirkungen und Handlungsoptionen auf lokaler und regionaler Ebene stärken. Zu diesem Zweck sollte im Rahmen des Projektes zunächst ein Stakeholder Mapping durchgeführt und eine Stakeholderliste erstellt werden, um einen Überlick über die relevanten Akteure in Kroatien zu bekommen. In einem kurzen Hintergrundpapier sollten die Entwicklungen bezüglich Anpassung an den Klimawandel in Kroatien dokumentiert werden und Empfehlungen für die nächsten Schritte gegeben werden. Schließlich sollte im Rahmen des Projekts ein Runder Tisch organisiert werden, bei dem die Entwicklungen bezüglich Klimawandelanpassung in Kroatien und erwartete Auswirkungen sowie Erfahrungen anderer EU-Staaten vorgestellt werden sollten.

2. Durchgeführte Maßnahmen, einschl. Beschreibung von Abweichungen

Folgende Aktivitäten wurden im Rahmen des Projekts durchgeführt:

Aktivität 1: Vorbereitung

Wie vorgesehen, wurde im ersten Projektmonat (08.11.2013) eine Skype-Konferenz der Partner BEF Deutschland und REC Kroatien mit zusätzlicher Teilnahme von Frau Višnja Grgasović vom kroatischen Umweltministerium durchgeführt, in dem der Zeitplan konkretisiert und Aufgaben und Verantwortlichkeiten geklärt wurden.

In Zusammenarbeit mit dem MENP listete REC HR die Stakeholder bezüglich Klimawandelanpassung in Kroatien auf (siehe Anlage 1). Die erstellte Liste beinhaltet neben den Stakeholdern auf nationaler sowie regionaler und lokaler Ebene auch deren Rolle in Bezug auf Anpassung und eine erste Bewertung der einzelnen Stakeholder hinsichtlich ihres Interesses, ihrer Einflussmöglichkeiten und ihrer Betroffenheit durch Klimawandel.

Aktivität 2: Dokumentation der aktuellen Entwicklungen bezüglich Anpassung („Country Brief“)

Nach Rücksprache zur Struktur des Dokuments mit dem MENP zu Projektbeginn arbeiteten BEF DE und REC HR eine Dokumentation zum Thema Anpassung an den Klimawandel in Kroatien aus. Neben einer kurzen Darstellung des EU-Politikrahmens bezüglich Klimawandelanpassung wurden darin die erwarteteten Auswirkungen des Klimawandels für Kroatien, Anfälligkeiten ver-

schiedener Sektoren des Landes sowie die derzeitigen und geplanten Entwicklungen in Bezug auf Anpassung dargestellt und Empfehlungen für das weitere Vorgehen gegeben. Besonderes Augenmerk wurde dabei auf die Integration von Anpassung in andere Politikbereiche („Mainstreaming“) sowie alle Politikebenen („Multi-level governance“) gelegt. Zusätzlich zur englischen Version wurde die Hintergrunddokumentation ins Kroatische übersetzt und in einer Arbeitsversion bereits an die Teilnehmer des Runden Tisches verteilt. Das Dokument wird auf der Internetseite des MENP zur Verfügung gestellt. Das Country Brief ist diesem Bericht als Anlage 2 beigefügt.

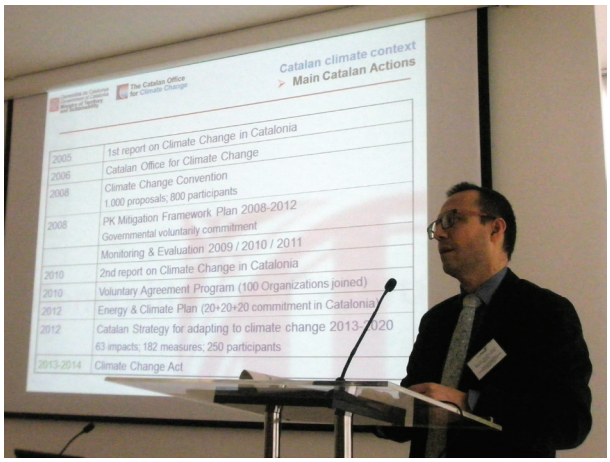
Aktivität 3: Runder Tisch

Umgehend nach Projektbeginn begannen BEF DE und REC HR damit, aktuelle Studien und Veröffentlichungen zu Klimawandelfolgen und Anfälligkeiten in Kroatien zu sammeln und durchzusehen. Dies diente einerseits der Erstellung der Hintergrunddokumentation und andererseits der inhaltlichen Vorbereitung des Runden Tisches.

Der Runde Tisch (siehe Anlage 3) fand in enger Zusammenarbeit mit dem MENP am 23.01.2014 in den Räumlichkeiten der kroatischen Handelskammer in Zagreb statt. Neben einigen kroatischen Sprechern (u.a. das Kroatische Meteorologische Institut) nahmen auf Einladung von BEF auch drei ausländische Sprecher an der Veranstaltung teil, um ihre Erfahrungen mit den kroatischen Teilnehmern zu teilen:

- Frau Sabine McCallum, Leiterin der Abteilung Umweltfolgenabschätzung und Klimawandel des österreichischen Umweltbundesamts;
- Herr Salvador Samitier i Marti, Leiter des katalanischen Klimabüros;
- Herr Domenico Gaudioso, Leiter der Abteilung Atmosphäre und Klimaservice des Italienischen Nationalen Instituts für Umweltschutz und Forschung (ISPRA).

Die Auswahl der Sprecher erfolgte auf Grund von mit Kroatien vergleichbaren Problemlagen, klimatischen Verhätnissen und sonstigen Rahmenbedingungen der Herkunftsländer der Sprecher. Auf Wunsch des MENP wurde für die Arbeitsgruppen eine regionaler Fokus gewählt. In drei Gruppen (Pannonische Ebene, Adriatische Küste und Dinnarische Alpen) diskutierten die Teilnehmer die Bedeutung des Klimawandels für verschiedene Sektoren der jeweiligen Region, die relevanten Stakeholder und zum Teil bereits mögliche Anpassungsmaßnahmen. Im Rahmen der Arbeitsgruppen wurde u.a. auf die Themen Katastrophen- bzw. Bevölkerungsschutz sowie Naturschutz eingegangen.



Salvador Samitier i Marti währed des Runden Tisches

Aktivität 4: Management und Sichtbarkeit des Projekts

Management: Während der Projektlaufzeit standen REC HR und BEF DE durch E-Mails und Telefonate in regelmäßigem Austausch. Außerdem wurden zwei Telefonkonferenzen mit dem MENP abgehalten, um einige konkrete Fragen bezüglich der Hintergrunddokumentation und des Runden Tisches zu klären. Ein persönliches Treffen zwischen BEF, REC und dem MENP fand am 22.01.2014 in den Räumlichkeites des Ministeriums statt. Hier wurden neben letzten Fragen bezüglich des Runden Tisches auch die weiteren Planungen des MENP zur Entwicklung der Anpassungsstrategie Kroatiens besprochen.

Sichtbarkeit: Für das Projekt wurde eine Unterseite auf der BEF Webseite eingerichtet: http://bef-de.org/index.php?id=68&L=1 (in deutscher Sprache) und http://bef-de.org/index.php?id=68&L=0 (in englischer Sprache). Auf dieser Webseite wurden auch die Projektergebnisse zugänglich gemacht (Veranstaltungsunterlagen sowie die Hintergrunddokumentation). Auch auf der Webseite von REC Kroatien sind die Projektergebnisse zur Verfügung gestellt (http://croatia.rec.org/strucnjaci-o-prilagodbi-klimatskim-promjenama/). Diese sollen außerdem auf der Website des MENP zum Klimawandel veröffentlich werden.

Sowohl das MENP als auch die Projektpartner REC und BEF sehen Bedarf zur Durchführung eines Folgeprojekts in Kroatien. Besonders wichtig erscheint es, die Erstellung der kroatischen NAS, die durch einen Unterauftragnehmer voraussichtlich ab Anfang 2015 erfolgen wird, durch Stakeholderdialoge in verschiedenen Regionen des Landes zu begleiten und auf diese Art und Weise einerseits Anregungen und Beiträge für die NAS zu liefern und andererseits relevante Stakeholder von Beginn an in den Strategieprozess einzubinden und auf diese Art und Weise ein Verantwortungsbewusstsein für Anpassungsmaßnahmen zu schaffen.

3. Erreichte Ergebnisse, einschl. Beschreibung von Abweichungen

Alle geplanten Maßnahmen wurden während des Projekts durchgeführt, sodass folgende Ergebnisse erreicht wurden:

- eine bessere Übersicht über relevante Akteure im Bereich Klimawandelanpassung in Kroatien durch die erstellte Auflistung der Stakeholder;
- ein erhöhtes Problembewusstsein in Bezug auf den Klimawandel und die Notwenigkeit zur Anpassung beim MENP und den Teilnehmern des Runden Tisches sowie zukünftigen Besuchern der Webseite des Ministeriums, auf der die Hintergrunddokumentation sowie die Dokumentation des Runden Tisches zugänglich gemacht werden;
- erste Hinweise für das MENP bezüglich der als relevant eingeschätzen Sektoren, Stakeholder und Anpassungsmaßnahmen auf regionaler Ebene durch die Diskussionsergebnisse der Arbeitsgruppen während des Runden Tisches (dokumentiert in Zusammenfassungen der Diskussionen durch die jeweiligen Moderatoren sowie die in den Arbeitsgruppen erstellten regionalen Poster – siehe Anlage 3).

4. Bewertung der erreichten Ergebnisse mit Bezug zum Projektziel

Das übergeordnete Projektziel war es, durch eine Förderung der Bewusstseinsbildung von regionalen und lokalen Behördenmitarbeitern sowie anderen Stakeholdern zum Thema Anpassung an den Klimawandel in Kroatien beizutragen. Nach Einschätzung von REC und BEF haben die durchgeführten Maßnahmen und erreichten Ergebnisse im Rahmen der Möglichkeiten der vergleichsweise kurzen Projektlaufzeit erfolgreich zu diesem Ziel beigetragen. Insbesondere der Runde Tisch ermöglichte es durch die Kombination aus auf Kroatien bezogenen Präsentationen und Erfahrungen anderer, mit Kroatien hinsichtlich klimatischer und sonstiger Bedingungen vergleichbarer EU-Staaten das Problembewusstsein der Anwesenden zu erhöhen. Die Hintergrunddokumentation fasst die derzeitigen Entwicklungen in Kroatien im Bereich Anpassung zusammen und benennt notwendige Maßnahmen zur Erarbeitung der Anpassungsstrategie unter Einbeziehung betroffener Akteure. Das Dokument wurde dem MENP bereits übergeben und wird durch die Bereitstellung auf der Webseite des Ministeriums auch anderen Stakeholdern einen Überblick über die Thematik und als wichtig erachteter Schritte liefern. Die Stakeholderliste stellte eine hilfreiche Grundlage für Einladung zum Runden Tisch dar und wird dem MENP in Bezug auf zukünftige Veranstaltungen und Mitteilungen zum Thema Anpassung sehr nützlich sein.

Arbeitsgruppe Anpassung Dinarische Alpen während des Runden Tisches in Zagreb

5. Einschätzung der Wirkungen des Projektes

Obwohl die Laufzeit des Projekts sehr kurz angesetzt war und die Möglichkeiten zu umfassenderen Maßnahmen aus diesem Grund begrenzt waren, wird die Wirkung des Projekts positiv eingeschätzt. In dem gerade angestoßenen Prozess der stärkeren Thematisierung von Klimawandelanpassung in Kroatien (u.a. wurde eine Novellierung des Gesetzes zum Schutz der Luftqualität initiiert, die die Entwicklung einer nationalen Anpassungsstrategie und eines Aktionsplans vorsieht) konnte das Projekt ein zusätzliches Signal hinsichtlich der Bedeutung von Anpassung setzen. Die hohe Teilnehmerzahl am Runden Tisch und die rege Teilnahme an Diskussionen im Plenum und in den Arbeitsgruppen zeigte den Bedarf an Informationen und Austausch zum Thema Anpassung. Das Projekt konnte hierzu einen wichtigen Beitrag leisten. Ebenso unterstützte das Projekt nicht nur das MENP dabei, eine bessere Übersicht über relevante Akteure im Bereich Klimawandelanpassung zu bekommen, sondern ermöglichte ebenso ein In-Kontakt-Treten relevanter Akteure untereinander bzw. einen explizit dem Thema Anpassung gewidmeten Austausch zwischen einander bereits bekannten Akteuren.

Die Tatsache, dass unter den Teilnehmern nur ein Vertreter der regionalen Ebene und vier Vertreter von Gemeinden anwesend waren zeigt die Notwendigkeit für ähnliche Veranstaltungen in verschiedenen Regionen des Landes mit besserer Erreichbarkeit für regionale und lokale Stakeholder.

6. Beurteilung des Projektes durch die Adressaten der Beratung

Das Ministerium für Umwelt- und Naturschutz zeigte sich mit dem Projekt sehr zufrieden. Die Stakeholderliste stieß beim MENP einen grundsätzlichen Denkprozess über einzubeziehende Akteure an und lieferte einen guten Überblick über wichtige Stakeholder auch außerhalb des bereits einberufenen Klimakommittees.

Hinsichtich des Runden Tisches hob das MENP insbesondere die Relevanz der Erfahrungen aus Österreich, Spanien und Italien hervor, die als sehr hilfreich für Kroatien wahrgenommen wurden. Die große Anzahl Teilnehmern zeigte dem MENP das beachtliche Interesse am Thema Anpassung. Diese Einsicht ebenso wie die Tatsache, dass diverse Stakeholder/ Sektoren die Bedeutung des Themas bereits realisiert zu haben schienen, führte wiederum beim MENP zu der Überzeugung, von Akteuren verschiedener Politikbereiche und -ebenen bei richtiger Einbindung einiges für den nationalen Anpassungsprozess lernen zu können. Es scheint jedoch noch immer großen Bedarf an Bewusstseinsbildung zu geben, da einige Sektoren nicht vertreten waren. Insbesondere die Frage, welche Auswirkungen des Klimawandels einzelne Stakeholder(-gruppen) betreffen werden, wurde vom MENP als wichtiges Thema in Bezug auf die notwendige zukünftige Kommuniation mit Stakeholdern genannt.

Auch die Teilnehmer des Runden Tisches äußerten sich in einem von BEF und REC am Ende der Veranstaltung verteilten Evaluierungsbogen fast ausschließlich positiv bis sehr positiv sowohl zur Organisation der Veranstaltung als auch zu der Qualität der Präsentationen. Die Einschätzung ihres eigenen Wissensstands ergab jedoch, dass ein Großteil der Teilnehmer das eigene Wissen insbesondere zu EU-Anpassungspolitiken und Anpassungsmöglichkeiten als gering einschätzt. Es besteht also weiterhin deutlicher Bedarf an Informationsvermittlung und Bewusstseinbildung.

Die Hintergrunddokumentation wurde vom MENP als sehr guter Überblick über das Thema Anpassung und die derzeitigen Entwicklungen in Kroatien wahrgenommen und wird auf der Website des Ministeriums auch externen Stakeholdern zur Verfügung gestellt. Die Empfehlungen lieferten dem MENP nach eigener Aussage hilfreiche Hinweise und werden bei zukünftigen Aktivitäten Beachtung finden.

Anhänge

1. Stakeholder-Liste
2. Country Brief
3. Dokumentation des Runden Tisches

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REGIONALNI CENTAR ZAŠTITE OKOLIŠA
Hrvatska

Stakeholder Analysis
Climate Change Adaptation in Croatia

CroAdapt

Position: SUPPORTIVE – NEUTRAL – NEGATIVE
Interest / Influence / Impact: HIGH – MEDIUM – LOW

Stakeholders represented in the Committee for Policy and Measures

STAKEHOLDERS		CHARACTERISTICS				
		Involvement in the issue	Interest in the issue	Influence/ power	Position	Impact of issue on actor
NATIONAL LEVEL – Ministries & government agencies						
1	Ministry of Environmental and Nature Protection – Sector for Atmosphere, Sea and Soils	Responsible for developing national adaptation Action Plan/Strategy, laws and policy regulation	High	High	Supportive	Medium
2	Ministry of Environmental and Nature Protection – Directorate for Nature Protection	Regulating and monitoring work of national parks & parks of nature, enforcement & compliance	Medium	High	Supportive	Medium
3	Ministry of Health	Laws and policy regulation	High	High	Supportive	Low
4	Ministry of Economy	Laws and policy regulation of trade, industry & energy sectors	Medium	High	Supportive	Medium
5	Ministry of Agriculture	Laws and policy regulation in agriculture & fisheries, forestry, rural development and water management; financing agricultural/rural development through EU-IPARD program	High	High	Supportive	Medium
6	Ministry of Construction and Physical Planning	Laws and policy regulation of energy efficiency in construction	Medium	High	Supportive	Low
7	Ministry of Finance	National budget planning, allocation of national co-financing for climate projects	Medium	High	Supportive	Low

This meeting is organized with the financial assistance of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety with means of the Advisory Assistance Programme for Environmental Protection in the Countries of Central and Eastern Europe, the Caucasus and Central Asia.

Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety

Umwelt Bundesamt

Co-organiser:

8	Ministry of Regional Development and EU Funds	Coordinating the use of EU funding schemes by sectors	Medium	High	Supportive	Low
9	Ministry of Tourism	Policy and regulation, encouraging/financing sustainable tourism development	Medium	High	Neutral	High
10	Ministry of Transport, Maritime Affairs and Infrastructure - ***Center for Search and Rescue at Sea***	Search and rescue operations at sea; coastal/sea protection in cases of emergency pollution	Medium	Medium	Supportive	High
11	Ministry of Science, Education and Sport	Regulation and financing of climate related research	Medium	Medium	Supportive	Low
12	Ministry of Entrepreneurship and Crafts	Laws and policy regulation, support to SMEs development	Medium	High	Supportive	Medium
13	Ministry of Labour and Pension System	Regulation of employment, labour market monitoring	Medium	High	Supportive	Low
14	Ministry of Culture	Preservation of cultural heritage against threats caused by climate change impact	Medium	Medium	Supportive	Medium
15	National Meteorological and Hydrological Service	Climate and climate related monitoring and forecasting, climate modeling of state atmosphere	High	Medium	Supportive	Low-Medium
16	State Institute for Nature Protection	Data collection; preparation of expert documents for nature protection, educational and promotion activities; specialized biodiversity inventorying and monitoring	Medium	Medium	Supportive	Medium
17	Croatian Hydrographic Institute, Split	Climate and climate related monitoring and forecasting of the sea	High	Medium	Supportive	Medium
18	Croatian Environment Agency	Data gathering on climate change, State of Environment reports	High	Low	Supportive	Low
19	Croatian Waters	Climate and climate related monitoring and forecasting of water bodies; large water infrastructure maintenance	High	High	Supportive	High
20	Environmental Protection and Energy Efficiency Fund	Support to RES, EE and emission reduction projects/programs through funding and partnership	High	High	Supportive	High

21	National Center for Protection and Rescue	Central organisation of early warning and emergency rescue (medical, firefighting, police, mountain rescue)	High	Medium	Supportive	High
22	Croatian Institute of Public Health	Public health monitoring; emergency warnings in potential health hazard situations	High	Medium	Supportive	High
23	Croatian Forests	Forest management, reforestation plans	High	High	Supportive	High
24	Croatian Tourist Board	Strategic planning of tourism activities - pressure on resource use (energy, water, coastal urban sprawl)	High	Medium	Positive	High
NATIONAL LEVEL – RESEARCH & BUSINESS SECTOR						
25	Croatian Forest Research Institute, Jastrebarsko	Applied research on climate impacts on forest ecology and sustainability; SEE region scientific cooperation	High	Low	Supportive	Medium
26	Economic Institute of Zagreb	Economic development plans, including energy and environment	Medium	Low	Supportive	Medium
27	Energy Institute 'Hrvoje Pozar'	Government agency, dealing with energy, emissions, technology consulting; national Energy Balance reporting	High	Low-Medium	Supportive	Medium
28	Institute of Oceanography and Fisheries (Split and Dubrovnik)	Monitoring of physical, chemical and biological aspects of the sea (South Adriatic focus)	High	Medium	Supportive	Medium
29	Rudjer Boskovic Institute (Zagreb; Centre for Marine Research in Rovinj)	Monitoring of physical, chemical and biological parameters of continental and marine environment, data analysis, modelling	High	Medium	Supportive	Medium
30	Ekonerg Institute	Research on climate mitigation and adaptation; preparation of national reports under UNFCCC	High	Medium	Supportive	Medium
31	Institute of Social Sciences 'Ivo Pilar'	Research on Integral Sustainability and Sustainable Development - environmental and energy policy	High	Low	Supportive	Low
32	Institute for Adriatic Culture and Melioration, Split	Innovative research in agriculture and forestry	High	Low	Supportive	Medium

33	Croatian Power Board (HEP)	Government-owned, electricity and heat production and distribution; numerous projects of CHP/cogeneration and retrofitting of plants/installations country-wide	Medium	High	Neutral	Medium
34	HEP Obnovljivi izvori energije – HEP Renewable Energy Sources	Government-owned, daughter company of HEP. Grouping and supporting RES projects, R&D, RES financing and exploitation to secure reliable, economical electricity production	Medium	Medium	Supportive	High
NATIONAL LEVEL – NGOs and INTERNATIONAL ORGANISATIONS						
35	Croatian Chamber of Commerce	Encouraging EE in SMEs, helping with introduction of Emissions Trading Scheme (ETS)	Medium	Medium	Supportive	Low
36	Green Action	RES and sustainable transport promotion, international and local projects	High	Medium	Supportive	Low
37	DOOR – Society for Sustainable Development Design	Web-portal for energy issues, involvement in energy policy development, international and local projects on EE/RES promotion	High	Medium	Supportive	Low
38	HRPSOR – Croatian Business Council for Sustainable Development	Capacity building, networking of businesses on environmentally-sound performance and CSR	Medium	Medium	Supportive	Medium (indirectly through members)
39	HU-CO2 Croatian Association for Carbon Footprint Reduction	Capacity building, info-exchange for businesses on CO2 reduction measures and ETS scheme	High	Low	Supportive	Low
40	Croatian Association of Towns	Information exchange and capacity building, policy lobbying for cases of joint municipal interest	Medium	Medium	Neutral-Supportive	Low (indirectly through members)
41	UNEP MAP – Center of Regional Activities for Priority Actions Programme (PAP/RAC)	Integrated coastal zone management	High	Medium	Supportive	Medium
42	UNDP Croatia	International organisation, promoting EE and sustainable development (capacity building, awareness raising, small local investments)	High	High	Supportive	Low

43	World Bank – Croatia	Supports EE application through ESCO approach, supports heating sector efficiency	High	High	Supportive	Low
44	GIZ – Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH	International organisation, promoting EE and sustainable development (capacity building, awareness raising)	High	Low	Supportive	Low
45	WWF Mediterranean Program - Croatia	International organisation, promoting nature conservation (capacity building, awareness raising), including in relation to climate adaptation	High	Medium	Supportive	Medium
46	ODRAZ – Sustainable Community Development	Rural development (LEADER approach) through stakeholder participation in planning & decision-making; sustainable transport promotion	High	Low	Supportive	Low
REGIONAL LEVEL						
47	County authority - departments for environment (21)	Administrative tasks on all environmental issues, monitoring and enforcement	Low	Medium	Neutral	Medium
48	County public institutions for nature conservation (21)	Management of conservation activities at regional level (all PA categories except national/nature parks)	Low	Low	Neutral	High
49	Regional Development Agencies (21)	Infrastructure/investment projects development and implementation	Low	Medium	Neutral	Low
50	Regional Tourism Boards (21)	Regional strategic planning of tourism activities - pressure on resource use	High	Low	Negative	High
51	Regional offices for protection and rescue (20)	Early warning and emergency rescue (medical, firefighting, police, mountain rescue)	High	Medium	Supportive	High
52	Regional public health institutes (21)	Public health monitoring; emergency warnings in potential health hazard situations	High	Medium	Supportive	High
LOCAL LEVEL						
53	Protected Area management authorities (18 national/nature parks)	Management of protected areas, implementing protection measures	Medium	Low	Supportive	High

54	Town departments for environment, and/or for infrastructure, municipal issues; single administrative departments in small towns & municipalities (128 + 428)	Administrative tasks on all environment & development issues, monitoring and enforcement; responsible for local-relevant investments, and for municipal services provision by local utilities (water, energy)	Low	Low-Medium	Neutral	High
55	Local Development Agencies in several towns	Infrastructure/investment projects development and implementation	Medium	Medium	Supportive	Medium
56	Local tourism boards; tourist agencies	Strategic planning of tourism activities; delivery of tourist services - pressure on resource use	High	Low	Negative	High
57	Cardiovascular Prevention and Rehabilitation Center, Zagreb	Health services to general population for cardiovascular problems caused by extreme weather changes (excessive heat or cold etc.)	High	Low	Supportive	Medium
58	Croatian Red Cross	Participates in "SEE Forum on Climate Change Adaptation", initiated a Croatian network of Civil Society Organizations on the CC adaptation topic.	HIgh	Low	Supportive	High
59	UNIVERSITY OF ZAGREB: • Faculty of Agriculture; • Faculty of Transport; • Faculty of Science; • Faculty of Forestry;	Research in climate impacts on agriculture; research in climate change impacts on natural resources	High	Low	Neutral	Low
60	UNIVERSITY OF RIJEKA: Faculty of Tourism and Hospitality Management in Opatija	Education and research in sustainable tourism management	Medium	Low	Neutral	Low
61	UNIVERSITY OF OSIJEK: Faculty of Agriculture	Research in climate impacts on agriculture	Medium	Low	Neutral	Low
62	University of Dubrovnik – Institute for the Sea and Coastal Zone	Research and monitoring of physical, chemical and biological aspects of the sea	High	Low	Neutral	Low

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Adaptation to Climate Change in Croatia

Country Brief

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CroAdapt

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1. Introduction

Since the 1980ies, there is growing awareness among scientists and decision-makers about climate change. This has led to the implementation of a large number of greenhouse gas (GHG) emission reduction policies on all policy levels, aimed at mitigating the severity of climate change. However, even if GHG emissions stop today, the past emissions will cause climate change to continue for decades. Therefore, adaptation to the changes already caused by the emissions of GHG in addition to the anticipated emissions will be necessary to meet the far-reaching consequences for environment, economy and society anticipated by experts. Climate change mitigation and adaptation actions are two different pillars of climate policy and should be complementary to each other.

Climate change adaptation consists of actions responding to current and future climate change impacts and vulnerabilities within the context of ongoing and expected societal change. Adaptation means not only protecting against negative impacts, reducing potential future damage and associated costs, but also taking advantage of any benefits and new opportunities that may arise due to new climate conditions.

Adaptation is still a rather new policy field on EU, national and regional level. In April 2013, the EU Adaptation Strategy was published and up to now, fifteen EU Member States have already developed national adaptation strategies (NAS). Also more and more regional and local responses are emerging, taking into account that there is no 'one-fits-all' approach to adaptation and concrete action will have to be taken on regional and local level in order to be able to address specific conditions and needs.

There are many issues that in combination drive countries to develop adaptation strategies. Besides the international climate negotiations and already developed EU policies also the experience of extreme weather events and the increasing availability of research on climate change impacts and adaptation are important driving factors for developing adaptation policies.

Croatia has recognized the need to develop a national climate change adaptation strategy and to bring adaptation also to the regional and local level, where concrete measures will need to be implemented. This paper shall support this process by outlining the relevant developments on EU level, giving a brief overview on climate trends and potential climate change impacts for Croatia, describing the current state regarding adaptation in Croatia and explaining the importance to address adaptation as a multi-level issue and integrate it into other policy sectors ("mainstreaming"). Finally, recommendations for further activities are given.

2. EU policy on adaptation to climate change

In 2009, the European Union (EU) published the White Paper Adapting to Climate Change: Towards a European Framework for Action (Commission of the European Communities 2009). Based on a wide-ranging consultation launched in 2007 by the Green Paper Adapting to Climate Change and further research, the White Paper outlined the EU's approach to adaptation and set a framework to reduce the EU's vulnerability to the impacts of climate change. The White Paper acknowledged the varying severity and nature of climate impacts between regions in Europe and therefore left adaptation decisions to the single Member States.

With the White Paper, the EU adopted a phased approach: Phase 1 (2009-2012) focused on building a stronger knowledge base on the impacts of climate change for the EU, taking climate change impacts into consideration in key EU policies, and employing a combination of policy instruments (market-based instruments, guidelines, public-private partnerships) to ensure effective delivery of adaptation. Phase 1 laid the ground for a comprehensive EU adaptation strategy.

In April 2013, at the beginning of the second phase set in the White Paper, the European Commission adopted an EU Adaptation Strategy. The overall aim of the strategy is to contribute to a more climate-resilient Europe. The strategy's key objectives are:

- to encourage all Member States to adopt national adaptation strategies, to provide funding for building up adaptation capacities and taking action, and to support adaptation in cities,
- to climate-proof EU action by further promoting adaptation on EU level, including mainstreaming of climate change (mitigation and adaptation) into key vulnerable EU policy sectors (such as agriculture, fisheries and cohesion policy), promoting the use of insurances against disasters, and ensuring that the EU's infrastructure is made more resilient,
- to address gaps in knowledge about adaptation and further develop the European climate adaptation platform (see also below) in order to make better informed decisions.

The strategy promotes activities of Member States respecting the principle of subsidiarity, i.e. the EU will not take action unless it is more effective than action taken at national, regional or local level. The EU sees a particularly strong role for action on community level when the impacts of climate change transcend the boundaries of individual countries (e.g. river and sea basins) and vary considerably across regions. With its adaptation strategy, the EU complements the activities of the Member States and promotes greater coordination and information-sharing between Member States. In 2017, the Commission will report to the European Parliament and the Council on the state of implementation of the strategy and propose its review if needed. The report will be based on information provided by Member States under the Monitoring Mechanism Regulation38 on national adaptation planning and strategies, the annual implementation reports for programmes funded by the European Structural and Investment funds in the period 2014-2020 and the Intergovernmental Panel on Climate Change's 6th Assessment Report to be issued in 2014.

The EU Adaptation Strategy highlights that adaptation measures need to be taken on all levels, from national to regional and local, and that a coherent approach and improved coordination are needed. It is stressed that active engagement of local and regional authorities will be essential. The European Commission will promote urban adaptation strategies notably by launching a voluntary commitment following the model of the Covenant of Mayors, an initiative of more than 4,000 local authorities voluntarily committed to improving the quality of life by pursuing EU climate and energy objectives.

Besides the strategy itself, the EU Adaptation Strategy Package includes several further documents, among them

- an impact assessment which aims at preparing evidence for political decision-makers on the advantages and disadvantages of possible policy option by assessing their potential economic, social and environmental impacts;
- a Green Paper on the prevention and insurance of disasters which evaluates and reports on the potential for the EU to support increased coverage of appropriate disaster risk insurance and financial risk transfer markets, as well as regional insurance pooling, in terms of knowledge transfer, cooperation, or seed financing,
- Guidelines on developing adaptation strategies which aim at helping to prepare or revise climate change adaptation strategies.

In order to improve knowledge management and share existing information and research among Member States, the EU has established the European climate adaptation platform Climate ADAPT (http://climate-adapt.eea.europa.eu/). The platform, launched in March 2012, serves as a database on climate change impact, vulnerability, and best practice on adaptation. It contains information on adaptation action on all policy levels (from the EU through regional and national to the local level) as well as several useful resources to support adaptation policy and decision making, such as a toolset for adaptation planning.

3. Climate change impacts and vulnerabilities

3.1 Climate trends and risks in Croatia

How exactly the global warming is changing the conditions in Croatia is still unclear, however, since the 19th century, meteorological data has been taken from several stations in Croatia, allowing for a reliable documentation of long-term climatic trends (Simac/ Vitale 2012: 18f.). The key trends of the 20th century can be summarized as follows (Ministry of Environmental Protection, Physical Planning and Construction 2010: 16ff.):

- All across the country, rising average temperatures were indicated, especially pronounced during the last 20 years. The increase of mean annual air temperature in the 20th century varied between 0.02°C per 10 years (Gospić) and 0.07°C per 10 years (Zagreb). The positive temperature trends in the continental parts of Croatia are mainly due to winter trends, while those on the Adriatic coast can mainly be attributed to summer trends.
- There has been a trend of slightly declining rates of annual precipitation during the 20th, continuing at the beginning of the 21st century, and an increase in the number of dry days all over Croatia. Also the frequency of dry spells, i.e. the number of consecutive dry days, has risen.

From all climate change driven hazards, only flooding has been identified by the National Hazard Assessment as major risk in Croatia (Simac/ Vitale 2012: 19). Due to the fact, that Croatia is situated in the Danube basin and is under strong influence of the Sava and Drava rivers, it is a highly flood-prone country and it is estimated that excluding the coastal zones 15% of the Croatian territory is prone to floods (ibid.: 21).

Other climate change driven hazards recognized as risks for Croatia are sea level rise, extreme temperature and precipitation, drought and wind. The Mediterranean, including the Croatian Adriatic coastline, is affected by global sea-level rises. Particularly at risk are low islands and river deltas which are vulnerable to coastal flooding. However, the Croatian coast is a tectonically active area which makes it difficult to accurately predict the impacts of sea level rise as long-term trends in sea level changes may be obscured (ibid.). The increasing temperatures and declining precipitation brings an increased risk of droughts, which is particularly high when there are longer periods of extreme temperatures. From the ten warmest years since the beginning of the 20th century, seven of them were recorded after the year 2000 in Zagreb, in Gospić six of them were recorded in the first years of the 21st century (Ministry of Environmental Protection, Physical Planning and Construction 2010: 17), 2003 being the hottest year in Croatia since 1862 (Simac/ Vitale 2012: 19). As regards winds, the bora and the jugo are the two dominant winds in Croatia, both major factors at the Adriatic coast. While severe bora winds can drastically decrease temperatures, jugo winds can cause serious coastal flooding (ibid.: 20). How exactly the frequency and strength of these winds will change under climate change is at present not known yet.

3.2 Sectoral impacts and vulnerabilities to climate change

Significant parts of the Croatian society and economy are vulnerable to variability in the existing climate and changes in the climate in future (Simac/ Vitale 2012: 21). Almost a quarter of the Croatian economy is based on sectors potentially vulnerable to climate change and extreme weather, which accounts for almost billion Euro a year (ibid.).

The agriculture sector is particularly vulnerable to climate change as it is in general very weather dependent. All direct characteristics of climate – temperature, precipitation, and weather extremes – impact the production. In 2001, 92% of Croatia was classified as rural and 48% of the population lived in rural areas (UNDP 2008: 120). Due to its overall value, its impact on food security and the employment it generates, agriculture is an important sector of the Croatian economy which already in the past years has strongly been impacted by climate variability. Extreme weather events, such as flooding and hail-storms, as well as water shortage resulted in average losses of 176 million Euro per year during 2000-2007 and the scale of damages could get worse in future (ibid.: 129). However,

earlier flowering and the development of other varieties of grapes, olives and fruits due to warmer winter and spring seasons have a somewhat positive impact on agricultural production, enabling a bigger production yield. However, the existing vineyard regions might therefore expand to a wider grape assortment which would result in a loss of regional character of wines and reduce their market competitiveness.

Tourism has for a long time been important in Croatia. The sector generates about 20% of the GDP and almost 30% of total employment (UNDP 2008: 52). Due to hotter day time temperatures along the Adriatic coast – which is the main tourist destination in Croatia, July and August being currently the most active months – many tourists might in future avoid these destinations in summer in favour of cooler locations. Also, a significant share of the touristic infrastructure is at risk of coastal flooding if the sea level rises (Simac/ Vitale 2012: 26).Both could have serious consequences on many local communities given the important role of tourism for the national economy. In addition to the coast, there are other specific natural sites, such as inland national parks. Warmer temperatures can lead to a variety of changes in coastal and inland ecosystems, such as changing the species composition of ecosystems (including increased amounts of mosquitos) and the levels of algae which both could negatively impact tourism as well.

Also health impacts are a major concern related to climate change in Croatia. Already in the past years, events such as heat waves, have had an impact on Croatian citizens and these impact are likely to increase in frequency due to future climate change (UNDP 2008: 90). Particularly vulnerable in extreme weather conditions are elderly and chronically ill people. Besides cardiovascular risks from heat waves, also changed allergic patterns resulting from changing pollen counts, an increase in illnesses carried by mosquitoes, birds and other organisms due to increased non-native species migration and longer warm periods, and increased bacteria growth in food may also emerge.

Coal and oil still splay an important role in Croatia's energy sector and the operation of power plants will be affected by water availability problems and temperature concerns due to the high dependence of those power plants for cooling water. In the past years, Croatia has increased its electricity production from renewable sources. Though being a very positive trend from an ecological point of view, also regarding the power production from renewable sources there are some concerns with regard to climate change, as it may affect in particular the country's hydropower production, in 2010 making up more than 60% of all national electricity production (Simac/ Vitale 2012: 26f.). However, the predicted number of warm days is likely to improve the opportunities for solar energy. As regards energy consumption, the end use in Croatia has increased in the past years (Dreblov et al. 2013: 7). Temperature rise across the country will lead to changes in the level of demand with expected rises of cooling energy and declines in heat energy (UNDP 2009: 52). More frequent extreme events would also threaten all types of energy infrastructure, with an associated increase of maintenance costs (ibid.).

Being among others used for drinking water, agriculture, wetland services, and the production of hydroelectric energy, water is an essential natural resource. As Croatian fresh water resources are abundant, they are not considered a limiting factor for development in Croatia (Ministry of Environmental Protection, Physical Planning and Construction 2010:18). Although there is no shortage of water per se in Croatia, risks do exist, in particular for the agriculture sector (water shortages at critical times of the growing season), the Croatian electricity production (decreased river flows may impact the electricity production from hydropower) and wetland services. However, the present knowledge on climate change impact on fresh water resources in Croatia is not sufficient for precise assessments yet (Pandžić n.d.: 22).

Impact of climate change on biodiversity and ecosystems is already visible in salt intrusion into wetlands and freshwater bodies. The resulting changes of vegetation as well as temperature changes might lead to ecosystem changes and therefore habitat fragmentation for many species, which might require adaptation in the protected areas management.

Climate change will also have an impact on fishing and marine industries. Changes in the distribution of species in the Adriatic Sea will result in both benefits and losses which may not be distributed equally. More research will be necessary to prevent losses and promote the potential benefits from climate change.

There is still significant uncertainty about the level of sea level rise in the Adriatic Sea. However, a lot of important economic activities take place on or near Croatia's coastal zone (e.g. tourism, shipbuilding, maritime transport, and agriculture), so sea level rise has the potential to become one of the most expensive climate change impacts (Pandžić n.d.: 25).

4. Current state of adaptation to climate change in Croatia

According to Article 118 of the Air Protection Act, the Ministry of Environmental and Nature Protection of the Republic of Croatia needs to prepare a comprehensive national action plan on adaptation to climate change. In line with recommendations of the EU strategy on adaptation to climate change and with the support of EU funding instruments, Croatia is currently in the process of preparing this national action plan, i.e. strategy on adaptation to climate change. An amendment of the Air Protection Act which includes the development of both a national adaptation strategy and adaptation plan is currently open for public consultation. It is planned to adopt the amendment until summer 2014.

The future adaptation strategy for Croatia will focus on several sectors identified as most vulnerable to climate change impacts: hydrology and water resources; agriculture; forestry; biodiversity and natural ecosystems; coastal zone management; tourism; and human health. It is also to define the priority measures and activities, as well as ways of integrating adaptation measures into sectoral development plans and strategic documents.

One policy measure has already been introduced by the Ministry of Enviromental and Nature Protection in relation to adaptation. This is the recent setting up of an Intersectoral Committee for the intersectoral coordination of policies and measures on climate adaptation and mitigation at national level. This two-tiered Committee includes institutional representatives of ministries and agencies to discuss policy issues, while experts and practitioners from various sectoral institutions will address technical issues. The members of this committee are nominated for one and a half years to allow a certain degree of coherence.

Although currently there are no sectoral strategies in place that address climate adaptation issues, activities in the field show already a degree of practical adaptation in certain sectors, such as:

- Agriculture: changes in the orientation of wine production as a reaction to earlier flowering and development of grapes, expansion of the wine production assortments in the continent;
- Civil protection: adaptation of fire-fighting activities to the longer fire-fighting season and increasing average summer temperatures, expanding activities from island/coastal to inner continental areas; intensification of heat-wave emergency preparedness among health services;
- Protection of coastal biodiversity and ecosystems: ex-situ and in-situ protection of endangered species to protect the genetic fund; preservation of migratory corridors for species that can adapt to changing habitats; modification of management plans and physical plans of protected areas; adaptation of protection programs at the level of taxa; developing infrastructure for scientific evaluation of the status, projections and monitoring of changes in ecosystems;
- Coastal zone management: In 2012, Croatia ratified the Protocol on integrated coastal zone management in the Mediterranean, committing to the development of a national strategy of integrated coastal zone management with action plans and programs in line with the joint regional framework. The national strategy should include vulnerability and hazard assessments of coastal zones, as well as planning for prevention, mitigation and adaptation measures to address the effects of natural disasters, in particular of climate change.

In the context of building capacities for practical work on climate adaptation, several projects have been implemented so far:

- The UNEP/MAP's Priority Actions Program/ Regional Activity Centre implements the project "Integrating impacts of climate variabil-

ity and change into integrated coastal zone management", aimed at assessing the costs of climate change and variability by using DIVA methodology (Dynamic Integrated Vulnerability Assessment) for the Croatian coastal area, and specifically for Šibenik-Knin County as one of the pilot areas in the Mediterranean Basin, and preparing an integrated coastal zone management plan for the County, all this by using a participatory planning method Climagine.

- A regional ORIENTGATE project (www.orientgateproject.org, July 2012 - June 2015), aimed at implementing coordinated climate adaptation actions across South Eastern Europe, through a partnership in 13 countries, contributing to a better understanding of the impacts of climate variability and climate change on water regimes, forests and agro-ecosystems. The main objective is networking and data exchange of up-to-date climate knowledge for the benefit of policy makers. The project involves two partners from Croatia: the Meteorological and Hydrological Service and the town of Koprivnica.

- The EU Directorate-General (DG) Climate's project "Adaptation strategies for European cities" (http://eucities-adapt.eu/cms/home/about-the-participating-cities/; January 2012 – June 2013) involved one Croatian town – Zadar - among 21 cities selected to receive free training and coaching to develop or improve their local adaptation strategies. Zadar developed a local vision document on adaptation and an action plan in 2013.

- The City of Zagreb has finished first phase of the background study „Climate adaptation plan for the City of Zagreb" in 2013 as well.

- In the frame of the South East European (SEE) Forum for Climate Change Adaptation (www.seeclimateforum.org/CCA-Forum/1/Home.shtml; 2011-2012), the Croatian Red Cross in cooperation with the Ministry of Health and regional public health institutes works continuously on building capacities of health workers for coping with climate change effects, through workshops and public discussions, distribution of educational materials in medical institutions, direct advisory services to elderly people, as well as HydroMet public emergency warnings in cases of weather extremes, heat waves and bio-meteorological forecasts.

5. Approaching climate change adaptation

5.1. Adaptation as multi-level issue

There is widespread recognition that in order to reduce vulnerability to climate change impacts and related threats, and taking advantage of potential opportunities that may arise from climate change, adaptation activities need to take place at various levels of governance. The development of adaptation policy can be approached in a "top-down" manner, responding to concerns about global climate change, international climate negotiations and already developed relevant EU policies, or in a "bottom up" manner reducing vulnerability to observed climate variability (e.g. floods, heat waves) on local or regional level (Swart 2009: 29). While national adaptation strategies are important to set the frame for adaptation, define the overall goals and strategic vision, adaptation on regional and local level are necessary to address appropriately the specific impacts, needs and conditions on regional or local level.

Approaching climate adaptation on different policy levels, it is very important to ensure that the taken measures are coherent across different sectors and levels of governance. Recognizing that different policy levels and stakeholders play a role in climate change adaptation, the topic presents itself increasingly as a challenge not only of international relations, but also of multi-level governance(Swart 2009: 105). Multi-level governance is defined as decision-making through a dynamic inter-relationship within and between different levels of governance, steered not only by the public, but also by private and other interests (Keskitalo 2010: 4; Hooghe/ Marks: 2001). The concept recognises that for effective policy-making also other actors and their interrelations play an important role, besides national governments which have traditionally been regarded as the principle actors in decision-making.

The EU Adaptation Strategy as well as most already existing National Adaptation Strategies (NAS) of EU Member States emphasise the need to take action at the regional or local level with a shared responsibility across administrative scales, reflecting that the effects of climate change will be felt locally and may vary greatly even within national borders (Swart 2009: 21).

The way, in which climate change impacts and adaptation are treated by actors on different levels is to a large extent dependent on different adaptation capacities, including financial resources, access to information, decision-making structures and other institutional features (Keskitalo 2010: 4f.; Smit and Wandel 2006).

5.2. Mainstreaming adaptation

Climate change will have diverse impacts on a variety of sectors. In order to ensure that all relevant policies take due account of climatic changes they are concerned with, it is therefore important to integrate or "mainstream" it into sectorial policies and institutional mechanisms. Mainstreaming climate change adaptation policy means that also actors whose main tasks are not directly concerned with adaptation to climate change incorporate this topic in their work and in this way contribute to attaining the defined goals. Mainstreaming efforts need to be coherent across various levels of governance.

While adaptation to climate change is a rather new policy field in most countries, it must be noted that many existing policies that apply to day-to-day monitoring and management procedures for coping with weather-related events, such as forest fires, floods or heat waves, already contribute to adaptation. Adaptation activities thus cover a wide range of policies that are not necessarily "labelled" as adaptation policies. These potentially already existing policies should be considered and assessed as well in order to get insight into improvements or adjustments that may be necessary.

There are several possibilities to enhance mainstreaming of climate change adaptation. One mechanism which is already in place in Croatia are inter-ministerial working groups on climate change adaptation. Another mechanism is the earmark budgets in each sector for adaptation tasks. In that way, the responsibilities are shared and adaptation is an integrated part in each sector. Last but not least, climate-proofing political decisions (sectorial strategies, investments, plans) across the sectors can help ensuring that climate adaptation issues are considered in all relevant documents.

6. Recommendations for further activities

The overall aim of national adaptation policy should be a more climate-resilient country. This means enhancing the preparedness and capacity to respond to the impacts of climate change at local, regional and national level. Although the choice of instruments plays doubtlessly an important role in reaching this goal, there are other aspects which shall be highlighted here as important determining factors for the success of becoming less vulnerable to climate change:

1. Adaptation to climate change is not necessarily about doing more, but it is also about new ways of thinking and dealing with risks and hazards, uncertainty and complexity. The still significant uncertainty regarding climate variability, long-term climate and socio-economic changes require flexible adaptation policies, which can deal with evolving scientific understanding and lessons learned from already implemented actions. This also means that adaptation policies need to be constantly updated with new information from monitoring, evaluation, and learning.

   - *Using different types of adaptation measures can be helpful to achieve a greater flexibility. For example, implementing a combination of 'grey' (i.e. technological and engineering solutions), 'green' (i.e. eco-system based approaches) and 'soft' (i.e. managerial, legal and policy approaches) adaptation options is often a good way to deal with the interconnections between natural and social systems.*

   - *More knowledge is needed to better understand the regional impacts of climate change in Croatia and to respond to new scientific findings and insights. We recommend regular exchange between scientific research institutes and policy makers in*

meetings, events or working groups to be informed about on-going activities and projects and be able to update adaptation policies once they are developed.

2. As mentioned in the previous chapters, climate change adaptation policies also require the integration of different levels of governance (European, national, regional, and local) and different sectors of economy and society. This complexity presents a challenge, by requiring 'horizontal' and 'vertical' integration of policies. However, if well-coordinated, this mainstreaming and cooperating among different policy levels also offers the potential for synergies and spill-over benefits. In order to develop a coherent approach and improve coordination it may be helpful to create or intensify supporting structures, such as an inter-ministerial working group, an institutionalized exchange among national and regional levels or even a new institution/ department in an existing institution responsible for information and coordination.

- *The inter-sectorial working group should keep up the work and be expanded by missing ministries. This working group, including the participating experts from universities and other institutions, should be used to discuss drafts of the national adaptation strategy and the action plan. Other ministries should be actively prompted to send their opinion on the national adaptation strategy and action plan.*
- *In order to address adaptation in a coherent manner on different policy levels, the responsibilities for different levels of governance should be clearly defined. It is recommended to either set up a coordinating body or assign the responsibility for managing the cooperation across administrative scales to an already existing institution/ department.*

3. Considering that social and economic contexts, as well as local environmental impacts play essential roles for choosing appropriate adaptation measures, it becomes clear that there cannot be a 'one-fits-all' approach to adaptation. While a national adaptation strategy is important to set the frame and objectives of adaptation, regional and local climate change adaptation strategies and plans are important to successfully adapt to the impacts of climate change.

- *Although Croatian regional and local climate change adaptation strategies and/ or plans are still very rare, a few local policy documents regarding adaptation do already exist or are under preparation (e.g. for Zadar and Zagreb) which could serve as an example also for other cities. Additionally, a lot of regional and local adaptation strategies and plans from other EU Member States have been developed and are available online.*
- *We recommend supporting mechanisms to foster the elaboration of regional and/or local climate strategies. This requires not only the strategies itself but preceding capacity building. For this first step we recommend the preparation and dissemination of information material tailored for the needs of the local level. As there is a lot of material available already in English language, a translation and adaptation would probably be enough. Roundtables as proposed below can also serve this purpose. For the actual elaboration, support schemes (e.g. financial support for developing the strategy document) and adaptation guidelines should be provided.*
- *For the selection of concrete measures on local level, multi-criteria analyses or cost-benefit analyses can be applied to assess the possible adaptation options. We recommend implementing a small pilot project to test and demonstrate such methods for a selected case.*

4. The involvement of stakeholders (policy makers, NGOs, business and citizens) from the beginning on is very important to develop adaptation policies that are tailor-made to regional and local conditions and needs. Stakeholder involvement is also essential to build adaptive capacity in the wider society and to create a sense of 'ownership' in adaptation policy, which will be very important for the success of adaptation implementation. With the help of a broad participation of actors it is possible to come to a prioritization of potential adaptation measures.

- *A series of moderated regional roundtables should be held in the frame of the adaptation process. This will create a dialogue between various stakeholders and facilitate the identification of priority sectors.*

5. The way of interaction of state and non-state actors from different levels plays an important role. A consensus-oriented goal formulation among well-informed stakeholders with high level of awareness has proven to be a very good precondition for effective policy-making, i.e. reaching the agreed goal. Providing comprehensive information among stakeholders and citizens and raising their awareness is therefore critical.

- *A communication strategy on climate change adaptation can be very useful to take on a strategic approach regarding communication and awareness raising.*
- *We recommend that the draft of the national adaptation strategy is open for public consultation.*
- *We recommend to set-up an on-line information platform in Croatian language that forms the central information point for events, publications and developments (either as a stand-alone website or integrated into a suitable existing online portal). A part of the information should be directly targeted to citizens and their role in the adaptation process. The on-line platform should also include Croatia-specific case studies.*

6. Climate change impacts should be systematically taken into account in future administrative actions on national, regional, and local level.

- *The revision of national strategies and planning documents should ensure that the revised versions are climate-proof. Especially spatial planning and infrastructure planning (national, regional and local level) should include the anticipated impacts of climate change.*

7. Cost-benefit analyses are an important tool to support the prioritization of adaptation measures. However, it should be considered that at present only limited information on costs and benefits of adaptation action on European, national, and local levels is available at present, and this information has to be considered with care as there is still much work to be done on improving assessment methods.

- *In order to reduce the knowledge gaps, cost-benefit analyses and accompanying research should be focused on priority sectors (to be identified in the adaptation strategy development process) in the beginning.*

8. At EU level, financial instruments for implementing adaptation policy are available and include, for example, cohesion funds, agriculture funds, and infrastructure funds, as well as funds from the LIFE+ and Horizon2020 programme.

- *National co-funding for EU funded projects can be allocated in line with the priority sectors identified in the national adaptation strategy.*
- *Research institutes should be encouraged to make use of EU funding for which Croatia, being a full EU member, is now fully eligible.*

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REPUBLIKA HRVATSKA
MINISTARSTVO ZAŠTITE
OKOLIŠA I PRIRODE

CroAdapt

Zagreb, 16 December 2013

SUBJECT: Invitation to the national round table
"Adaptation to climate change in Croatia – a multi-level approach"
Zagreb, January 23, 2014

According to the Air Protection Act, adopted in 2011, and in line with the recommendations of the EU Strategy on Adaptation to Climate Change, the Ministry of Environmental and Nature Protection (MENP) of the Republic of Croatia is planning to prepare a national strategy on adaptation to climate change. Climate change adaptation policies consist in anticipating the negative impacts of climate change, in order to develop and implement appropriate measures with the aim of reducing potential future damages and costs, or taking advantage of opportunities that may arise linked to new climatic conditions.

While a national strategy is important to set the framework for climate change adaptation in the country, action must be taken on all policy levels, from national to regional and local level to meet the varying severity and nature of climate impacts between regions.

The project CroAdapt supports the Ministry of Environmental and Nature Protection in following a multi-level approach regarding climate change adaptation. In the frame of the project, the Ministry of Environmental and Nature Protection in close cooperation with the Regional Environmental Center - Country Office Croatia and the Baltic Environmental Forum Germany, is cordially inviting you to the

National round table "Adaptation to climate change in Croatia – a multi-level approach"

*which will be held on **23 January 2014 in Zagreb***

*at the **Croatian Chamber of Commerce – EU Center, Nova cesta 3-7***

The round table will set off the national discussion on the expected climate change impacts for Croatia and its three geographical regions, the Adriatic coast, the Dinaric Alps, and the Pannonian Basin. Speakers from other European countries will present their experiences in developing adaptation strategies and measures, and approaching the topic in a multi-level way.

Expected participants include representatives from relevant national ministries, regional and local authorities, national academic institutions and experts in the field of climate change and adaptation.

As your organisation has been recognised as an important stakeholder in this process, we would greatly appreciate participation of your representatives in the roundtable. Please confirm your attendance **latest by January 20, 2014**, by using the application form attached. For any additional information please do not hesitate to refer to our project partner REC Croatia (contact: Irena Brnada, T: 01/4810774, E: ibrnada@rec.org).

Sincerely,

Marija Sculac Domac
Assistant Minister

REPUBLIKA HRVATSKA
MINISTARSTVO ZAŠTITE OKOLIŠA I PRIRODE

REGIONALNI CENTAR ZAŠTITE OKOLIŠA Hrvatska

BEF GERMANY

CroAdapt

NATIONAL ROUND TABLE
"Adaptation to climate change in Croatia – a multi-level approach"

23 January 2014
Zagreb, Croatian Chamber of Commerce's EU Center, Nova cesta 3-7

Moderation: Heidrun Fammler (BEF Germany)

9:00-9:30	Registration of participants	
9:30 – 09:40	Welcome by the organizer	Marija Sculac-Domac, Assistant Minister, Ministry of Environmental and Nature Protection
9:40 – 10:00	Introduction to the meeting and to the issue	Matthias Grätz, Baltic Environmental Forum (BEF) Germany
10:00 – 10:20	Climate variability, expected climate change impacts and projections	Kreso Pandzic, Meteorological and Hydrological Service
10:20 – 10:40	Plans regarding the national climate adaptation policy of the Republic of Croatia	Visnja Grgasovic and Melita Zdilar, Ministry of Environmental and Nature Protection
10:40 – 11:00	Adaptation as a sectoral issue: examples from the agricultural sector in Croatia	Prof. Milan Mesic, University of Zagreb, Faculty of Agriculture
11:00 – 11:30	***Coffee break***	
11:30 – 11:50	Adaptation as a regional issue: results of the project CLIMAGINE in Šibenik-Knin County	Daria Povh Škugor, UNEP/MAP's Priority Actions Programme/Regional Activity Centre
11:50 – 12:20	Adaptation as multi-level governance issue: the EU frame and experiences in Austria	Sabine McCallum, Federal Environment Agency Austria, Head of Unit Environmental Impact Assessment and Climate Change
12:20 – 12:50	Adaptation as multi-level governance issue: the experiences in Spain from a regional perspective	Salvador Samitier i Martí, Head of the Catalan Office for Climate Change, Ministry of Territory and Sustainability Catalan Government
12:50 – 13:45	***Lunch***	
13:45 – 14:15	Adaptation as multi-level governance issue: experiences from Italy and guidelines for municipalities	Domenico Gaudioso, Italian National Institute for Environmental Protection and Research, Head of the Atmosphere and Climate Service

This meeting is organized with the financial assistance of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety with means of the Advisory Assistance Programme for Environmental Protection in the Countries of Central and Eastern Europe, the Caucasus and Central Asia.

Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety

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HGK 1852

14:15 – 15:30	Thematic workshop: Climate change adaptation in Croatia from a regional perspective (1) Adriatic coast (2) Pannonian Plane (3) Dinnaric Alps (4) How can adaptation be successfully addressed on regional and local level? (international speakers/ participants)	Moderation: Group (1): Irena Brnada (REC) Group (2): Petra Brandelek (REC) Group (3): Ministry of Environmental and Nature Protection Group (4): Heidrun Fammler (BEF)
15:30 – 16:00	***Coffee break***	
16:00 – 16:30	Feedback from the working groups, wrap-up and closing of the event	

**** The event is held in Croatian and English, with simultaneous interpretation provided.***

This meeting is organized with the financial assistance of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety with means of the Advisory Assistance Programme for Environmental Protection in the Countries of Central and Eastern Europe, the Caucasus and Central Asia.

Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety

Umwelt Bundesamt

Co-organiser:

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MINISTARSTVO ZAŠTITE OKOLIŠA I PRIRODE
REGIONALNI CENTAR ZAŠTITE OKOLIŠA Hrvatska

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NATIONAL ROUND TABLE
"Adaptation to climate change in Croatia – a multi-level approach"
Zagreb, 23 January 2014

CroAdapt

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NATIONAL ROUND TABLE
"Adaptation to climate change in Croatia – a multi-level approach"
Zagreb, 23 January 2014

CroAdapt

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NATIONAL ROUND TABLE
"Adaptation to climate change in Croatia – a multi-level approach"
Zagreb, 23 January 2014

CroAdapt

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Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety

Umwelt Bundesamt

Co-organiser:

Adaptation to climate change – a multi-level approach

Zagreb, 23.01.2014

BEF

ABOUT THIS EVENT

Background

- EU wide adaptation efforts
- Recognition of the importance of the topic and first steps also in Croatia
- Goal of the event: contributing to the adaptation to climate change in Croatia by increasing awareness of national, regional and local authorities
- Supported by the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety as well as the Federal Environment Agency

Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety

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Contents of the event

- Climate change in Croatia
- Planned policies in Croatia
- First experiences and case studies from Croatia
- Adaptation as multi-level governance issue: experience from abroad (Austria, Spain, Italy)
- Regional working groups

Agenda

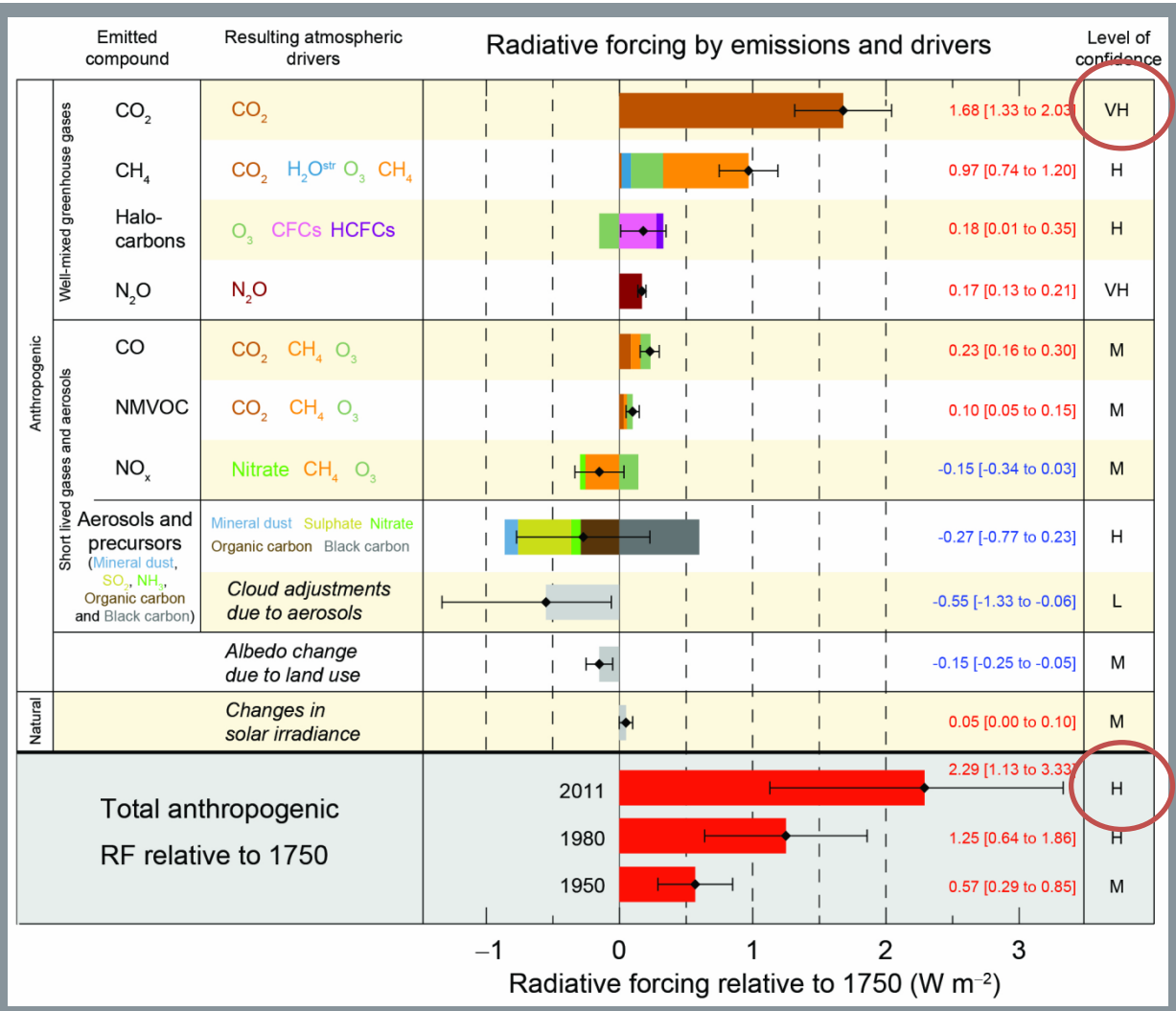
9:00-9:30	*Registration of participants*	
9:30 – 09:40	Welcome by the organizer	Marija Sculac-Domac, Assistant Minister, Ministry of Environmental and Nature Protection
9:40 – 10:00	Introduction to the meeting and to the issue	Matthias Grätz, Baltic Environmental Forum (BEF) Germany
10:00 – 10:20	Climate variability, expected climate change impacts and projections	Kreso Pandzic, Meteorological and Hydrological Service
10:20 – 10:40	Plans regarding the national climate adaptation policy of the Republic of Croatia	Visnja Grgasovic and Melita Zdilar, Ministry of Environmental and Nature Protection
10:40 – 11:00	Adaptation as a sectoral issue: examples from the agricultural sector in Croatia	Prof. Milan Mesic, University of Zagreb, Faculty of Agriculture
11:00 – 11:30	*Coffee break*	
11:30 – 11:50	Adaptation as a regional issue: results of the project CLIMAGINE in Šibenik-Knin County	Daria Povh Škugor, UNEP/MAP's Priority Actions Programme/Regional Activity Centre (tbc)
11:50 – 12:20	Adaptation as multi-level governance issue: the EU frame and experiences in Austria	Sabine McCallum, Federal Environment Agency Austria, Head of Unit Environmental Impact Assessment and Climate Change
12:20 – 12:50	Adaptation as multi-level governance issue: the experiences in Spain from a regional perspective	Salvador Samitier i Martí, Head of the Catalan Office for Climate Change, Ministry of Territory and Sustainability Catalan Government
12:50 – 13:45	*Lunch*	

Agenda

14:15 – 15:30	**Thematic workshop:** **Climate change adaptation in Croatia from a regional perspective** (1) Adriatic coast (2) Pannonian Plane (3) Dinnaric Alps (4) How can adaptation be successfully addressed on regional and local level? (international speakers/ participants)	Moderation: Group (1): Irena Brnada (REC) Group (2): Petra Brandelek (REC) Group (3): Ministry of Environmental and Nature Protection Group (4): Heidrun Fammler (BEF)
15:30 – 16:00	Coffee break	
16:00 – 16:30	Feedback from the working groups, wrap-up and closing of the event	

INTRODUCTION TO ADAPTATION TO CLIMATE CHANGE

Antropogenic climate change is happening



Source: 5th Assessment report

Reactions to climate change

Mitigation

- Emission reduction
- Increase storage capacities of GHG gases

Adaptation

- Cope with climate change
- Prevent damages
- Make use of advantages

Changes in local climate…

- *Warmer on average*
- *Increased likelihood of torrential rains, dry spells*
- *Less annual precipitation*

…cause sectoral impacts…

- *More cardio-vascular problems in summer*
- *Changes in crop yields*
- *Different tourism patterns*

…that need adaptation.

Different sectors

- Adaptation is an issue that effects many, if not most sectors
  - Agriculture and industry
  - Forestry, Fishery
  - Tourism
  - Health, civil protection
  - Energy supply, infrastructure
  - Biodiversity, nature conservation

Mainstreaming climate adaptation

- Integrate adaptation into different policy sectors as horizontal issue
- Ways to do that:
  1. Interministerial working groups
  2. Allocate bugdet to sectors
  3. Climate-proofing political decisions (strategies, investments, plans)

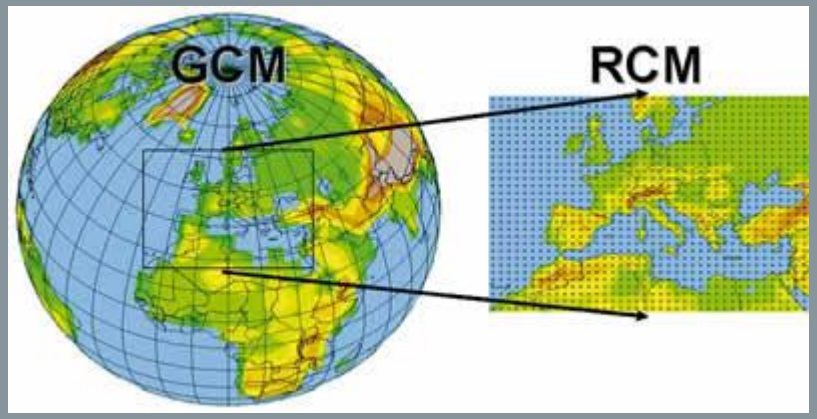
Basic principles for adaptation starters

1. Look for win-win solutions and no regret measures
2. Should not counteract mitigation or other adaptation efforts (maladaptation)
3. Increase capacities and knowledge basis
4. Integrate stakeholders from the beginning
5. Prioritize concerns and adaptation options

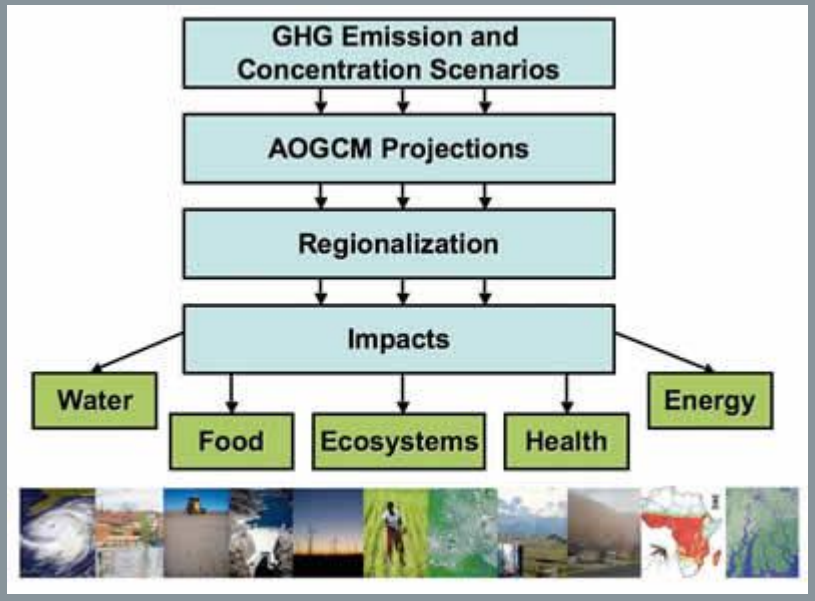
The adaptation process (roughly)

Preparatory step

1. Impact assessment (regionalised models for projections)



Source: WMO



Source: WMO

The adaptation process (roughly)

2. Assess vulnerabilities and indentify priority sectors (with stakeholder involvement)

Vulnerability …describes the adaptive capacity of structures and processes to potential impacts, taking into account their value/importance

- Based on scientific assessment (either study, expert opinion)

The adaptation process (roughly)

3. Develop an adaptation strategy and an adaptation action plan (include mechanisms to enable adaptation on the local level)

> *The adaptation strategy explains goals and motivation (knowledge basis, impacts, vulnerabilities), lists priority sectors, needs for main-streaming and multi-level governance and attributes responsibilities.*

> *The action plan is a selection of measures from several adaptation options that aim at increasing the adaptive capacity. They can be selected according to different methods (cost-benefit analysis, multi-criteria analysis…)*

The adaptation process (roughly)

4. Monitor it, evaluate it regularly and improve

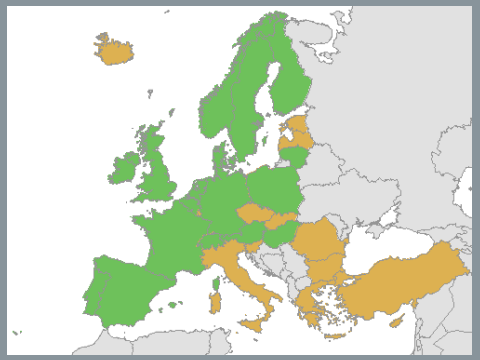
> *The adaptation strategy and the action plan need regular evaluation and revision*
>> *Finland (2012), Germany (until end of 2014)*

Multi-level governance in adaptation

EU Adaptation Strategy (April 2013)

Promoting action by Member States

National adaptation strategies



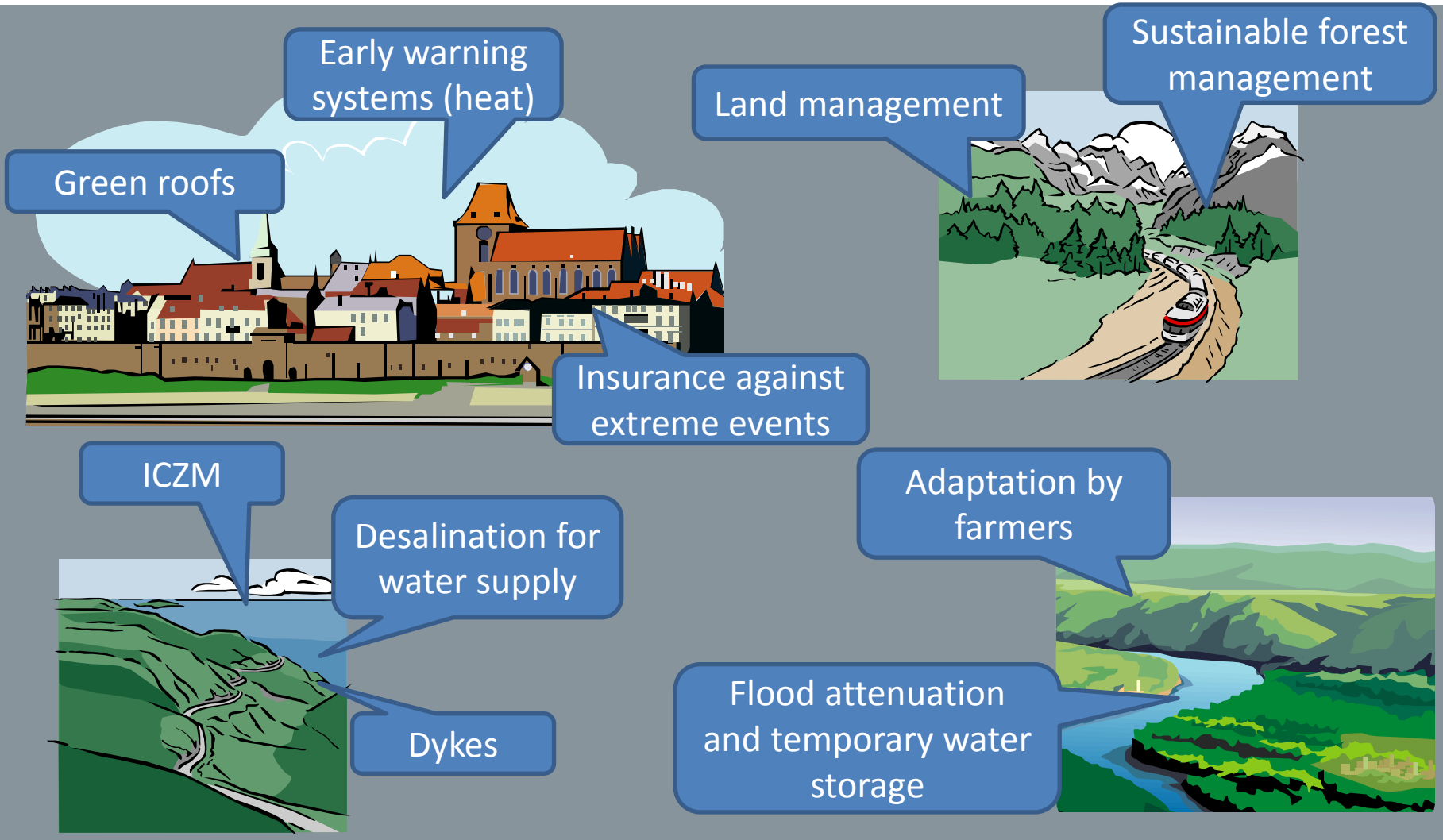
…And action plan

- Needs
- Priorities

- Funding mechanisms & support
- Obligations, responsibilities
- Legal frame, planning system

Regional and local level

Grey, green and soft measures



Case studies 1 – new varities and production systems in the wine sector (Spain)

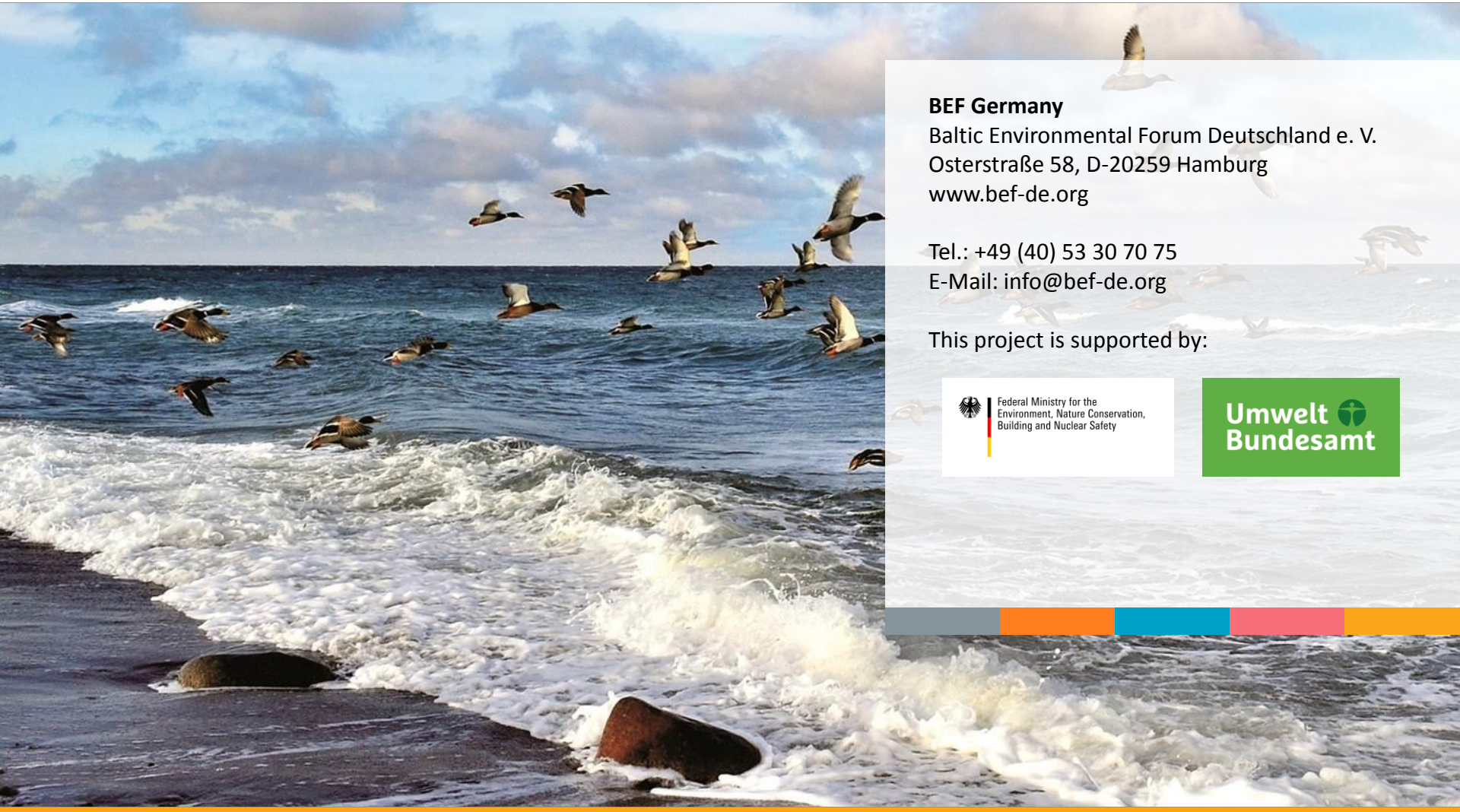
- **Adaptation goal:** adapt the wine sector to new, long-term variability, climate change, and market constraints
- **Adaptation actions:**
  - Assessment of changes in the ripening process of grapes in conditions of climate change
  - Investigation of possible changes in the production process (e.g. desease control)
  - Development of new genetic varieties and/ or the use of existing adapted grape varieties
  - Discussion and possibly adjustment of the systems of protected designation of origins (PDO)
- **Financing:** 27 mio. EUR for a 4-year research project (45% public funds, 55% private sector)

Case studies 2 – regional early warning system (Italy)

- **Adaptation goal:** to monitor and prevent different health-related risks
- **Adaptation action and costs**:
  - Enhancing a monitoring system for insect-born diseases, incl. scientific research and educational activities (ca. 9 m €/ year)
  - Setting up of a warning and prevention system for health risks caused by heat waves in urban areas (ca. 5 m €/ year)
  - Maintaining an early warning system for floods and landslides supporting the Regional Civil protection agency, incl. a daily hydrogeological bulletin on the likelihood of flooding (ca. 6 m €/ year)

Contact

CroAdapt



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Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety

Umwelt Bundesamt

Climate variability and the expected effects of climate change scenario in Croatia

Krešo Pandžić
Meteorological and Hydrological Service Croatia

DHMZ

SUMMARY

1) Global climate monitoring
2) Monitoring the climate in Croatia
3) Global climate scenario
4) Climate scenario for Croatia
5) Impact of climate change and adaptation measures
6) Conclusion

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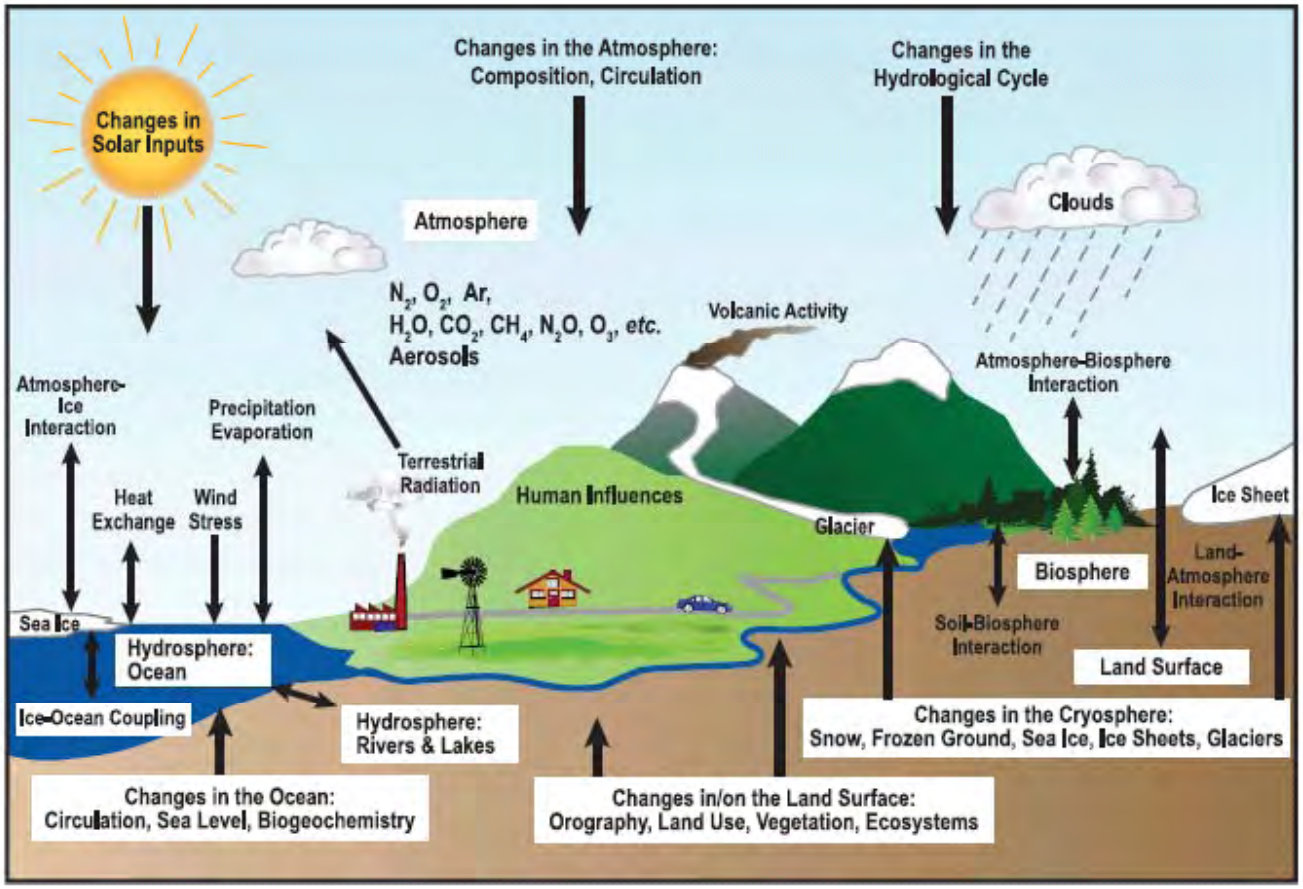
1. Global climate monitoring

Schematic representation of the components of the climate system



FAQ 1.2, Figure 1. *Schematic view of the components of the climate system, their processes and interactions.*

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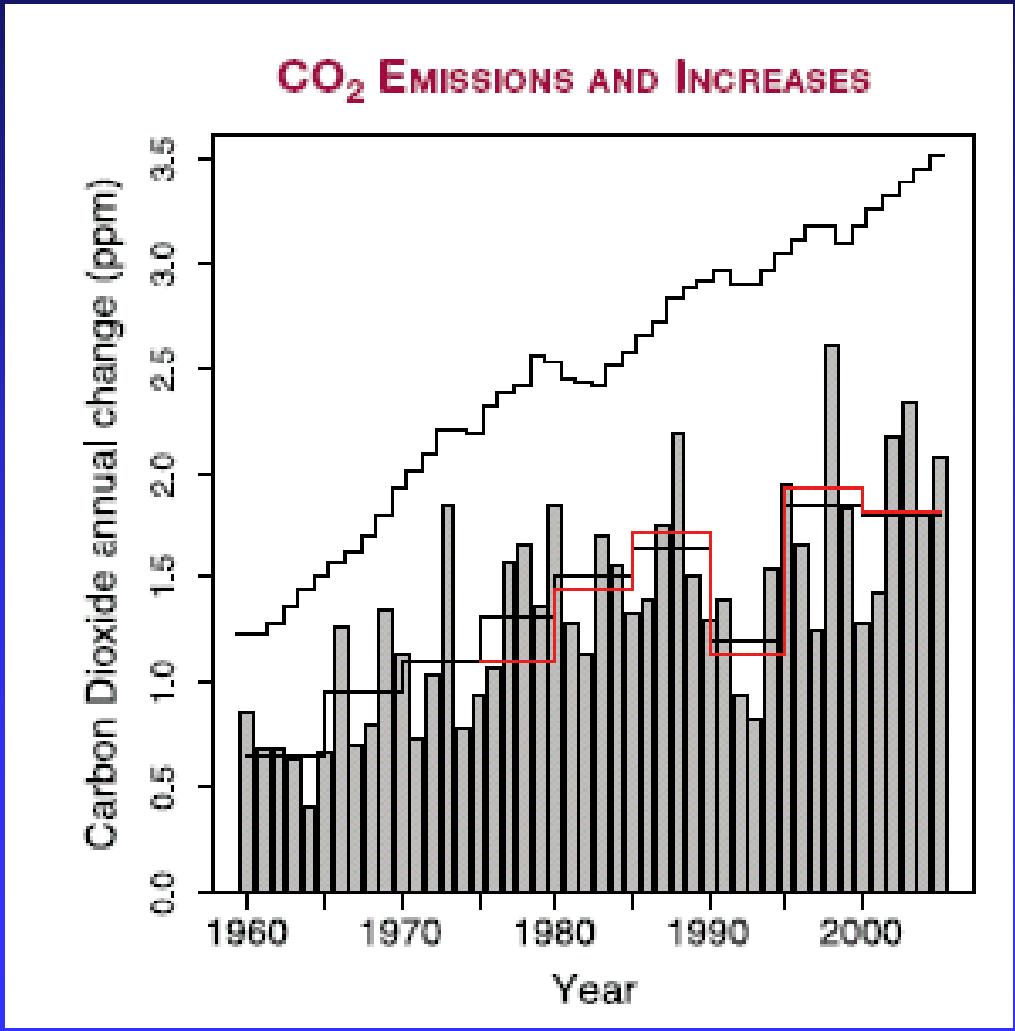
Global registered increase of CO2 concentration in the atmosphere



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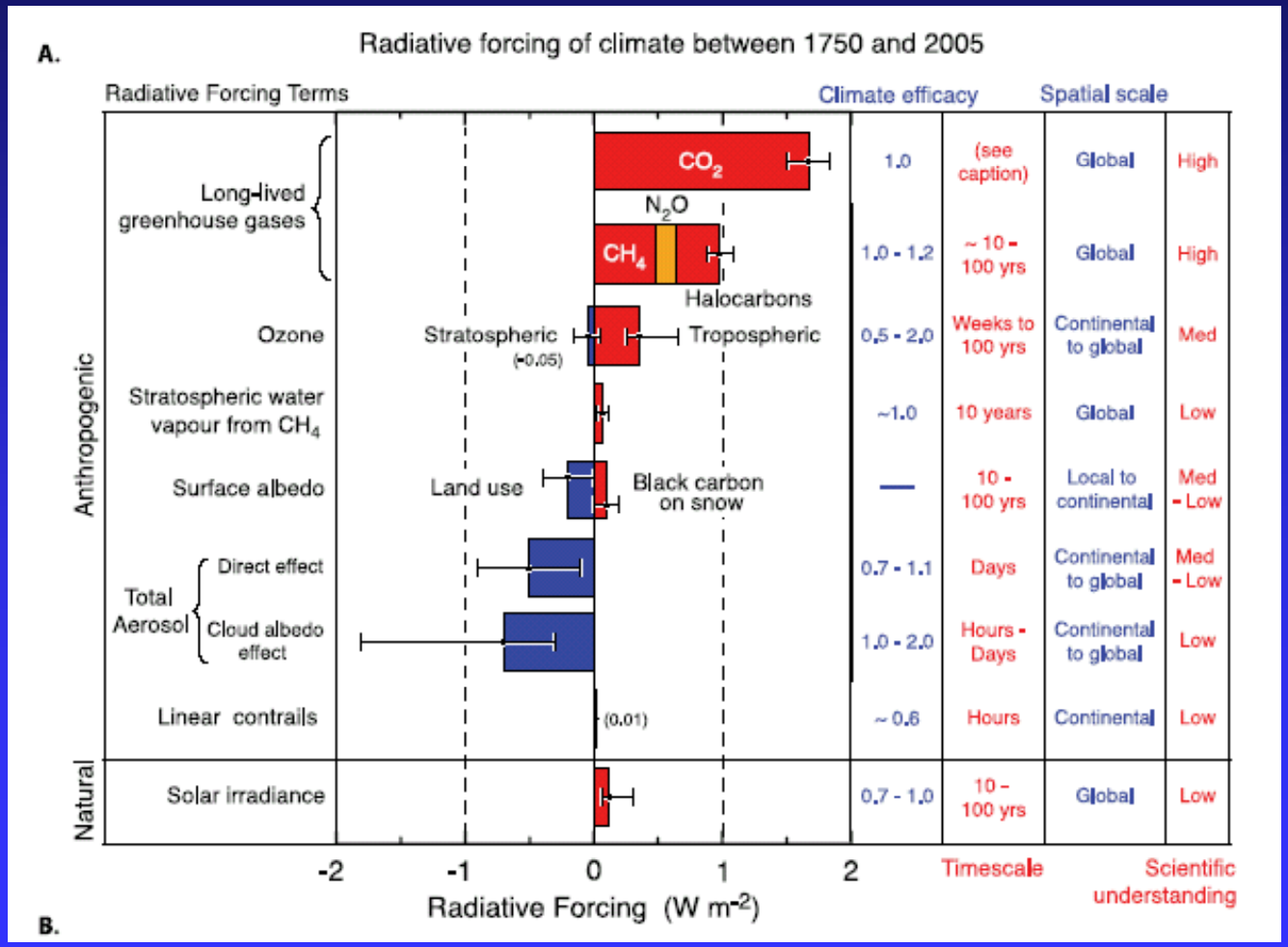
Radiation "forcing" - the contributions of individual greenhouse gases and aerosols



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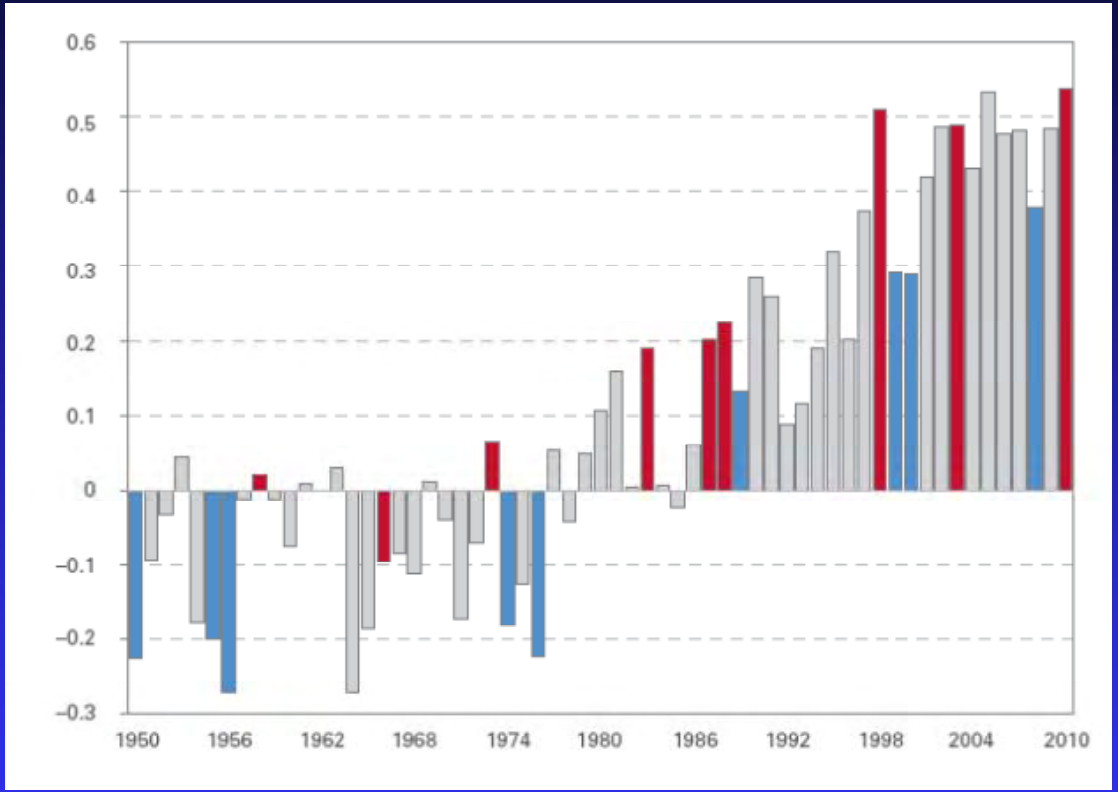

Anomalies of mean annual temperature

Global surface temperature anomalies (°C) for the period 1950-2010 compared to the standard period 1961-1990, incl. labeling the years with occurences of La Nina (blue) and El Nino (red) (WMO, 2013)

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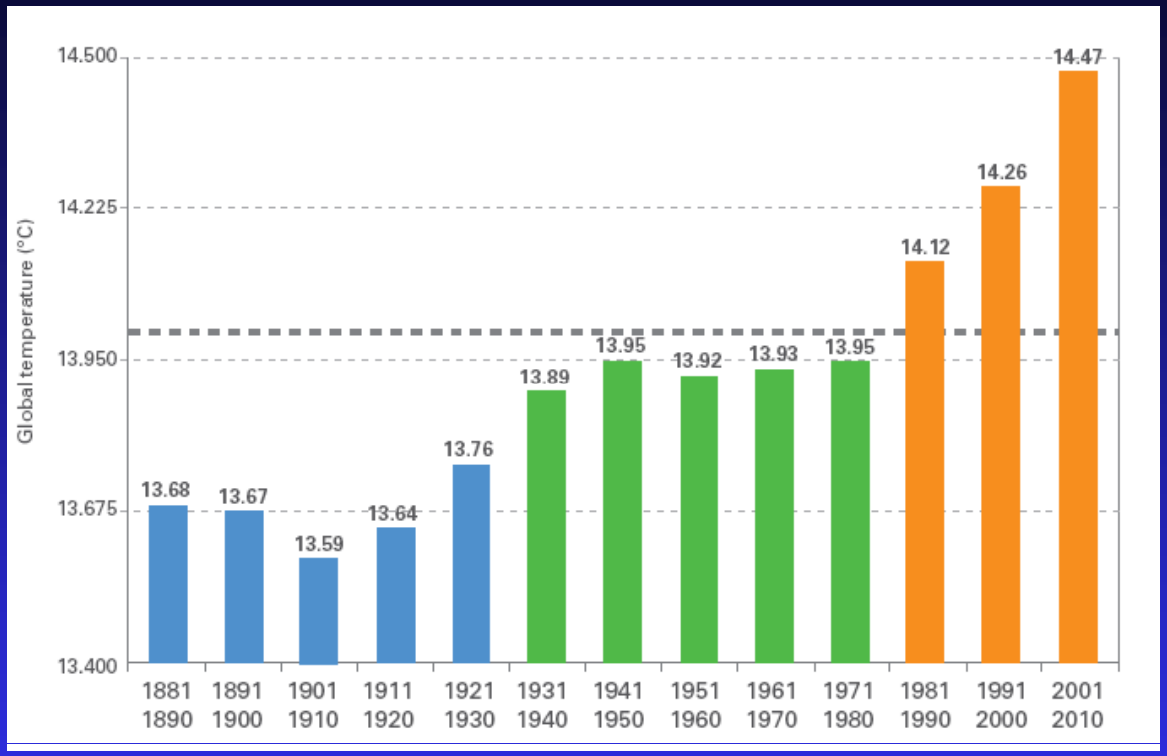

2001-2010 is the warmest decade since 1881

Global combined surface air temperature over land and sea surface temperature (°C). The horizontal gray line indicates the value of long-term averages for the period 1961-1990 (14°C) (WMO, 2013)

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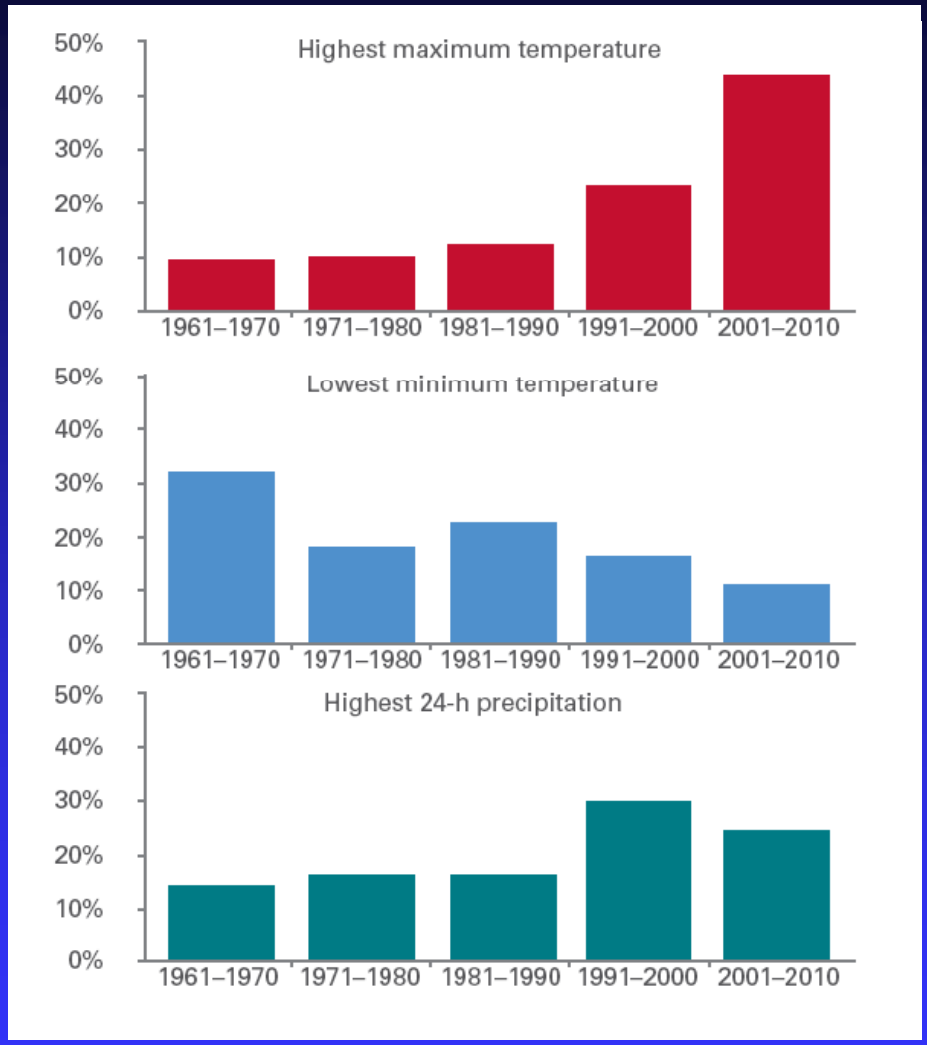

Extreme maximum and minimum air temperatures and 24-hour precipitation in the last five decades (WMO, 2013)

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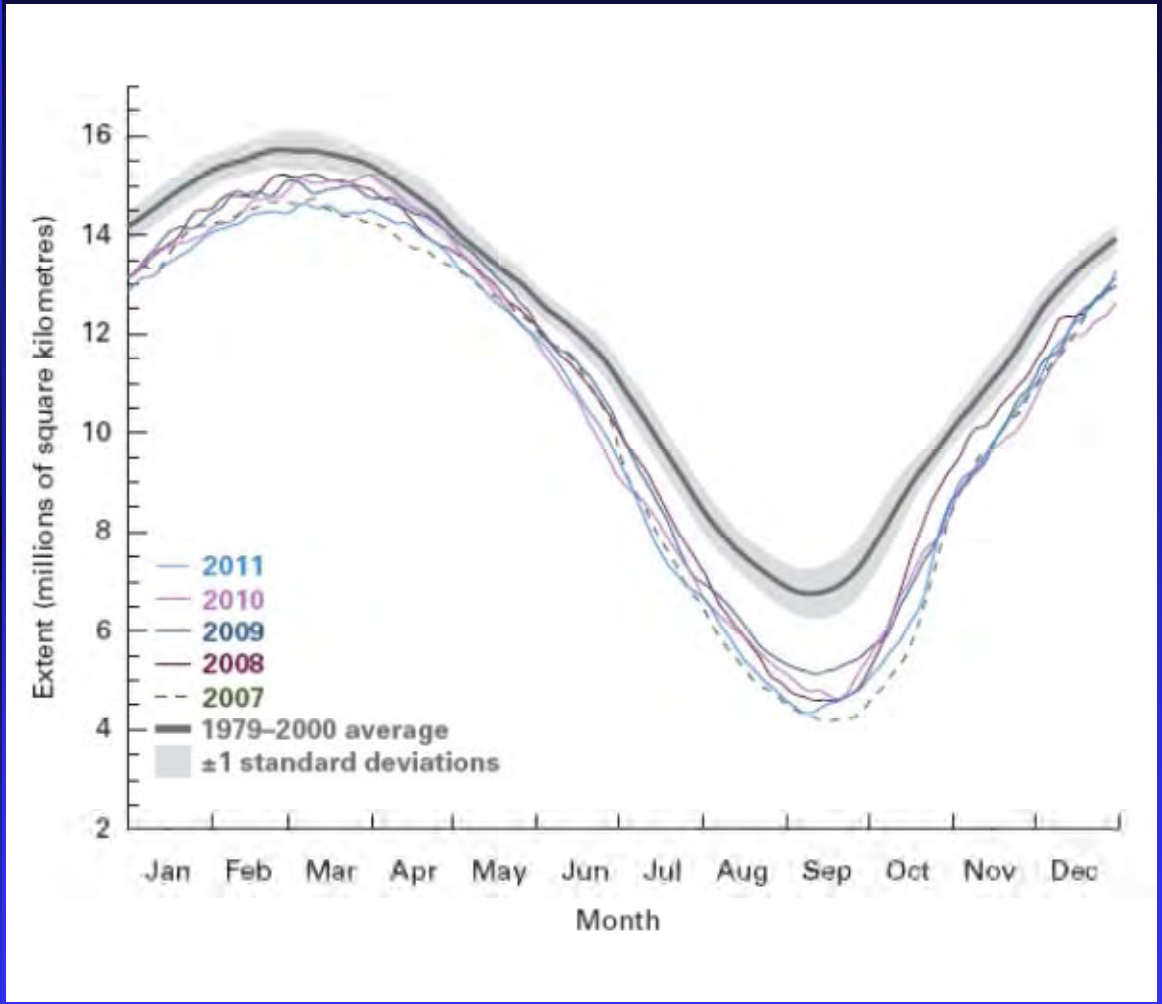

Icy sea covering the northern hemisphere in 2011 compared to previous years, and the average from 1979-2000

(WMO, 2012)

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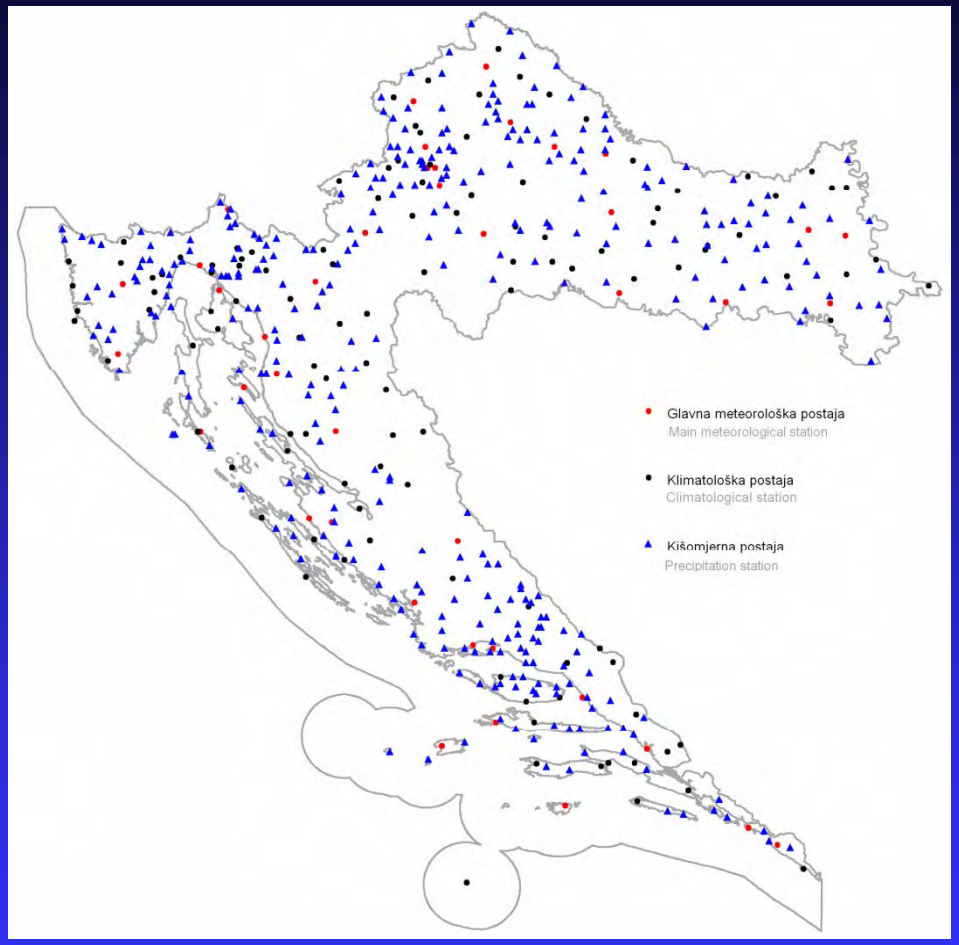
2. Climate monitoring in Croatia



- Distribution of meteorological stations in Croatia; observation period begins in 1851 (Dubrovnik);
- Zagreb Grič longest uninterrupted observation - since 1862

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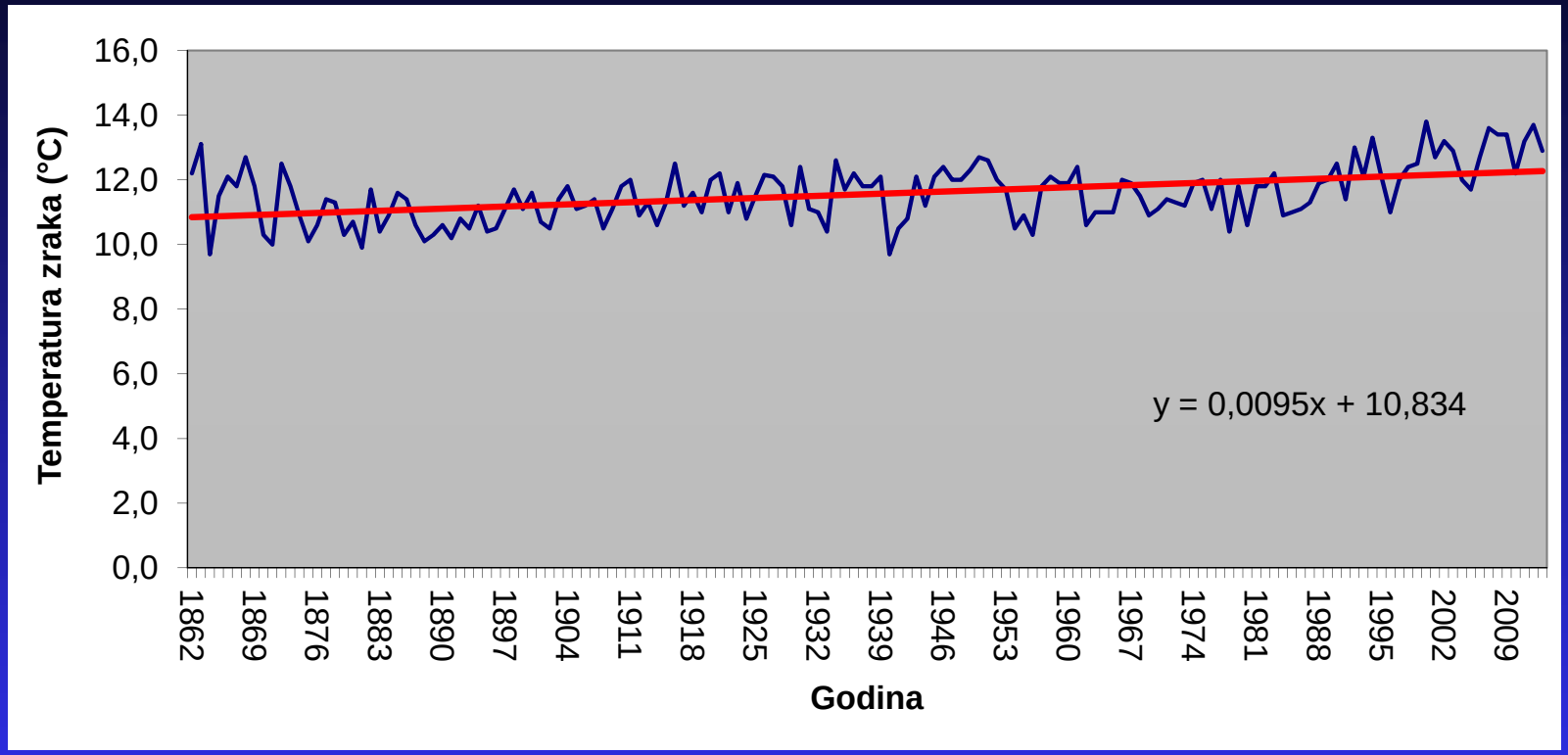

- Mean annual air temperature for Zagreb Grič for the period 1862-2013, a pronounced positive trend

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Mean decadal spatial temperature for Croatia in the period 1901-2010 (11 stations)

DECADE	Mean temperature (°C)	Anomaly against average 1961-1990 (°C)
1901-1910	NA	NA
1911-1920	NA	NA
1921-1930	NA	NA
1931-1940	NA	NA
1941-1950	NA	NA
1951-1960	NA	NA
1961-1970	12,7	0
1971-1980	12,6	-0,1
1981-1990	12,8	0,1
1991-2000	13,3	0,6
2001-2010	13,7	1,0

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Definition of the index of temperature extremes :

Cold temperature extreme indices		
FD	Cold days (absolute threshold)	Number of days with minimal air temperatures <0°C
Tn10%	Cold nights (threshold by percentile)	Number of days with minimal air temperatures lower than threshold, defined as 10th percentile of minimal air temperature for calendar day in the period1961-1990.
Tx10%	Cold days (threshold by percentile)	Number of days with maximum air temperatures lower than threshold, defined as 10th percentile of maximum air temperature for calendar day in the period 1961-1990.
CSDI	Duration of cold periods	Number of days in minimum-6-consecutive-day periods with minimal air temperature under TnN10
Warm temperature extreme indices		
Tn90%	Warm nights (threshold by percentile)	Number of days with air temperature higher than threshold, defined as 90th percentile of minimal air temperature for calendar day in the period1961-1990.
Tx90%	Warm days (threshold by percentile)	Number of days with air temperature higher than threshold, defined as 90th percentile of maximum air temperature for calendar day in the period 1961-1990.
WSDI	Duration of warm periods	Number of days in minimum-6-consecutive-day periods with maximum air temperature over Tn90
SU	Warm days (absolute threshold)	Number of days with maximum air temperatures ≥25°C

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Relative incidence of trends (number of days to 10 years) of warm (SU, Tx90, Tx10, WSDI) and cold (FD, Tx10, Tn10, CSDI) indices of temperature extremes at 41 meteorological stations in Croatia.

Trend	SU	Tx90	Tn90	WSDI	FD	Tx10	Tn10	CSDI
≤-6.0	0.0	0.0	0.0	0.0	2.4	0.0	2.4	0.0
-5.9--4.0	0.0	0.0	0.0	0.0	7.3	7.3	17.1	0.0
-3.9--2.0	0.0	0.0	0.0	0.0	36.6	**63.4**	**39.0**	2.4
-1.9-0.0	0.0	0.0	0.0	0.0	**43.9**	29.3	31.7	**92.7**
0.1-2.0	4.9	0.0	2.4	0.0	7.3	0.0	7.3	4.9
2.1-4.0	29.3	0.0	2.4	29.3	2.4	0.0	2.4	0.0
4.1-6.0	**36.6**	2.4	12.2	**46.3**	0.0	0.0	0.0	0.0
6.1-8.0	29.3	**29.3**	12.2	14.6	0.0	0.0	0.0	0.0
8.1-10.0	0.0	26.8	22.0	9.8	0.0	0.0	0.0	0.0
10.1-12.0	0.0	17.1	**24.4**	0.0	0.0	0.0	0.0	0.0
12.1-14.0	0.0	19.5	14.6	0.0	0.0	0.0	0.0	0.0
14.1-16.0	0.0	4.9	4.9	0.0	0.0	0.0	0.0	0.0
16.1-18.0	0.0	0.0	2.4	0.0	0.0	0.0	0.0	0.0
18.1-20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
>20.0	0.0	0.0	2.4	0.0	0.0	0.0	0.0	0.0

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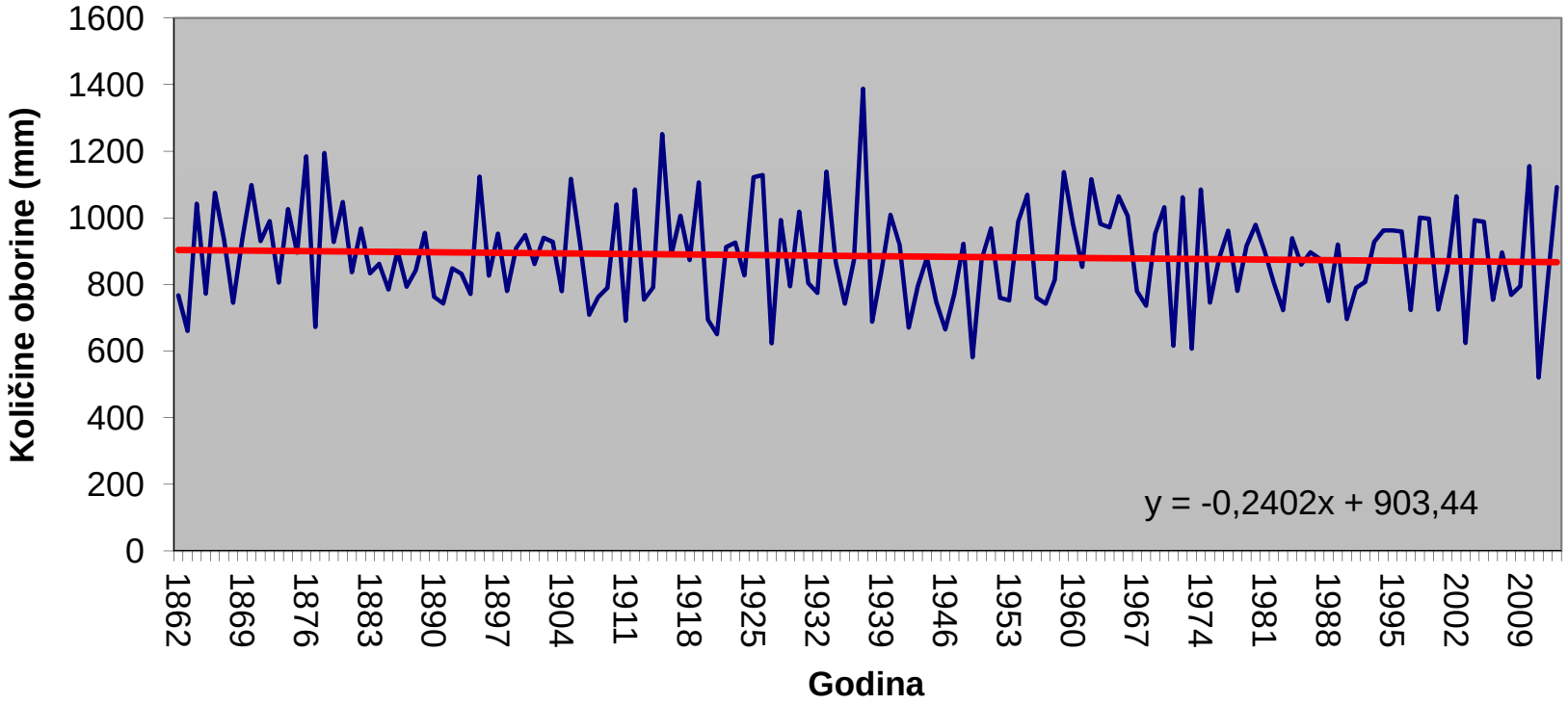
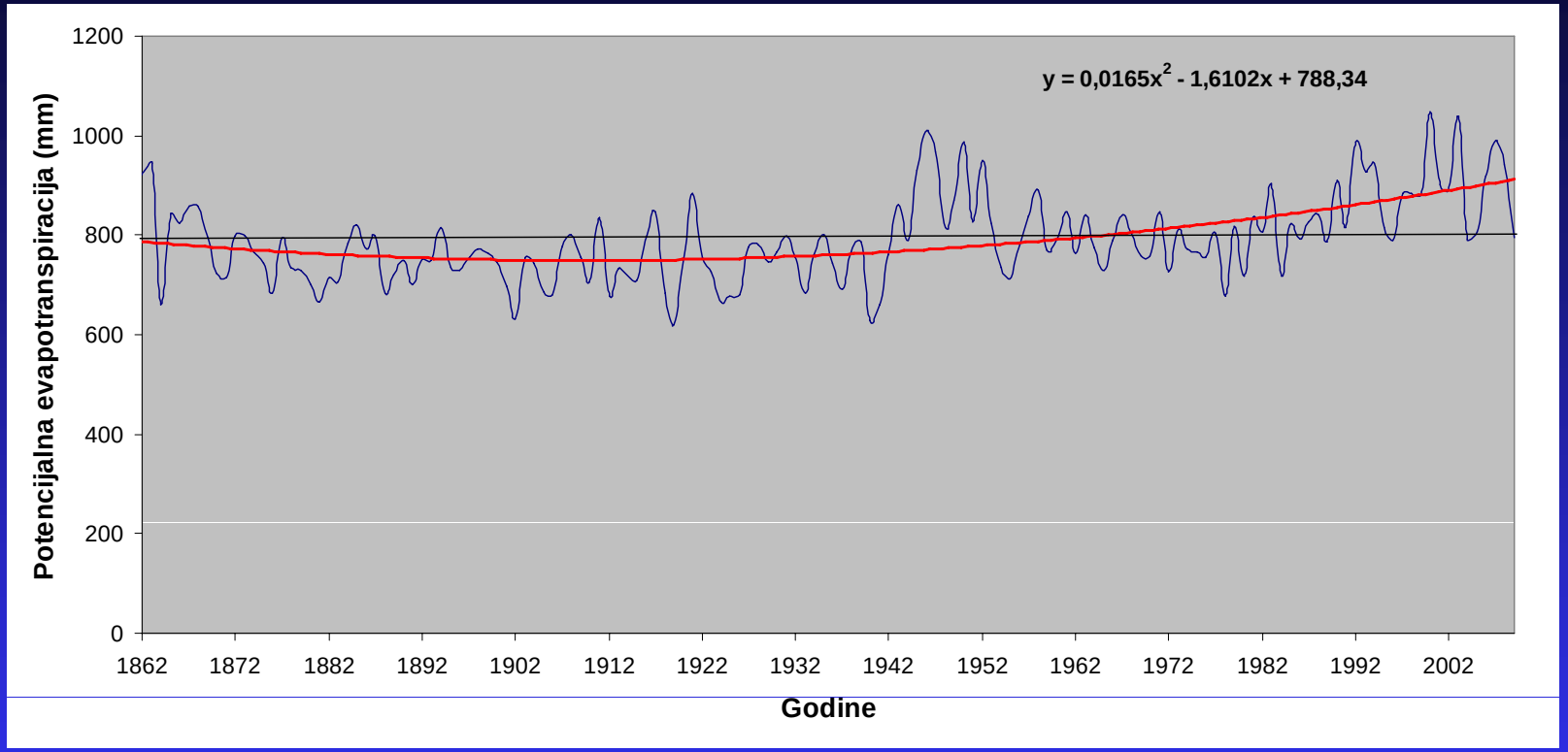


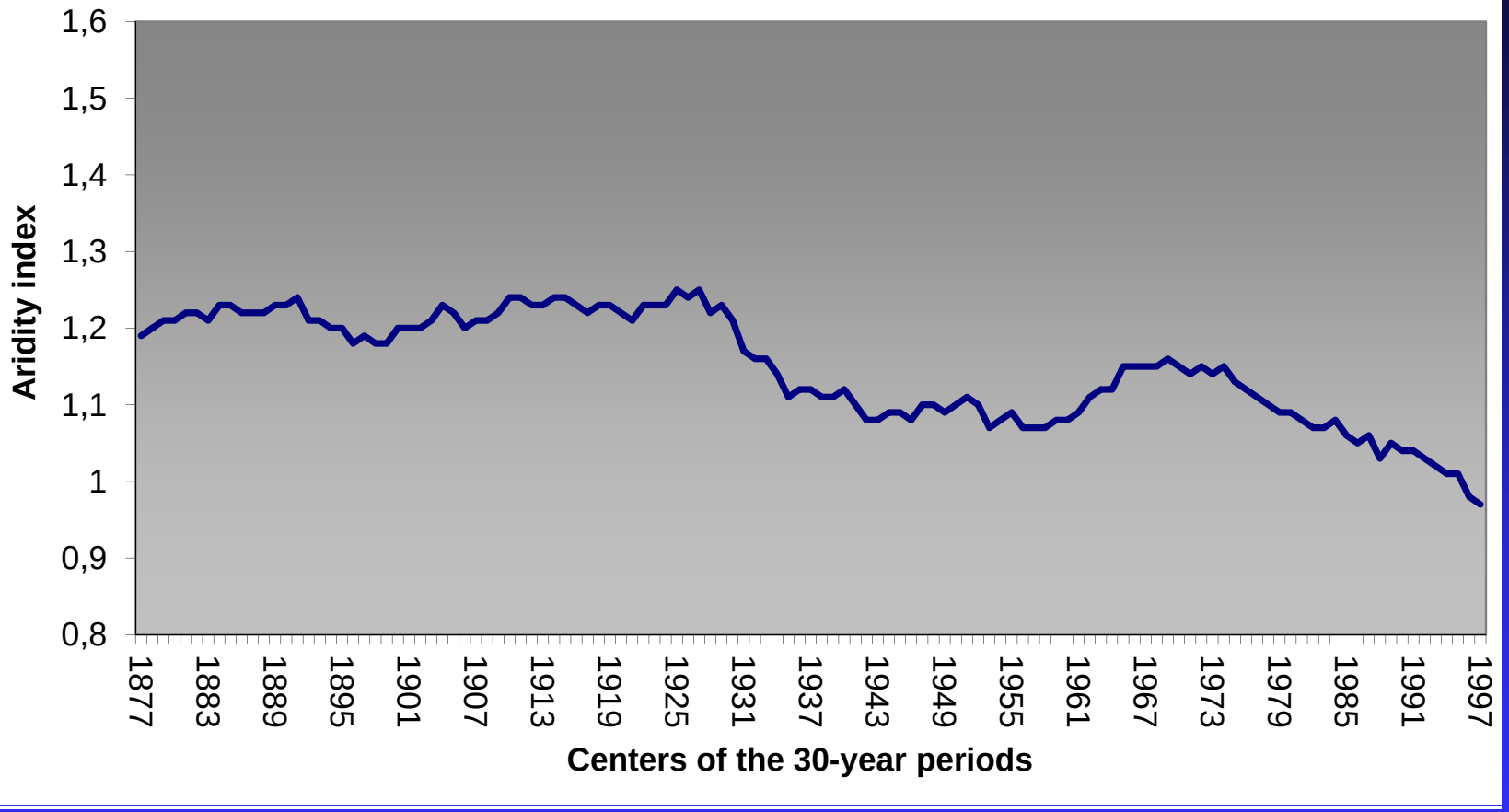
- **Annual precipitation at Zagreb Grič station for the period 1862-2013; slightly negative trend**

DHMZ



- **Annual amount of potential evapotranspiration for Zagreb Grič, period 1862-2008; positive trend depends on the positive air temperature trend**

DHMZ



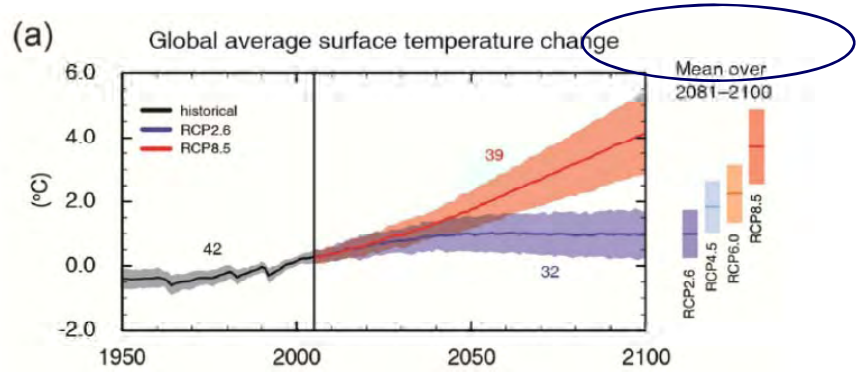
- **Aridity index (AI = P/PET), P as 30-year precipitation and PET as 30-year evapotranspiration; climate in Zagreb becomes drier than in the period 1962-2012**

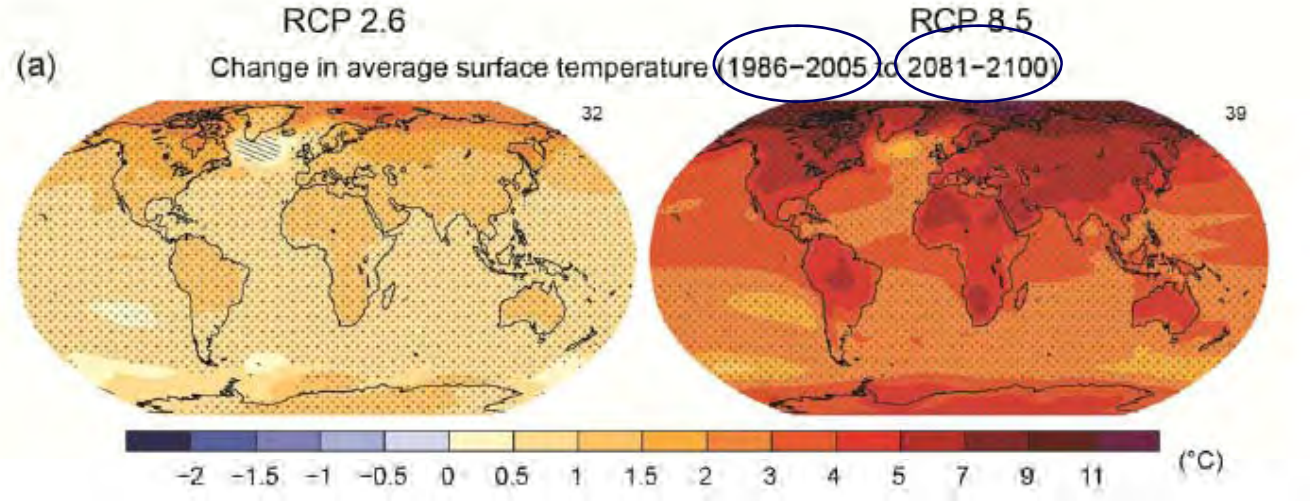
DHMZ

3. Global climate scenario

Fifth IPCC Report - The physical scientific basis

Global projections of air temperature till 2100

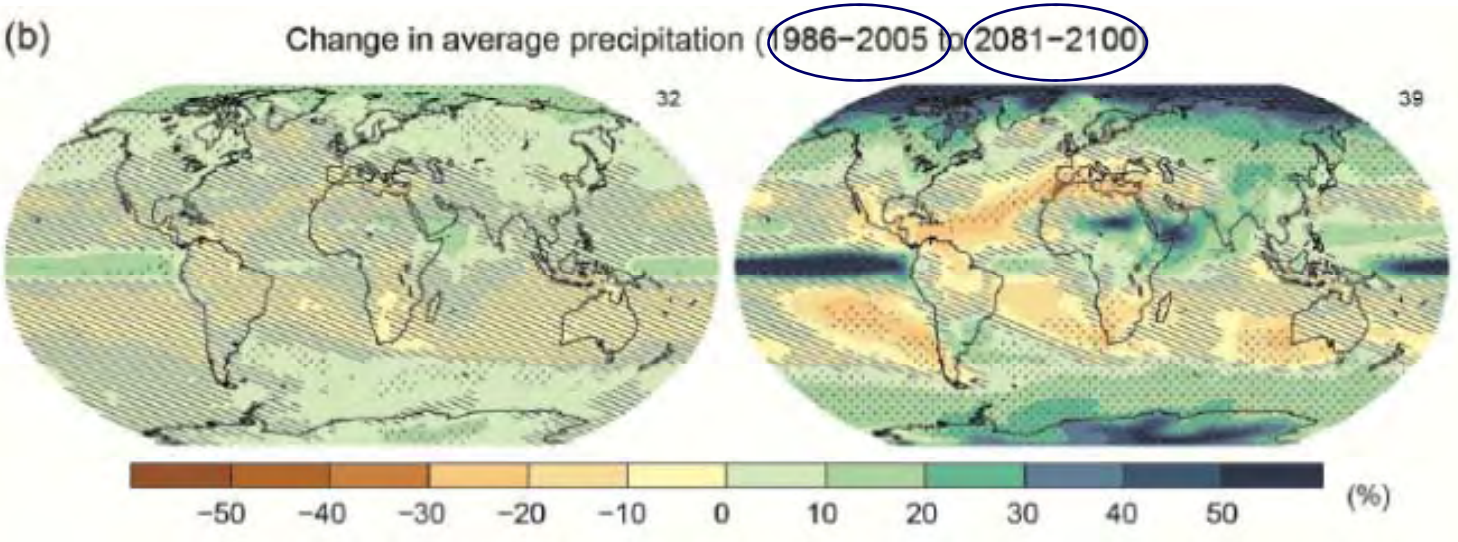




DHMZ

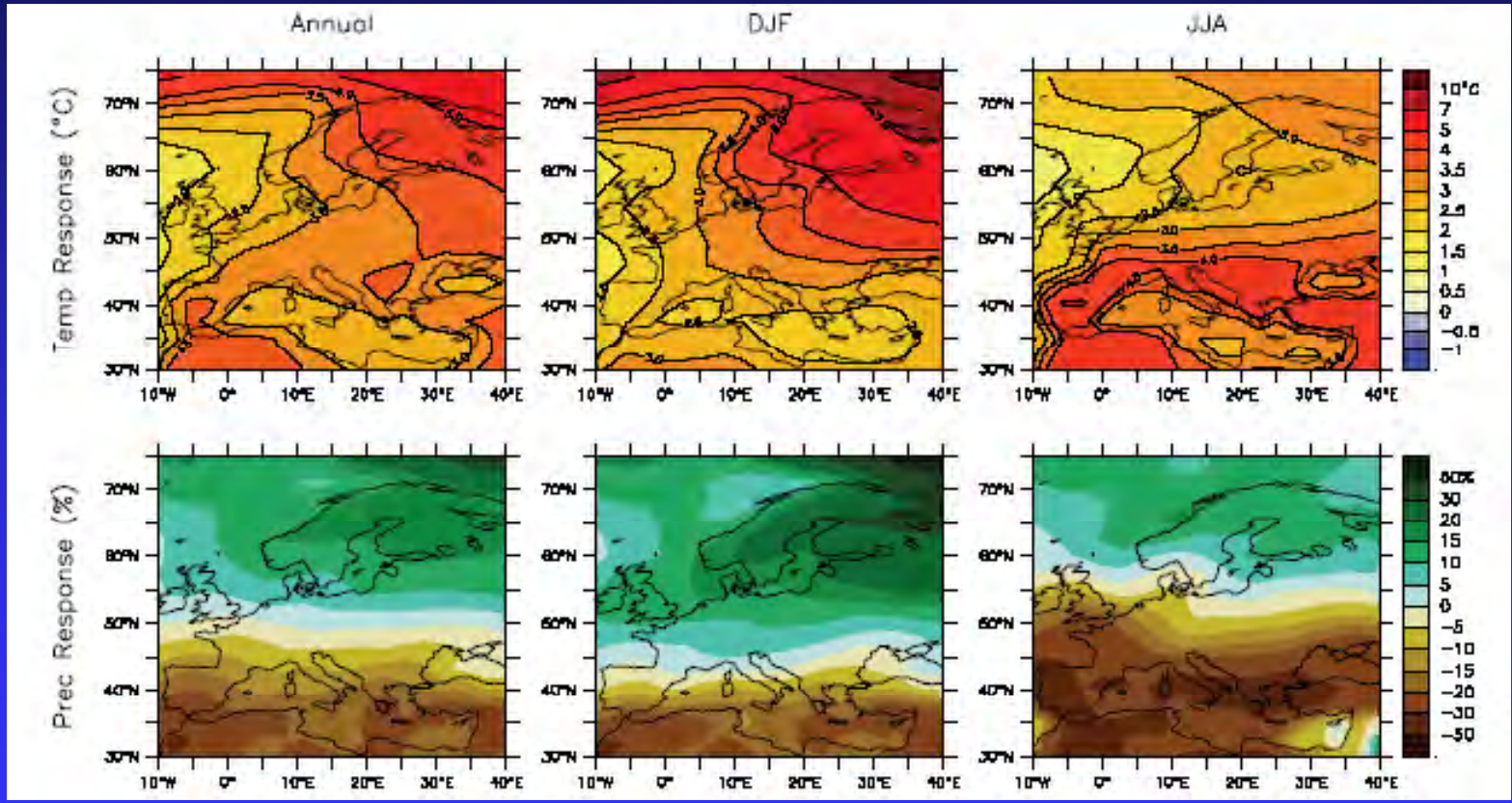
Fifth IPCC Report - The physical scientific basis

The global rainfall scenario till 2100



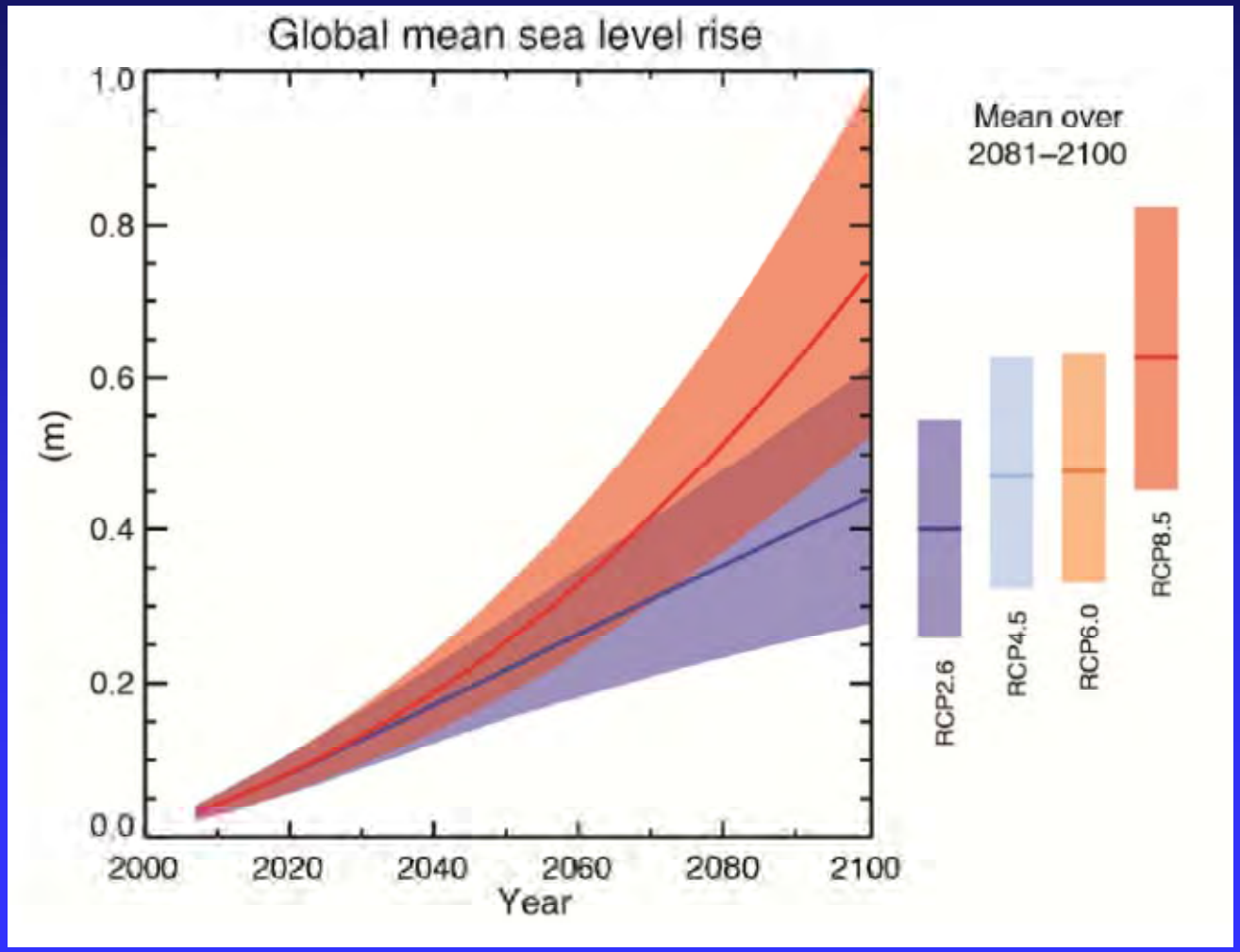
DHMZ

Climate scenario for Europe - 4th IPCC report?



DHMZ

- **Expected sea level rise of about 0.5 m (5th IPCC report)**



DHMZ

4. Climate scenario for Croatia

- ***Regional climate models*** **with relatively high spatial resolution of 10-50 km are used for the analysis of local and regional climate and form the basis for the study of future climate change**

- **Compared with global climate models of usual 100-300 km spatial resolution, regional climate models describe the climate of small spatial scales (as in the case of Croatia), which is largely dependent on local topography, the distribution of land and sea, and distance from the sea (6th National Communication on climate change)**

DHMZ

• The 6th National Communication describes results of the future climate change on the Croatian territory for two basic meteorological parameters: temperature at 2m altitude (T2m) and precipitation

• For each of these parameters results are related to the two sources of data:

a) dynamic adjustment/downscaling, at the resolution of 35 km, of the regional climate model RegCM developed at the Meteorological and Hydrological Service (MHS) according to the IPCC A2 scenario (Nakićenović et al. 2000)

b) dynamic adjustment of various regional climate models from the European project ENSEMBLES (van der Linden and Mitchell 2009, Christensen et al. 2010) according to the IPCC A1B scenario, presenting a combination of 18 models.

DHMZ

- In the ENSEMBLES simulations the “current" climate (P0) is also defined for the period 1961-1990 in which regional climate models were forced with global climate models and measured GHG concentrations

- For future climate (21st century) simulation results are divided into three periods: 2011-2040 (P1; therefore the same as for MHS RegCM simulation), 2041-2070 (P2), and 2071-2099 (Q3)

- Climate Change in the three subsequent periods is calculated as the difference between mean 30-year values P1-P0, P2-P0 and P3-P0

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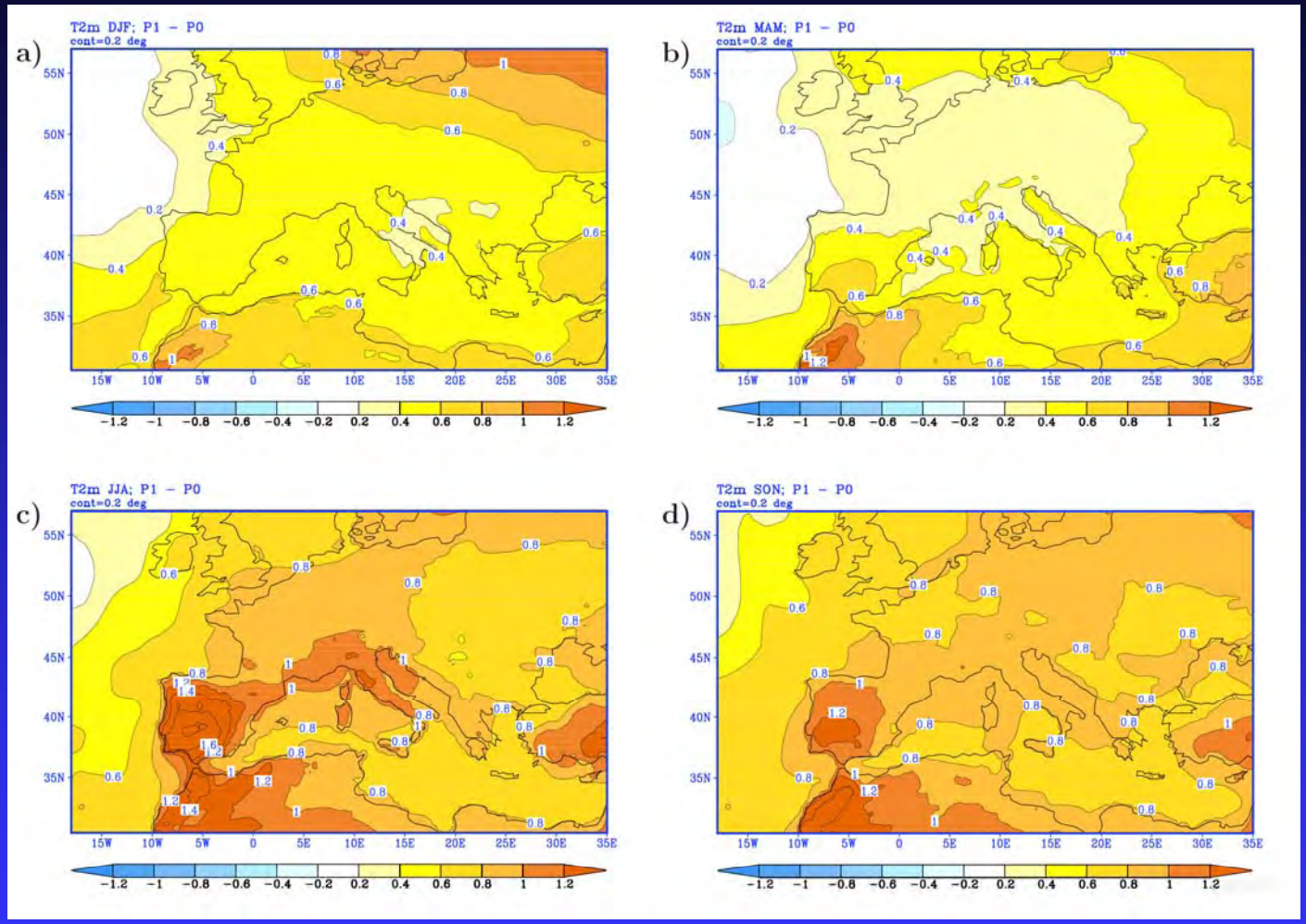
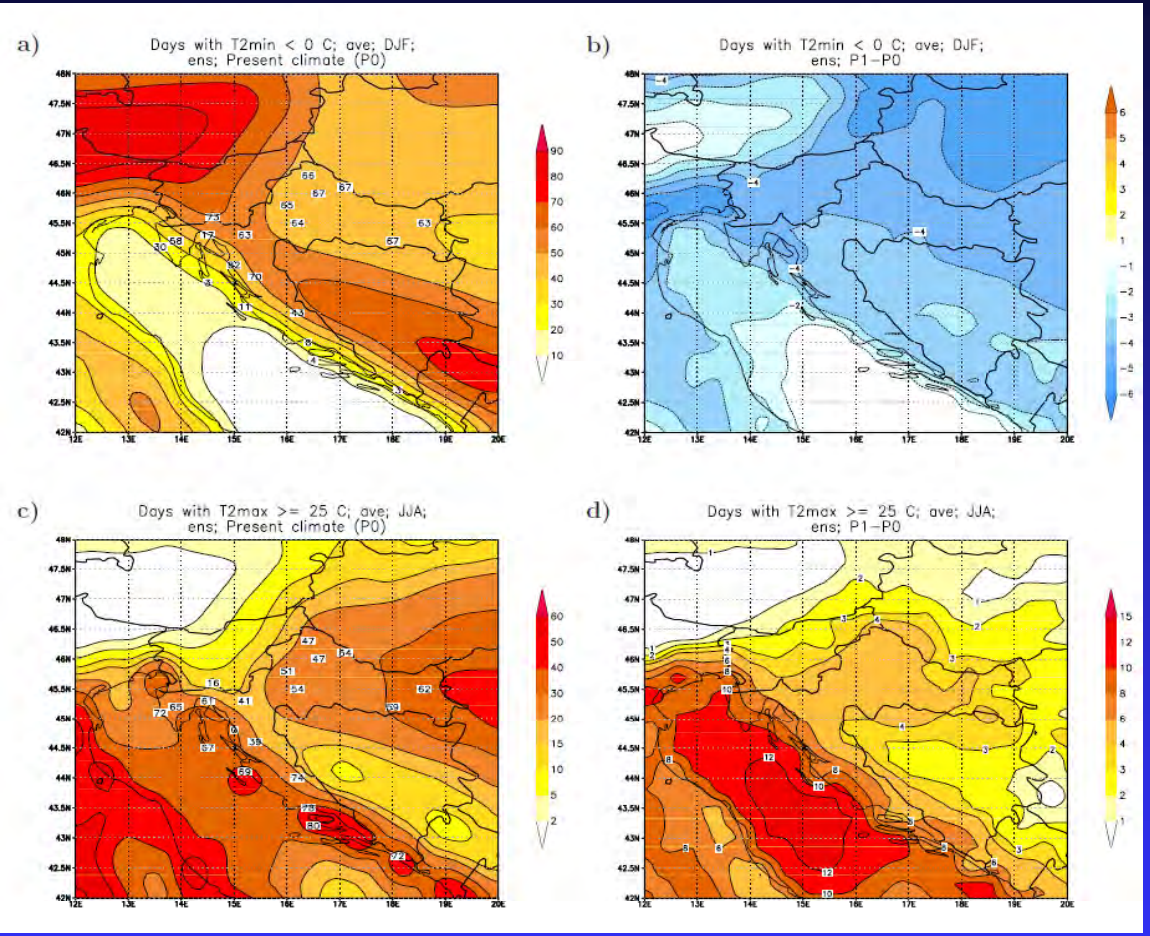


• **Example of distribution of air temperature anomalies for the first climatic period: a) winter, b) spring, c) summer d) autumn**

DHMZ



- **a) current number of cold days, b) cold days - future climate, c) current warm days, d) warm days - future climate**

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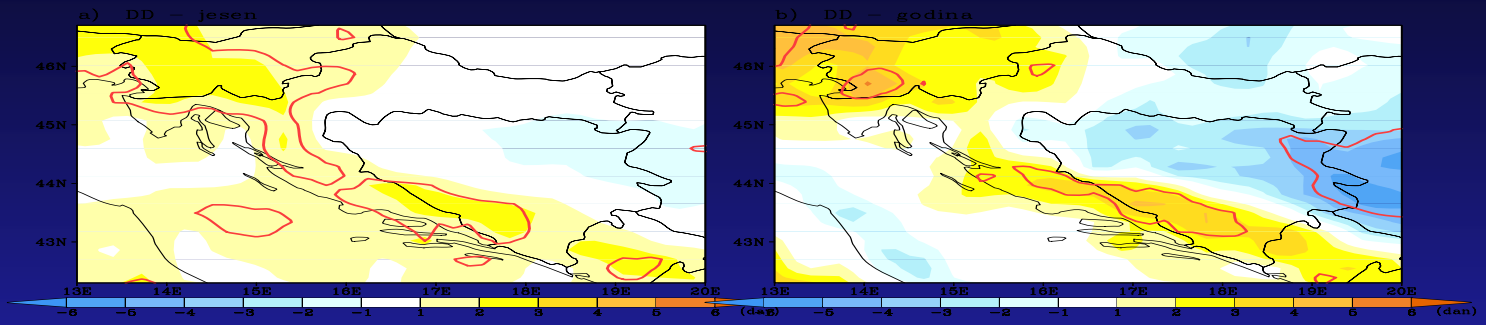

• **Change in the number of dry days (DD) in the near future (2011-2040) compared to the reference period (1961-1990) in autumn (a) and at annual level (b). Statistically significant changes with 95%-reliability are marked as red curve.**

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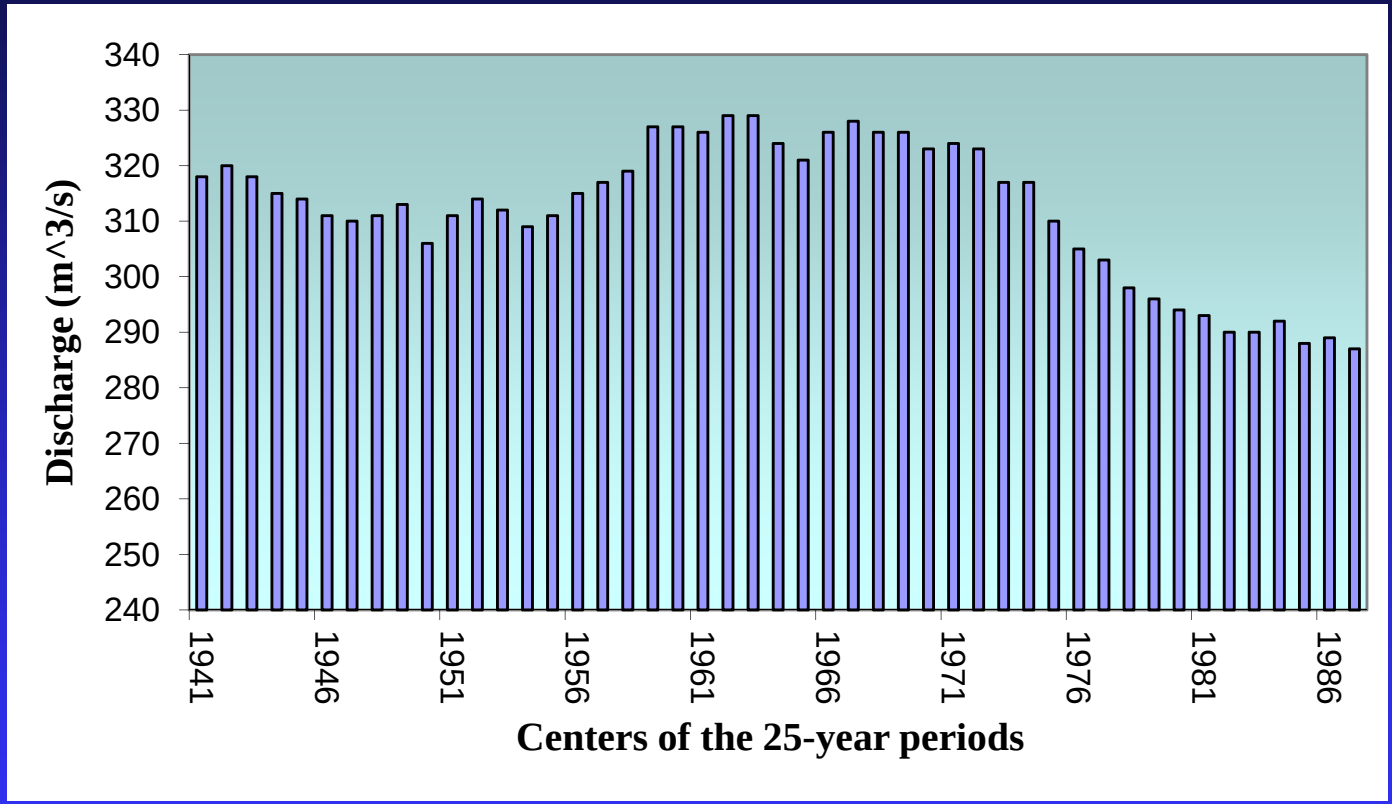
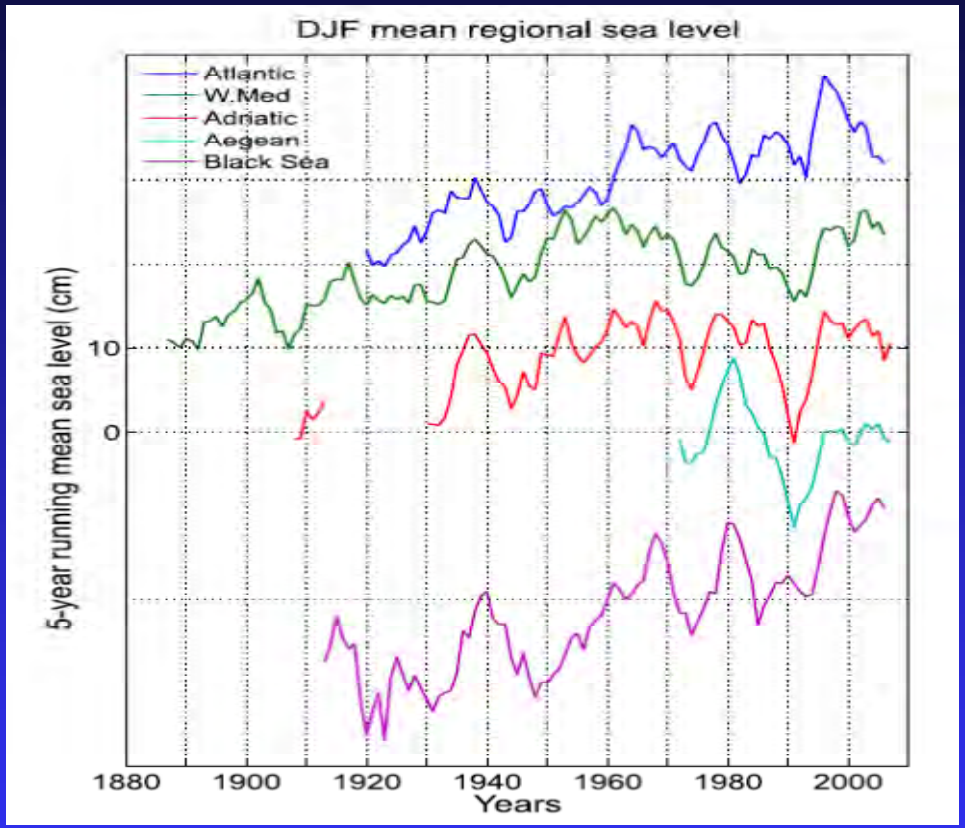
5. Impact of climate change and adaptation measures



25-year moving averages of the Sava River flow in Zagreb for the period 1931-2000

DHMZ



5-year moving averages of mean sea level values in winter (DJF) for 5 areas (Orlić and Pasarić, 2010)

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According to estimates, the expected rise of mean sea level on the Adriatic Sea by 2100 is uncertain – ranging btw. 9 - 88 cm

Flooded valley of the Neretva River valley after sea-level rise
0.50 m (light gray)
0.88 m (dark gray).

Good news is that mean sea level rise will probably happen gradually – which allows securing the necessary time to adapt (A Climate for Change - UNDP Croatia)

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Tourism

According to climate change scenario, Adriatic tourist destinations lose attractiveness in the current tourist season "peak“, due to high temperatures

Many destinations that in the period 1961-1990 were rated as ‘very good’ and ‘excellent’

in the period 2071–2100 will become ‘acceptable’ or ‘undesirable’

In contrast, it is likely that conditions for spring and autumn tourism will improve.

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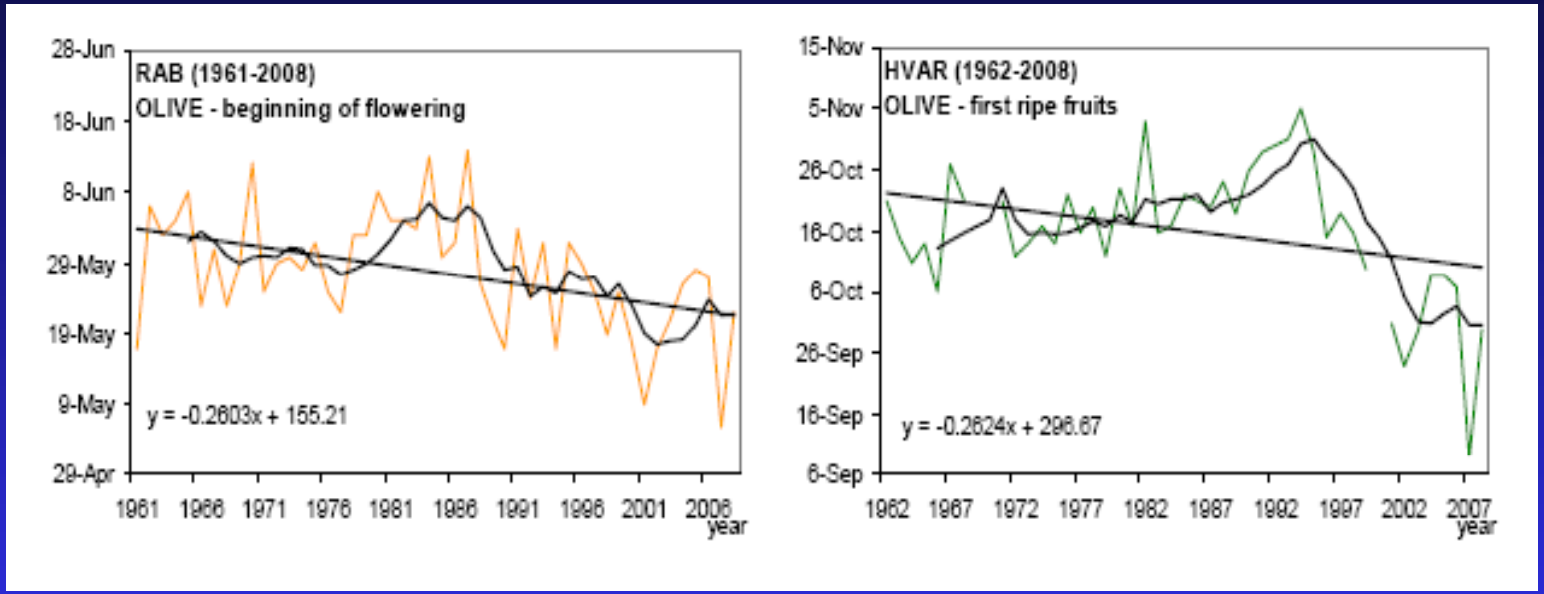

Time series of pheno phase of an olive tree, 5-year moving averages for islands of Rab and Hvar for the period 1961–2008 (MENP; 2010)

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- increasing rainfall intensity in short periods (more torrential floods), more frequent drought periods and heat waves

- mapping of hazards and risks

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Risk matrix:

horizontal – impact;
vertical- likelihood of occurence

	Negligible	Marginal	Critical	Catastrophic
Certainly	High	High	Extreme	Extreme
Probably	Moderate	High	High	Extreme
Possible	Low	Moderate	High	Extreme
Unlikely	Low	Low	Moderate	Extreme
Rarely	Low	Low	Moderate	High

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a) Analogy to GEF program proposed for Adriatic coastal zone management

- **identify past and current weather conditions in the Croatian territory**

- **determine the impact of climate oscillations and changes on various components of the climate system and on the socio-economic activity (sectors): lithosphere, hydrosphere, atmosphere, ecosystems, energy and industry, tourism, transport and services, population and distribution of settlements**

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- **Use global climate modelling scenarios and fine resolution regional data models (e.g. 10km x 10km) including empirical adaptation to local conditions (downscaling)**

- **determine the impact of current and future climate change on the components of the climate system and sectors of human activity, i.e. evaluate the risks, including the risk matrix and mapping of current and future climate until the end of 21st century**

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b) Available capacities

There might be enough available capacity in Croatia for the evaluation of existing climate conditions and interpretation of global climate scenarios at the local level (*downscaling)*, for example at the Meteorological and Hydrological Service.
To assess the impact of climate variability and change on the components of climate system and sectors of human activity, i.e. preparing assessment and mapping of natural disasters and risks, there is a need to strengthen the capacity and involvement of other stakeholders.

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c) Interested parties (institutions)

- **Ministry of Environmental and Nature Protection (MENP)**
- **Meteorological and Hydrological Service (DHMZ), Zagreb**
- **Croatian Environment Agency, Zagreb**
- **Ministry of Agriculture, Zagreb**
- **Ministry of Tourism, Zagreb**
- **Institute of Oceanography and Fisheries, Split**
- **Croatian Hydrographic Institute, Split**
- **Center for Marine Research, Rovinj**
- **Academy of Arts and Sciences, Zagreb**
- **Regional Environmental Centre for Central and Eastern Europe - Croatia Country Office (REC)**

6. Conclusion

- In Croatia, a respectable amount of literature in the form of reports is already available (6 national communications - MENP), books (Climatic Atlas of Croatia – DHMZ); Climate for Change - UNDP Croatia), as well as scientific and technical papers

- There are experiences in climate monitoring and downscaling (DHMZ) and on environmental impacts of climate oscillations and changes (water resources, sea level rise, impact on biosphere - phenology)

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- **Implementation of a number of pilot projects related to climatic oscillations and changes, as well as to impacts on the components of the climate system and sectors of human activity (GEF; IPA, UNEP, UNDP, REC)**
- **It is necessary to strengthen the capacity to assess vulnerability and risk from climate oscillations and changes**

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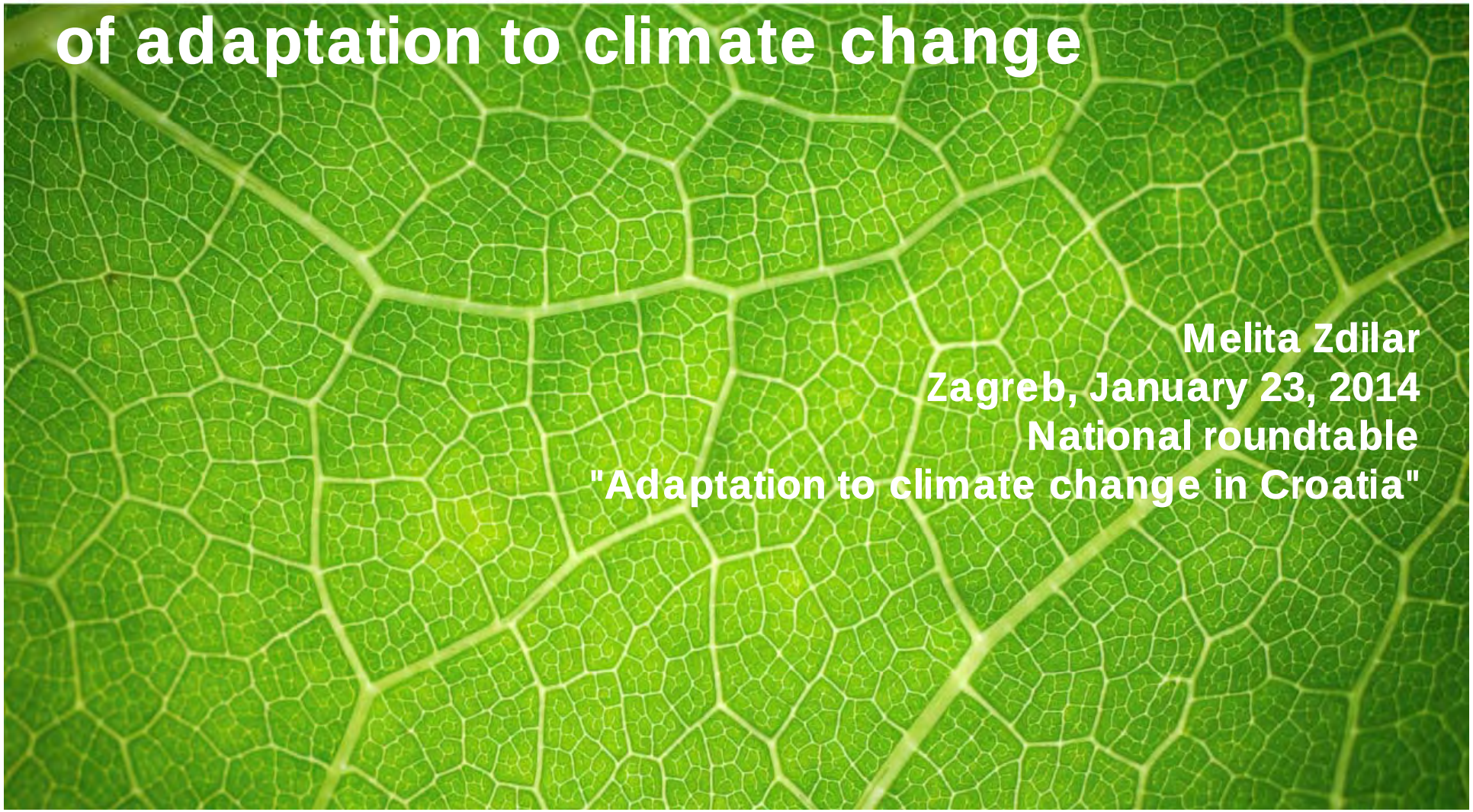
THANK YOU

DHMZ

REPUBLIKA HRVATSKA

MINISTARSTVO ZAŠTITE
OKOLIŠA I PRIRODE

Croatian national policy of adaptation to climate change



Melita Zdilar

Zagreb, January 23, 2014

National roundtable

"Adaptation to climate change in Croatia"

SUMMARY

- Intro
- UNFCCC and the Kyoto Protocol
- The legal framework
- EU strategy on climate change adaptation
- Adaptation to climate change in Croatia
- Conclusion

INTRO

- Human impact or impact of GHG on global warming becomes more evident;
- Extreme weather conditions are also more evident ;
- Daily media reporta on hardships faced by humans, economy and nature due to various adverse weather conditions;
- UNFCCC and the Kyoto Protocol have launched awareness of climate change;
- To achieve the goal - limit the global temperature increase to 2°C – global changes will be necessary, therefore it is encouraging that countries that did not have any commitments now also gradually include in climate protection programs;

United Nations Framework Convention on Climate Change (UNFCCC) - fundamental objectives:

- Stabilise GHG concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system;
- Such a level should be achieved within a time frame sufficient to allow ecosystems to natural adaptation to climate change, to ensure that food production is not threatened and to enable sustainable economic development;
- The Parties should protect the climate system for the benefit of present and future generations on the basis of equity and in accordance with their common but differentiated responsibilities and capabilities.

United Nations Framework Convention on Climate Change (UNFCCC)

- Accepted in the Rio Summit in 1992;
- 195 countries ratified;
- Republic of Croatia joined in 1996.

Law on Ratification of the United Nations Framework Convention on Climate Change
(Official gazette-International Agreements #02/96)

- To achieve the goal of limiting temperature rise to 2°C, emissions need to start reducing already by 2020, and a new agreement must contribute to reducing emissions to levels from 1990 until the year 2030, which would be equivalent to a global reduction of emissions of 25% compared to 2010;

- It is necessary to include sectors that have not been adequately or at all involved - such as forestry, agriculture, aviation, shipping, and additional GHG.

THE KYOTO PROTOCOL

- Signed in Kyoto in 1997, effective since February 16, 2005;
- 192 countries ratified;
- It commits the Annex I parties to average emissions reduction of 5% compared to the baseline year 1990 in the period from 2008 to 2012;
- States implement domestic measures to reduce GHG emissions; measures are complemented by the application of flexible mechanisms: CDM (Clean Development Mechanism), JI (Joint Implementation) and ETS (emission trading system).

THE KYOTO PROTOCOL

- Croatian Parliament ratified the Kyoto Protocol on April 27, 2007;
- Croatia party to the Kyoto Protocol from August 28, 2007;
- Croatia operates under Annex B of the Kyoto Protocol - obligation to reduce GHG emissions by at least 5% compared to the year 1990 in the commitment period 2008-2012 (1st commitment period);

Law on Ratification of the Kyoto Protocol with the United Nations Framework Convention on Climate Change

(Official gazette-International Agreements #05/07)

THE KYOTO PROTOCOL

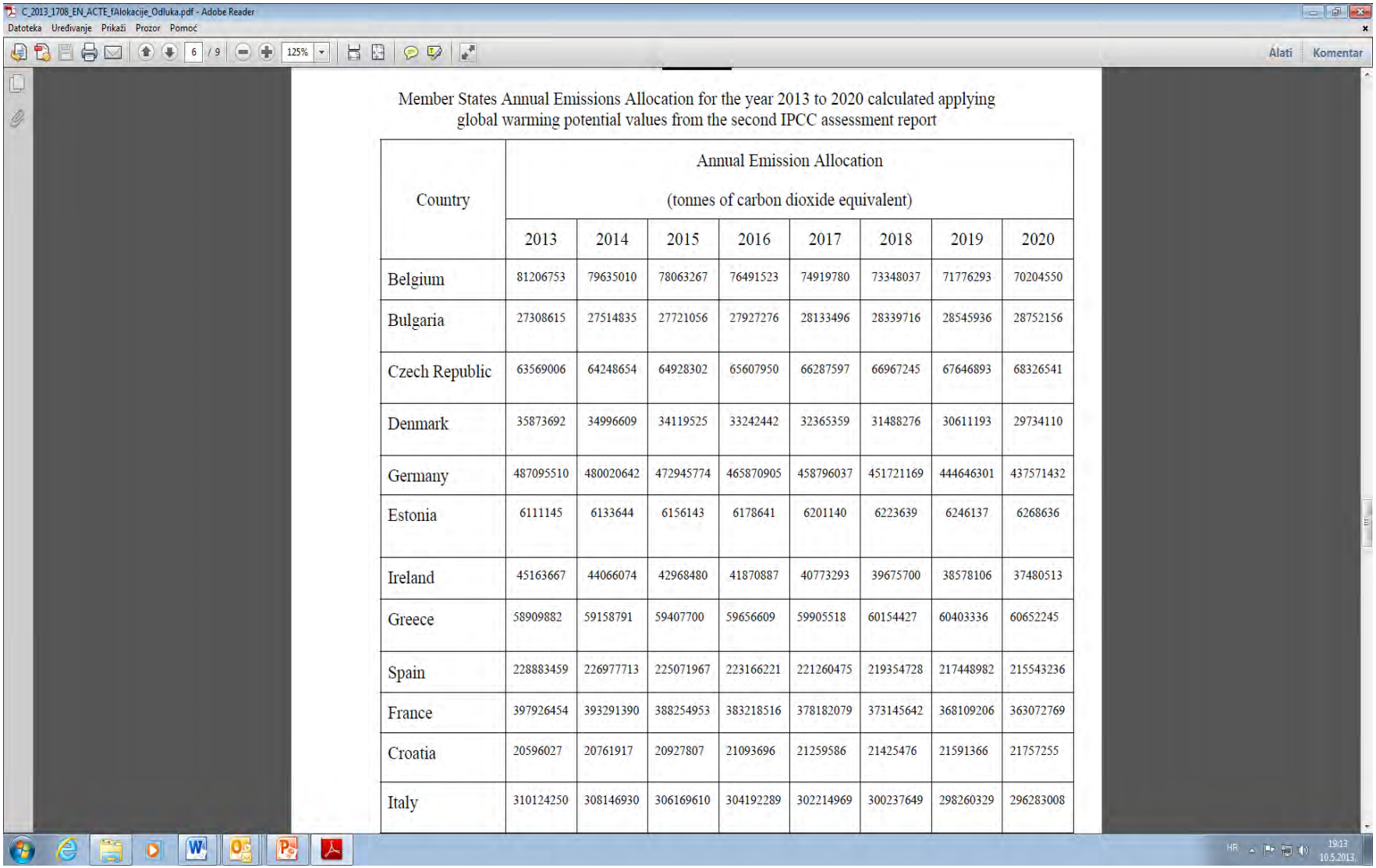
- It is likely that the reduction targets which are covered by the parties of the 2nd Kyoto commitment period (2013-2020), and indicated at voluntary basis as part of the Copenhagen Agreement (not adopted and therefore not legally binding), will not be sufficient to keep the temperature increase at 2°C
- In Doha in 2012, parties adopted a timetable by which the adoption of a global agreement on climate change must be achieved by 2015.

CROATIAN GOAL

- Croatia - absolute goal established in accordance with Croatian obligations as EU member;

- For each year in the period 2013-2020, the amount of GHG emitted from sectors not covered by the emission trading scheme is limited to the amount of annual national quota set by EU regulation: +11% by 2020 compared to 2005.

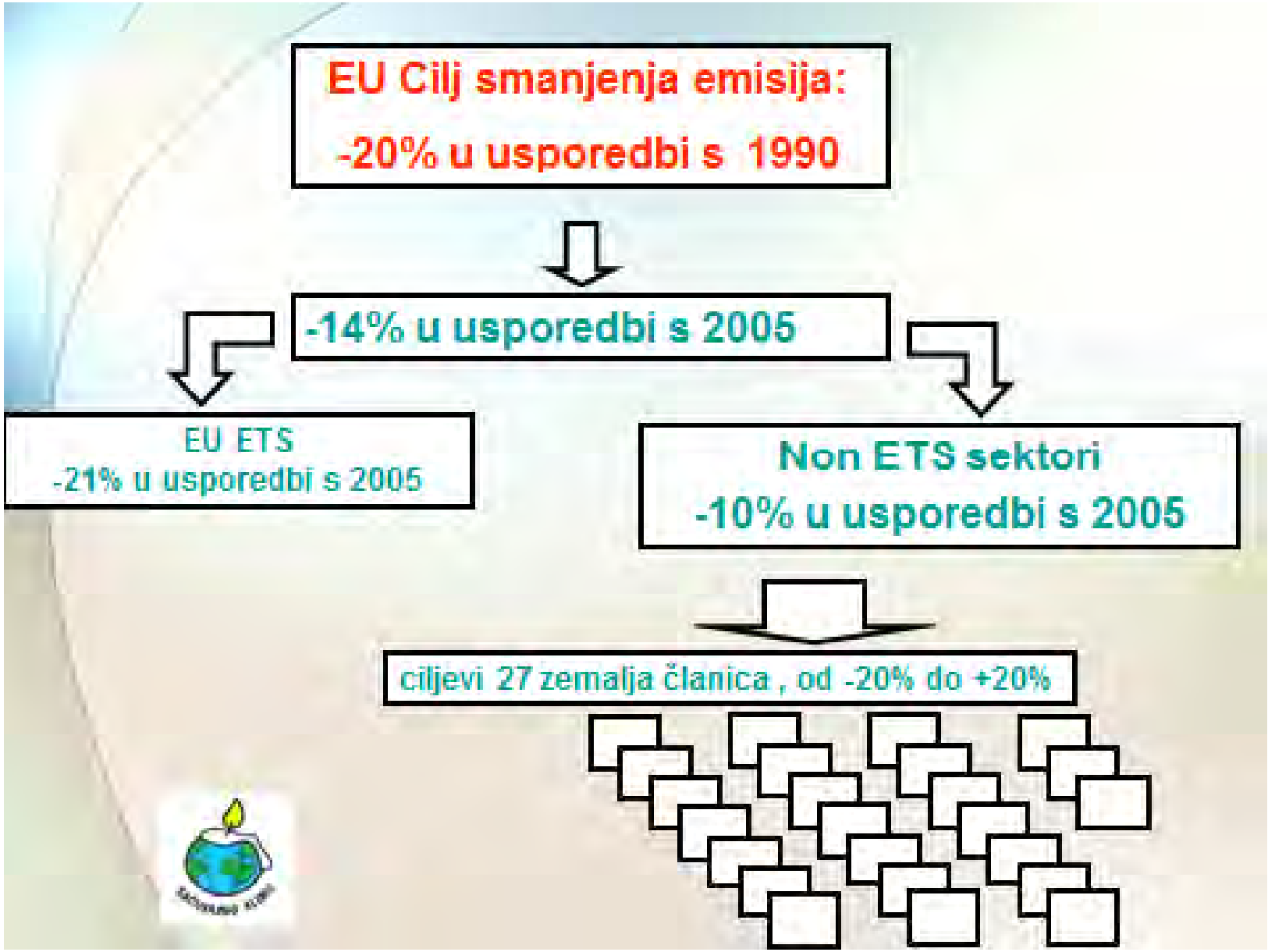
Decision 2013/162 / EU on annual emission allocations for Member States and Croatia



Member States Annual Emissions Allocation for the year 2013 to 2020 calculated applying global warming potential values from the second IPCC assessment report

Country	Annual Emission Allocation (tonnes of carbon dioxide equivalent)							
	2013	2014	2015	2016	2017	2018	2019	2020
Belgium	81206753	79635010	78063267	76491523	74919780	73348037	71776293	70204550
Bulgaria	27308615	27514835	27721056	27927276	28133496	28339716	28545936	28752156
Czech Republic	63569006	64248654	64928302	65607950	66287597	66967245	67646893	68326541
Denmark	35873692	34996609	34119525	33242442	32365359	31488276	30611193	29734110
Germany	487095510	480020642	472945774	465870905	458796037	451721169	444646301	437571432
Estonia	6111145	6133644	6156143	6178641	6201140	6223639	6246137	6268636
Ireland	45163667	44066074	42968480	41870887	40773293	39675700	38578106	37480513
Greece	58909882	59158791	59407700	59656609	59905518	60154427	60403336	60652245
Spain	228883459	226977713	225071967	223166221	221260475	219354728	217448982	215543236
France	397926454	393291390	388254953	383218516	378182079	373145642	368109206	363072769
Croatia	20596027	20761917	20927807	21093696	21259586	21425476	21591366	21757255
Italy	310124250	308146930	306169610	304192289	302214969	300237649	298260329	296283008

THE LEGAL FRAMEWORK



THE LEGAL FRAMEWORK

Zakon o zaštiti zraka (Narodne novine 130/11)

Uredba o provedbi fleksibilnih mehanizama Kyotskog protokola (Narodne novine 142/08)

Odluka o prihvaćanju Petog nacionalnog izvješća Republike Hrvatske prema Okvirnoj konvenciji Ujedinjenih naroda o promjeni klime (Narodne novine 24/10)

Pravilnik o načinu besplatne dodjele emisijskih jedinica postrojenjima (Narodne novine 43/12)

Uredba o načinu trgovanja emisijskim jedinicama stakleničkih plinova (Narodne novine 69/12)

Uredba o praćenju emisija stakleničkih plinova, politike i mjera za njihovo smanjenje u Republici Hrvatskoj (Narodne novine 87/12)

Odluka o dražbovatelju za obavljanje poslova dražbe emisijskih jedinica i izboru dražbenog sustava (Narodne novine 124/12)

Pravilnik o praćenju emisija stakleničkih plinova u Republici Hrvatskoj (Narodne novine 134/12)

Pravilnik o načinu korištenja Registra Europske unije (Narodne novine 4/13)

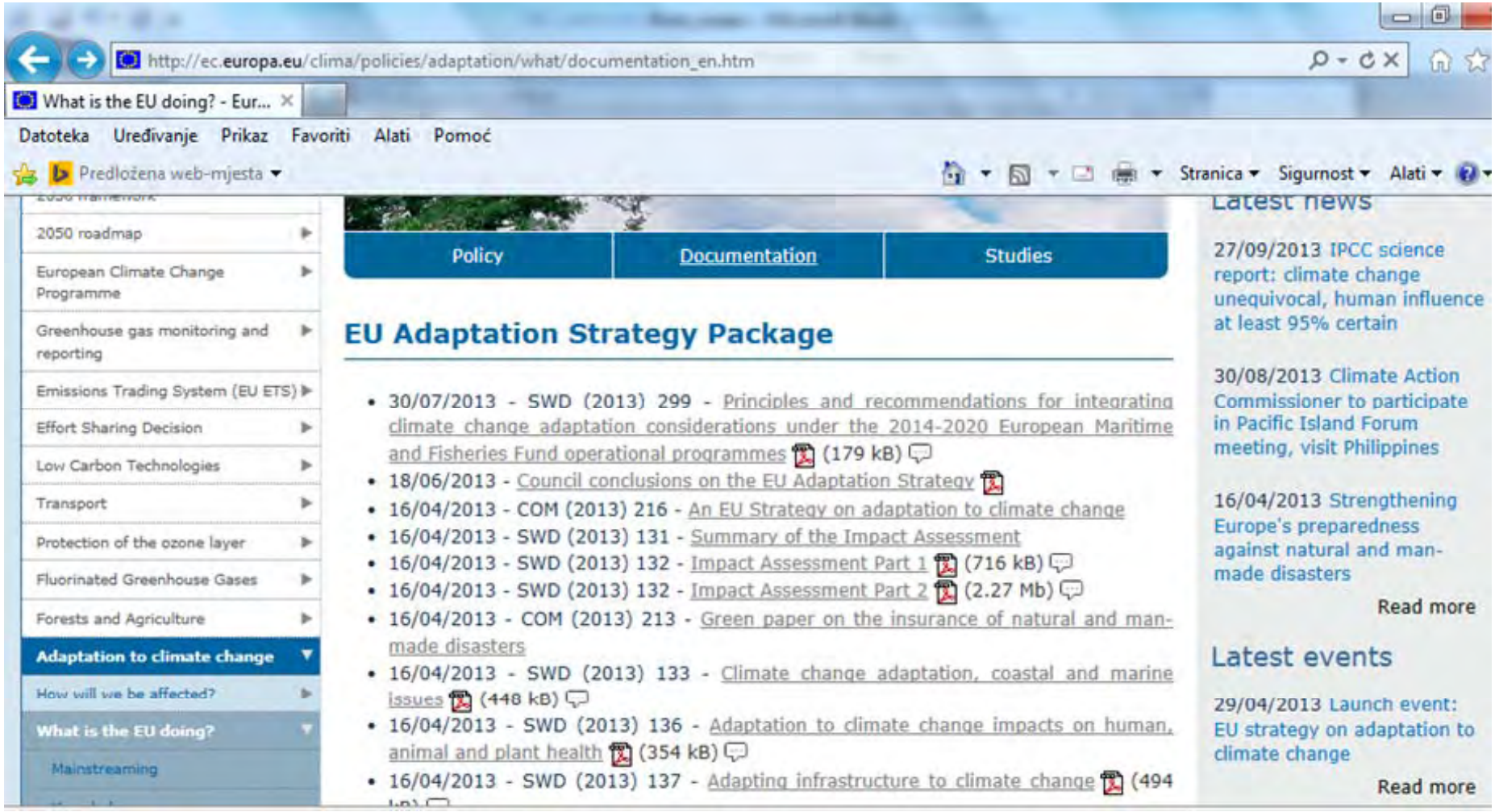
Uredba o dražbi emisijskih jedinica stakleničkih plinova (Narodne novine 19/13)

Pravilnik o praćenju, izvješćivanju i verifikaciji izvješća o emisijama stakleničkih plinova iz postrojenja i zrakoplova u razdoblju koje započinje 1. siječnja 2013. Godine (Narodne novine 77/13)

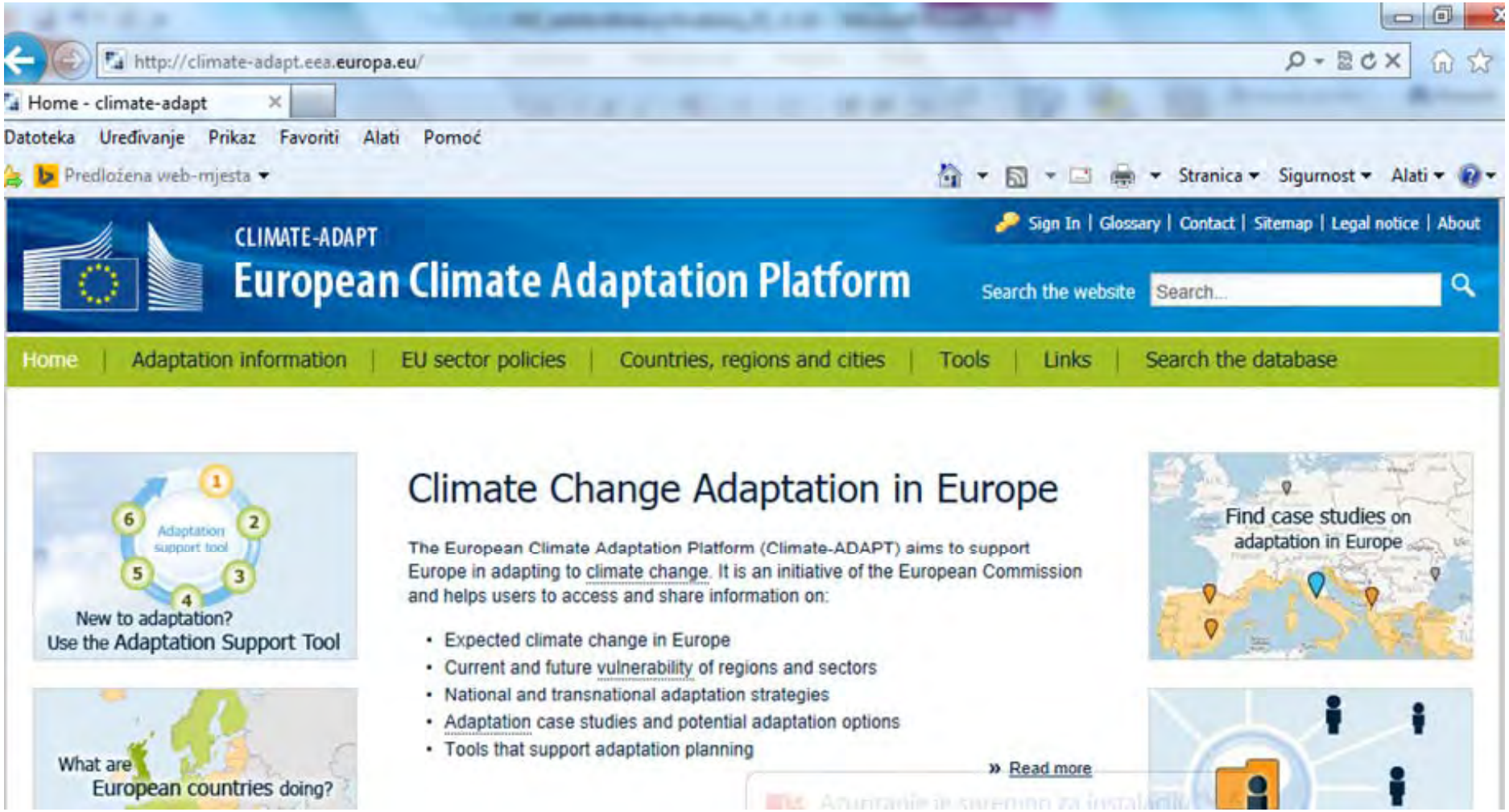
Odluka o donošenju Plana zaštite zraka, ozonskog sloja i ublažavanja klimatskih promjena u Republici Hrvatskoj za razdoblje od 2013. do 2017. Godine (Narodne novine 139/13)

Odluka o osnivanju Povjerenstva za međusektorsku koordinaciju za nacionalni sustav za praćenje emisija stakleničkih plinova (Narodne novine 6/14)

EU strategy on climate change adaptation



EU strategy on climate change adaptation



Adapting to climate change in Croatia

- Even with implementation of GHG reduction measures some areas will be affected by climate change; so countries should, for all sectors vulnerable (hydrology and water resources, agriculture and fisheries, forestry, biodiversity and natural ecosystems, coasts and coastal area, tourism and human health) assess the impact of climate change and adaptation measures;

- It is necessary to solve the issues of loss and damage, measures related to extreme weather conditions, and to improve cooperation between states to exchange experiences and knowledge – to be defined by an international agreement planned for 2015.

Adapting to climate change in Croatia

- With its extensive coastline, Croatia is exposed to the impacts of climate change;
- Increase in average temperatures, floods, sea level rise, extreme temperatures and winds suggest changes;
- Sectors vulnerable to climate change impacts: hydrology and water resources, agriculture, fisheries, forestry, biodiversity and natural ecosystems, coasts and coastal areas, tourism and human health;
- Art. 118 of Air Protection Act (OG 130/11) stipulates the obligation to prepare an Action Plan for climate change adaptation;
- Amendments to AP Act – stipulate obligation to prepare a **Strategy of adaptation with the action plan,** which will set goals and priorities for the implementation of CC adaptation measures in Croatia.

Adapting to climate change in Croatia

- Preparation and adoption of the 6th National Communication of Croatia to the UNFCCC;
- Development of the Low-Carbon Development Strategy according to EU Plan;
- EU has adopted the Roadmap for moving to a low-carbon economy in 2050. Indicative targets are reduction of GHG emissions by 40% until 2030, 60% until 2040, and 80-95% until 2050.

Conclusion

- impact of climate change is already evident;
- different regions and sectors will be affected in the various ways;
- it is necessary to develop impact scenarios and assess the adaptation measures;
- costs of adaptation measures may in future go beyond the costs of mitigation measures;
- Strategy of adaptation to climate change is planned for 2016.

THANK YOU

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http://klima.mzoip.hr

Adaptation as a sectoral issue: examples from the Croatian agricultural sector

Milan Mesić
University of Zagreb, Faculty of Agriculture
Department of General Agronomy
Zagreb, January 23, 2014

1. Introduction

- Today, we are unable to predict the options for adaptation of agriculture sector to projected changes of climate
- In the future, production technologies may be developed which are unknown today. Same like 100 years ago it was impossible to know what agricultural and animal husbandry methods will be used today.

1. Introduction

- "The advantage of Optimum ® AQUAmax ® hybrid is its significantly greater tolerance to stressful conditions.“
- “For many years now, DuPont Pioneer has been selecting hybrids tolerant to drought. Since 2009 the company has doubled the funding, developing and selecting new conventional hybrids for drought conditions in eight research centers in Europe."

Prof.Dr. Norman Borlaug

- “Unless progress with agricultural yields remains very strong, the next century will experience sheer human misery that, on a numerical scale, will exceed the worst of everything that has come before".

Fritz Haber

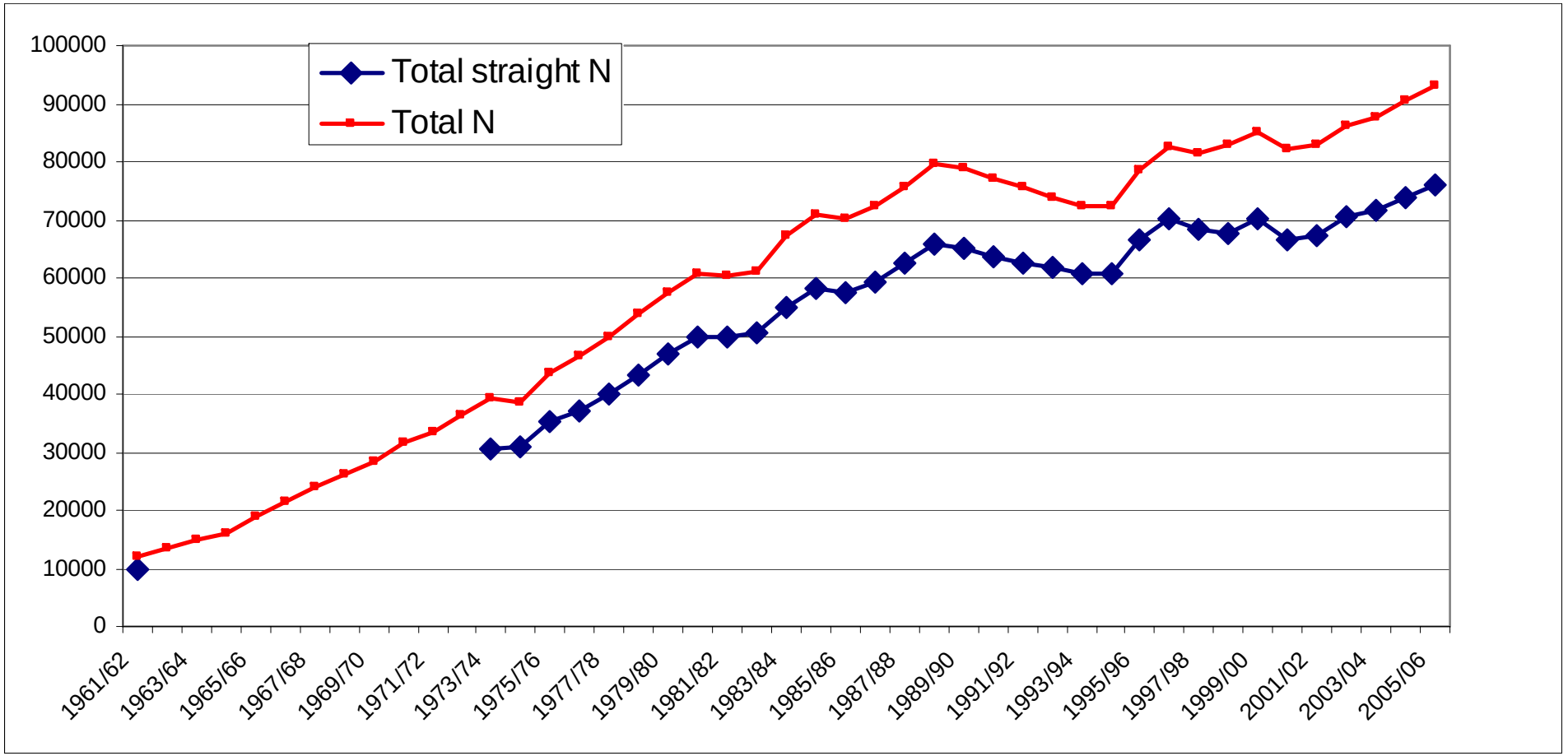
Carl Bosch

Important to know:

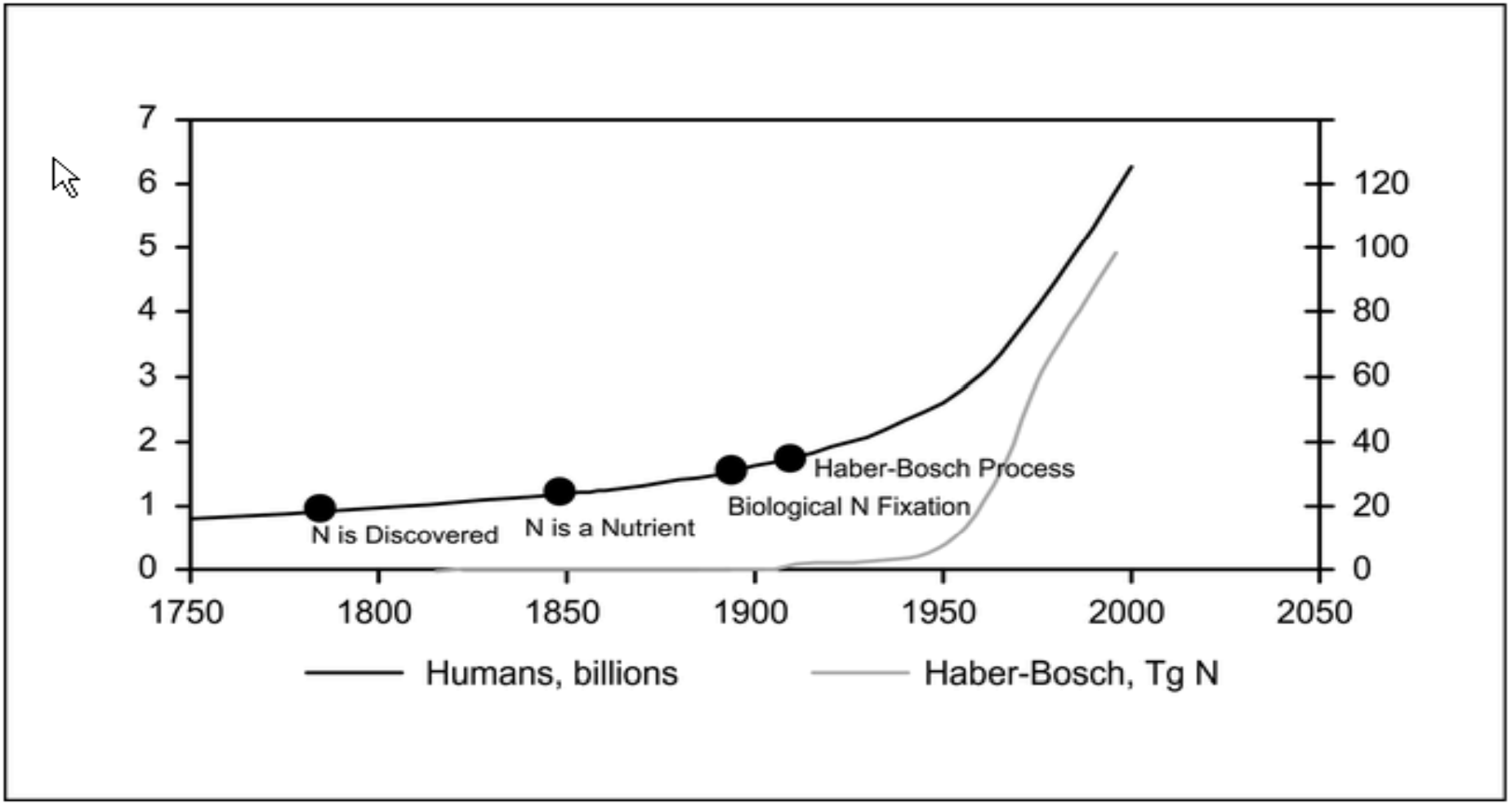
- About 50% of food produced today is the result of application of mineral nitrogen - HABER BOSCH nitrogen synthesis process
- Without mineral N - 1 ha of good agricultural soil provides about 2 tons of grain
- With nitrogen fertilizer - about 8-10 t/ha

- Source: European Nitrogen Assessment

Global consumption of mineral N



N reactive – reactive nitrogen also valued through CO_2 emissions



2. Goal

- To show the impact of drought on:
  - wheat yield,
  - agronomic efficiency of fertilizer,
  - nitrogen removal and loss from the soil.
- To illustrate the impact of low temperatures
  - On the yield of rapeseed
- To display the carbon content in soils and point to the risks of its reduction

3. Methods of work

- Analysis of the results of field trials:
  1. **Control**
- 2. **N_0 PK,**
- 3. **N_{100} PK,**
- 4. **N_{150} PK ,**
- 5. **N_{200} PK,**
- 6. **N_{250} PK,**
- 7. **N_{250} PK+ PG,**
- 8. **N_{250} PK+ ZT+$CaCO_3$, Dol.**
- 9. **N_{300} PK**
- 10. **Black fallow**

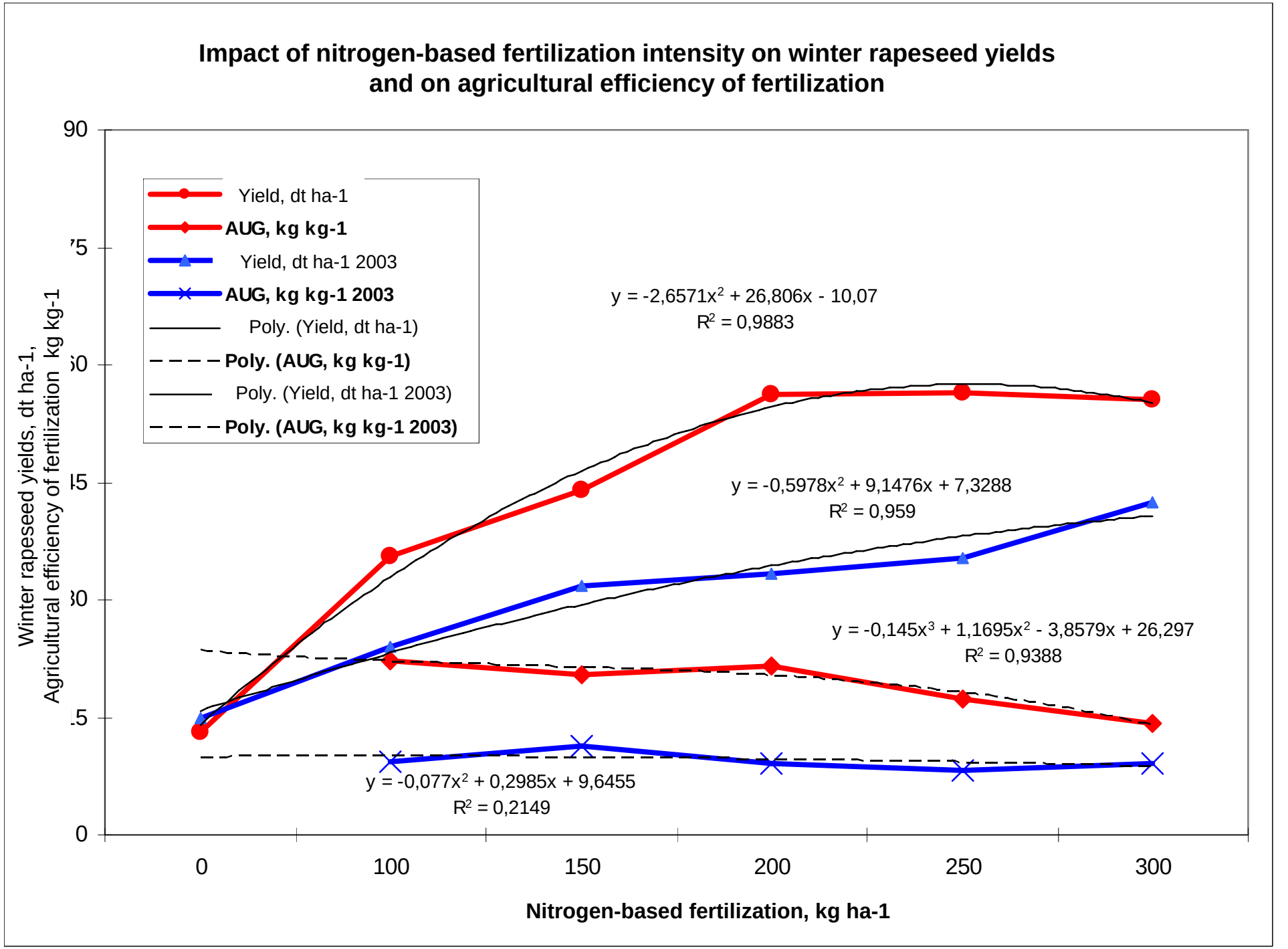
Since 1996

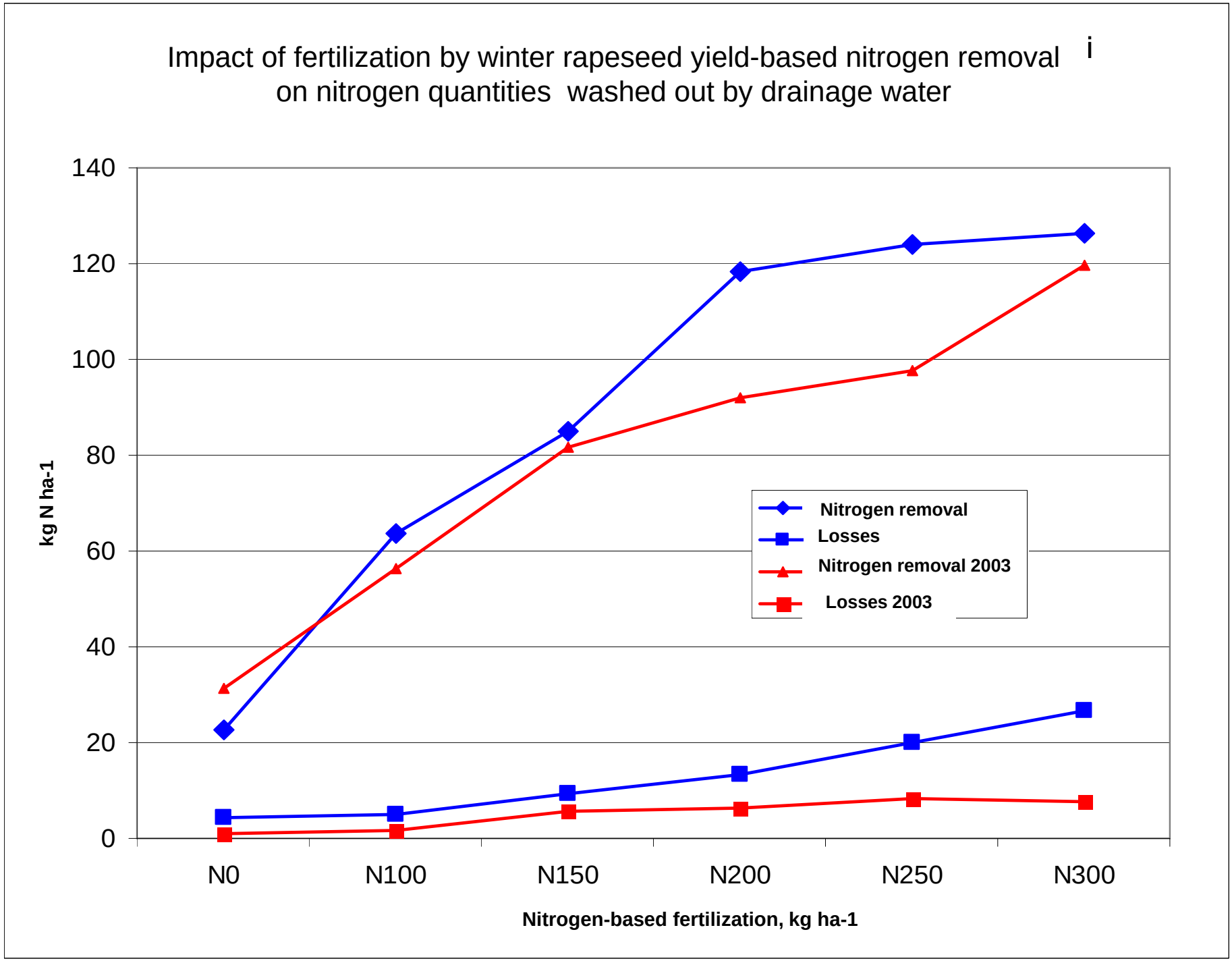
- 10 lysimeters
- 20 drainpipes
- A lot of work in the field, in the laboratory and in the office.

4. Results

- Example of winter wheat in the dry year of 2003 demonstrates effects of poor weather conditions during crop vegetation period.

- It compares the influence of fertilization on the average wheat yield for vegetative years 1996/97 and 1999/2000 against the yield achieved in 2003, the agronomic efficiency of fertilization, as well as nitrogen losses through drainage water.

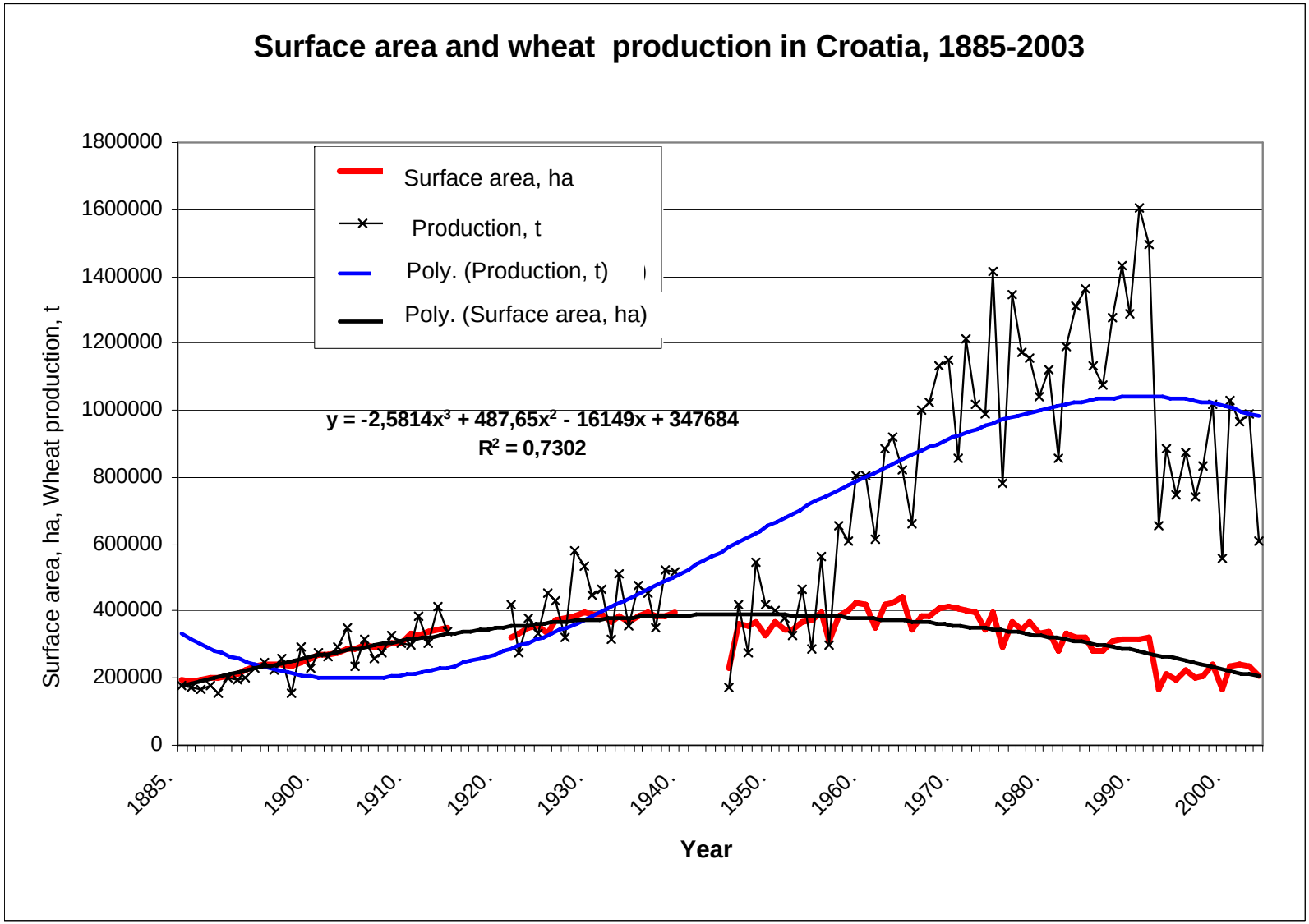

Impact of nitrogen-based fertilization intensity on winter rapeseed yields and on agricultural efficiency of fertilization
Yield, dt ha-1
AUG, kg kg-1
Yield, dt ha-1 2003
AUG, kg kg-1 2003
Poly. (Yield, dt ha-1)
Poly. (AUG, kg kg-1)
Poly. (Yield, dt ha-1 2003)
Poly. (AUG, kg kg-1 2003)
y = -2,6571x² + 26,806x - 10,07
R² = 0,9883
y = -0,5978x² + 9,1476x + 7,3288
R² = 0,959
y = -0,145x³ + 1,1695x² - 3,8579x + 26,297
R² = 0,9388
y = -0,077x² + 0,2985x + 9,6455
R² = 0,2149
Winter rapeseed yields, dt ha-1, Agricultural efficiency of fertilization kg kg-1
90
0
0
100
150
200
250
300
Nitrogen-based fertilization, kg ha-1


Impact of fertilization by winter rapeseed yield-based nitrogen removal on nitrogen quantities washed out by drainage water
i
140
120
100
80
60
40
20
0
kg N ha-1
N0
N100
N150
N200
N250
N300
Nitrogen-based fertilization, kg ha-1
Nitrogen removal
Losses
Nitrogen removal 2003
Losses 2003

4. Results

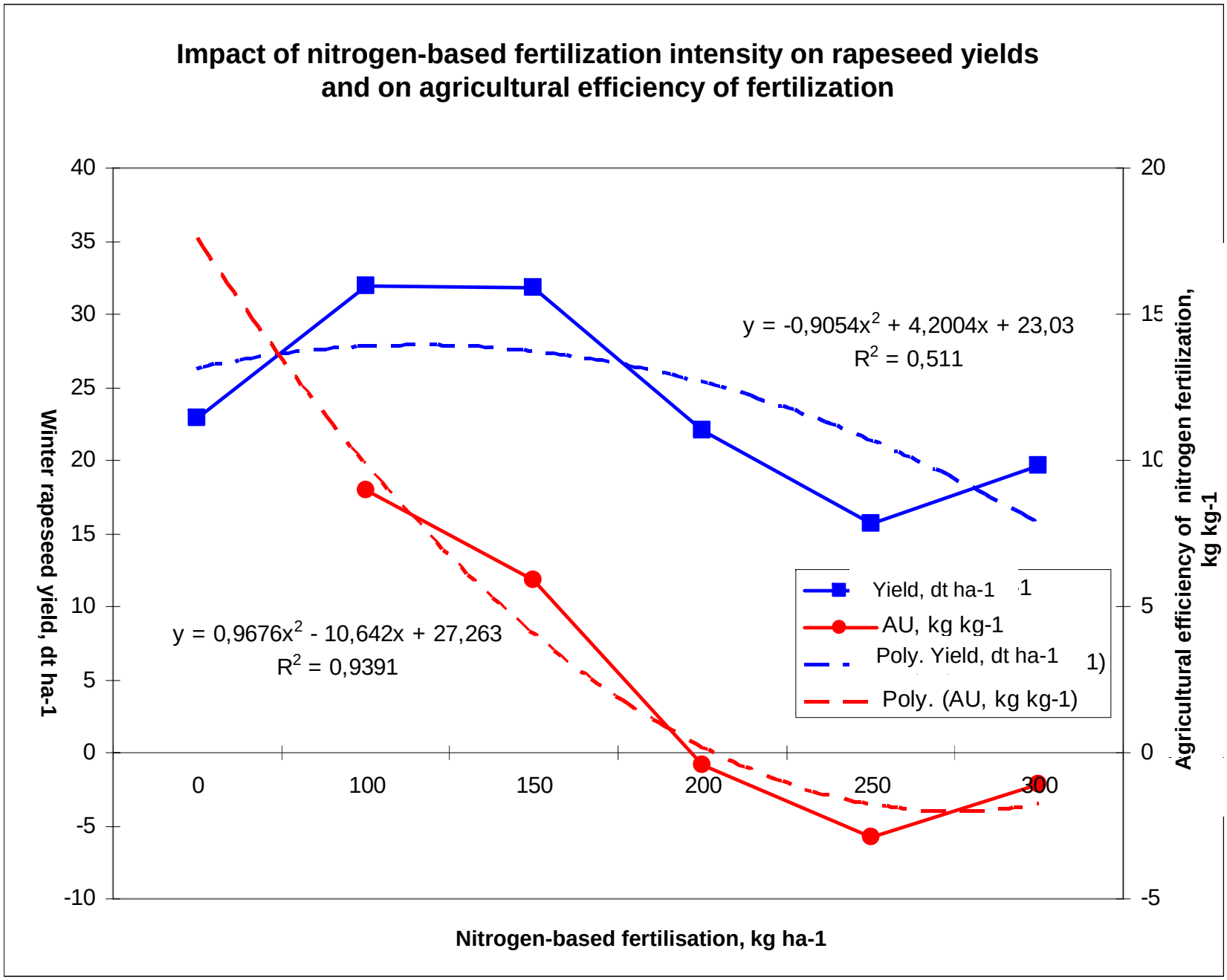
- Assuming frequent repetition of such weather conditions at the time of intense wheat growth, flowering, pollination and ripening, we can expect a reduction in yield, lower usability of applied nitrogen fertilizer, and thus lower profitability of production and bigger negative environmental impact.

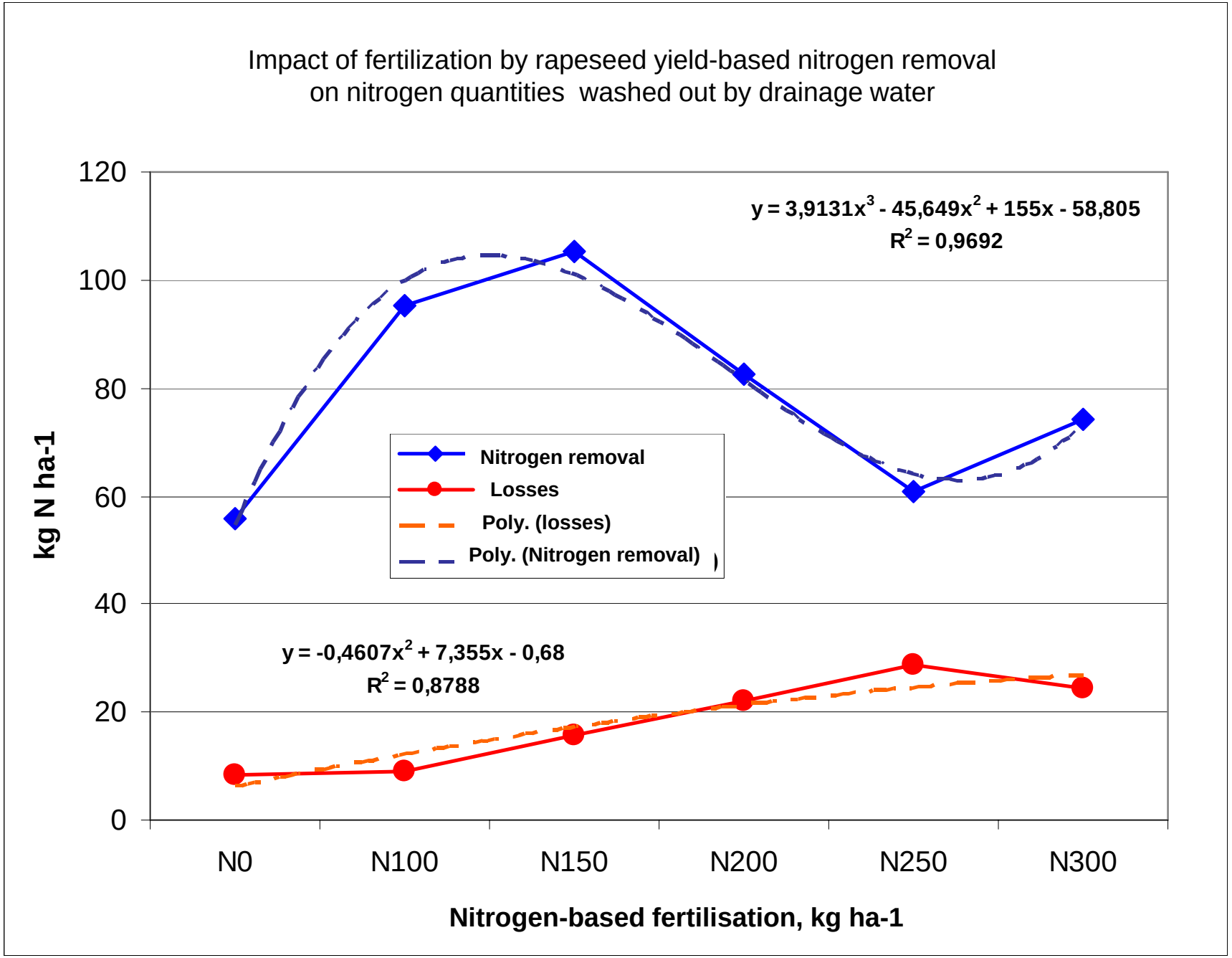
4. Effect of all factors



4. Results - effect of low temperatures

- Freezing of crops during March decisively influenced the crop development, especially in the case of higher fertilizer treatments. In variants 6, 7, 8 and 9, with 250 and 300 kg/ha nitrogen, some plants were destroyed by black frost.
- This applies exactly to those plants which have grown faster thanks to fertilization. Average for 1998 and 2001.


Impact of nitrogen-based fertilization intensity on rapeseed yields and on agricultural efficiency of fertilization
Winter rapeseed yield, dt ha-1
Agricultural efficiency of nitrogen fertilization, kg kg-1
Nitrogen-based fertilisation, kg ha-1
y = -0,9054x2 + 4,2004x + 23,03
R2 = 0,511
y = 0,9676x2 - 10,642x + 27,263
R2 = 0,9391
Yield, dt ha-1
AU, kg kg-1
Poly. Yield, dt ha-1
Poly. (AU, kg kg-1)
40
35
30
25
20
15
10
5
0
-5
-10
20
15
10
5
0
-5
0
100
150
200
250
300


Impact of fertilization by rapeseed yield-based nitrogen removal
on nitrogen quantities washed out by drainage water
120
100
80
60
40
20
0
kg N ha-1
y = 3,9131x3 - 45,649x2 + 155x - 58,805
R2 = 0,9692
Nitrogen removal
Losses
Poly. (losses)
Poly. (Nitrogen removal)
y = -0,4607x2 + 7,355x - 0,68
R2 = 0,8788
N0
N100
N150
N200
N250
N300
Nitrogen-based fertilisation, kg ha-1

4. Results - effect of low temperatures

- The highest agricultural efficiency of fertilization was observed in variants with 100 kg of nitrogen. Increasing nitrogen fertilization reduced the efficiency of winter rapeseed, and application of over 200 kg of nitrogen has caused negative values.

- At highest water content, resulting from large nitrogen consumption and increased vegetative mass, the most developed and abundant rapeseed quickly perished.

5. Possibility of adaptation?

- According to possible climate change scenarios as envisaged by meteorological experts, the expected climate change intensity and trends are likely to gradually require major changes in crop production systems.

5. Possibility of adaptation?

- According to scenarios used in the First National Communication on Climate Change, annual number of days with temperatures above **5°C** in a 100-years period would increase in the lowland Croatia by **35-84 days**, and periods of temperatures above **20°C** by **45-73 days**.

5. Possibility of adaptation?

- Should predictions come true, the current technology of cultivation of agricultural crops will suffer great changes.
- However, with the application of modern technology, in terms of increased temperature and the **provision of adequate water**, the total predicted climate change **could positively impact the increase of yields and quality** of crops.

5. Possibility of adaptation?

- Certainly, the expected climate change may have negative effects, and only few of them can be predicted.

- Cold air fronts, drought, hail, frost, wind, floods, various extremes, especially in unexpected seasons...

5. Possibility of adaptation?

- Crop rotation, planting dates, crop selection ....
- Assortment, creation and introduction of new varieties and hybrids ....
- Introduction of new crops?
- Application of new tillage and generally new ways of soil management
- Irrigation, protection from frost, hail
- Timely and proper fertilization, protection, ...
- Organic and biodynamic agriculture, ...

World Soils Book Series

Ferdo Bašić

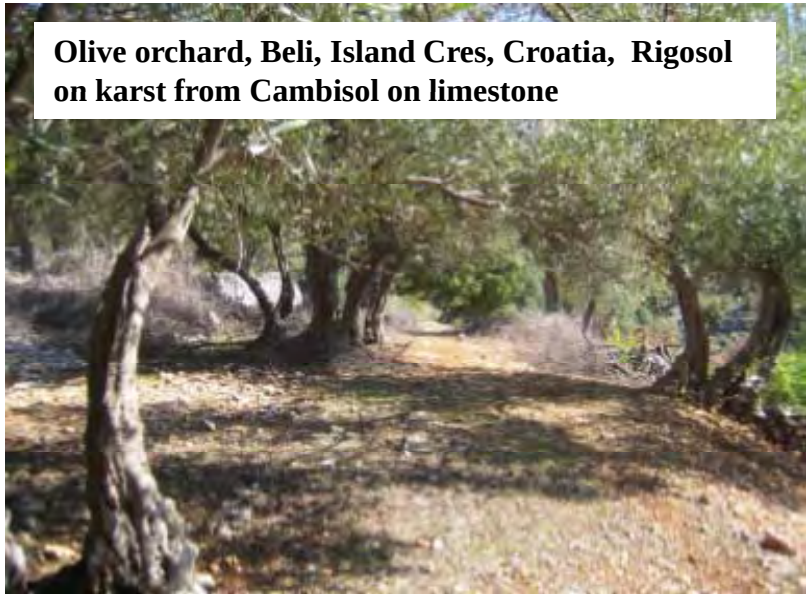
The Soils of Croatia

Springer

6. Changes in soil properties?

- Different natural environments (pastures, meadows, forests)
- Agroecosystems (vineyards, gardens, arable land)
- Croatia (Mediterranean area) & Hungary (Panonian plain)
- Soil samples taken during the spring and summer 2010
- Soil depths: 0-3 cm, 3-10 cm, 0-30 cm, 30-60 cm and 60-90 cm, depending on the location, region, soil type and type of ecosystem

Meadow, Szentgal, Hungary, Eutric Cambisol



Olive orchard, Beli, Island Cres, Croatia, Rigosol on karst from Cambisol on limestone

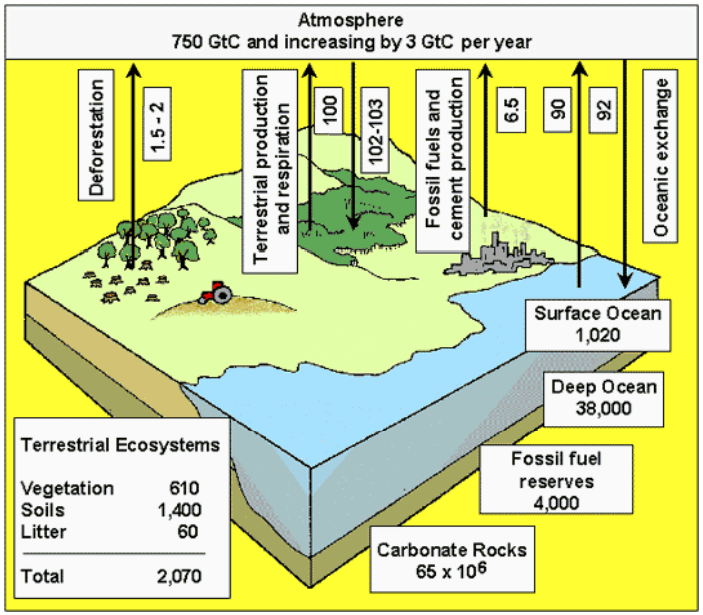
Source:

A Bilateral Project between Hungarian and Croatian scientists founded by Governments (2009 - 2011); Leaders: Prof M. Birkas & Prof M. Mesic

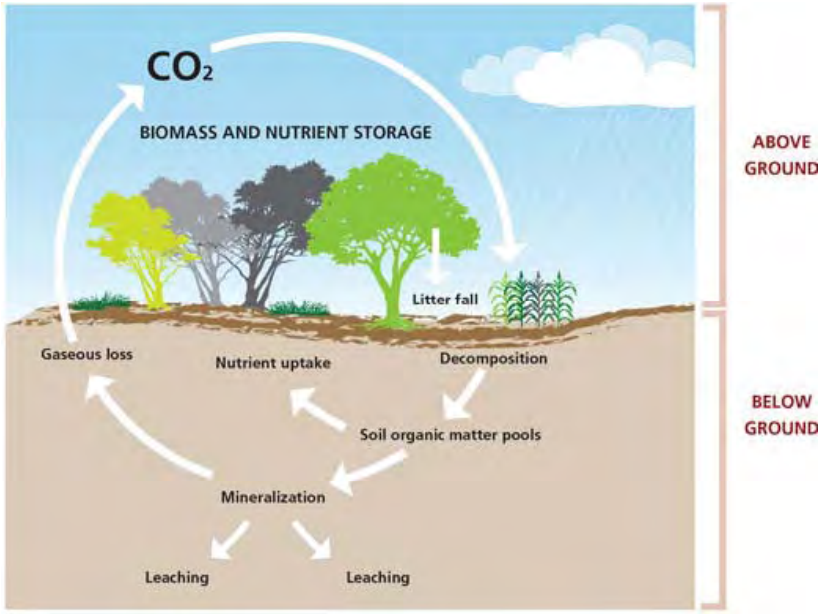
Impact of tillage and fertilization on probable climate threats in Hungary and Croatia, soil vulnerability and protection

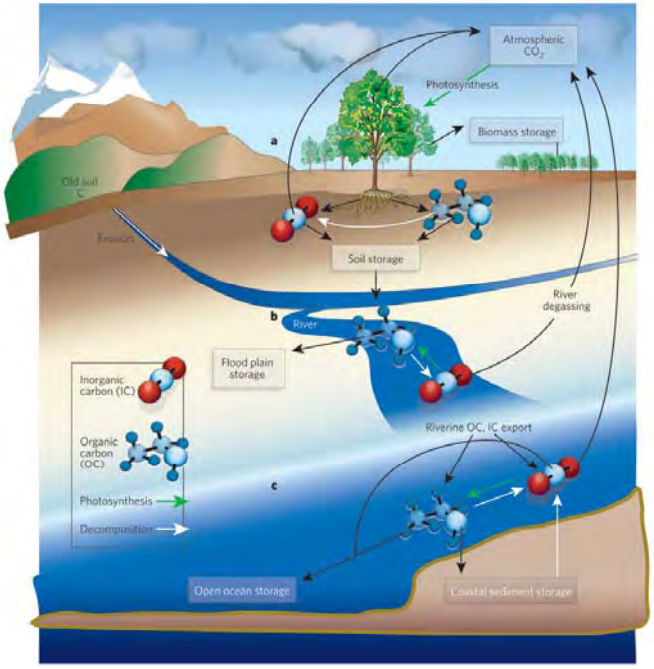
C in the soil

→ Soils are the largest carbon reservoir of terrestrial carbon cycle



Source: www.fao.org





Source: www.nature.com

Contribution of Agriculture sector to climate change (GHG emission)

Globally - agriculture ~ 12 %

EXECUTIVE SUMMARY

Agricultural lands (lands used for agricultural production, consisting of cropland, managed grassland and permanent crops including agro-forestry and bio-energy crops) occupy about 40-50% of the Earth's land surface.

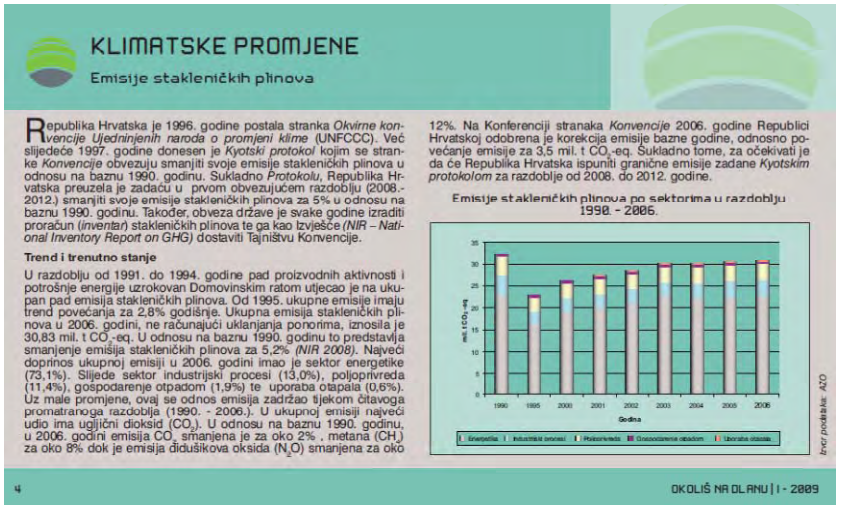
Agriculture accounted for an estimated emission of 5.1 to 6.1 $GtCO_2$-eq/yr in 2005 (10-12% of total global anthropogenic emissions of greenhouse gases (GHGs)). CH_4 contributes 3.3 $GtCO_2$-eq/yr and N_2O 2.8 $GtCO_2$-eq/yr. Of global anthropogenic emissions in 2005, agriculture accounts for about 60% of N_2O and about 50% of CH_4 (*medium agreement, medium evidence*). Despite large annual exchanges of CO_2 between the atmosphere and agricultural lands, the net flux is estimated to be approximately balanced, with CO_2 emissions around 0.04 $GtCO_2$/yr only (emissions from electricity and fuel use are covered in the buildings and transport sector, respectively) (*low agreement, limited evidence*).

Considering all gases, the global technical mitigation potential from agriculture (excluding fossil fuel offsets from biomass) by 2030 is estimated to be ~5500-6,000 $MtCO_2$-eq/yr (*medium agreement, medium evidence*). Economic potentials are estimated to be 1500-1600, 2500-2700, and 4000-4300 $MtCO_2$-eq/yr at carbon prices of up to 20, 50 and 100 US$/$tCO_2$-eq, respectively About 70% of the potential lies in non-OECD/EIT countries, 20% in OECD countries and 10% for EIT countries (*medium agreement, limited evidence*).

Soil carbon sequestration (enhanced sinks) is the mechanism responsible for most of the mitigation potential (*high agreement, much evidence*), with an estimated 89% contribution to the technical potantial. Mitigation of CH_4 emissions and N_2O emissions from soils account for 9% and 2%, respectively, of the total mitigation potential (*medium agreement, medium evidence*). The upper and lower limits about the estimates are largely determined by uncertainty in the per-area estimate for each mitigation measure. Overall, principal sources of

Source: IPCC, Report 2007

In Croatia - agriculture ~ 12 %



KLIMATSKE PROMJENE

Emisije stakleničkih plinova

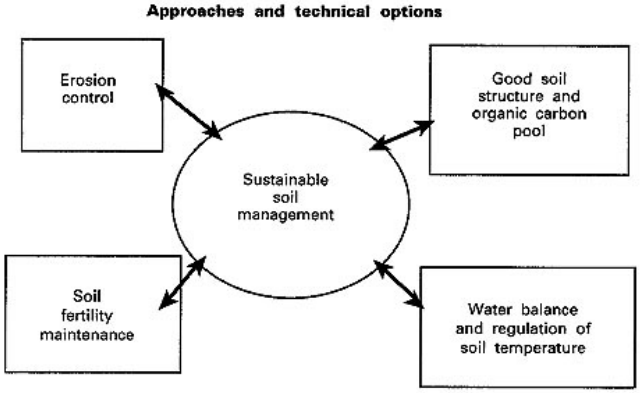
Republika Hrvatska je 1996. godine postala stranka *Okvirne konvencije Ujedinjenih naroda o promjeni klime* (UNFCCC). Već slijedeće 1997. godine donesen je *Kyotski protokol* kojim se stranke *Konvencije* obvezuju smanjiti svoje emisije stakleničkih plinova u odnosu na baznu 1990. godinu. Sukladno *Protokolu*, Republika Hrvatska preuzela je zadaću u prvom obvezujućem razdoblju (2008.-2012.) smanjiti svoje emisije stakleničkih plinova za 5% u odnosu na baznu 1990. godinu. Također, obveza države je svake godine izraditi proračun (*inventar*) stakleničkih plinova te ga kao Izvješće (*NIR – National Inventory Report on GHG*) dostaviti Tajništvu Konvencije.

Trend i trenutno stanje

U razdoblju od 1991. do 1994. godine pad proizvodnih aktivnosti i potrošnje energije uzrokovan Domovinskim ratom utjecao je na ukupan pad emisija stakleničkih plinova. Od 1995. ukupne emisije imaju trend povećanja za 2,8% godišnje. Ukupna emisija stakleničkih plinova u 2006. godini, ne računajući uklanjanja ponorima, iznosila je 30,83 mil. t CO_2-eq. U odnosu na baznu 1990. godinu to predstavlja smanjenje emisija stakleničkih plinova za 5,2% *(NIR 2008)*. Najveći doprinos ukupnoj emisiji u 2006. godini imao je sektor energetike (73,1%). Slijede sektor industrijski procesi (13,0%), poljoprivreda (11,4%), gospodarenje otpadom (1,9%) te uporaba otapala (0,6%). Uz male promjene, ovaj se odnos emisija zadržao tijekom čitavoga promatranoga razdoblja (1990. - 2006.). U ukupnoj emisiji najveći udio ima ugljični dioksid (CO_2). U odnosu na baznu 1990. godinu, u 2006. godini emisija CO_2 smanjena je za oko 2% , metana (CH_4) za oko 8% dok je emisija didušikova oksida (N_2O) smanjena za oko 12%. Na Konferenciji stranaka *Konvencije* 2006. godine Republici Hrvatskoj odobrena je korekcija emisije bazne godine, odnosno povećanje emisije za 3,5 mil. t CO_2-eq. Sukladno tome, za očekivati je da će Republika Hrvatska ispuniti granične emisije zadane *Kyotskim protokolom* za razdoblje od 2008. do 2012. godine.

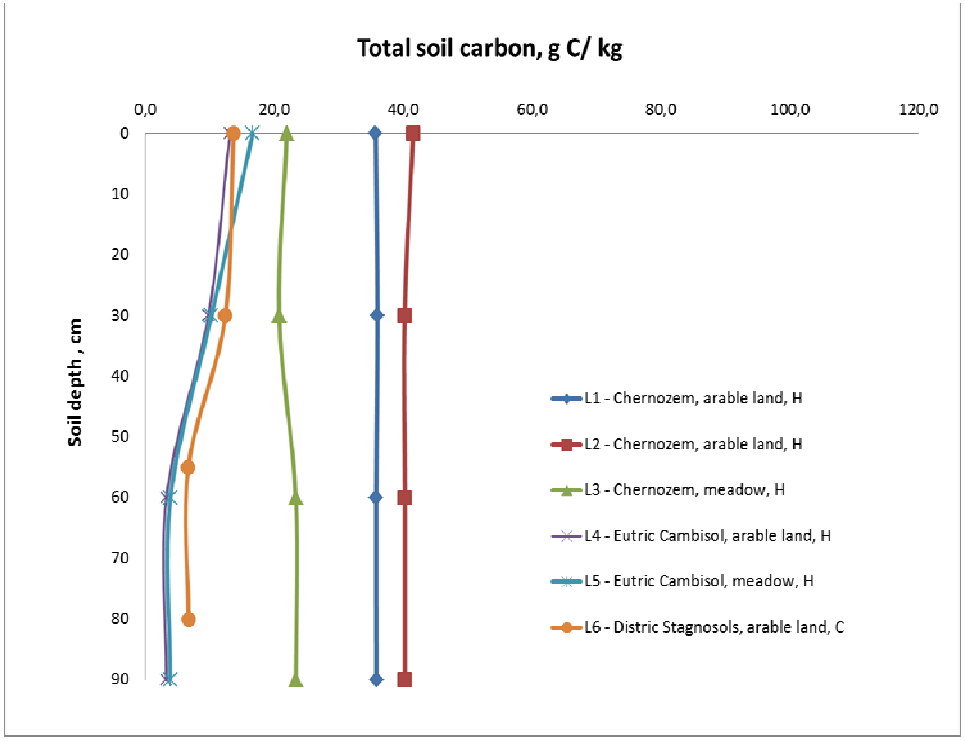
Emisije stakleničkih plinova po sektorima u razdoblju 1990. - 2006.

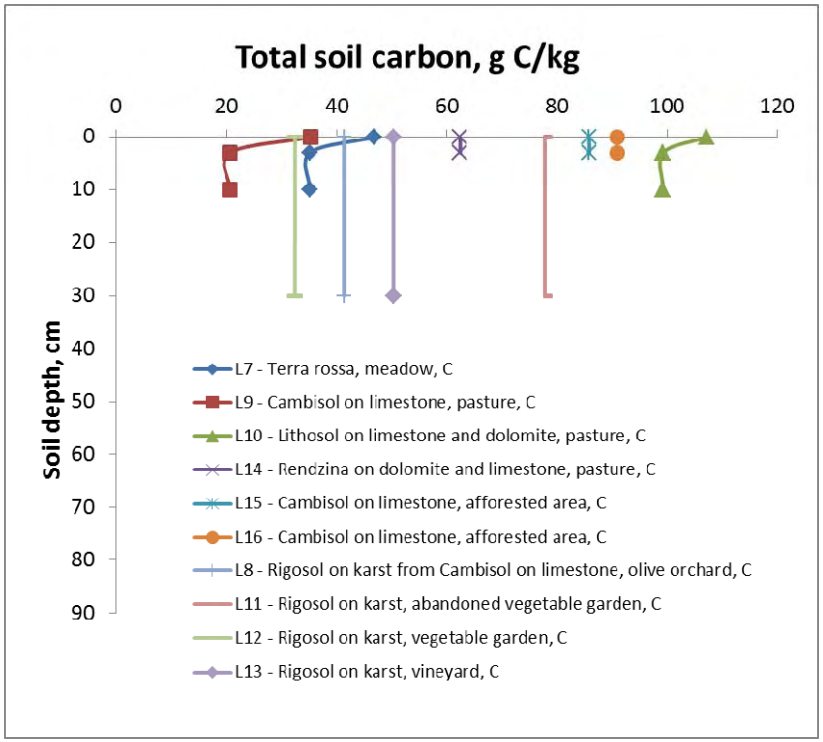
Source: Croatian Environment Agency, 2009



Source: http://www.agnet.org

Carbon content in typical Panonian soils (left) and Mediterranean soils (right)

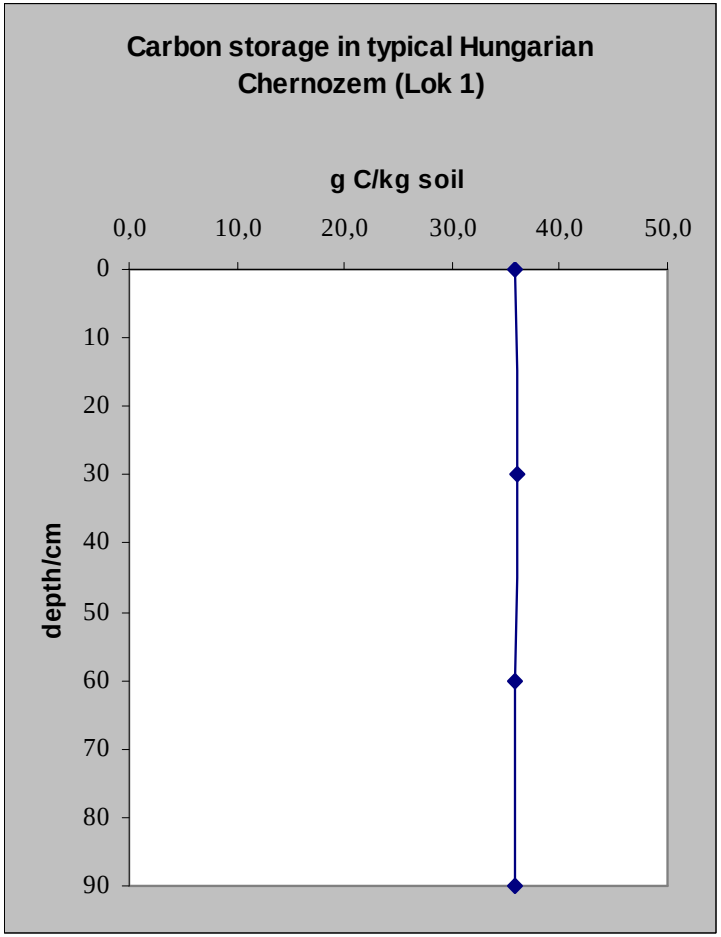




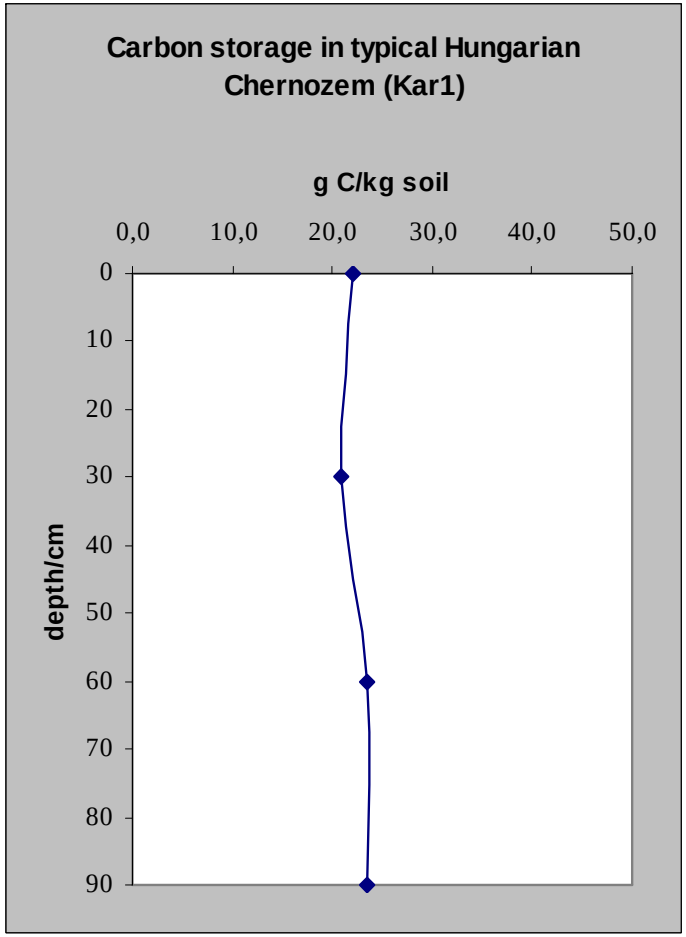
- from 3.3 g C/kg in Szentgal, arable land on eutric cambisol (60-90 cm; L4)

to 107.2 g C/kg in Mediterranean grassland (Cres) on lithosol (0-3 cm; L10)

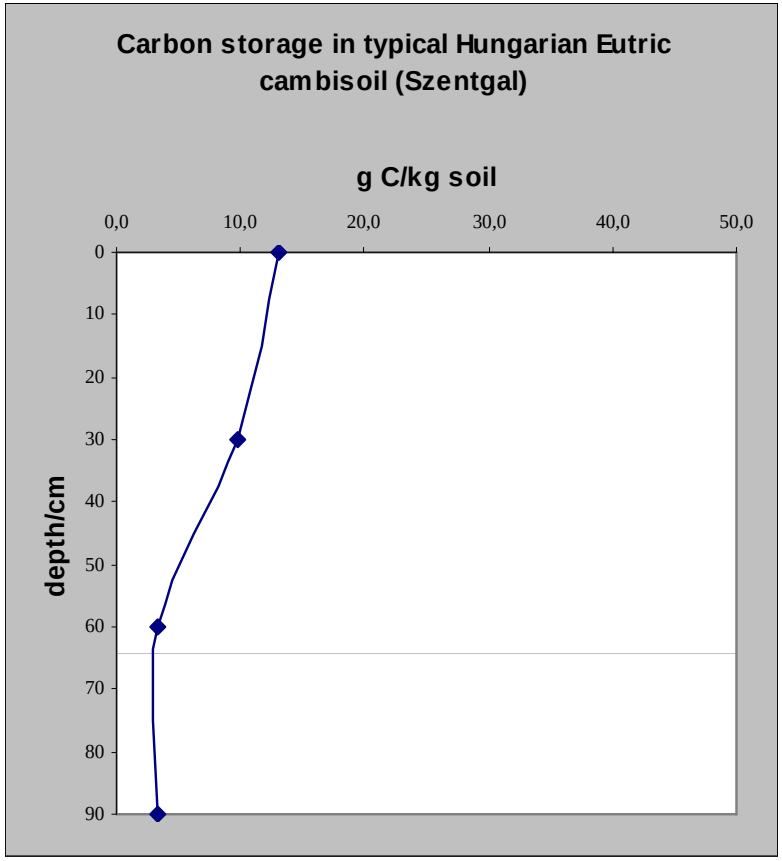
C - Hungarian soil – Mezőhegyes L1 – arable land



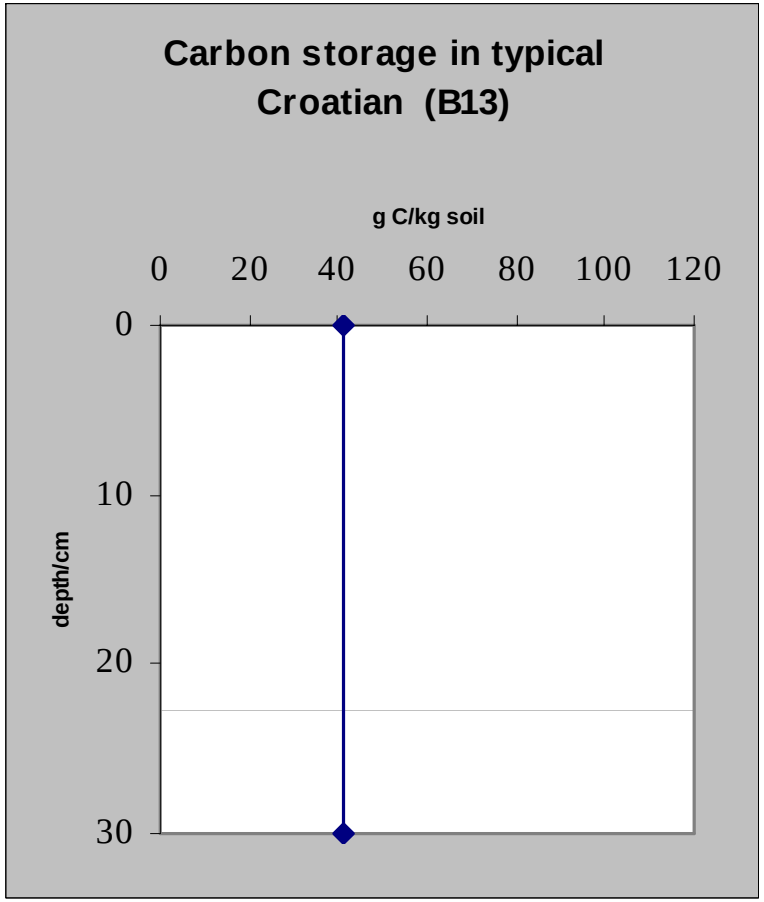
C - Chernozem – Karcag 1 - meadow



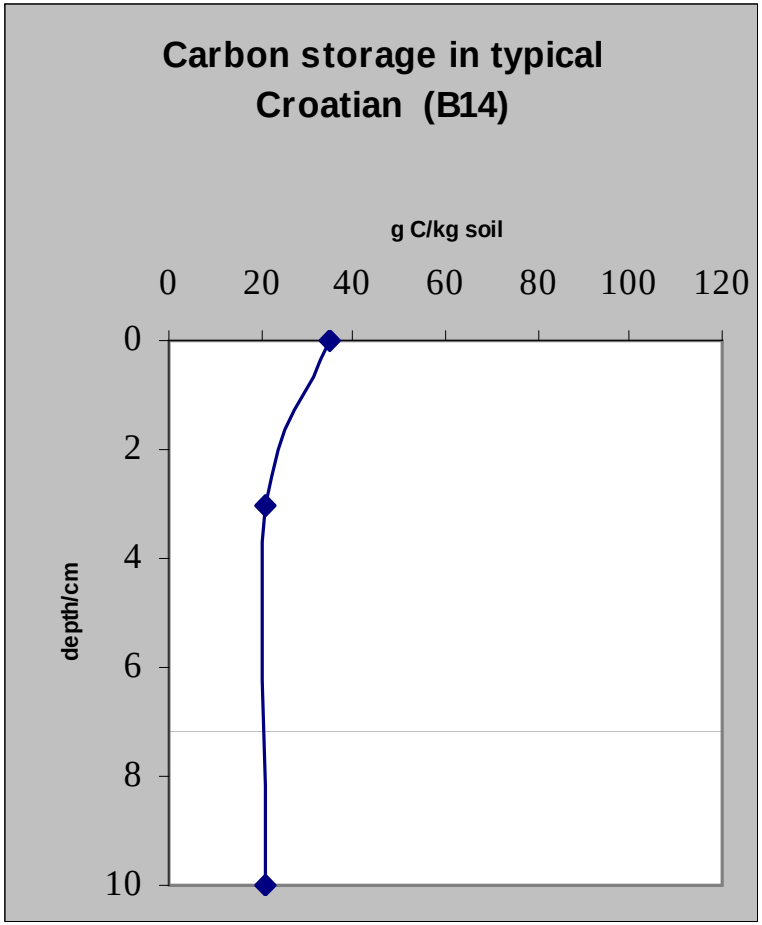
Eutric Cambisol – Szentgal – Arable land



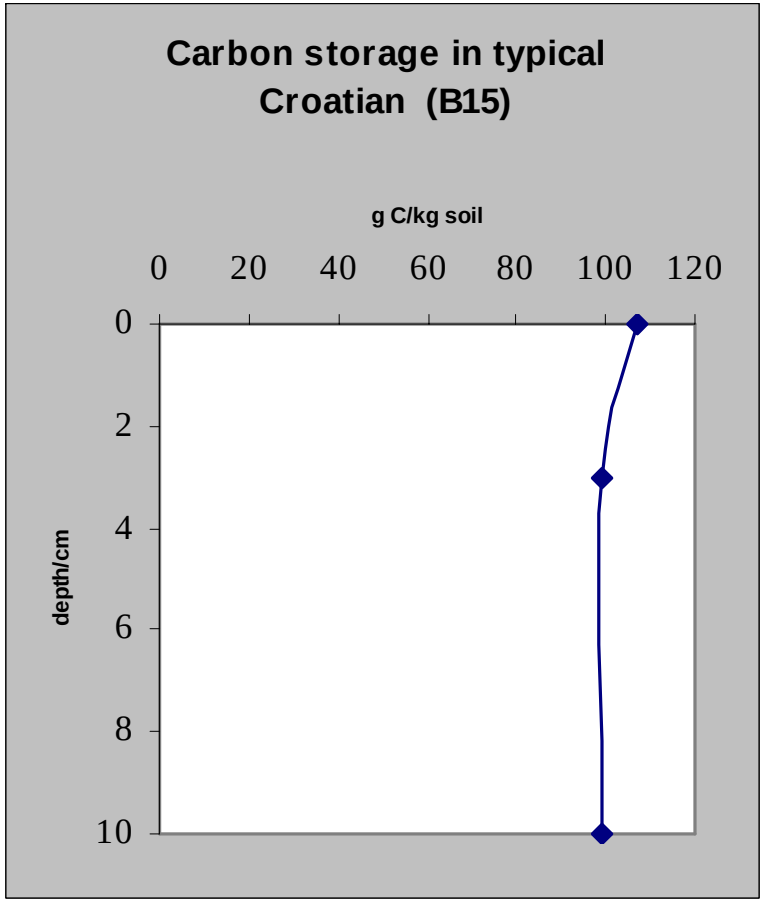
Croatian soil, Cres island – olive orchard



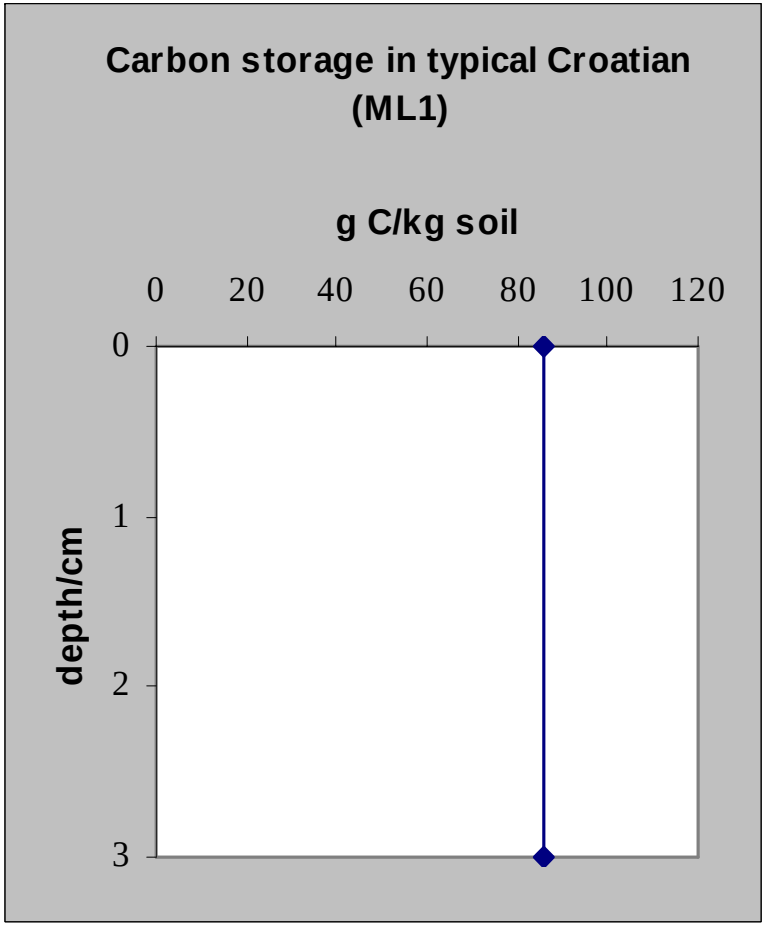
Croatian soil, Cres island – pasture



Croatian soil, Cres island – grassland

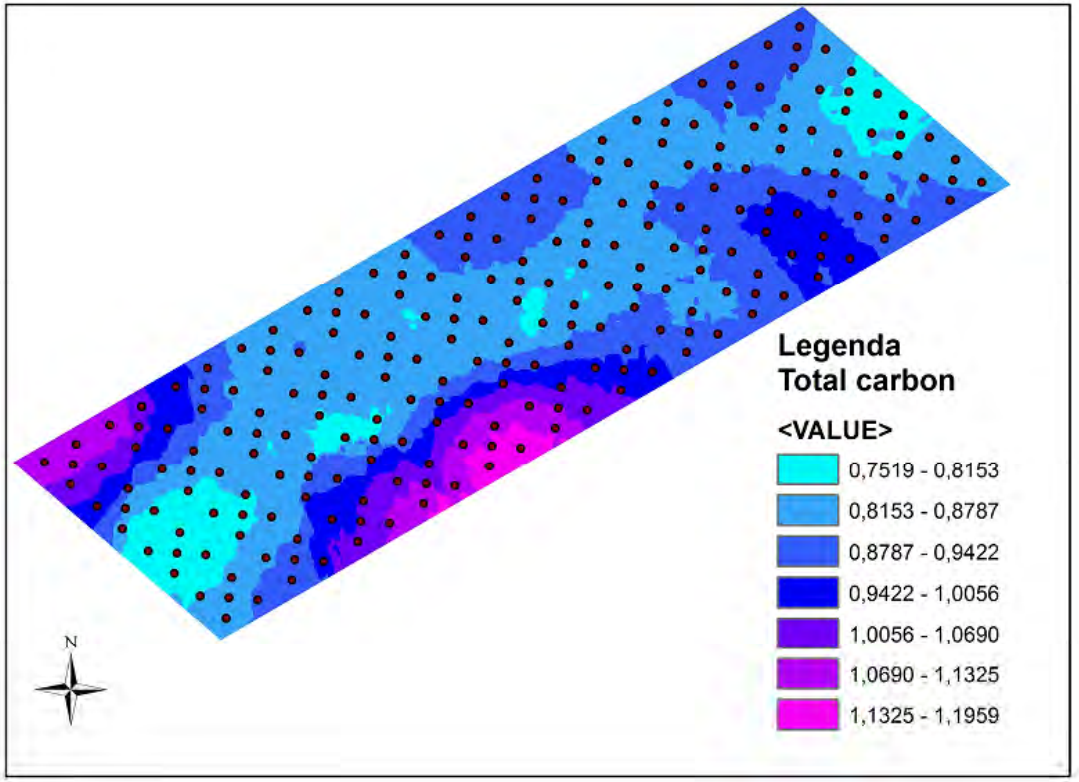


Croatian soil, Mali Lošinj island – Cambisol



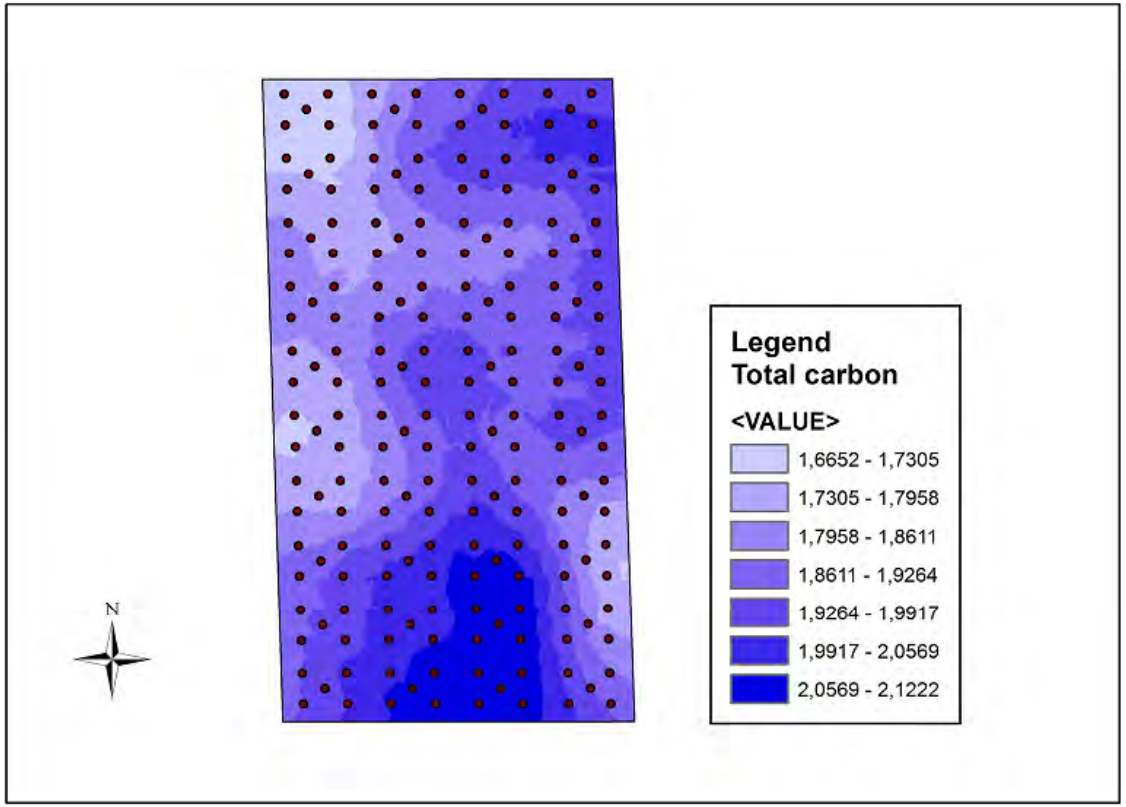
Total C - Pseudogley

- Location:
  Central Croatia
- Area – 2 ha
- 240 samples
- **0.8-1.2 %**



Total C - Chernozem

- Location: Eastern Croatia, Vukovar region
- Area – 2 ha
- 200 samples
- **1.6- 2.1 %**



6. Changes in soil properties

- Increasing temperatures increase the intensity of soil breating cca 2.4 times at 10 °C intervals.
- For instance, average annual soil temperature increase of only **0.3 °C** would result in additional release of cca **2 billion tons C** per year, globally.

6. Changes in soil properties

- Organic matter in the soil (organic carbon) impacts the soil's physical, chemical and biological features
- This topic is today brought to attention by international convenctions – on desertification, biodiversity, climate change

6. Changes in soil properties

- Organic matter dynamics in the soil is very complex, partially conditioned by aerobic or anaerobic conditions, which also affect the final outcome of organic matter decomposition (CO_2, CH_4, N_2O – greenhouse gases).
- Soil management, carbon and nitrogen cycles will be crucial for future survival.

7. Conclusion

- We should explore the possibility of introducing new technologies that could be useful for soil protection, and for adapting agriculture to climate change.
- Numerous obstacles can be overcome by proper actions.
- This work involves more investment in research and **in education of all stakeholders involved in agricultural activities.**

Thank you for your attention!

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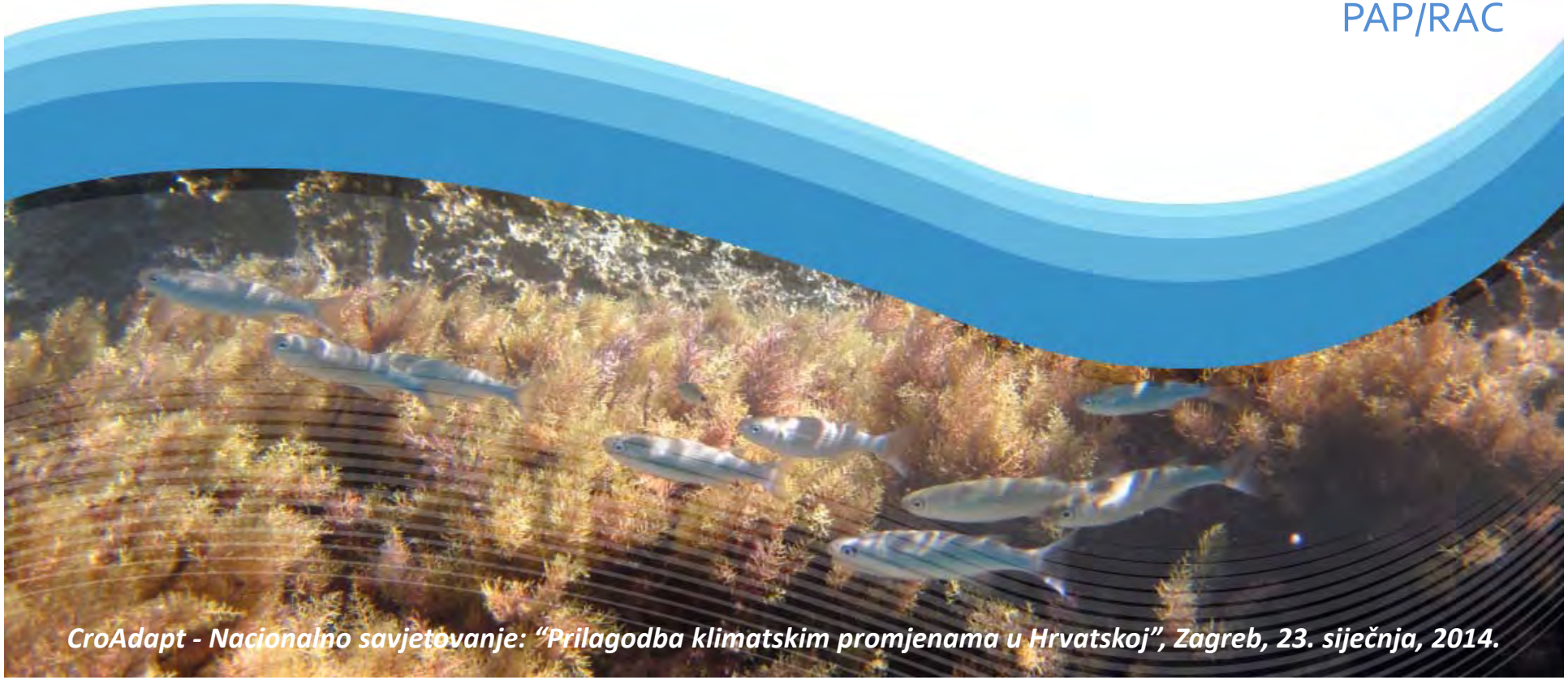
PAP/RAC

ClimVar & ICZM

Daria Povh Škugor
daria.povh@ppa.t-com.hr
PAP/RAC



CroAdapt - Nacionalno savjetovanje: "Prilagodba klimatskim promjenama u Hrvatskoj", Zagreb, 23. siječnja, 2014.

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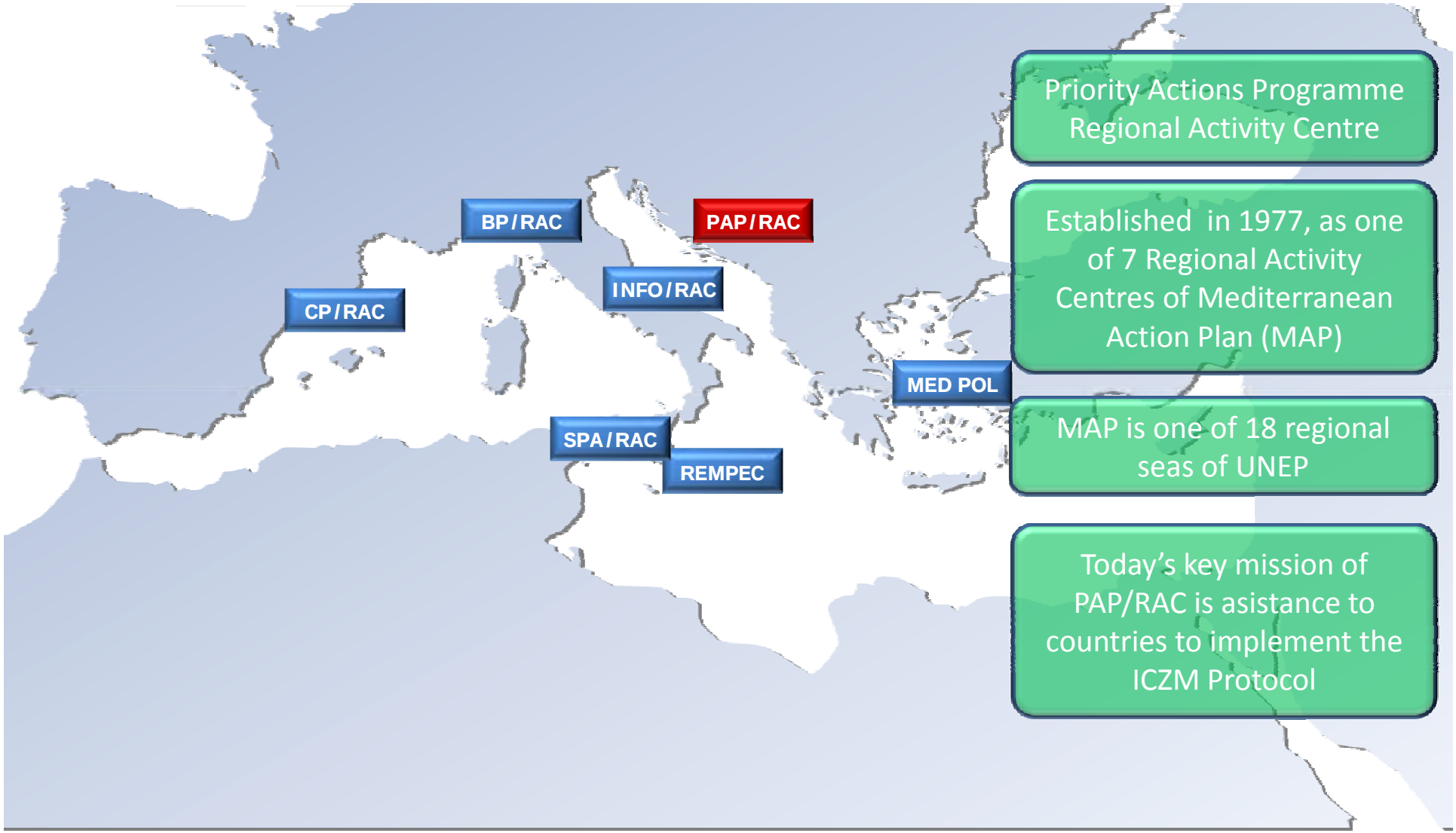

Priority Actions Programme Regional Activity Centre

Established in 1977, as one of 7 Regional Activity Centres of Mediterranean Action Plan (MAP)

MAP is one of 18 regional seas of UNEP

Today's key mission of PAP/RAC is asistance to countries to implement the ICZM Protocol

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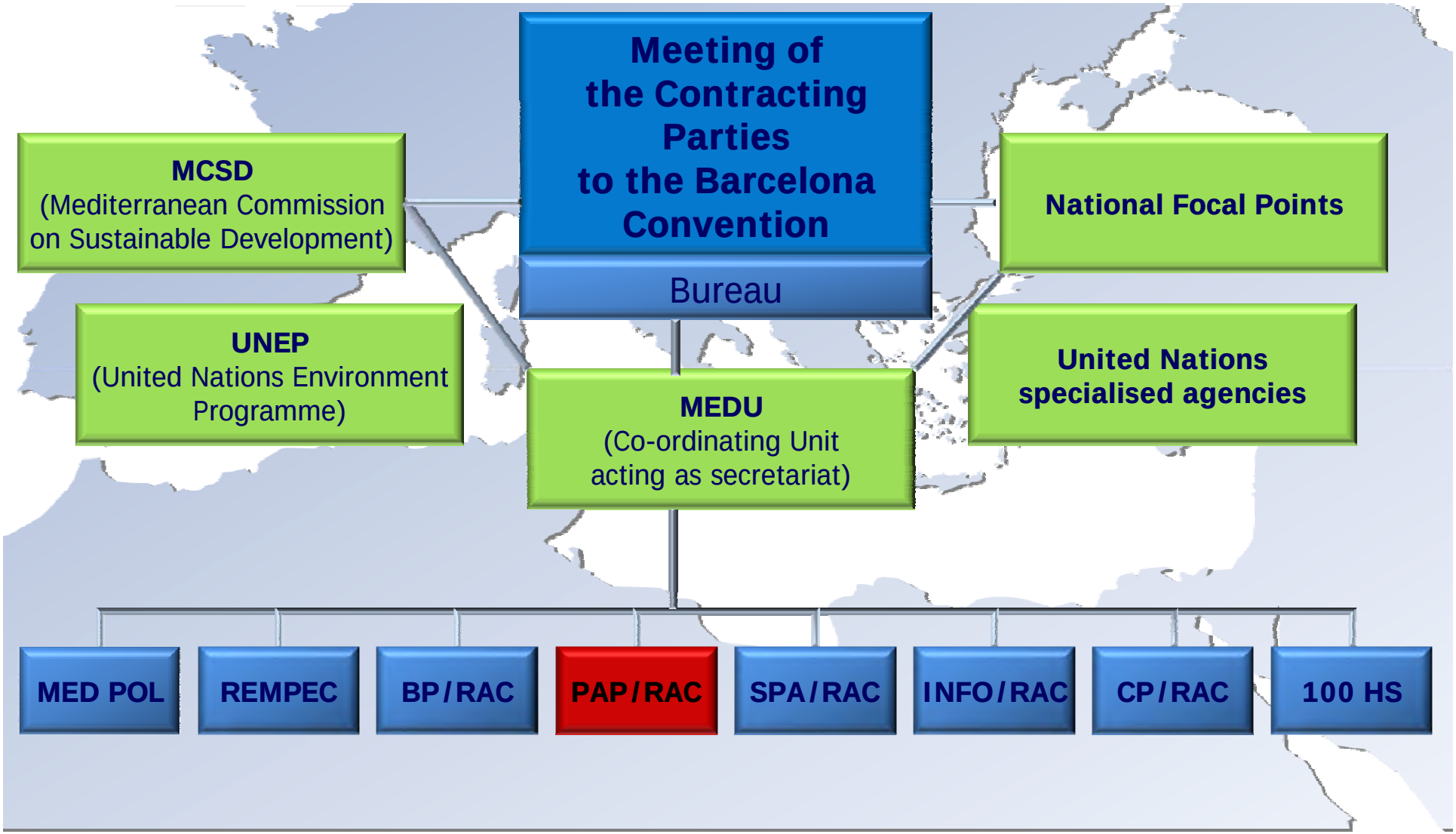
MAP STRUCTURE



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Key PAP/RAC Achievements

PAP/RAC

1993 1996 **1997** 1999 **2000** 2002 **2004** 2005 **2007** 2008 **2010** Ongoing...

Coastal Area Management Programmes (CAMPs) - MAP's programmes for sustainable coastal management

ICZM PROTOCOL
Signed in 2008
Entered into force 2011

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Project presentation

Cost assessment - DIVA

ICZM Plan

Climagine

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ClimVar & ICZM in a nutshell

PAP/RAC

Main objectives

To assist countries to mainstream the issue of climate variability and change into the ICZM by using instruments provided by Mediterranean ICZM Protocol.

Financing

US$ 2.3M (GEF funds) plus
US$ 7M co-financing

Duration

2-year duration (2013-2014)

IMPLEMENTING AGENCY

UNEP

EXECUTING AGENCIES

Coordinating Unit of the UNEP/MAP; PAP/RAC; GWP-Med and Blue Plan

COUNTRIES OF IMPLEMENTATION

Morocco, Algeria, Tunisia, Egypt, Palestinian Authority, Albania, Montenegro and Croatia

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ClimVar & ICZM
- a part of wider perspective -

PAP/RAC

MedPartnership project

The biggest partnership project in Mediterranean - against land-based pollution, for conservation of biodiversity and for ICZM

12 countries,
10 partners
Budget: 12,9MUS$
+36 M cofinancing
Duration: 5 years

Climate Variability and ICZM

Mission: To include climate variability and change

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Project Components

PAP/RAC

MedPartnership

- **INTEGRATED APPROACHES**
- LAND BASED POLLUTION
- BIODIVERSITY CONSERVATION

ClimVar and ICZM

- DATA MANAGEMENT
- **KNOWLEDGE BUILDING**
- **INTEGRATION INTO ICZM**

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Project Activities

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INTEGRATED APPROACHES:

National ICZM Strategies: Algeria & Montenegro

Economic & Social Assess. for Croatian Marine & Coastal Strategy

ICZM plans: Reghaia (Algeria) , Buna/Bojana TB

Integrative Methodological Framework

Replication: Croatian Marine and Coastal Strategy

LAND BASED POLLUTION

BIODIVERSITY CONSERVATION

ClimVar and ICZM

DATA MANAGEMENT

KNOWLEDGE BUILDING:

DIVA: Croatia & Tunisia

Downscaling of DIVA Šibenik-Knin County (Croatia)

INTEGRATION INTO ICZM:

ICZM Plan with focus on CVC – Šibenik-Knin County (Croatia)

Awareness raising

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Project Activities

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INTEGRATED APPROACHES:

National ICZM Strategies: Algeria & Montenegro

Economic & Social Assess. for Croatian Marine & Coastal Strategy

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INTEGRATION INTO ICZM:

ICZM Plan with focus on CVC - ŠK County (Croatia)

Awareness raising

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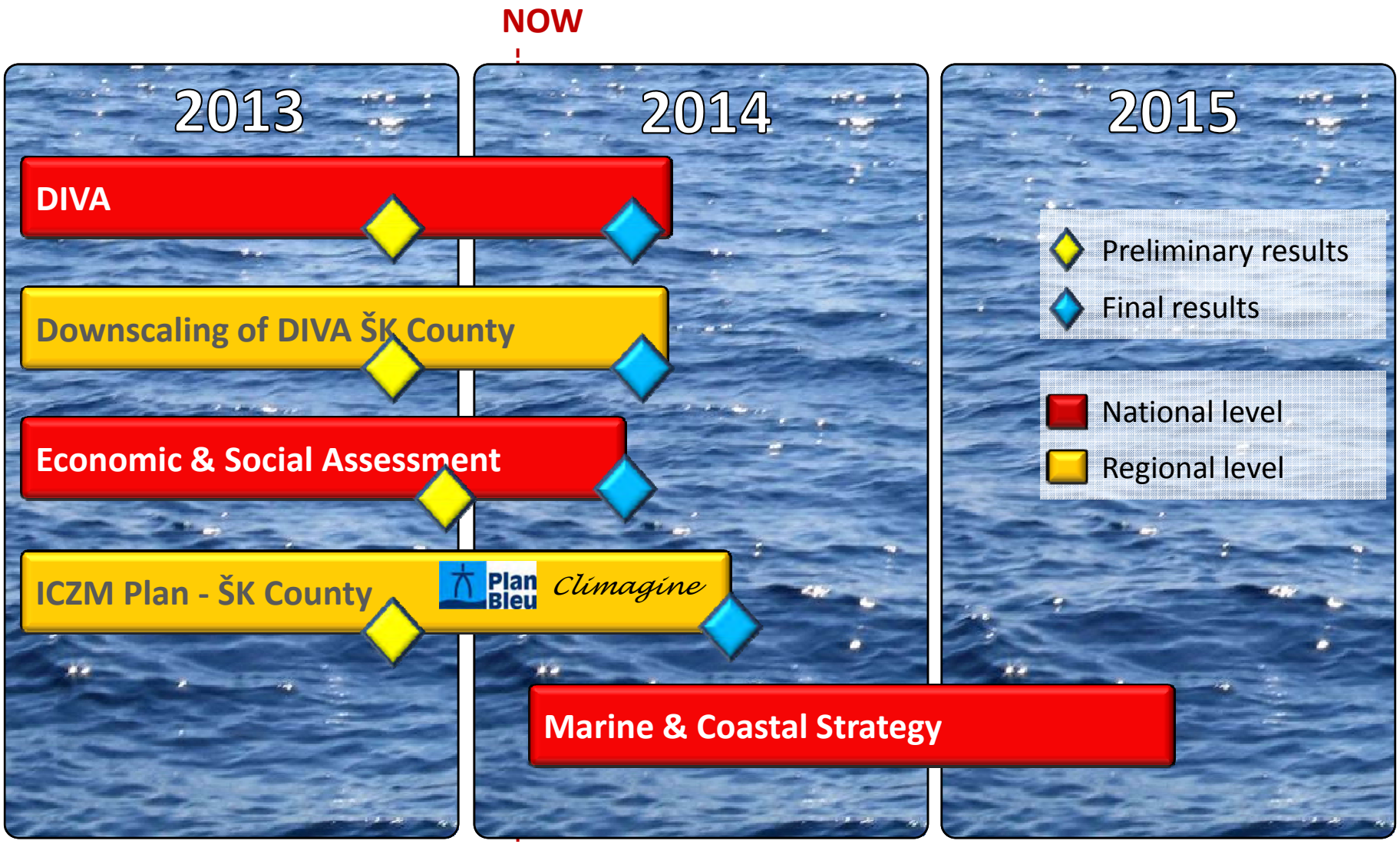
Activities in Croatia



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What is DIVA?

PAP/RAC

Global Climate Forum

DIVA

- **Dynamic Interactive Vulnerability Assessment** – considered as currently most comprehensive and most relevant method policy-wise

- integrated global model for assessing biophysical and socio-economic consequence of sea-level rise and associated extreme water levels acc. to various physical and socio-economic scenarios, taking into account various adaptation strategies.

- **DIVA** was formed within DINAS COAST project, and applied in others such as PESETA, CLIMATE-COST, ADAM and BRANCH, UNFCCC report on coastal area adaptation, in Asia-Pacific Integrated Coastal Vulnerability Assessment Network of Southeast and East Asia, COMPASS project for Argentina, Bracil and Chile etc.

University of Kiel

bc3
BASQUE CENTRE
FOR CLIMATE CHANGE
Klima Aldaketa Ikergai

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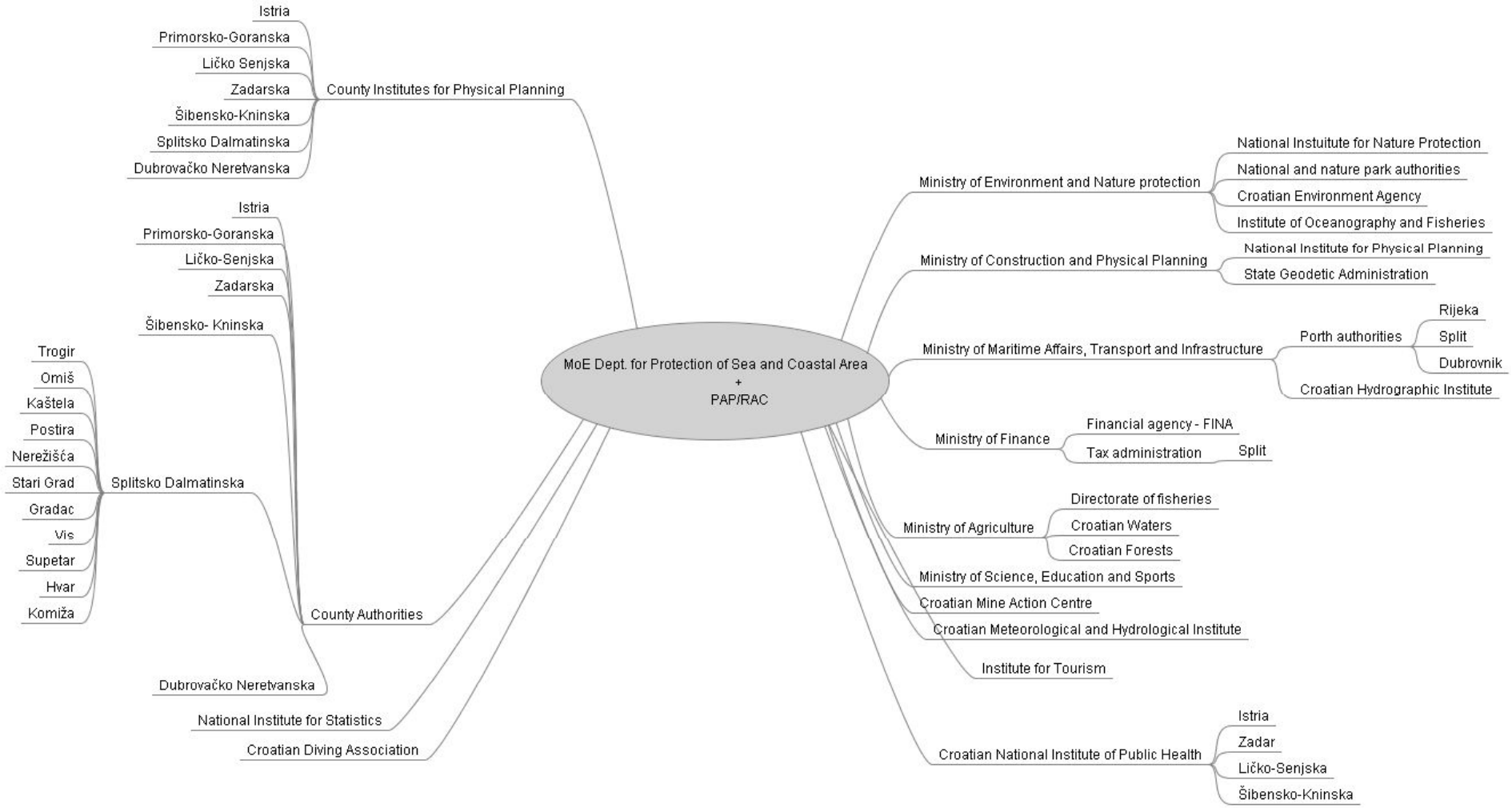
DIVA – DATA COLLECTION



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DIVA – COASTAL SEGMENTATION

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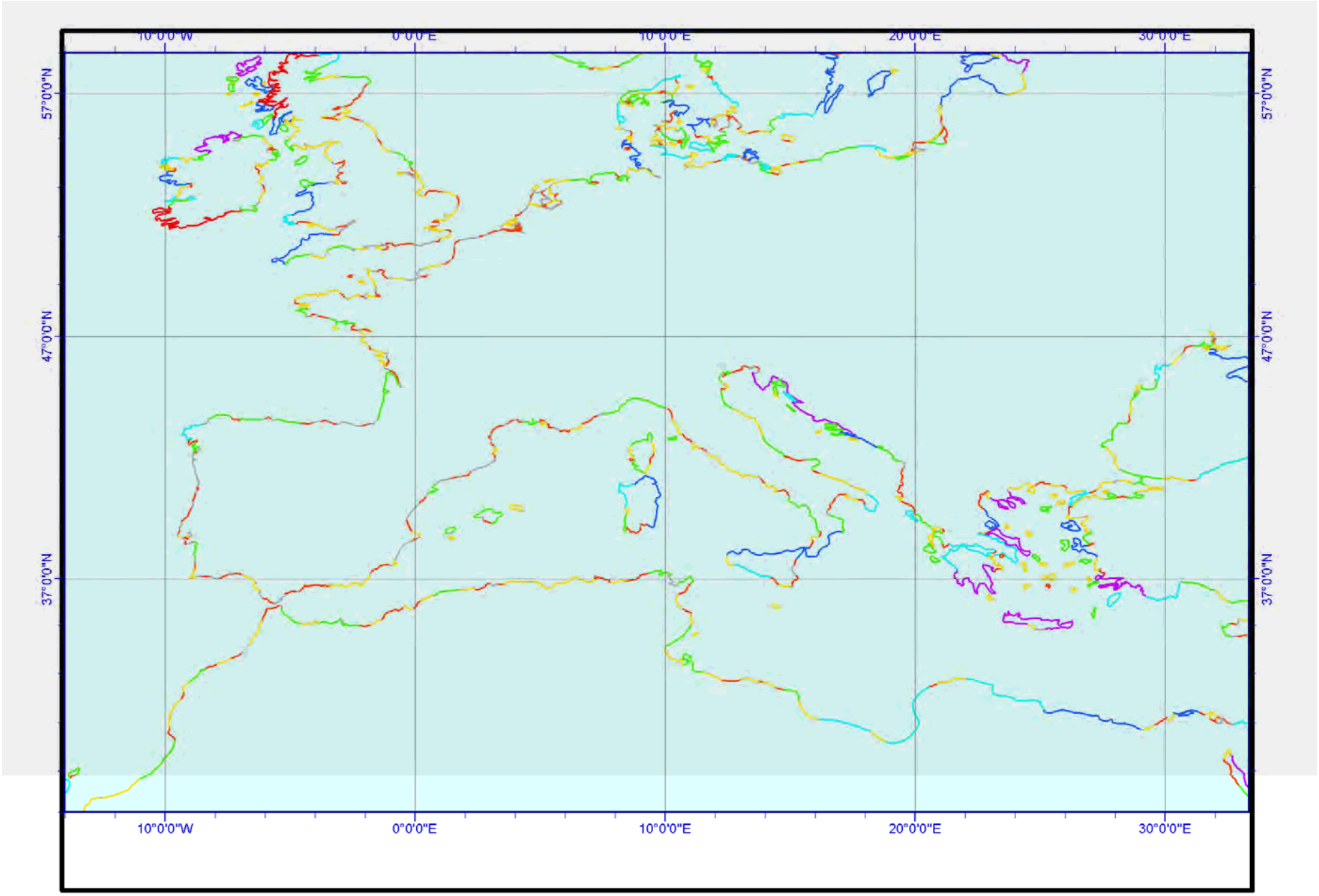

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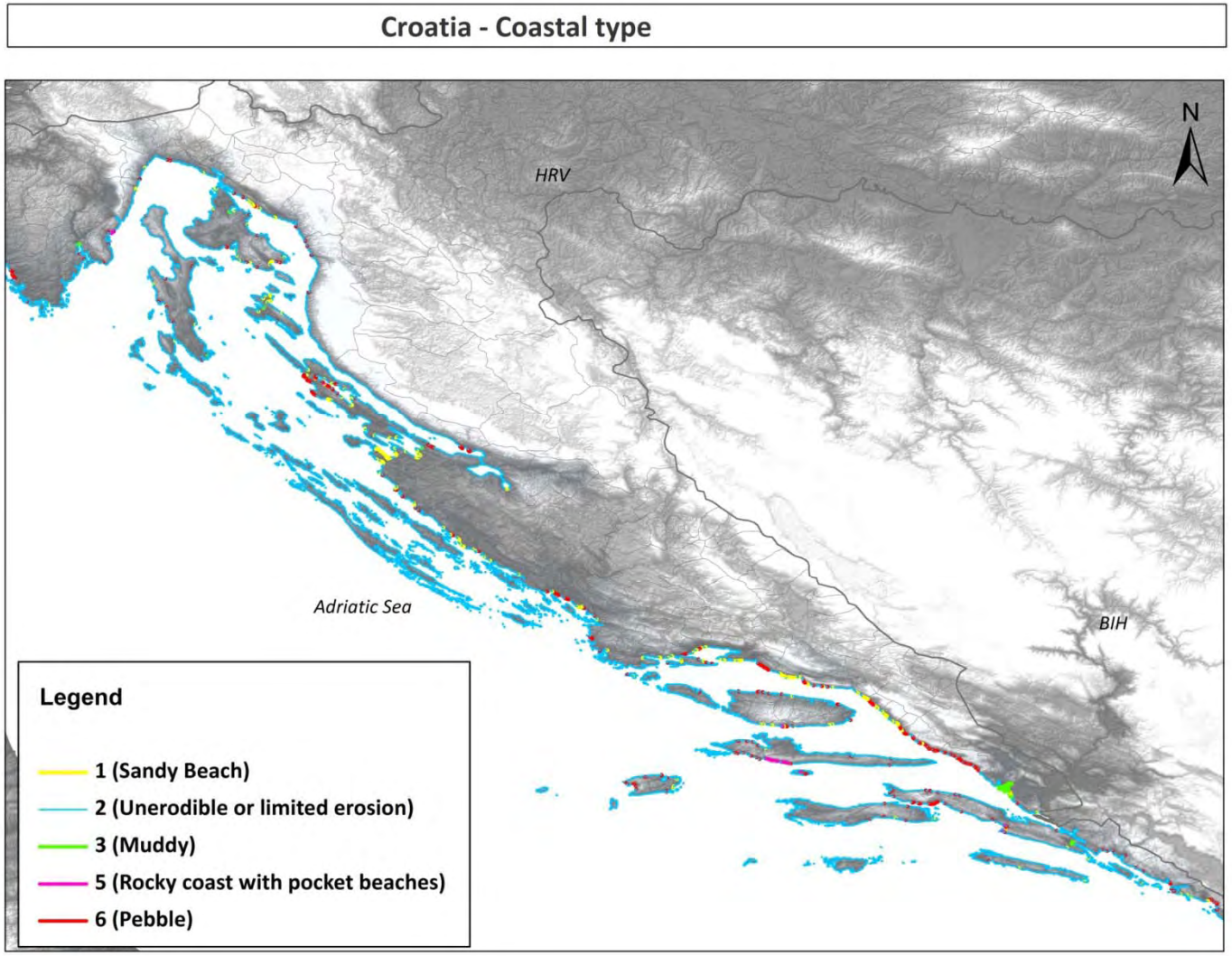
DIVA – CROATIAN COASTLINE



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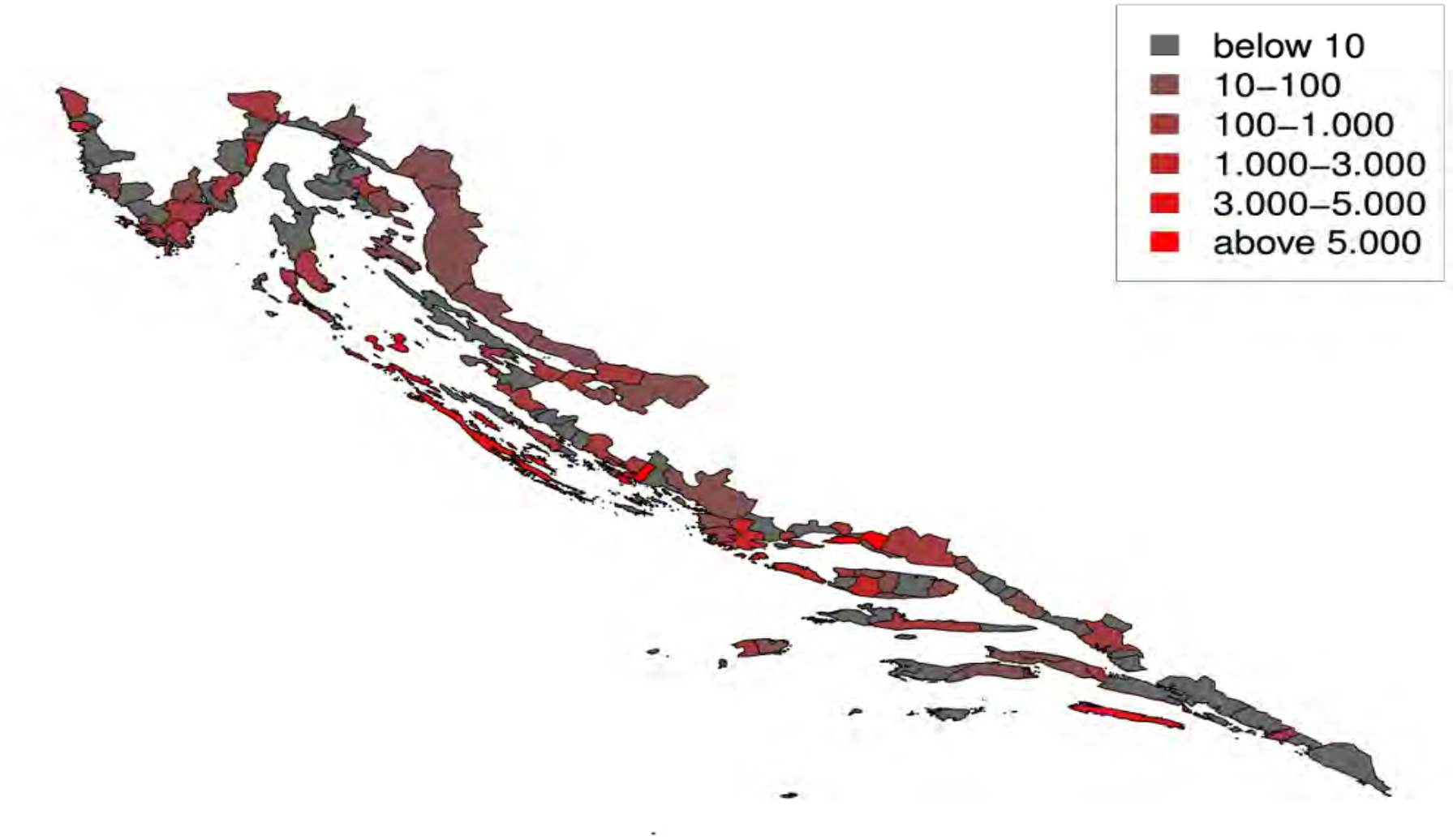
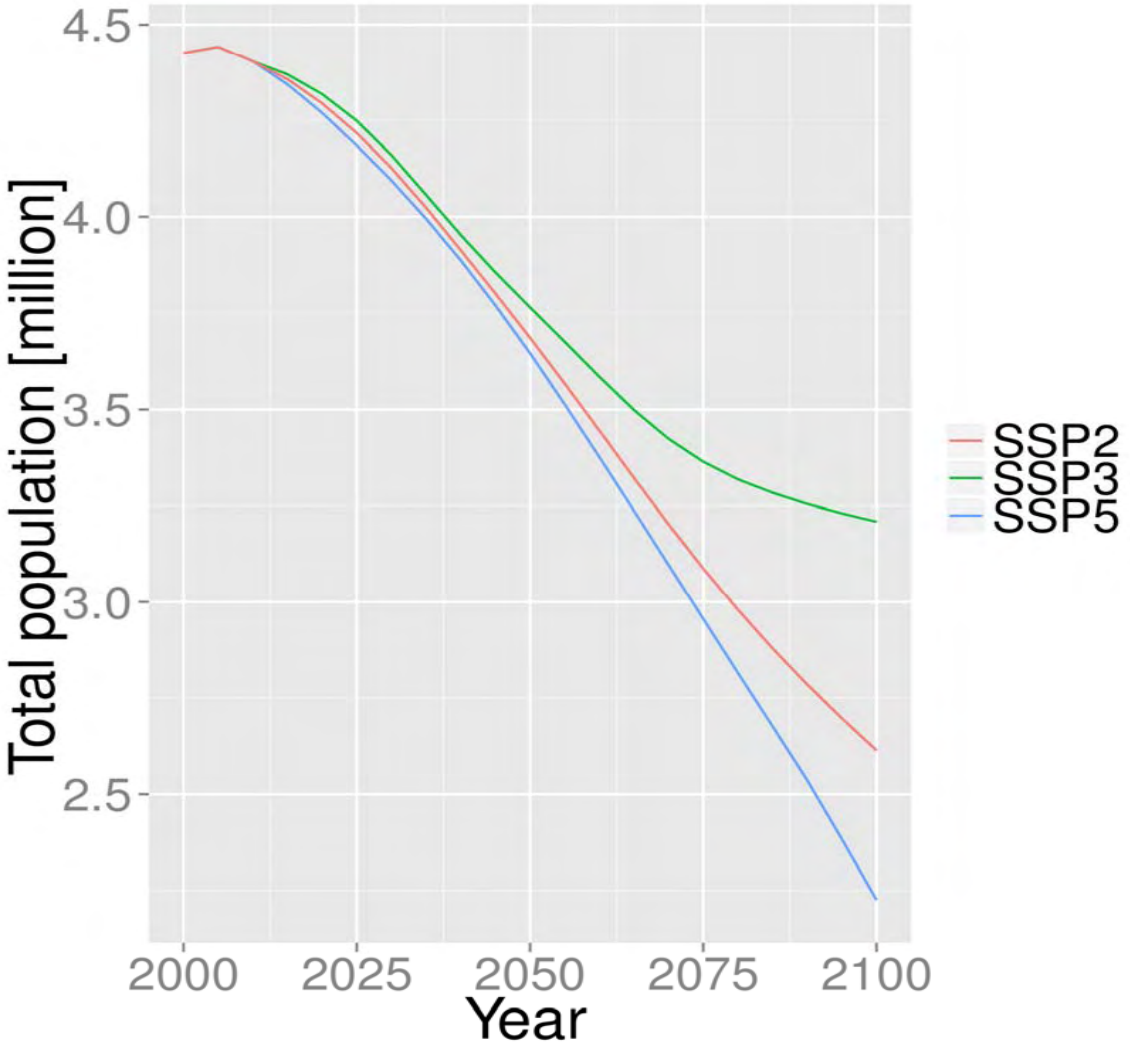
Croatia – People below 2m in 2011

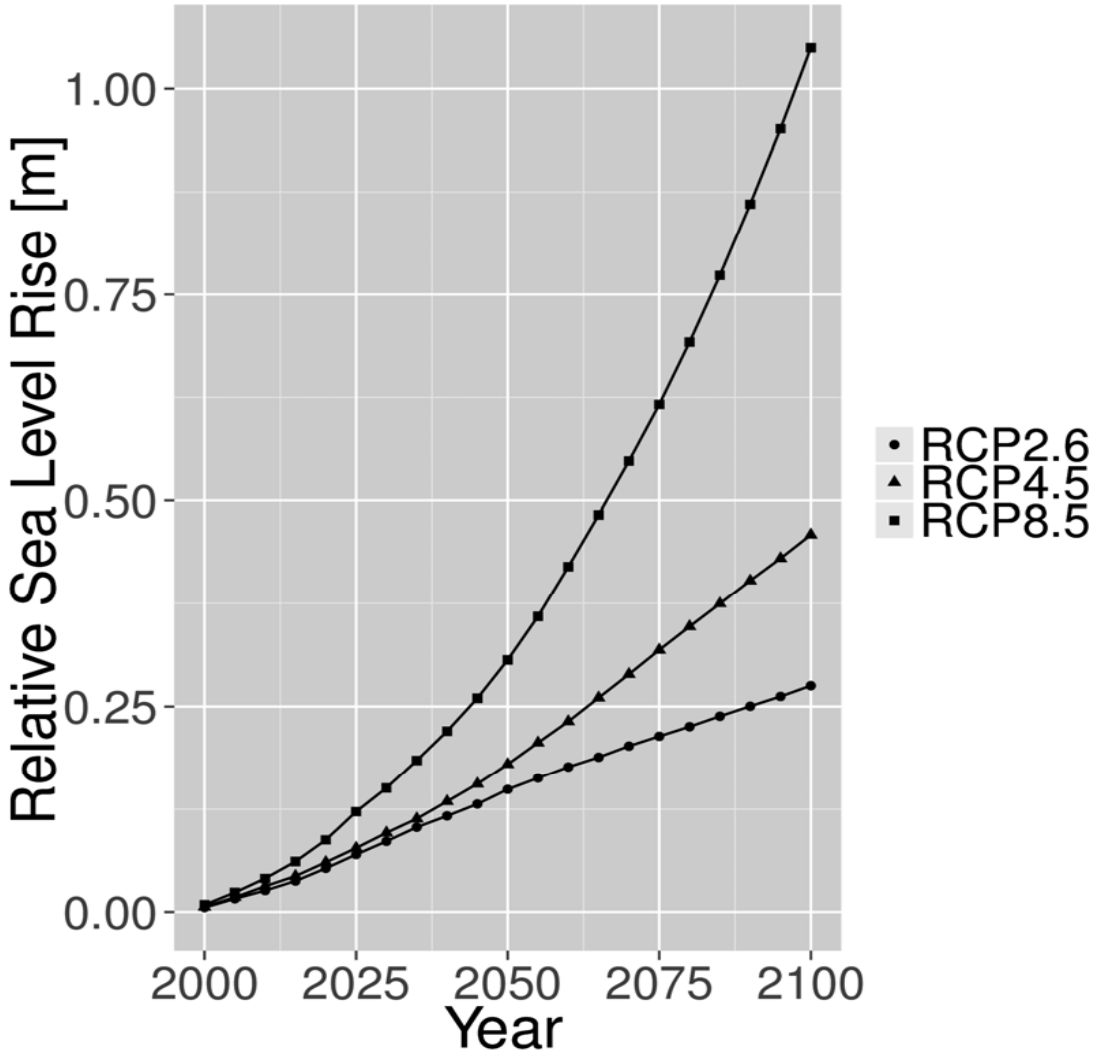


Croatia – Population scenarios



- We use 3 socio-economic scenarios
- SSP3: poor, densely populated world
- SSP5: rich, less densely populated world
- SSP2: in between
- Declining population for Croatia in all scenarios
- 2100: 2.2 to 3.4 million people
- Source: SSPs, IIASA

Croatia – Sea level rise scenarios



- Three SLR scenarios: RCP2.6, RCP4.5, RCP8.5
- All computed with HadGEM2-ES and an ice-shield melting projection
- SLR for Croatia between 28 and 105 cm in 2100
- Uplift included

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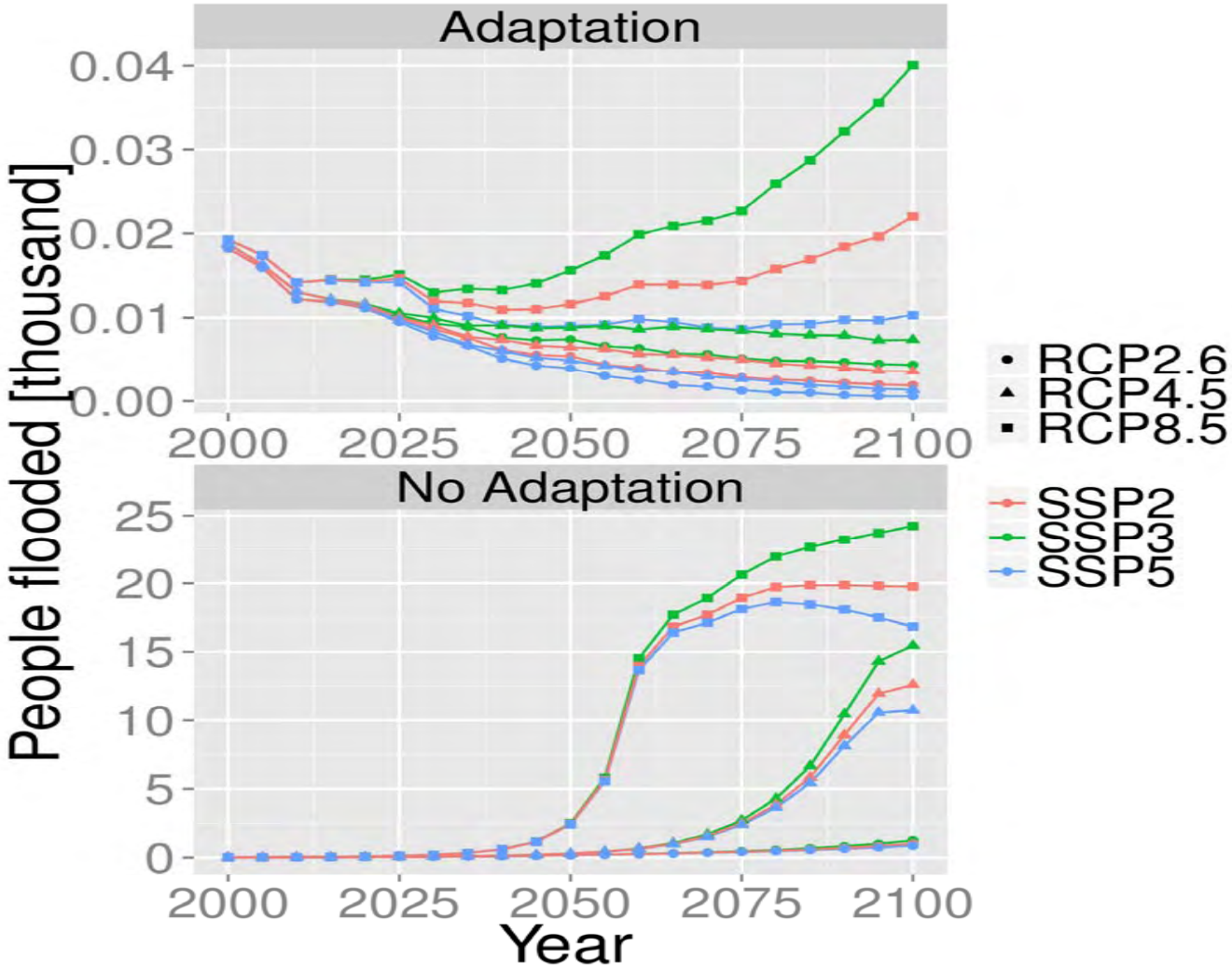
Croatia – People Flooded



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Croatia – People Flooded

2100, SSP2, RCP4.5, no Adaptation

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COASTAL CONSTRUCTION TRENDS…

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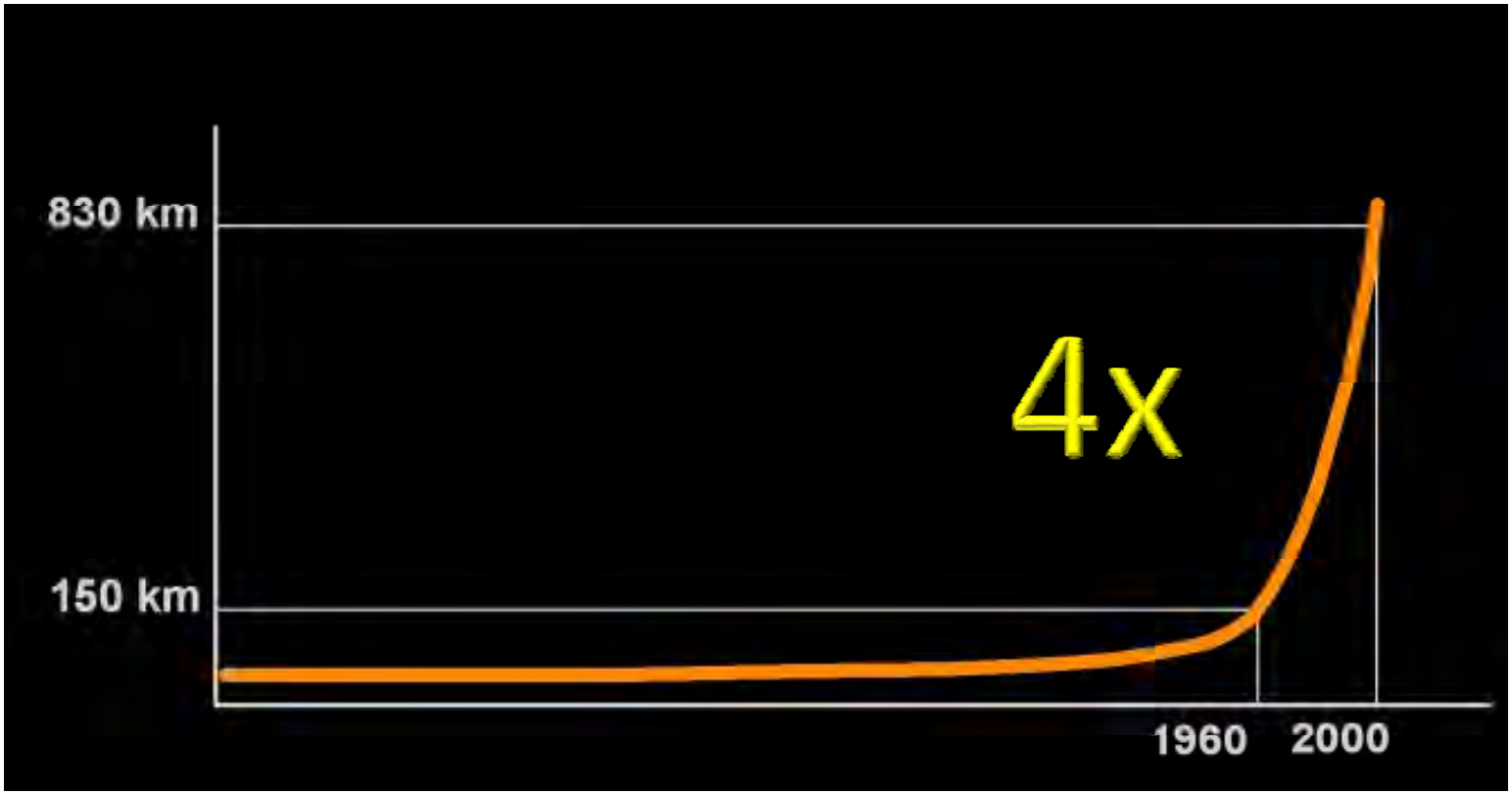

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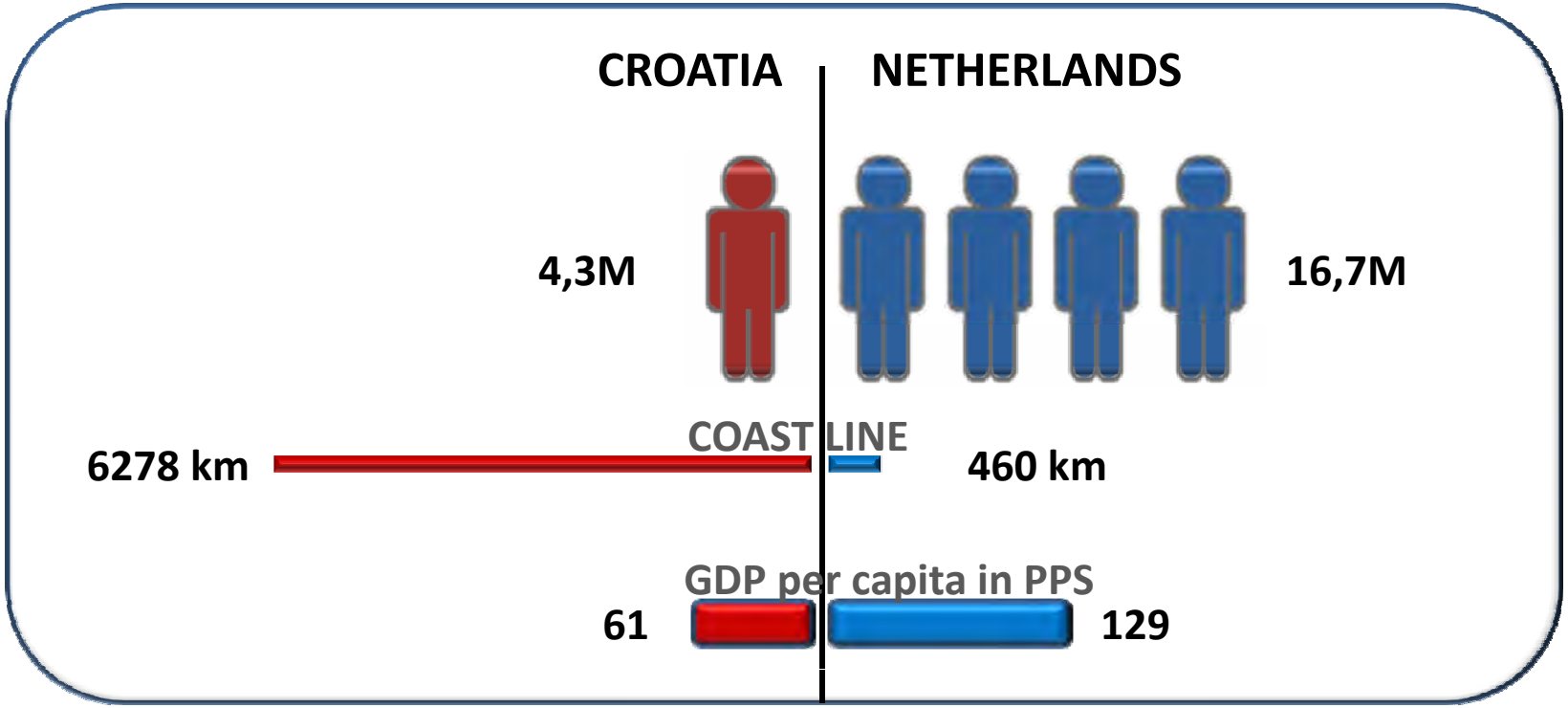
WHO WILL COVER THE COST…



Split Area - Areas below 1m

Dubrovacko-Neretvanska - Areas below 1m

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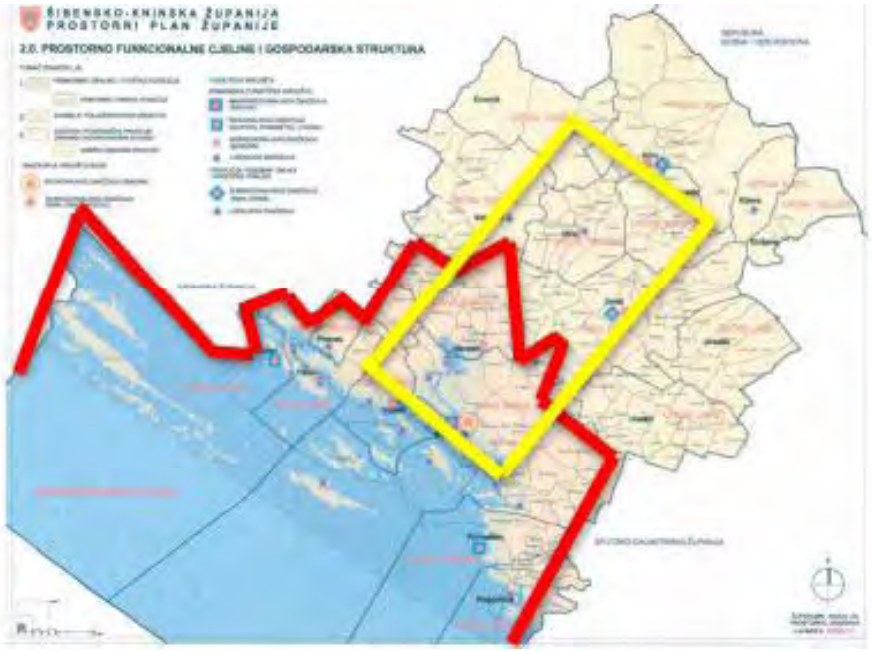
IUOP

Plan integralnog upravljanja obalnim područjem
Šibensko-kninske županije

PURPOSE OF IZCM PLAN DEVELOPMENT

- Defining sustainable development policy of the Šibenik-Knin County's coastal zone
- Coordination of development initiatives
- Support to formulation of sectoral policies and plans
- Support to mainstreaming sectoral plans into coastal zone sust. development policy



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Plan integralnog upravljanja obalnim područjem
Šibensko-kninske županije

LEGAL BASIS

- ICZM Protocol
- Zoning Plan of the Šibenik-Knin County
- At national level, no legal obligations to prepare ICZM plans or CC adaptation plans exist yet

EXPECTED RESULTS

- ICZM plan is not a zoning, normative or regulatory document, but an indicative plan
- It defines specially endangered areas in relation to coastal processes, particularly areas vulnerable to climate change and variability
- It suggests mitigation measures which should be incorporated into normative plans
- It defines a system of coastal zone management instruments to avoid conflicts achieve agreement and consensus
- Primarily a long-term plan, in line with the long-term nature of the consequences of coastal processes

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Šibensko-kninske županije

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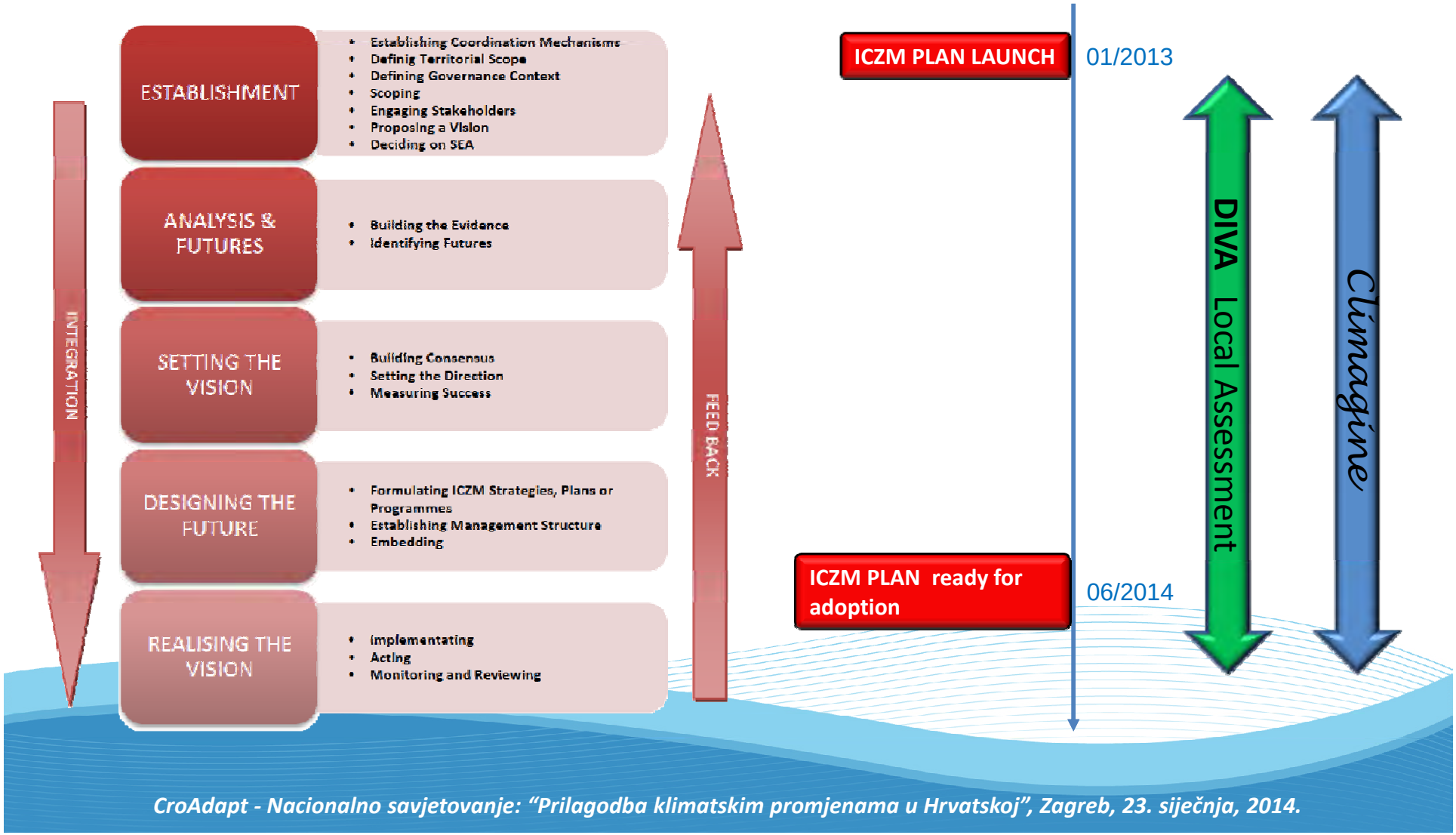
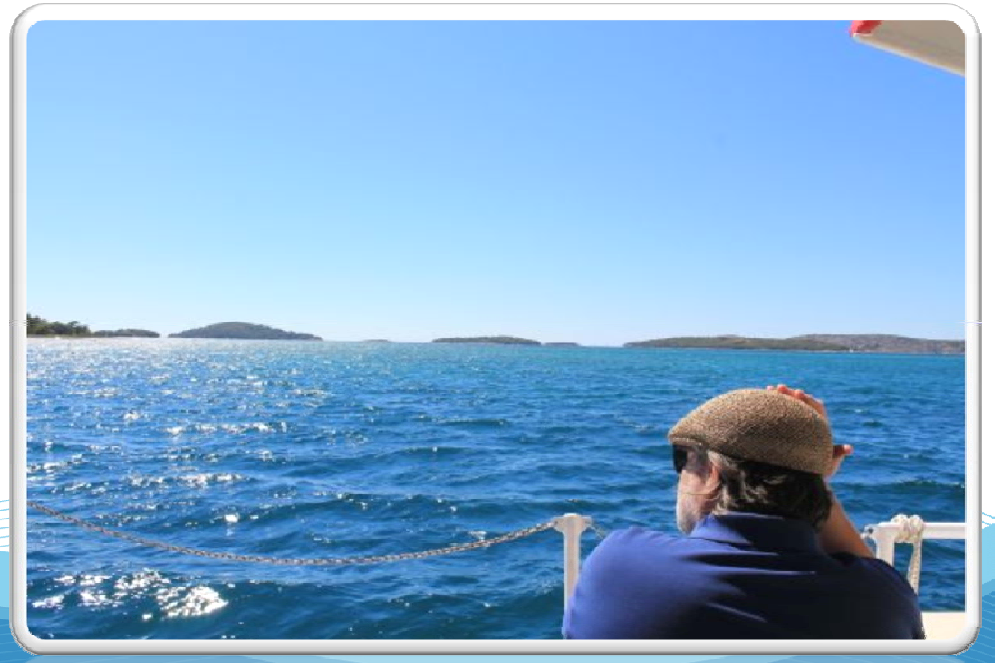
ICZM PLAN PREPARATION PROCESS



THEMES:

1. Territory as the key resource of coastal zone
2. Climate variability and change, a transversal theme that impacts:
   - waters & water management
   - infrastructure,
   - biodiversity,
   - economy and society.

3. Tools – GIS



DIAGNOSTIC ANALYSIS:

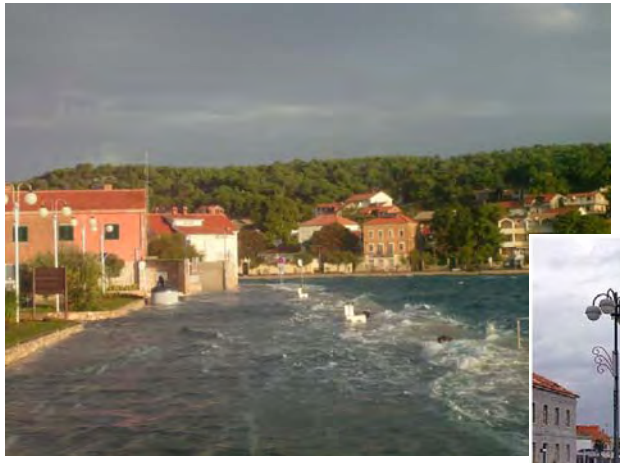
- Coastal resources
- Development pressures/drivers
- Analysis of existing vulnerability/status
  - Nature-based
  - Socio-economic
  - Institutional
- Developmental and climatic scenarios
- Analysis of future vulnerability

Dolac, 2012

Dolac, 2013

Jadrija

Pirovac, 2010

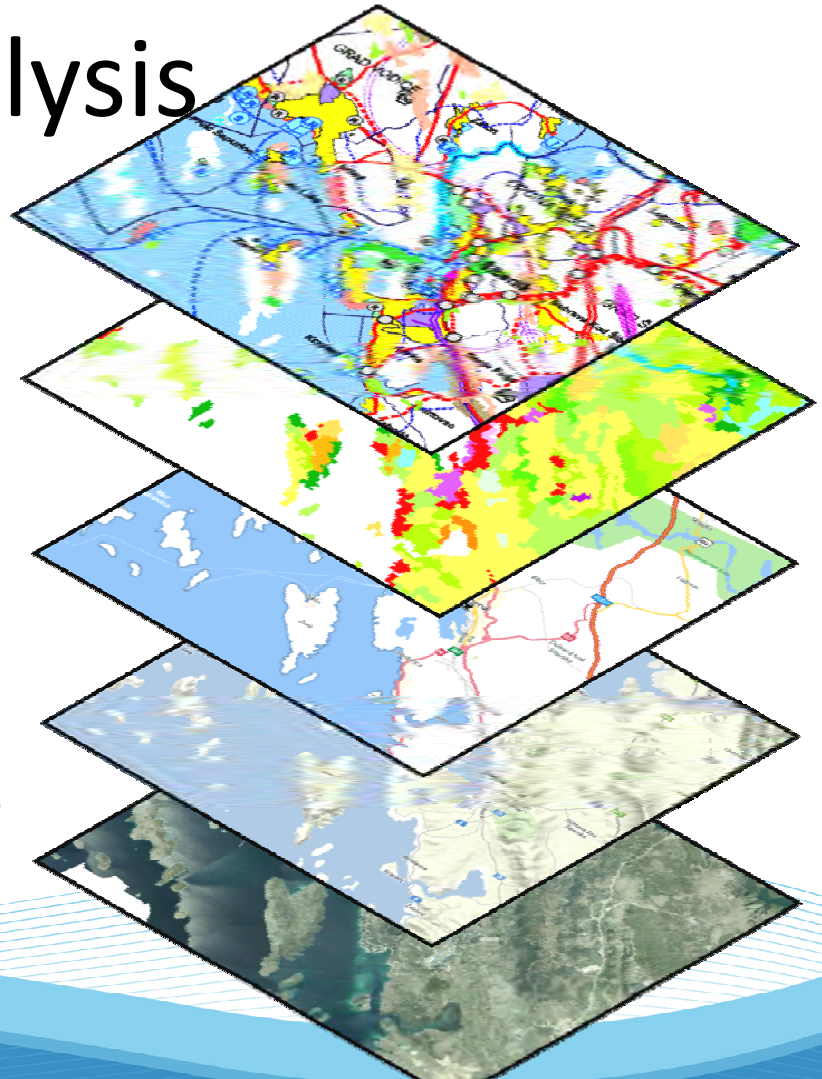


Vodice, 2008

Tisno

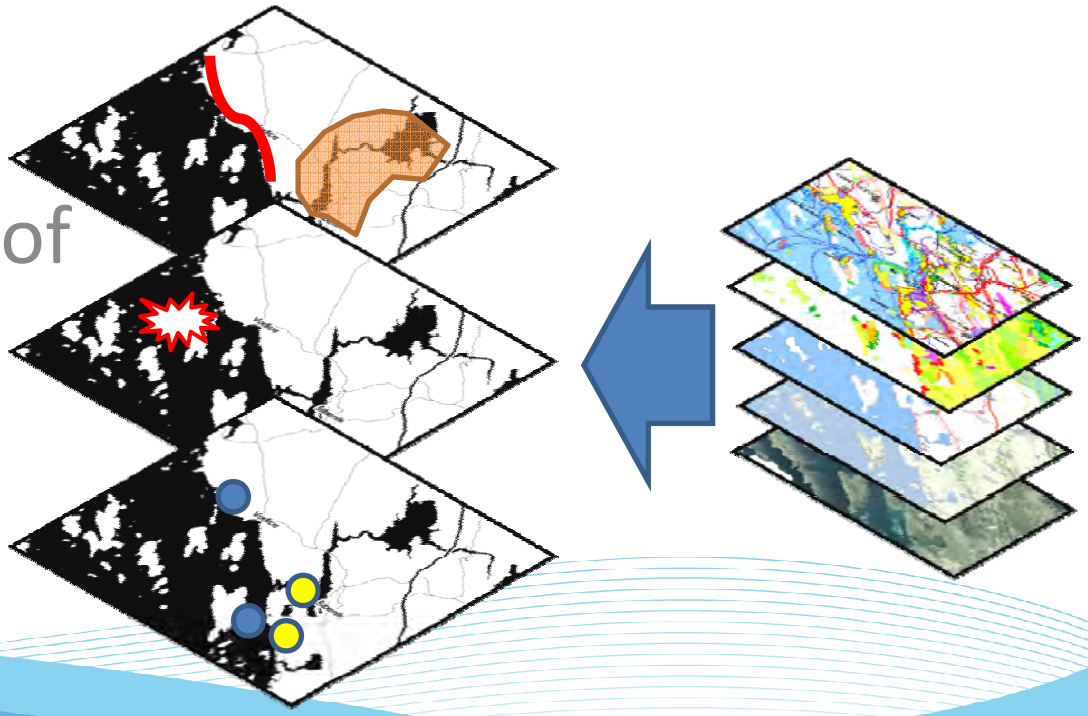
Geospatial data analysis

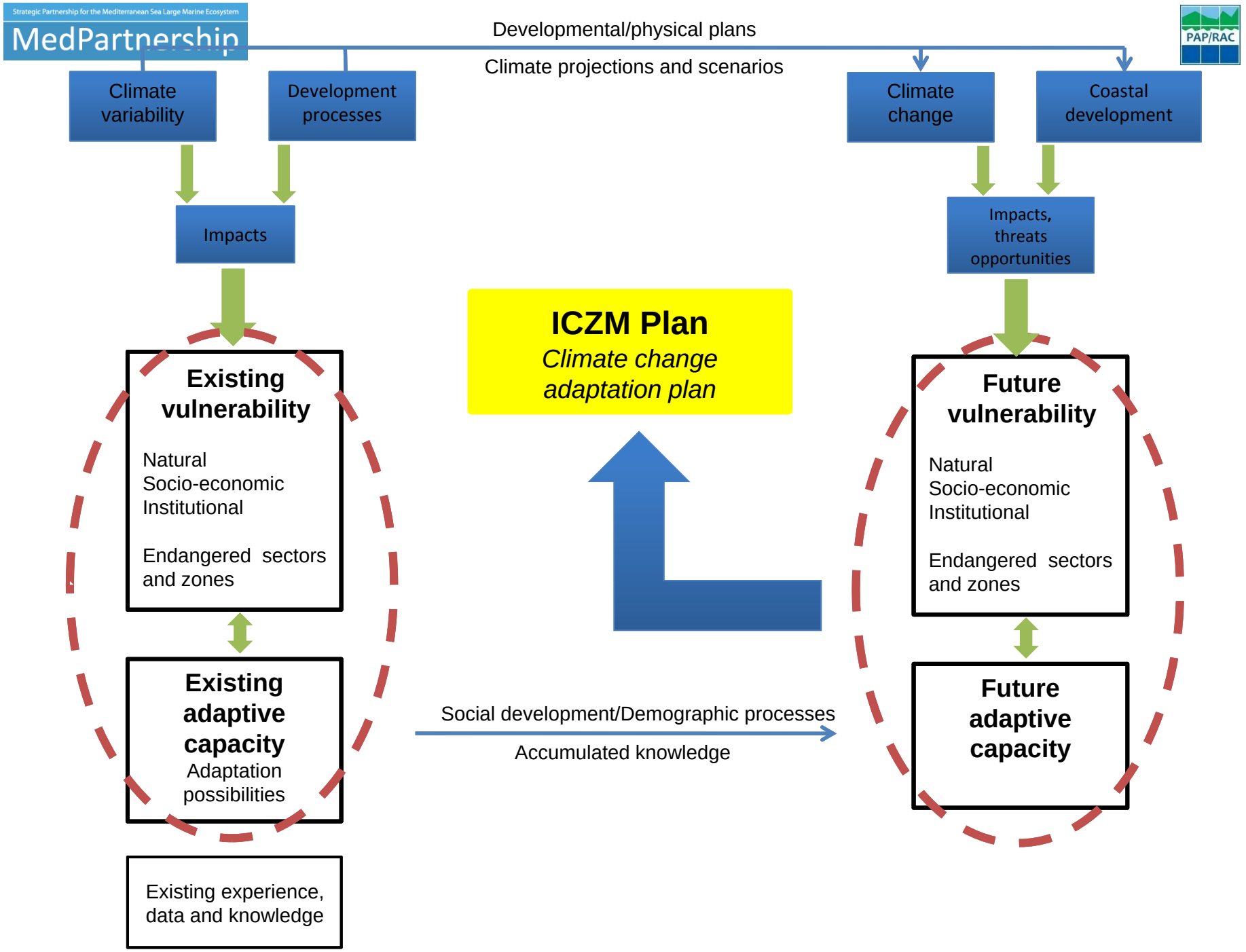
- Ortophoto map
- Topography
- Administrative division
- Demographic data & economic statistics
- Coastal zone
- Hydrological data
- Physical planning data (purpose, infrastructure, protection)
- Protection of territory



Geospatial analysis

- Climate hazards
- Negative impacts of development processes
- Vulnerabilities

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Developmental/physical plans
Climate projections and scenarios
Climate variability
Development processes
Climate change
Coastal development
Impacts
Impacts, threats opportunities
ICZM Plan
Climate change adaptation plan
Existing vulnerability
Natural
Socio-economic
Institutional
Endangered sectors and zones
Existing adaptive capacity
Adaptation possibilities
Existing experience, data and knowledge
Future vulnerability
Natural
Socio-economic
Institutional
Endangered sectors and zones
Future adaptive capacity
Social development/Demographic processes
Accumulated knowledge

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What is Climagine?

CLIMAGINE

is a participatory method that enables identification of the vision of sustainable development; describe, assess and question the past, present and future sustainability levels of local systems by using sustainability indicators and thresholds; set the goals and define necessary monitoring schemes for sustainable development achievements – with special focus on climate change, all with the help of relevant social actors.

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Šibensko-kninske županije

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PARTICIPATORY APPROACH

What did Climagine reveal?

Themes identified

- tourism
- coastline infrastructure (facilities, water supply & sewage, ports/harbours,…)
- agriculture
- mariculture
- *fires*
- *heat waves*
- *drinking water (accessibility, salinity, quality)*
- *pollution (industry near Knin)*
- *lake eutrophication*
- *sea level rise in Krka river estuary*
- *local economy on islands*
- *…*

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OPEN-AREA FIRES

- Identified as the nearest climate hazard
- High temperatures, less precipitation and more drought periods will certainly increase the fire hazards (IPCC)
- Extended duration of fire season is expected, extreme conditions in many areas, as well as increased risk zones and higher probability of fires over large-areas (ForestEurope, 2010)
- According to EFFIS database, Croatia is among the European countries with the highest fire hazard

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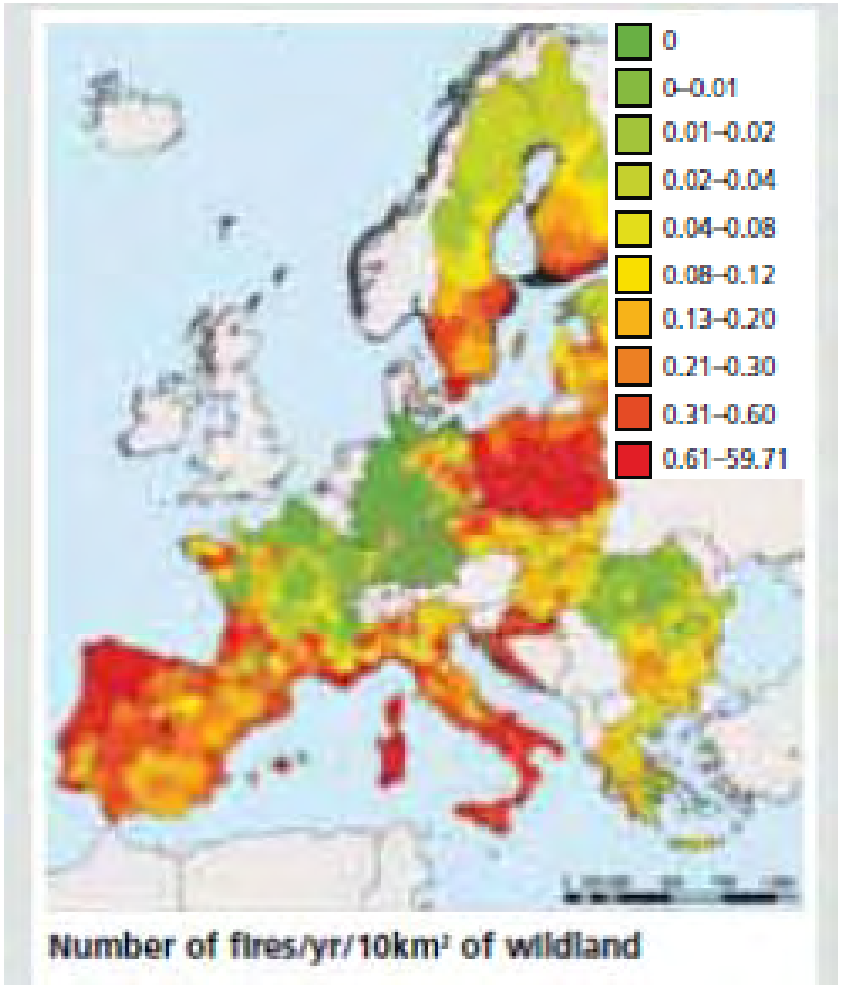
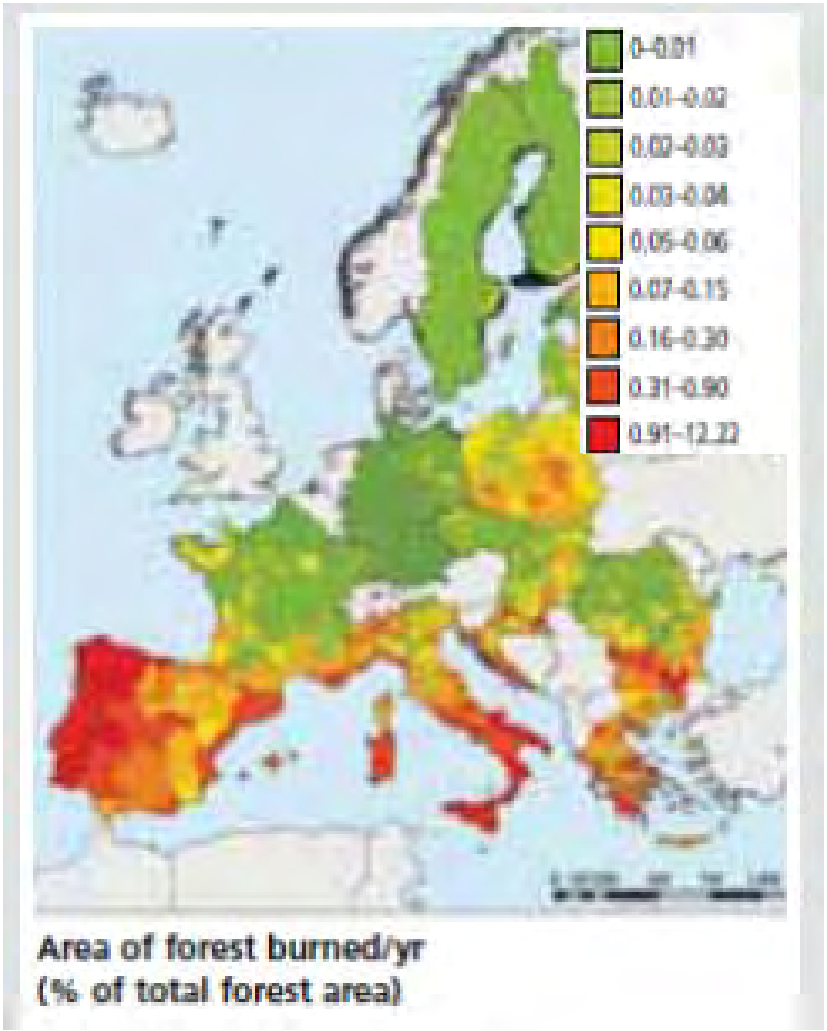
PAP/RAC

Average forest fire density and average burned forest percentage in Europe, 1998–2007





Source: FAO Global Forest Resources Assessment 2010

Strategic Partnership for the Mediterranean Sea Large Marine Ecosystem
MedPartnership

PAP/RAC

iczm a better way

visualising the coastal future you want
...enabling you to achieve it

Thank You for your attention!

ENVIRONMENT AGENCY AUSTRIA umweltbundesamt

Introducing Climate Change Adaptation across governance levels: From the EU to experiences in Austria

Sabine McCallum Zagreb 23 January 2014

EU strategy on adaptation to climate change

Adopted: European Commission on 16 April 2013

Overall aims: Make Europe more climate-resilient - enhance the preparedness and capacity of all governance levels to respond to the impacts of climate change

Three key objectives:

1. Promoting action by Member States: The Commission encourages all Member States to adopt comprehensive adaptation strategies and will provide guidance and funding to help them build up their adaptation capacities and take action.

2. Promoting better informed decision-making by addressing gaps in knowledge about adaptation and further developing the European Climate Adaptation Platform (Climate-ADAPT) as the 'one-stop shop' for adaptation information in Europe.

3. Promoting adaptation in key vulnerable sectors through agriculture, fisheries and cohesion policy, ensuring that Europe's infrastructure is made more resilient, and encouraging the use of insurance against natural and man-made disasters.

The EU Adaptation Strategy package 1/3

Communication: "An EU Strategy on Adaptation to Climate Change", COM (2013) 216	To present the main challenges and the suggested policy orientations to address them
Impact Assessment (vol. I and II), SWD (2013) 132 and SWD (2013) 133	To prepare evidence for political decision-makers on the advantages and disadvantages of possible policy options by assessing their potential economic, social and environmental impacts
Green Paper on the prevention and insurance of disasters, COM (2013) 213	To evaluate and report on the potential for the EU to support increased coverage of appropriate disaster risk insurance and financial risk transfer markets, as well as regional insurance pooling, in terms of knowledge transfer, cooperation, or seed financing
Guidelines on developing adaptation strategies, SWD (2013) 134	To help prepare or revise climate change adaptation strategies. To build on and make more operational the Adaptation Support Tool available on Climate-ADAPT

The EU Adaptation Strategy package 2/3

Climate change adaptation, marine and coastal issues, SWD (2013) 133	To provide further background material supportive of the Communication on adaptation challenges for marine and coastal issues. To present the outline of actions that the Commission is undertaking in the area of coastal zones, marine issues and climate change adaptation
Adapting to climate change impacts on human, animal and plant health, SWD (2013) 136	To emphasise the social and environmental implications of climate change and climate change adaptation on health issues, as well as highlighting most recent initiatives in the area
Adapting infrastructure to climate change, SWD (2013) 137	To provide further background material supportive of the Communication on adaptation challenges in three key economic sectors: energy, transport and construction/buildings

The EU Adaptation Strategy package 3/3

Climate change, environmental degradation and migration, SWD(2013) 138	To provide an overview of the research and data on the inter-linkages between migration, environmental degradation and climate change. To review initiatives of relevance for the topic which are already being taken by the EU in various policy fields. To analyse on-going debates on policy responses at EU and international level
Technical guidance on integrating climate change adaptation in programmes and investments of Cohesion Policy, SWD (2013) 135	To provide advice, methods, tips and examples to understand and integrate climate adaptation needs and priorities into Operational Programmes for the next programming period (2014-2020)
Principles and recommendations for integrating climate change adaptation considerations under the 2014-2020 rural development programmes, SWD (2013) 139	To provide advice, methods, tips and examples to understand and integrate climate adaptation needs and priorities into Member States' Rural Development Programmes (RDP) for the next programming period (2014-2020)

Other related documents and studies

- Guidelines for Project Managers: Making vulnerable investments climate resilient, non-paper
  -> To provide support to developers of physical assets and infrastructure on the steps they can take to make investment projects resilient to climate variability and change.

- Methodologies for climate proofing investments and measures under cohesion and regional policy and the common agricultural policy – Final report; Identifying the climate risks related to rural areas and adaptation options; sectoral fiches Cohesion policy and adaptation
- Background report to the preparation of the Impact assessment on the EU adaptation strategy – part I+II
- Report analysing the results of the public consultation on the preparation of the EU Adaptation Strategy

The EU Adaptation Strategy package: http://ec.europa.eu/clima/policies/adaptation/what/documentation_en.htm

Related studies: http://ec.europa.eu/clima/policies/adaptation/what/studies_en.htm

Results of the public consultation: http://ec.europa.eu/clima/consultations/articles/0015/report_en.pdf

Support to the preparation of the EU strategy

- From December 2011 until February 2013 by the service contract "Support to the development of the EU strategy for adaptation to climate change" – EU AdaptStrat (CLIMA.C.3/SER/2011/0026)

- Project team: Environment Agency Austria (EAA): Project Lead
  Fresh Thoughts Consulting (FT): Project Co-Lead
  Ricardo - AEA
  FEEM Servizi Srl (FEEM)
  Alterra
- Main Tasks
  - ✓ Compile comprehensive background information to inform the Impact Assessment
  - ✓ Consolidate current knowledge, identify knowledge gaps and develop a strategy for closing them
  - ✓ Identify and assess policy options
  - ✓ Review existing EU policies and elaborate concrete options for mainstreaming adaptation
  - ✓ Facilitate exchange between and cooperating with Member States, regions, cities and all other relevant stakeholders, including EC internal exchange through lunch seminars with COM services
  - ✓ Elaborate guidelines for adaptation

Selected areas of support for the EU Adaptation Strategy:
The cascade of mainstreaming 1/7

- Mainstreaming concept
  - ✓ 'Mainstreaming', 'climate proofing' and 'integration' of adaptation are increasingly important in policy making, reflecting the view that adaptation to climate change cuts across various policy areas/sectors that are affected by climate change
  - ✓ The objective of mainstreaming climate change adaptation is to ensure that relevant policies take due account of climatic changes they are concerned with and thus help increasing societal and ecosystem resilience
  - ✓ Mainstreaming efforts need to be coherent across various levels of governance
  - ✓ Policy mainstreaming also has the potential to tackle specific bottlenecks like inconsistencies in policy and market beyond introducing adaptation considerations -> cross-sectoral policy integration

Selected areas of support for the EU Adaptation Strategy: **The cascade of mainstreaming 2/7**

- Mainstreaming efforts at EU level
  - ✓ The EU White Paper on adaptation (EC, 2009) already strongly recommended climate proofing of key EU policy areas
  - ✓ Mapping the status-quo of mainstreaming efforts at EU level mid-2012 showed that:
    - Integration of climate change considerations in some key EU sectors has been achieved in line with what was proposed in the White Paper and beyond
    - However, only a limited number of legislative acts are considering climate change with varying level of detail
    - Several policy areas are not at all addressing climate change
    - ➡ Mainstreaming adaptation into a much wider set of policies and legal actions is needed

Selected areas of support for the EU Adaptation Strategy: **The cascade of mainstreaming 3/7**

- Mainstreaming efforts at national level
  16 EU Member States have adopted a national adaptation strategy (NAS) so far:
  - ✓ Each of the NAS has been developed with sectoral focus
  - ✓ Integration and mainstreaming adaptation with existing national programmes and policies is central to all NAS
  - ✓ Some NAS set out concrete action plans (Austria, Denmark, Finland, France, Germany, Malta and Spain)
  - ✓ Only two of the NAS in place (Belgium and Ireland) consider transboundary issues, i.e. those issues affecting neighbouring countries (linking to EU projects and/or requirements for transposing EU legislation into national law)
  - ✓ None of the NAS make direct links to macro-regional perspectives and interregional coordination

Selected areas of support for the EU Adaptation Strategy: **The cascade of mainstreaming 4/7**

- Mainstreaming efforts at transnational level
  - ✓ Many transnational cooperation projects on adaptation have been initiated over the last years (majority financed by EU-funds, e.g. LIFE+/INTERREG)
  - ✓ INTERREG activities are taking place in all regions in Europe (most focus on North-West Europe and the Alps while less adaptation projects address the Mediterranean and Eastern Europe) that:
    - differ in scope and focus, but share the advantage to deal with regional specifics
    - focus on stakeholder involvement at regional and local level to gather knowledge and specific needs from the regional and local communities and develop jointly feasible adaptation responses
    - are set up with case study regions within the greater transnational cooperation area, where project results can be tested and discussed with regional and local stakeholders towards their practical applicability

Selected areas of support for the EU Adaptation Strategy: **The cascade of mainstreaming 5/7**

- The hierarchy of mainstreaming across governance levels

  Adaptation mainstreaming cuts across different jurisdictional levels, from the EU via the national to the sub-national and local levels of policy making

  - ✓ EU: Institutionalise mainstreaming for amendments and new EU policies
  - ✓ National level:
    - Implementation of EU policies under further refinement in various affected sectors
    - No legal requirement to develop national adaptation strategies (NAS), but requests from UNFCCC and the EU Adaptation Strategy
    - NAS should provide framework for mainstreaming, following a systematic approach of coordinating adaptation needs horizontally across sectors
  - ✓ Sub-national/regional/local level: Sub-sequent activities and concrete adaptation measures following national requirements and interregional or cross-border cooperation

Selected areas of support for the EU Adaptation Strategy:
The cascade of mainstreaming 6/7

- BUT:

  No linear policy and decision making in practice due to:

  - ✓ Differing timeframes (e.g. set policy revision cycles)
  - ✓ Governance and institutional structures
  - ✓ Lack of political will
  - ✓ Level of understanding and acceptance for the need to take action (if legal requirements are missing)
  - ✓ Degree of being directly concerned with climate change impacts triggering action
  - ✓ Lack of sufficient data and information in some sectors for evidence based decision making

Selected areas of support for the EU Adaptation Strategy:
The cascade of mainstreaming 7/7

- How to ensure coherence of mainstreaming efforts?
  - ✓ Stakeholder involvement is key!
  - ✓ Identify the right entry point and make use of existing instruments and processes
  - ✓ Establish a well defined mechanism for coordination,
    provide necessary guidance, capacity building and resources
    - Vertical integration requires not only hierarchical mainstreaming, but also engagement with the private sector and making use of existing networks
    - Active information sharing and guidance will enhance integration adaptation across all levels of decision making
  - ✓ Foster Science – Policy interfaces (SPIs)
    - Establish/Make use of existing processes for an active exchange of science and policy communities
    - Influence the set-up of research funding introducing requirements for policy-relevant outcomes and "end-user" involvement

Selected areas of support for the EU Adaptation Strategy:
EU guidelines on developing adaptation strategies 1/4

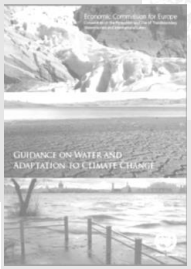
Methodological Approach

- Step 1: Screening existing guidelines/guidance
  - ✓ Keyword-internet research to identify guidelines in the form of written reports or online toolkits (mostly in English language, but also in German and French)

Result = 55 guidelines

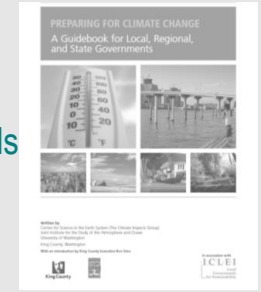
Guidelines available …

… for certain countries



… for certain sectors
…or cross-sectoral

… for certain levels
…or multi-level



Selected areas of support for the EU Adaptation Strategy:
EU guidelines on developing adaptation strategies 2/4

- Lessons learned from screening:
  - ✓ Build on existing evidence base from a wide range of disciplines, expertise and practical experiences
  - ✓ Address adaptation as an dynamic process and as a result of mutual learning
  - ✓ Establish a clear link to real policy process and existing structures, activities, etc.
  - ✓ Follow a pragmatic approach
  - ✓ Involve target groups activity in the development process
  - ✓ Address possible barriers in adaptation proactively
  - ✓ Suggest a simple and widely applicable monitoring and evaluation system
- Further relevant issues:
  - ✓ Present case studies and good practice examples across Europe
  - ✓ Highlight the European context with implications on the national level (e.g. transboundary issues)

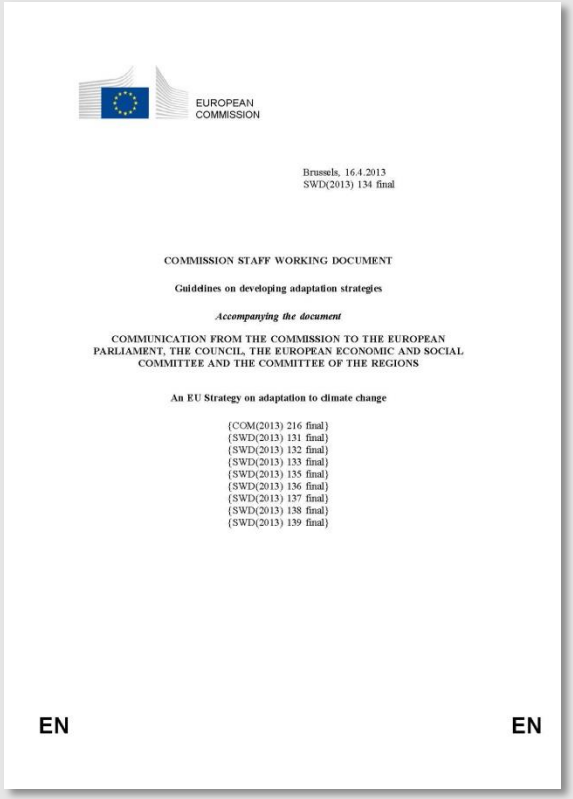
Selected areas of support for the EU Adaptation Strategy: **EU guidelines on developing adaptation strategies 3/4**

- Step 2: Develop draft guidance
  - ✓ Based on existing work and practical experiences with other guidance development processes (e.g. for the national level, EU RAS)
- Step 3: Discuss outline and key issues with national policy and decision makers
  - ✓ EEA EIONET meeting (22-23 May 2012, Brussels)
  - ✓ Member State Meeting for Southern Europe (29 May 2012, Rome)
  - ✓ CIRCLE-2-Share workshop - Views and Challenges in Central and Eastern Europe (27-28 June 2012, Vienna)
  - ✓ Second Nordic International Conference on Climate Change Adaptation (29-31 August 2012, Helsinki)
- Step 4: Finalise guidance
  - ✓ Published with the Adaptation Strategy package as Staff Working Document (SWD)

Selected areas of support for the EU Adaptation Strategy: **EU guidelines on developing adaptation strategies 4/4**

- Structure
  - ✓ Organized along the six steps of the adaptation support tool provided under Climate-ADAPT
  - ✓ New step 1: Preparing the ground for adaptation
    Introducing key elements important to build the basis for a successful adaptation process
  - ✓ Remaining five steps should be considered as iterative and closely interlinked phases

- Content
  - ✓ Recommendations for each step plus concluding step
  - ✓ Examples from Member States for each step
  - ✓ Further information: key principles, self-check, glossary, EU support, funding instruments


EUROPEAN COMMISSION

Brussels, 16.4.2013
SWD(2013) 134 final

COMMISSION STAFF WORKING DOCUMENT

Guidelines on developing adaptation strategies

Accompanying the document

COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

An EU Strategy on adaptation to climate change

{COM(2013) 216 final}
{SWD(2013) 131 final}
{SWD(2013) 132 final}
{SWD(2013) 133 final}
{SWD(2013) 135 final}
{SWD(2013) 136 final}
{SWD(2013) 137 final}
{SWD(2013) 138 final}
{SWD(2013) 139 final}

EN EN

Austrian Adaptation Policy Process

Start: 2007

Political mandate: Development of National Adaptation Strategy is included in the federal government program 2008-2013

Main responsibility: Federal Ministry of Agriculture, Forestry, Environment and Water Management

Coordination: Support from Kyoto-Forum (= cooperation between all federal Ministries and representatives from all nine provinces)

Adopted: Council of Ministers in October 2012

Austrian Adaptation Policy

Overall aim

- to reduce anticipated negative impacts of climate change on Austria's society, economy and environment
- to use positive effects of climate change and allow synergies
- to provide an overall framework in which adaptation should take place

Characteristics of the development process

- Sectoral (14 sectors addressed) and iterative approach
- National Adaptation Strategy (NAS) and National Action Plan (NAP) jointly developed
- close collaboration with science
- broad stakeholder engagement to support the development of the NAS

NAS/NAP Process	Facilitating activities
Start: 2007 **Responsibility**: Federal Ministry of Agriculture, Forestry, Environment and Water Management	**Website** www.klimawandelanpassung.at with comprehensive information about climate change/adaptation in Austria and activities towards the development of the NAS
Support:"Kyoto-Forum" (cooperation between the aforementioned Ministry and representatives from all nine Austrian provinces)	**Database** providing adaptation examples with search option by sector, governance level, spatial patterns and research vs. practical example
Political support: Federal government program 2008-2013	**Newsletter** on climate change adaptation for Austria
Development process: Gradual development of a "Policy Paper" as basis for the final strategy	Accompanying **participation process** - involving all relevant stakeholders from government, business and public – 2009-2011
(Scientific) Expert studies on the **identification of first recommended adaptation actions** for different sectors to be included in "Policy Paper"	**Identification of first recommended adaptation actions** to be discussed in the participation process and integrated into the strategy ("Policy Paper")

Website: www.klimawandelanpassung.at

Main content
Climate change in Austria
Adaptation to climate change
Austrian adaptation strategy: background, content and participation process
Research projects
Database: adaptation measures
Links/Glossary/Newsletter

Participation process

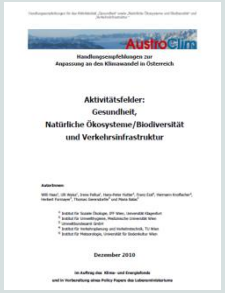
- Environment Agency Austria carried out the participation process in close cooperation with responsible Ministry and Kyoto Forum (= steering group)
- 106 institutions (e.g. federal and provincial Ministries, interest groups, NGOs) were actively involved in the participation process

Financed by	Duration	Sectors discussed
Climate- and Energy Fund Austria	1.phase: January 2009 – September 2010 2.phase: October 2010 – July 2011	Agriculture, Forestry, Water, Tourism, Energy Biodiv., Natural hazards, Buildings, Health, Transport infrastructure

Objectives

- ✓ Raise awareness
- ✓ Provide a platform for exchange
- ✓ Foster transparent decision-making
- ✓ Improve the NAS/NAP quality
- ✓ Enhance acceptance
- ✓ Facilitate the implementation

Close cooperation between science and policy makers



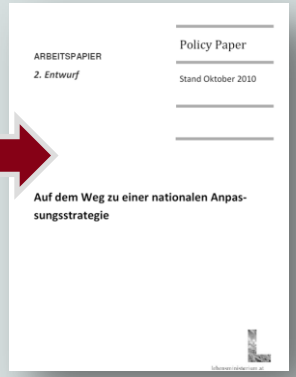
Scientific studies on adaptation options

for each sector addressed in the NAS/NAP such as agriculture, water, health, etc.

3 stakeholder consultation rounds

Policy Paper

= „working paper“



Results

Austrian Adaptation Strategy (+ NAP)

Lessons Learned

- Sharing information and engaging stakeholders and scientists was a resource-intensive process…

  … **BUT** absolutely worth the effort!

- Other ministries and provinces were involved via various formats of engagement ...

  ... **BUT** a formal institutional set-up is missing!

- Engagement in the development process was crucial...

  ... **BUT** it should continue when implementing!

- Every adaptation process is very context specific…

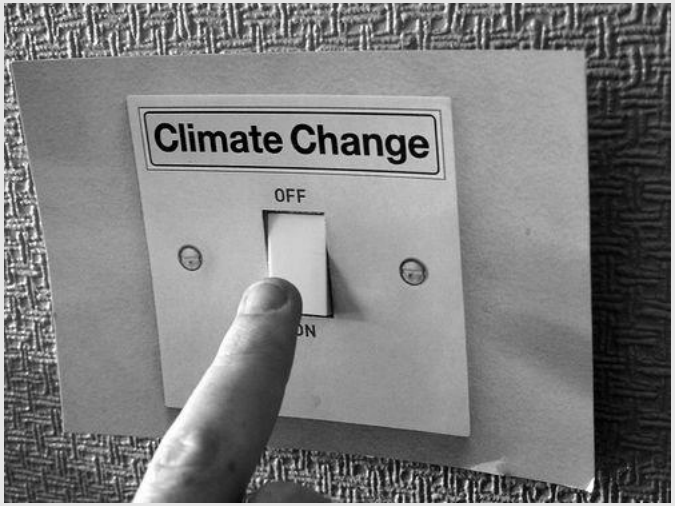
  … **BUT** transnational exchange of experiences is very inspiring and helpful!

Ongoing activities for implementation

- Informal workshops with policy makers in provinces
- Brochure to introduce adaptation to the broad public
- Translation of NAS and parts of website into English
- Research studies dealing with questions such as cost of inaction, costs of adaptation measures, adaptation support for sub-national level, communication of adaptation, etc.
- Monitoring and evaluation approach
- ...

Source: Linux Solution Austria

Context of the NAS available in english at:
http://www.lebensministerium.at/dms/lmat/umwelt/klimaschutz/klimapolitik_national/anpassungsstrategie/strategie-kontext/AustrianAdaptationStrategy_Context_FINAL_25092013_v02_online.pdf



THANK YOU!

Sabine McCallum

Head of Unit Environmental Impact Assessment and Climate Change

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umweltbundesamt

Environment Agency Austria

http://www.umweltbundesamt.at

Generalitat de Catalunya
Government of Catalonia
Ministry of Territory and Sustainability

The Catalan Office for Climate Change

Climate Change Adaptation as a multi-level governance issue. Experiences from the regional level in Spain.

Catalan Strategy for Adapting to Climate Change (2013-2020)

23 January 2014
Zagreb

Catalonia

➢ Overview

Catalonia

➢ Overview

Catalonia has also its own culture and its own language, which is spoken by about 10 million people, shared with other regions in Spain (Region of Valencia, Balearic Islands) and also in Languedoc-Roussillon in the South-East of France.

7.5 million inhabitants
16% Spanish pop.

32,113 Km^2
6% Spanish area

235 inhabitants/km^2

GDP: 210.150 millions € **2011**
20% Spanish GDP
GDP pc: 28.270 €
12% higher UE average
25% Spanish exports originate in Catalonia

SECTORIAL STRUCTURE OF EMPLOYMENT (%) **2011**

Agriculture: 1,9 Industry: 18,4 Public works: 7,3 Services: 72,4

SECTORIAL STRUCTURE OF GROSS VALUE ADDED (GAV - %)

Agriculture: 0,9 Industry: 20,3 Public works: 10,6 Services: 68,2

GHG emissions

➢ 2011. LULUCF not included

≈ 34.000 MT CO_2.
40.000 MT CO_{2eq}
(2010 LULUCF not included)

3.631 MT CO_2 eq.

1,3%

321,4 MT CO_2 eq.

14,3%

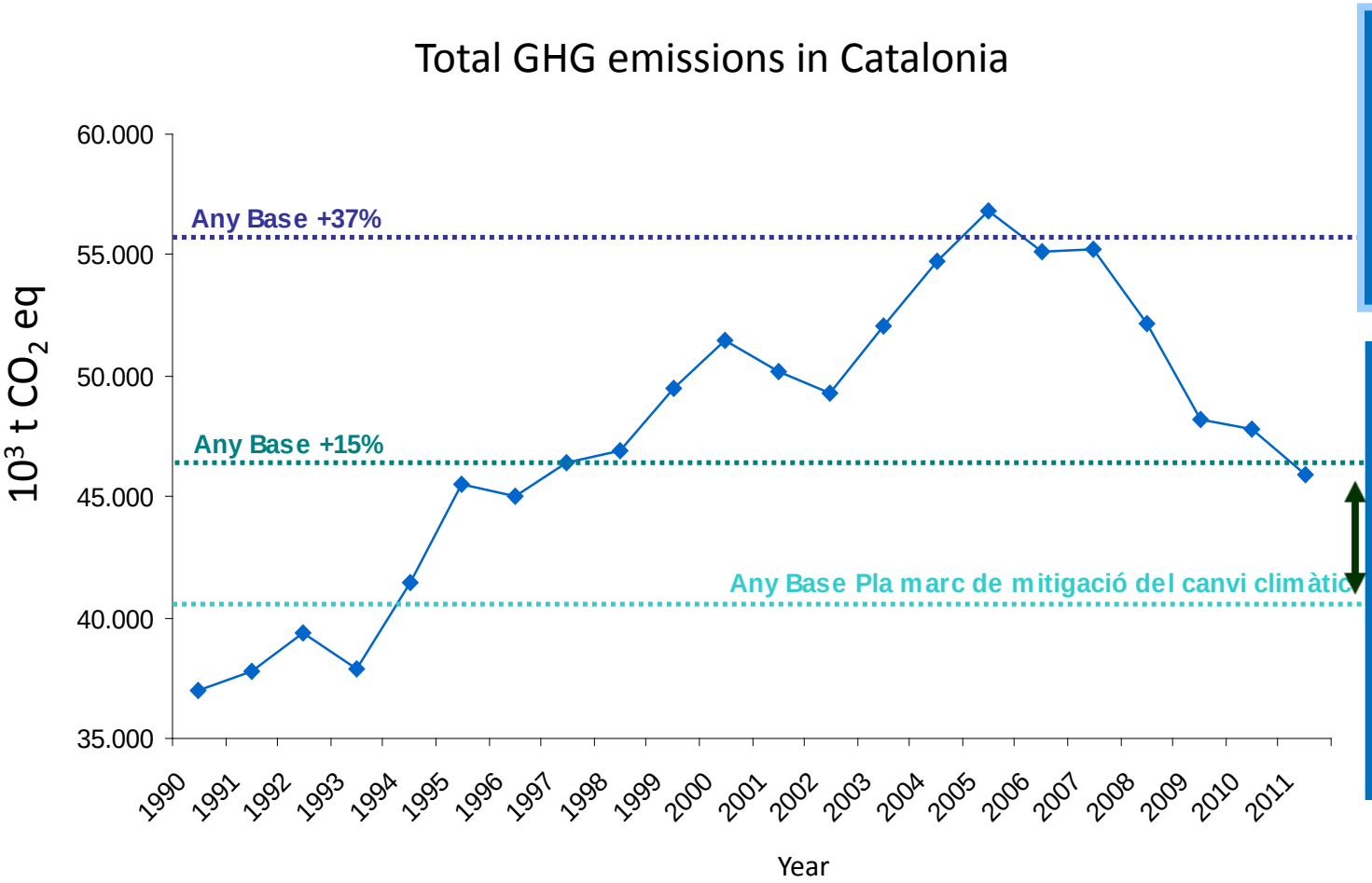
45,9 MT CO_2 eq.

0,11%

Catalan context

➢ 2008-2012

	Base year	1990	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
10^3 t CO_2 eq	40.331	36.971	45.508	44.987	46.454	46.871	49.504	51.490	50.186	49.289	52.032	54.764	56.786	55.101	55.254	52.194	48.206	47.772	45.917



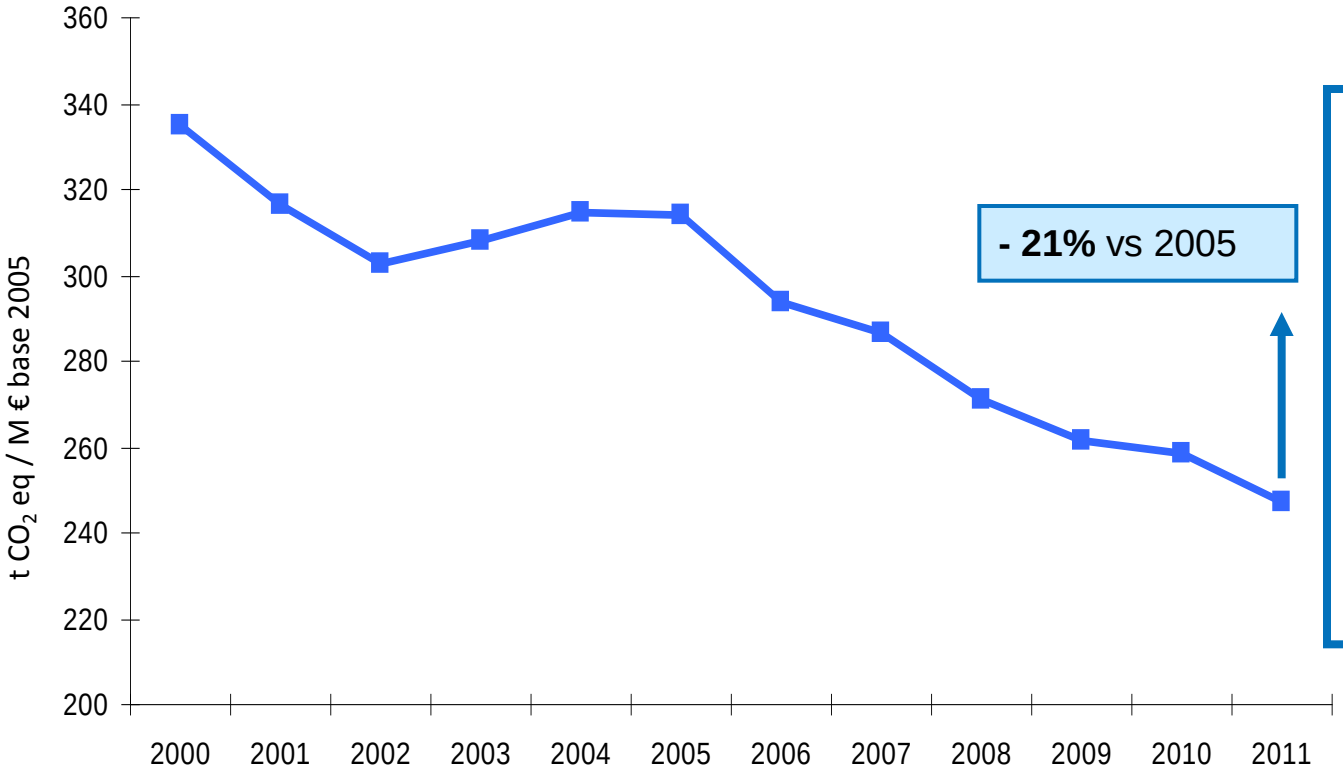
4% reduction 2011 total emissions vs 2010

14% increase in emissions in 2011 compared to the base year and 24% increase vs 1990

Catalan context

➢ 2011

Continuous improvement in energy intensity and emissions of the Catalan economy. Generation of the same GDP using less fossil resources



Emissions per GDP (gCO2eq/€)

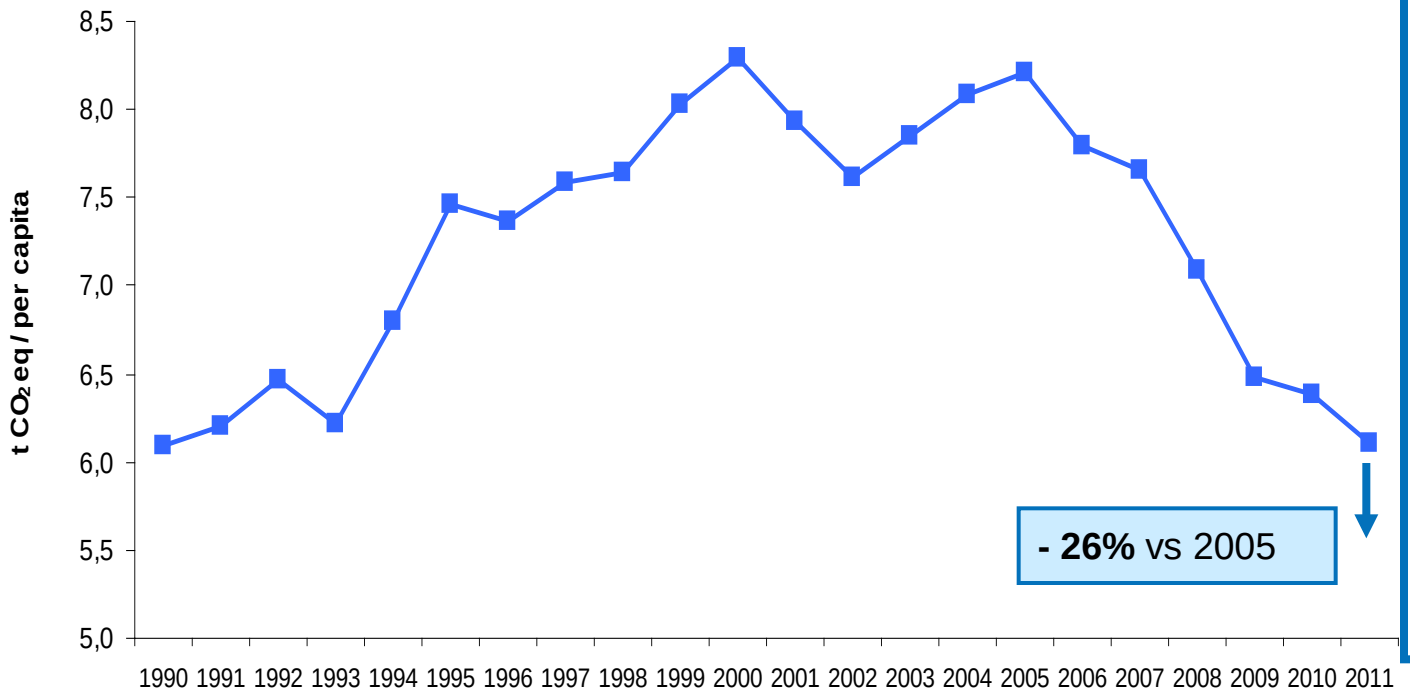
Year 2011:

- Catalonia: 247
- Spain: 368
- EU-27: 387

Year 2000:

- Catalonia: 335
- Spain: 489
- EU-27: 503

Decoupling GHG emissions and population growth



Emissions per capita [tCO2 eq per cap]

Year 2011:
- Catalonia: 6,1
- Spain: 7,6
- EU-27: 9,1

Year 2000:
- Catalonia: 8,3
- Spain: 9,4
- EU-27: 10,5

Year 1990:
- Catalonia: 6,1
- Spain: 7,3
- EU-27: 11,8

Spain

➢ **Federal Country**

1) Decentralization of political power
2) 2 levels of Government: Federal and Regional Government
3) Recognition and guarantee of the right to **political autonomy.**

Ability to decide and develop **own policies** within the framework of powers vested by Federal and Regional Laws.

1) Decentralization of political power
2) 2 levels of Government: Federal and Regional Government
3) Recognition and guarantee of the right to **political autonomy.**

Acquire self-government institutions and its own legal system.

The exercise of the legislative function through a parliament chosen by universal suffrage.

Political leadership, executive function and regulatory power.

The financial autonomy for the development and implementation of recognized competences.

Ability to decide and develop **own policies** within the framework of powers vested by Federal and Regional Laws.

➢ Environment governance

• Spanish Government:	Basic law
• Catalan Government:	Additional protection requirements, Authorisation, Control.

Complexity and cross sectorial nature of climate change: energy, transport, agriculture, infrastructure, health, tourism etc. Catalan Government has exclusive power over the course of the two main lines of action on climate change (mitigation and adaptation) from the different sectorial policies.

Catalan context

➢ Different levels of governance

The objectives of the EU (and UNFCCC) for the non ETS sectors are binding only on the level of countries

The relationships between the federal and the regional government are of great importance.

Objectives

Responsibilities

Resources

At regional level

Countries are built in different organizational levels, and a large part of the responsibilities on climate policy, specially in non ETS sectors, are in the hands of regional and local governments.

Multilevel relationship

➢ **Problems**

One of the very encouraging effects of the international climate change negotiations is that we are seeing ever increasing actions on both adaptation and mitigation **undertaken at the national, subnational and regional levels**. We have learned over the past few years that the path forward cannot be either a **top down** (intergovernmental regulation) or a **bottom up** exercise (domestic policies, business action, public engagement). The path forward has to be the **result of concurrent, mutually reinforcing efforts** that help us to spiral up toward the tipping point of transformation.

Climate Change: Why We Need a Multilateral Solution
S. Rajaratnam School of International Studies. Singapore, 18 October 2012
Christiana Figueres, Executive Secretary
United Nations Framework Convention on Climate Change

Generalitat de Catalunya
Government of Catalonia
Ministry of Territory and Sustainability

The Catalan Office for Climate Change

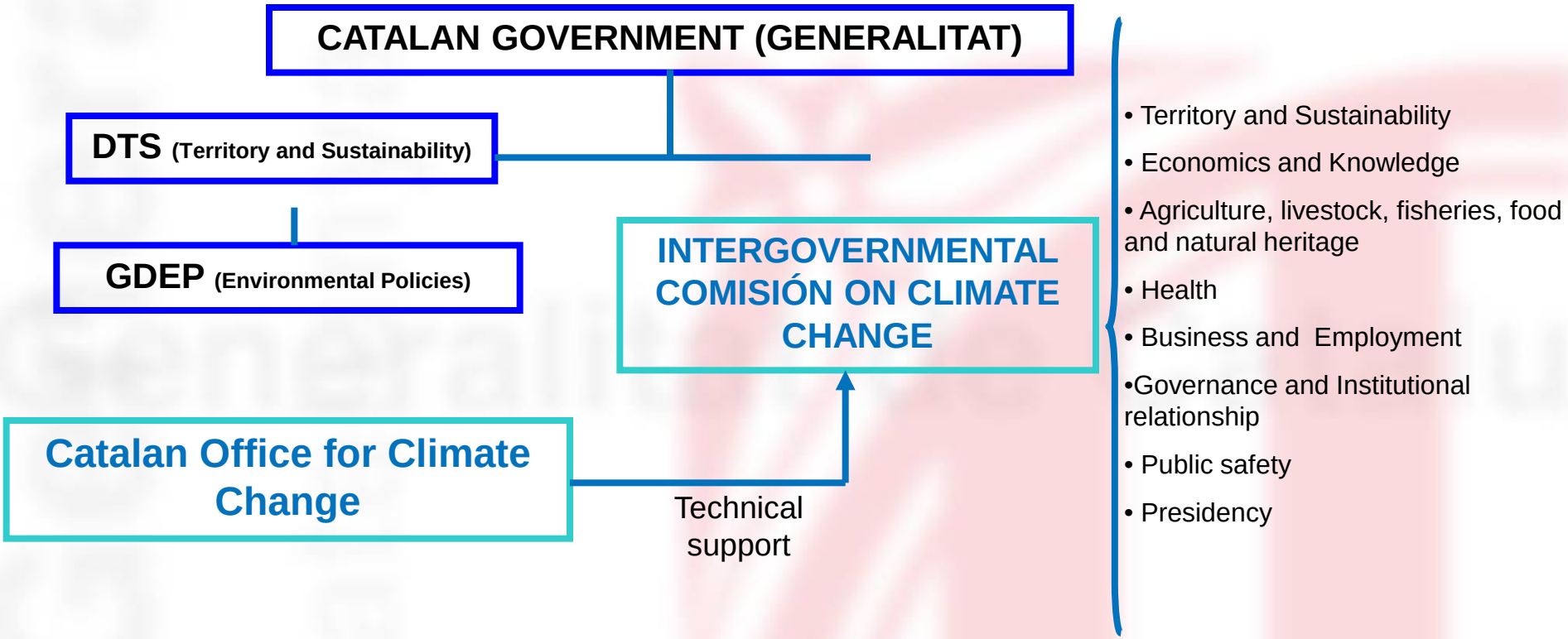
Multilevel climate relationship

➢ Spain - Catalonia

SPAIN	CATALONIA
GOVERNMENT - MINISTERIES	GOVERNMENT - MINISTERIES
ENVIRONMENT COUNCIL Regional Ministers Federal Ministers	
CLIMATE CHANGE INTERGOVERNMENTAL COMISSION	CLIMATE CHANGE INTERGOVERNMENTAL COMISSION WG Adaptation WG Mitigation WG Markets WG Fluorinated gases
SPANISH OFFICE FOR CLIMATE CHANGE	CLIMATE CHANGE COMISISION FOR POLICY COORDINATION WG Inventories and Mitigation WG Impacts and Adaptation WG European Trade System
	CATALAN OFFICE FOR CLIMATE CHANGE
NATIONAL COUNCIL FOR CLIMATE	
	SUSTAINABLE DEVELOPMENT COUNCIL

Intergovernmental Commission and The Catalan Office for Climate Change

In late 2006 the Government of Catalonia provides two formal instruments to address climate change in Catalonia: the Catalan Office for Climate Change and the Intergovernmental Commission on Climate Change



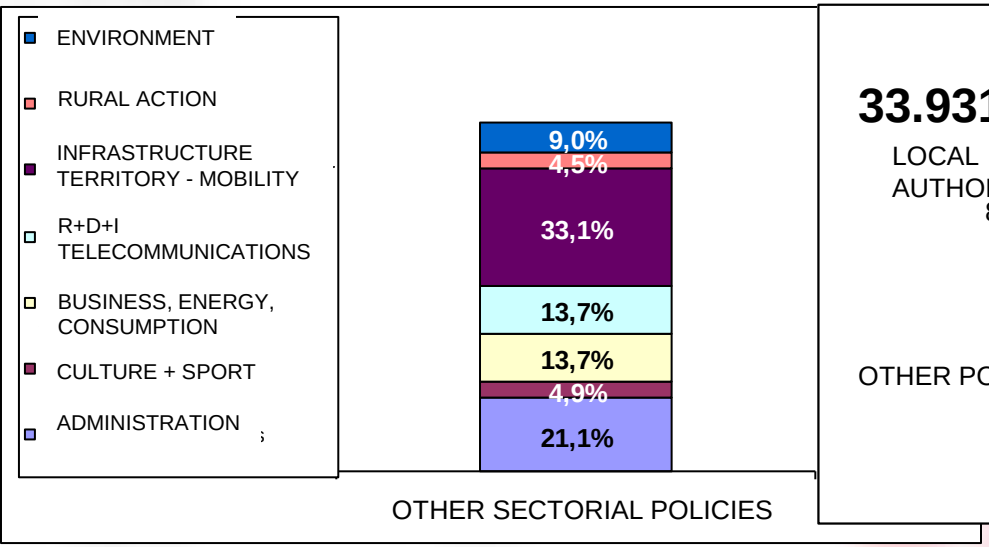
Catalan climate context

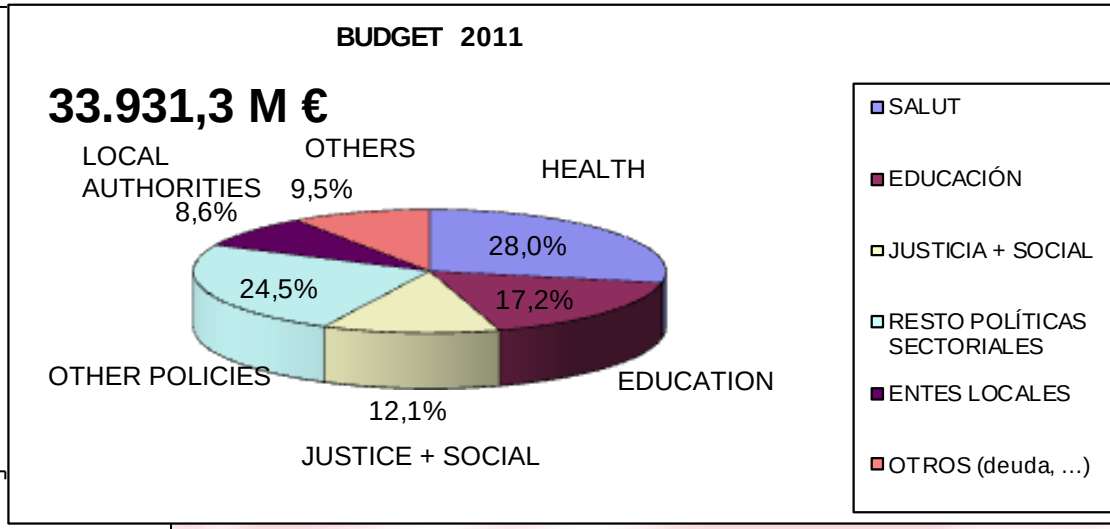
➢ Main Catalan Actions

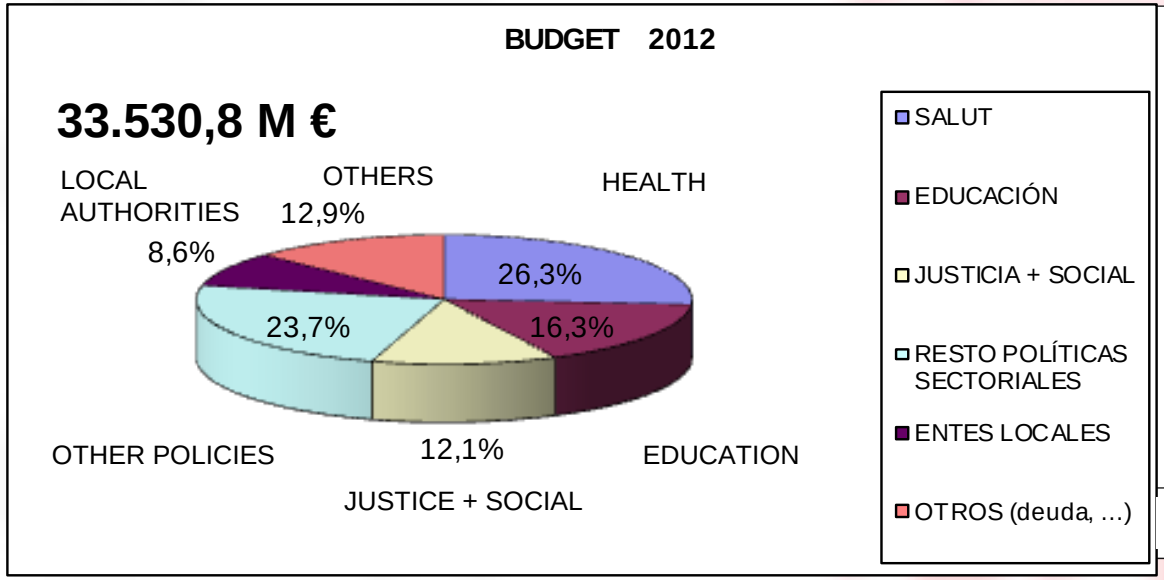
2005	1st report on Climate Change in Catalonia
2006	Catalan Office for Climate Change
2008	Climate Change Convention 1.000 proposals; 800 participants
2008	PK Mitigation Framework Plan 2008-2012 Governmental voluntarily commitment
	Monitoring & Evaluation 2009 / 2010 / 2011
2010	2nd report on Climate Change in Catalonia
2010	Voluntary Agreement Program (100 Organizations joined)
2012	Energy & Climate Plan (20+20+20 commitment in Catalonia)
2012	Catalan Strategy for adapting to climate change 2013-2020 63 impacts; 182 measures; 250 participants
2013-2014	Climate Change Act

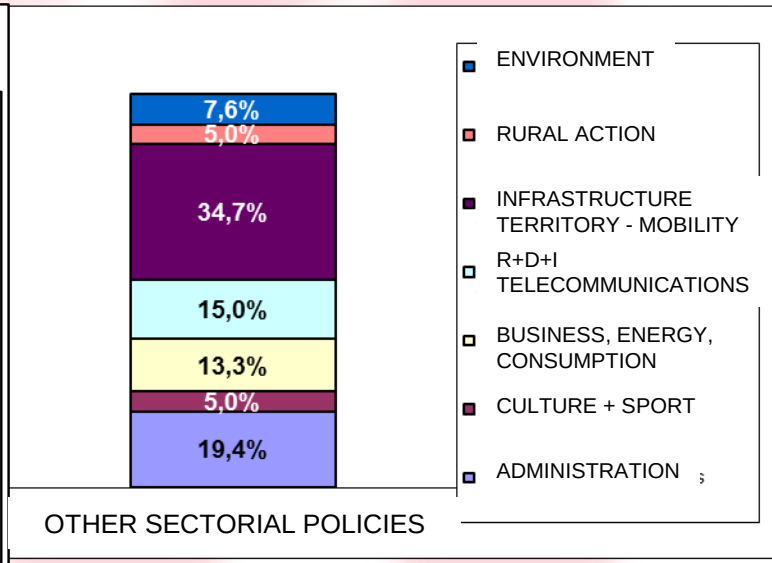
Catalan climate context

Budget









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CATALAN STRATEGY FOR ADAPTING TO CLIMATE CHANGE

Spanish level

➢ Main Elements

❑ Climate Scenarios

❑ National Plan for Adapting to Climate Change (approved in 2006)

Framework for coordination among government activities in assessing impacts, vulnerability and adaptation to climate change in Spain.

- ➢ **Work Programs: 2006, 2009, 2013**
- ➢ **Monitoring Reports: 2008, 2011, 2013-2014**

❑ National Adaptation Platform

Tool for all those experts, organizations, institutions and stakeholders that need accessing and exchanging information, knowledge and experiences on impacts, vulnerability and adaptation to climate change as well as a tool to enhance communication among all of them.

http://www.adaptecca.es

→ http://climate-adapt.eea.europa.eu/

Catalan Strategy for Adapting to CC

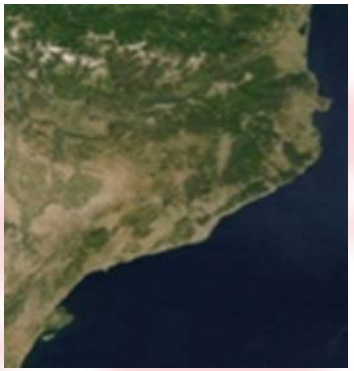
➢ Main Elements

Main goal: to become **less vulnerable** to climate change impacts strengthening the adaptive capacity and resilience of citizens and organizations in Catalonia.

Diagnosis of impacts (observed and potential) in 11 natural systems and socioeconomic sectors

Downscaled scenarios:

- Scenarios A2, A1B, B1
- 10km grid
- Projections until 2050, baseline 1971-2000
- Temperature, Precipitation and Wind speed



Adaptative actions proposed

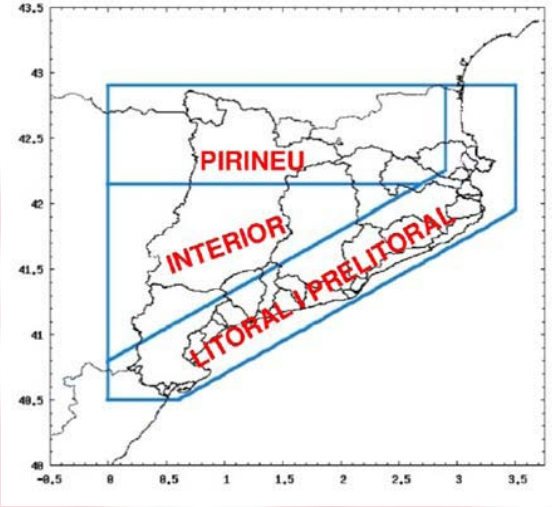
Strong **stakeholders involvement** through a **public participation process** to discuss measures proposed and to introduce new ones. Final aim was to achieve a **bottom-up** process taking in consideration all stakeholders thoughts and recommendations.

Catalan Strategy for Adapting to CC

➢ Impacts

Most vulnerable areas:
Pyrenees (mountain region) and Ebro's Delta (costal zones)

Main climatic impact:
Temperatures increase of extreme value and heat waves



Most vulnerable system:
WATER

Public / Private sector :
Private sector awareness and action are generally low.
Public sector is crucial to guarantee policy coherence across many sectorial policies (mainstreaming) helping to ensure its effectiveness and efficiency

Catalan Strategy for Adapting to CC

- **Open to society**

Summary number of proposals received and evaluated

Government Sessions	77
Sessions with Socio-economic Sectors	14
Meeting with representatives of the local administration	5
Session with Scientific Community	89
Regional meetings in Catalonia	207
Online form	36

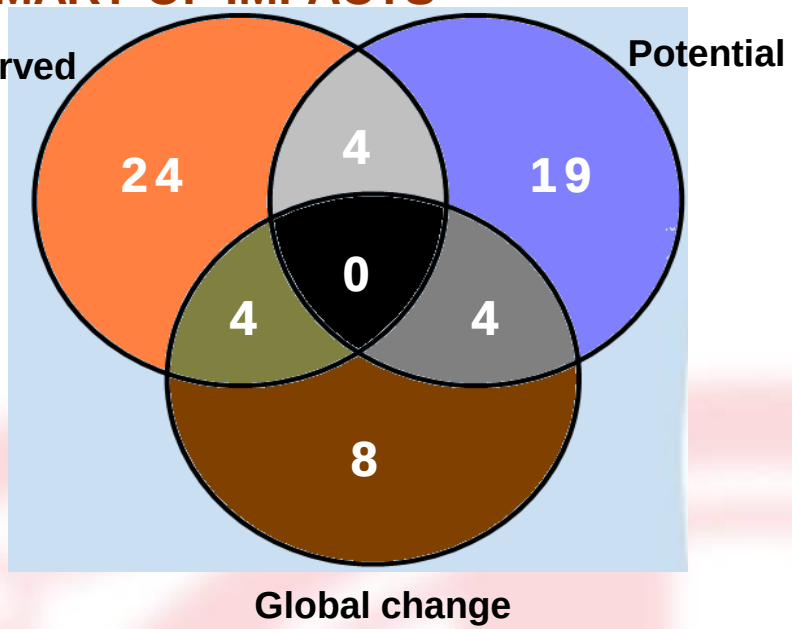
428 proposals received and evaluated

288 Accepted (67,3%)
26 Partially accepted (6,1%)
71 Not included (16,6%)
43 Not accepted (10%)

Catalan Strategy for Adapting to CC

➢ Impacts and measures

SUMMARY OF IMPACTS



SUMMARY OF MEASURES

30 GENERIC (cross-cutting) proposed

152 SPECIFIC (sectors/systems) proposed

182 TOTAL

Catalan Strategy for Adapting to CC

Goals

Strategic goal

to become **less vulnerable**
to climate change impacts

Operational goal

generating **Knowledge** and transferring **Information**

Building capacity

Transversal goal

RDI

POLICY PLANNING

OPORTUNITIES

specific measures for:

natural systems
- Agriculture and livestock
- Biodiversity
- Water management
- Forest Management

socioeconomic sectors
- Energy sector
- Fisheries
- Health
- Industry, Services and Trade
- Mobility and transport infrastructure
- Tourism
- Town Planning and Housing

generic measures cross-cutting natural systems and socioeconomic sectors

Catalan Strategy for Adapting to CC

➢ Measures

Unknown, Brown cows in Aigüestortes National Park

WHAT CAN WE DO?

Promote research at the Institute of Agrifood Research and Technology (IRTA), other research centres and university departments on the impact of efficient water use on productivity in irrigated and dry cultivation.

Incorporate observed and forecast climate change impacts in Catalonia and, in particular, the current deficiencies in guaranteeing water supply into agricultural irrigation planning.

Favour the implementation of local agriculture through tax incentives in order to achieve sustainable agriculture.

Total impacts	Total number of measures
6	15

Catalan Strategy for Adapting to CC

➢ Measures

Water barrier against sea incursion into the Llobregat aquifer

When the Catalan Water Agency suggested the water barrier project, involving injecting reclaimed water into the deep Llobregat aquifer, it was as one of the measures for preventing the historic overuse of the aquifer, together with recharge ponds and the extraction regulatory plan.

Catalan Water Agency

One of the forecast (and partly observed) impacts of climate change in coastal areas is the rise in sea levels, which, together with the slower recharging of groundwater, will increase the salinisation of coastal aquifers. The saltwater intrusion barrier is, therefore, an excellent climate change adaptation measure.

Catalan Strategy for Adapting to CC

➢ Measures

Diversification of winter tourist resorts

Some ski resorts owned by the Catalan Government, such as Núria or La Molina have pioneered the development of a tourism offer outside the snow season, through new family activities: guided excursions, horse-riding trails, archery, canoeing, etc.

La Molina Government of Catalonia

Broadening the range of activities and the time of year not only favours the economic viability of these ski resorts, but also their adaptation to the forecast (and partly observed) impacts of climate change: fewer days with snow.

Catalan Strategy for Adapting to CC

➢ Measures

Action plan to prevent the effects of a heat waves on health (POCS)

Promoted by the Catalan Ministry of Health, and last revised in 2012, the POCS establishes a series of measures and recommendations for the most vulnerable public to prevent the impact of heat waves.

Government of Catalonia

Heat waves will be one of the extreme weather phenomena with the greatest increase in frequency in the future due to climate change.

Catalan Strategy for Adapting to CC

➢ Next Steps

Catalan Strategy for Adapting to Climate Change

Sector based action plans

- Promoted by the corresponding ministries
- Public and private participation
- High priority measures
- Budget

Technical development

Development of a set of indicators for effective monitoring the vulnerability of different sectors and systems over time.

Reporting

- Catalan Office for Climate Change.
  - ✓ Assessment of action plans
- Intergovernmental Committee on Climate Change,
  - ✓ In a maximum of 3 years, will present to the Government and Parliament a progress report on the Strategy in Catalonia, and will determine whether the ESCACC requires revision

Projects

- Pyrenees Climate Change Observatory
- Regional climate change adaptation in the Mediterranean area (Life)

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P Y R E N E E S

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Pyrenees Climate Change Observatory (OPCC)

Unión Europea
Fondo Europeo de Desarrollo Regional

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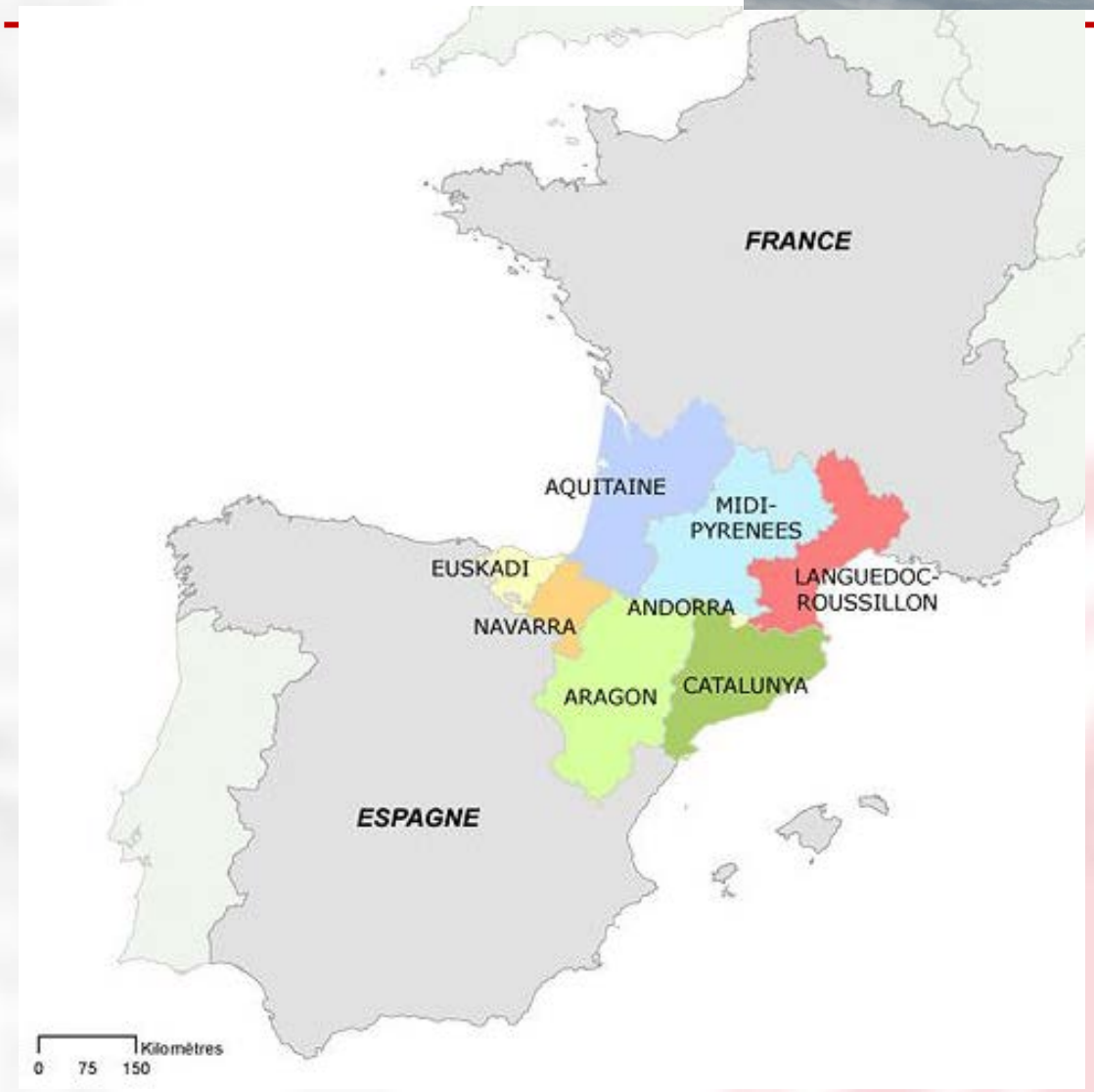

About the Pyrenees Working Community (CTP)

Eight political entities from three states:

- **France**
(Aquitaine, Midi-Pyrénées, Languedoc-Roussillon)
- **Spain**
(Catalunya, Aragón, Navarra, Euskadi)
- **Principat d'Andorra**

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Why cross-border cooperation and climate change is a priority to the Pyrenees Working Community (CTP)?

- ✓ In its 2007 report, the Intergovernmental Panel on Climate Change (IPCC) identified mountainous areas particularly sensitive to climate change.
- ✓ Climate change impacts natural systems and socio-economic sectors.
- ✓ Climate change has no borders: to work alone, without cooperation, is a nonsense.

For these reasons, the CTP launched **the Pyrenees Climate Change Observatory (OPCC)** in 2010. The OPCC project has been scheduled in the European program POCTEFA (2011-2013). Its actions are supported by 65% by ERDF.

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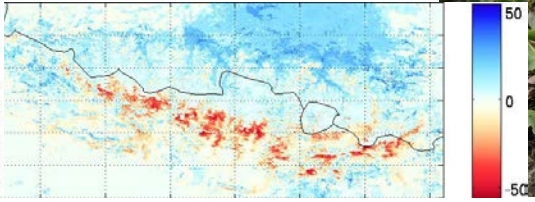

OPCC's mission: to interpret and disseminate scientific, and to support **decision-making** on climate change in the Pyrenees.

OPCC's main goal: **to monitor and understand** climate evolution in the Pyrenees with the aim of **becoming less vulnerable** to the impacts of climate change, and **adapting to its effects**

OPCC's actions

Climate, Biodiversity, Forests and Natural Hazards, Water, Remote Sensing, Geoportal and Adaptation

... in order to develop **coherent adaptation strategies** and to contribute to the **adoption** of the results and of the tools created **by all administrations of the territory of the CTP.**

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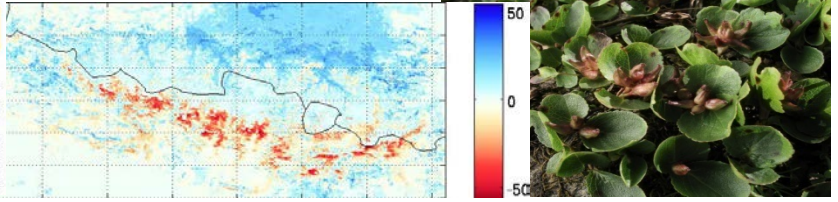

Climate action in the OPCC's project: **Development of a unique database** of high quality climate series based on precipitation, temperature, and the definition of common indicators to all territories of the Pyrenees.

Biodiversity action in the OPCC's project: **Network monitoring** of species and populations of the vascular flora of the Pyrenees to detect the impact of climate change and to develop possible measures to control or adapt.

Forests and Natural Hazards in the OPCC's project: **Understanding** the potential impacts of climate change on natural hazards. Propose guidelines to improve the management of forests integrating climate change.

Water in the OPCC's project: **Apply knowledge** of the impact of climate change on water resources. Develop methodologies to integrate climate change in the Drought Management Plan.

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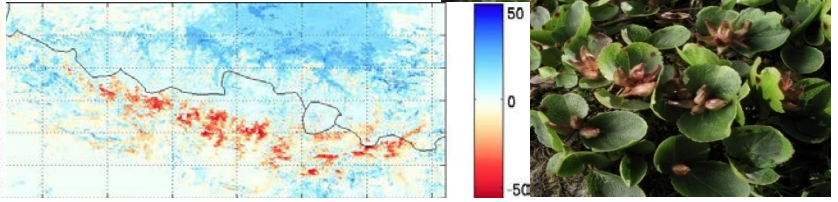
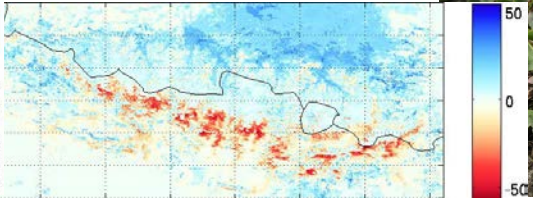


Remote Sensing in OPCC's project: Understand and **characterize** the effects of climate change on vegetation, snow and soil occupation.

Geoportal in OPCC's project: **Development** of a common protocol transboundary climate change monitoring. Diffusion studies, catalogs, data mapping and climate change in the Pyrenees: **www.opcc-ctp.org**

Adaptation action in OPCC's project: **Understand and analyze adaptation** initiatives in the territory. Diagnosing the Pyrenees vulnerability to climate change. Analysis of adaptation measures in other european mountains transferable to the Pyrenees. Seminar presentation: spring 2013.

Coordination, Communication and lobbying: **Project coordination** among partners, including the scientific committee. Communication and dissemination of the project through website, Newsletter, social networking, seminars, participation in conferences and events, and organizing the final event of the project .



"Adaptation to climate change in the Pyrenees"

PHASE 1 : PYRENEES

Common diagnosis of the Pyrenees and adaptation experiences

✓Identify climate change impacts in the Pyrenees for a first approach on vulnerability analysis

✓Identify and analyze existing adaptation initiatives in the Pyrenees

PHASE 2 : EUROPEAN MOUNTAINS

Knowledge transfer of European experiences on adaptation

✓Identify and analyze existing adaptation initiatives of other European mountain areas

✓Elaborate useful documentation of reference for Pyrenean stakeholders that support them in their adaptation planning to climate change

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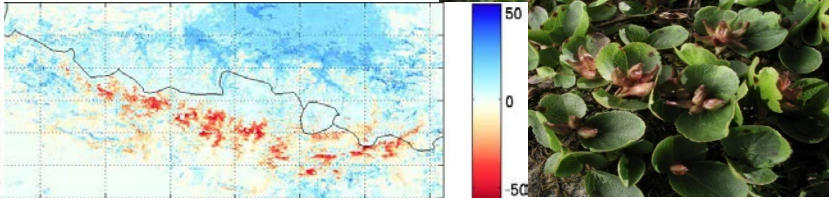
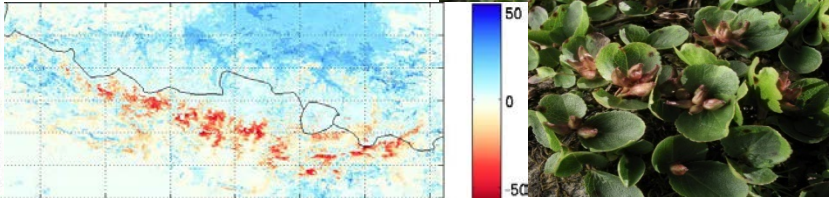


“Adaptation to climate change in the Pyrenees”

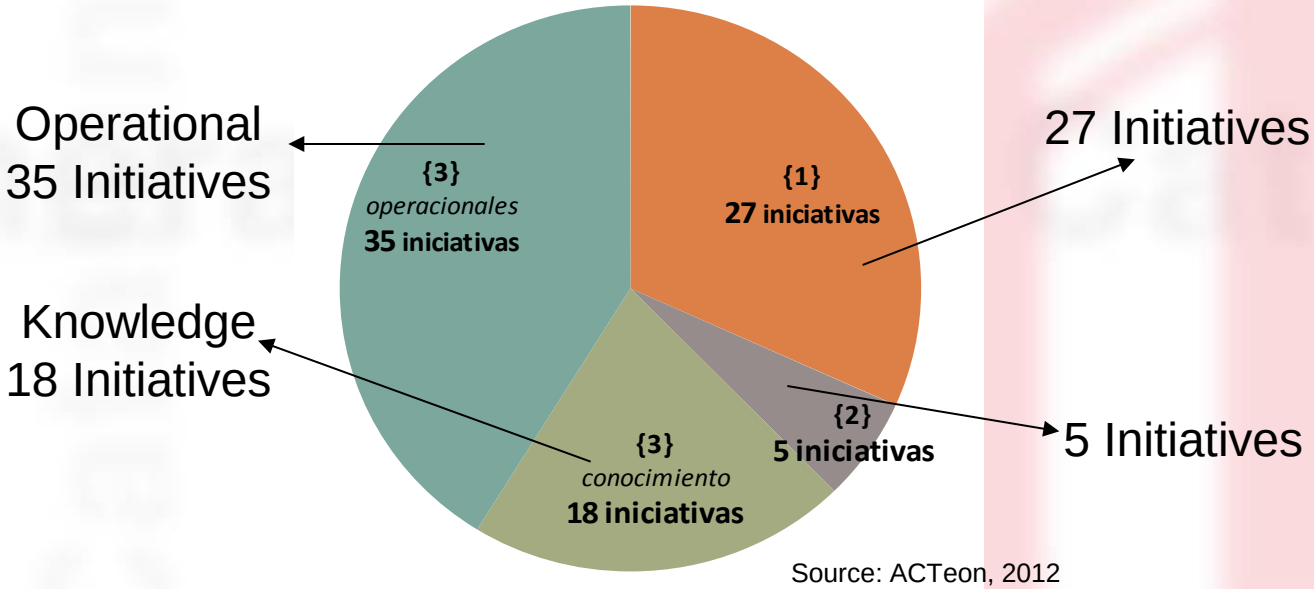
- ✓**A study about vulnerability:** Characteristics of the Pyrenees; observed and expected impacts of climate change
- ✓Date base with **85 Pyrenean adaptation initiatives and 18 European adaptation initiatives,** classified and analyzed
- ✓**2 publications**

For further information: www.opcc-ctp.org



PYRENEES: 85 initiatives analyzed and classified

- **Type 1:** new initiatives implemented with a **clear objective to adapt** to climate change
- **Type 2** : already existing initiatives that **evolved to integrate climate change**
- **Type 3** : already existing initiatives that contribute to **reduce vulnerability** to climate change (of the territories or economic activities) where **« adaptation » is explicitly NOT an objective**



Source: ACTeon, 2012

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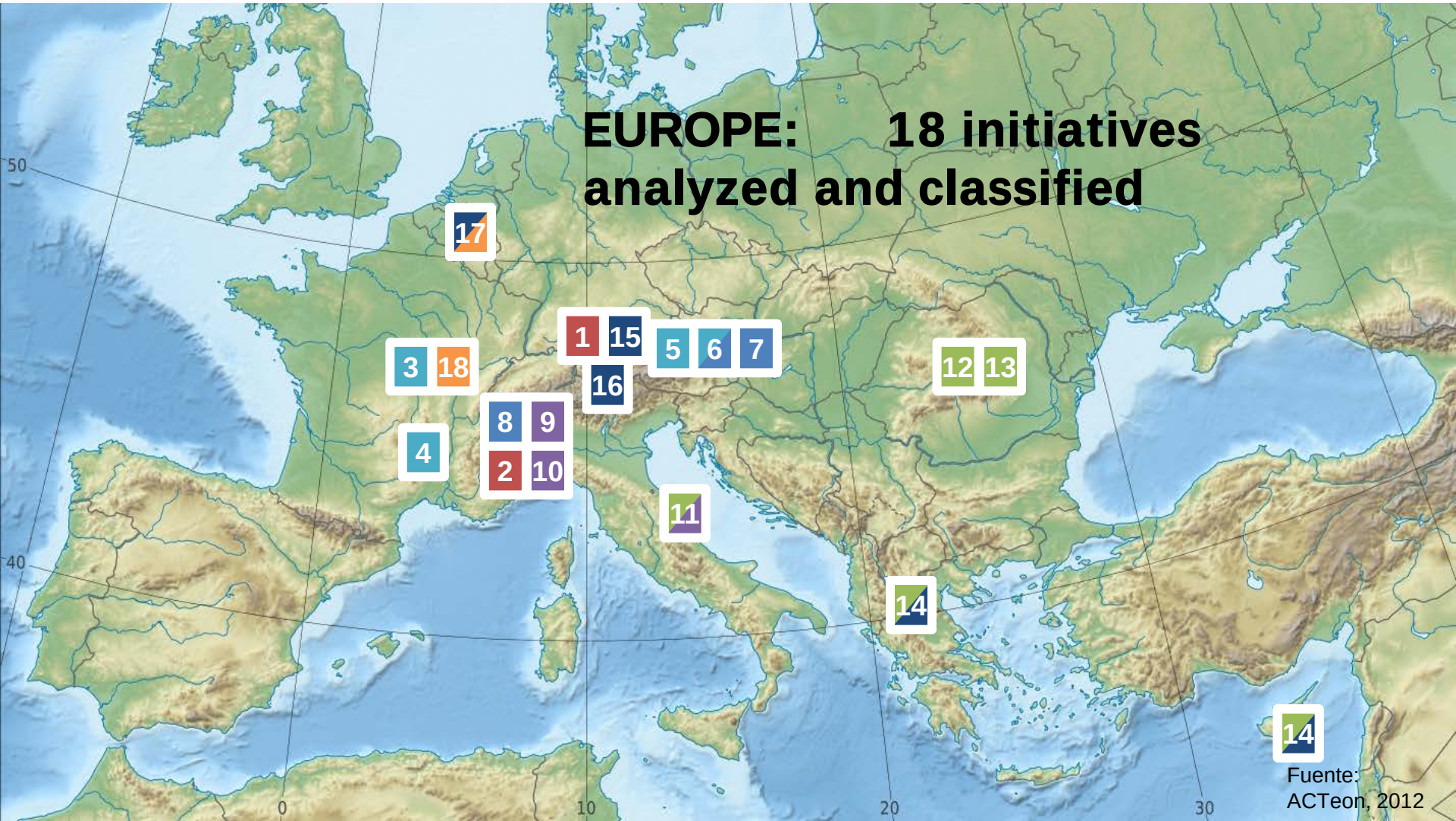
- TOURISM
- WATER MANAGEMENT
- BIODIVERSITY
- TRANSVERSAL
- AGRICULTURE
- FOREST
- POTENTIAL NATURAL RISKS



Fuente: ACTeon, 2012

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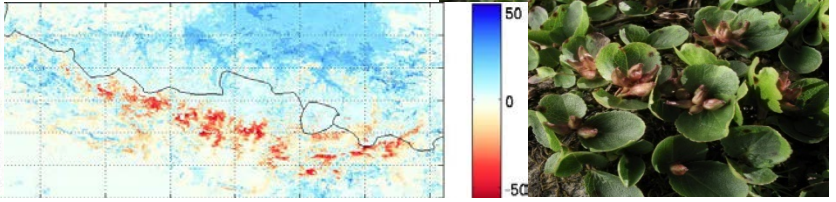

Next steps...

Think about

- ✓ Consolidate efforts on observation, monitoring and dissemination
- ✓ Transfer of knowledge into economic activity impacts and into an operational level
- ✓ Strengthen synergies with other European mountain areas

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LIFE12 ENV/ES/000536 LIFE MEDACC
Demonstration and validation of innovative methodology for regional climate change adaptation in the Mediterranean area

LIFE MEDACC

PROJECT LOCATION: Catalonia
BUDGET INFORMATION: Total amount: 2,548,841 €
EU co-funding: 1,266,208 €
DURATION: Start: 01/07/2013 - End: 30/06/2018
Coordinating Beneficiary: OCCC
Associated Beneficiaries: CREAF, IPE, IRTA

CONTEXT

The Mediterranean Basin is one of the world's most susceptible areas to suffer the impacts of global change. Besides, 60% of the water-poor countries in the world are located in this area. Water demand in the region is expected to increase in a context of a drier and warmer future climate. In consequence, a general decrease of water availability in this region is expected, affecting the supply for industries, agriculture, urban uses and natural systems (forests).

PROJECT OBJECTIVES

To test innovative methodology through demonstration activities performed in three selected watersheds where adaptation measures in water use, agriculture and forest management will be tested. Moreover, the project aims:

a) assessing in detail the climate and land use change impacts and vulnerabilities of selected watersheds,
b) diagnosing and evaluating the adaptation measures that have been already applied in those watersheds,
c) proposing a strategy for adapting those watersheds to climate change through the development of an action plan,
d) involving stakeholders through the creation of a monitoring and management panel and the development of participatory activities.

On successful completion of the project, we wish to make all the Mediterranean area benefit from the innovative strategies of this project and to help the application and further develop European policies related to climate change adaptation.

EXPECTED RESULTS

Agriculture: A 5-10% reduction of water consumption keeping current crop production in pilot sites (1 ha per watershed) after adaptation measures.

Forests: Maintain or reduce mortality episodes despite global warming and rainfall pattern change in pilot sites (1 ha) after adaptation measures. Convert current high combustible forest (model 4 and 7 of Rothermel combustibilty classification) to low combustible forest (model 8 and 5) in pilot sites (1 ha) after adaptation measures.

Water management: a) maintain current water consumption for urban uses and b) manage dams to guarantee water supply under different scenarios.

www.medacc-life.eu

Thank you very much !

The Catalan Office for Climate Change (OCCC)
occc@gencat.cat
htpp://www.gencat.cat/canviclimatic

Zagreb, 23 January 2014
Workshop “Adaptation to climate change in Croatia”

ADAPTATION AS MULTI-LEVEL GOVERNANCE ISSUE: EXPERIENCES FROM ITALY AND GUIDELINES FOR MUNICIPALITIES

Domenico Gaudioso
ISPRA – Italian National Institute for Environmental Protection and Research

ISPRA
Istituto Superiore per la Protezione e la Ricerca Ambientale

SUMMARY

- The Italian National Adaptation Strategy
- Guidelines for a Regional Adaptation Plan in Lombardy
- Guidelines for Local Adaptation Plans (LIFE ACT project)
- Conclusions: next steps

THE ITALIAN NATIONAL ADAPTATION STRATEGY

THE ITALIAN NATIONAL ADAPTATION STRATEGY (NAS)

- Institutional Coordinator:

  Italian Ministry for the Environment, Land and Sea

- Technical Coordination:

  Euro-Mediterranean Center for Climate Change (CMCC)

- National Project SNAC "Elements for the elaboration of a National Adaptation Strategy to climate change"
- Coordinator of the Technical Table: Sergio Castellari
- Start: July 2012
- End: June 2014

NAS: THE CONTENT

NATIONAL ADAPTATION STRATEGY (NAS)

- Involvement of stakeholders and decision-makers
- Analysis of possible mainstreaming of adaptation in the different sectorial policies
- Review after n years
- A National Adaptation platform

NATIONAL ADAPTATION PLAN (NAP)

- Implementation of NAS with governance and funding allocation
- Evaluation of implementation (indicators)

NAS: THE STEPS OF THE PROCESS

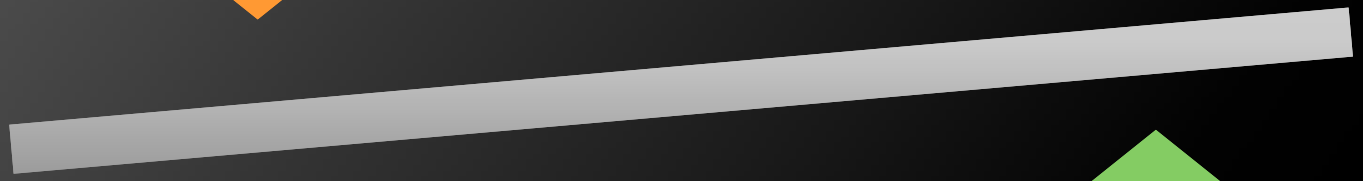
- involvement of national stakeholders
- CCIVA national assessment
- reviews of all documents from Scientific Community, Stakeholders Community (public and private sector) and Institutional Community (Ministries, Regions, Province, Municipalities, Regional EPAs and Civil Protection)
- provision of recommendations and guide-lines to build adaptive capacity in different sectors and scales in order to implement cost-effective adaptation measures (mainly anticipatory adaptation)

NAS: THE APPROACH

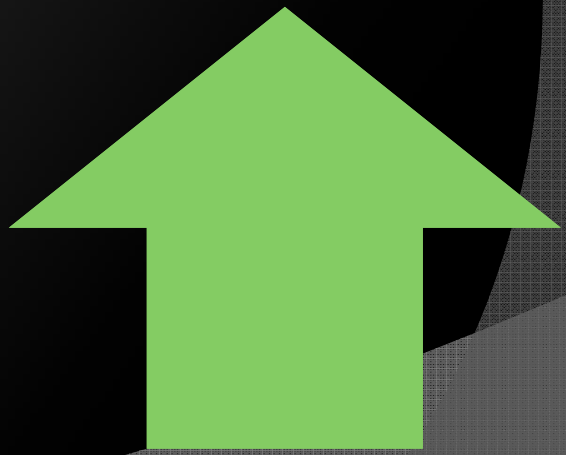
TOP DOWN:

Technical Panel – about 100 national scientists and sectoral experts

Interministerial Panel – Ministries, regional authorities, province authorities and municipalities



BOTTOM-UP:



Participatory process – transparency, sharing with national stakeholders (civil society, scientific community, private sector...)

NAS: THE STRUCTURE

THREE DOCUMENTS

1. Technical Report: “National assessment of knowledge on climate change, impacts, vulnerability and adaptation for relevant sectors”
2. Technical Report: “Analysis of European and national policy framework for adaptation “
3. Strategy Document: “Elements for an Italian NAS”

PARTICIPATORY APPROACH

- October – November 2012: On-line survey through a questionnaire
- 31/10/13 – 31/12/2013: On line review of the draft of the Strategy Document
- 9 – 10/12/2013: Three public consultations on the draft of the Strategy Document

NAS: NATIONAL CCIVA ASSESSMENT

- Definition and identification of sectors
- Assessment of present and expected impacts of climate change for each sector
- Assessment of vulnerability of each sector to the present and future climate
- Assessment of adaptative capacity of each sector
- Evaluation of already implemented adaptation measures for each sector
- Tentative estimate of cost of inaction and adaptation for each sector

NAS: THE SECTORS

1. WATER RESOURCES (quantity and quality)
2. DESERTIFICATION, SOIL DEGRADATION and DROUGHTS
3. HYDROGEOLOGICAL RISK
4. BIODIVERSITY and ECOSYSTEMS:
   - Terrestrial ecosystems
   - Marine ecosystems
   - Inland water ecosystems and transition ecosystems
5. HEALTH
6. FORESTRY
7. AGRICULTURE, ACQUACULTURE, FISHERY:
   - Agriculture and Food Production
   - Marine Fishery
   - Aquaculture
8. ENERGY (production and consumption)
9. COASTAL ZONES
10. TOURISM
11. URBAN SETTLEMENTS
12. CRITICAL INFRASTRUCTURES:
    - Cultural Heritage
    - Infrastructures for Transport
13. SPECIAL CASES:
    - Mountain Areas (Alps and Apennines)
    - Po river basin

NAS: POSSIBLE NEXT STEPS AFTER ADOPTION

- A National Adaptation Platform
- Preparation of a Plan of Action:
  - ✓ analysis of institutional competences at national, regional, provincial and local levels
  - ✓ agreement on priority adaptation actions to be implemented
  - ✓ agreement on time scale of intervention
  - ✓ allocation of funds

GUIDELINES FOR A REGIONAL ADAPTATION PLAN IN LOMBARDY

LOMBARDY: TOWARDS A REGIONAL ADAPTATION STRATEGY

- On the basis of a number of national and EU research projects implemented since 2006 at the regional level, the Lombardy Region has approved in 2012 a document providing "Guidelines for a Climate Change Adaptation Plan for Lombardy"
- With a view to the Regional Adaptation Strategy, to be established in 2013-2014 on the basis of the National Adaptation Strategy, the Guidelines provide:
  - ✓ general methodological approaches
  - ✓ identification of most vulnerable sectors
  - ✓ identification of priority actions

THE SCIENTIFIC APPROACH

- climate change scenarios, on the basis of observed trends;
- quantitative assessment of the impacts for each vulnerable sector, as a function of the previous scenarios;
- integrated risk analysis, considering both risks directly or indirectly related to climate change and other anthropogenic risks;
- adaptation actions, taking into consideration the severity of the impacts, the time horizons used for the assessment and the cost / effectiveness ratio of the interventions

VULNERABLE SECTORS

- Human health: heat waves
- Soil protection: increased in hydro-geological risk
- Water resources (both quality and availability): drought and water scarcity
- Tourism: increase in the altitude of the line of snow-reliability
- Agriculture: water stress and greater spread of pests
- Mountain areas: deglaciation and permafrost melting
- Forests, biodiversity and protected areas: biodiversity loss, changes in alteration of habitats and areal distribution
- Energy sector: reduction of hydro-electricity generation
- Transport and mobility: impacts on transport infrastructure
- Air quality: increase in emissions and concentrations of pollutants

GUIDELINES FOR CLIMATE CHANGE ADAPTATION PLANS AT LOCAL LEVEL (LIFE ACT PROJECT)

WHY THE GUIDELINES?

With these guidelines the Partners of the project ACT would like to give their contribution by making available to other communities their EXPERIENCE, as well as illustrating STRENGTHS and WEAKNESSES identified during their local adaptation process.

The Document was prepared by:

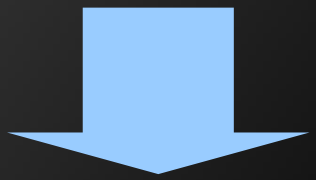
the Institute for Environmental Protection and Research (ISPRA, Italy)

in cooperation with the local partners of the project:

the Municipalities of Ancona (Italy), Bullas (Spain) and Patras (Greece)

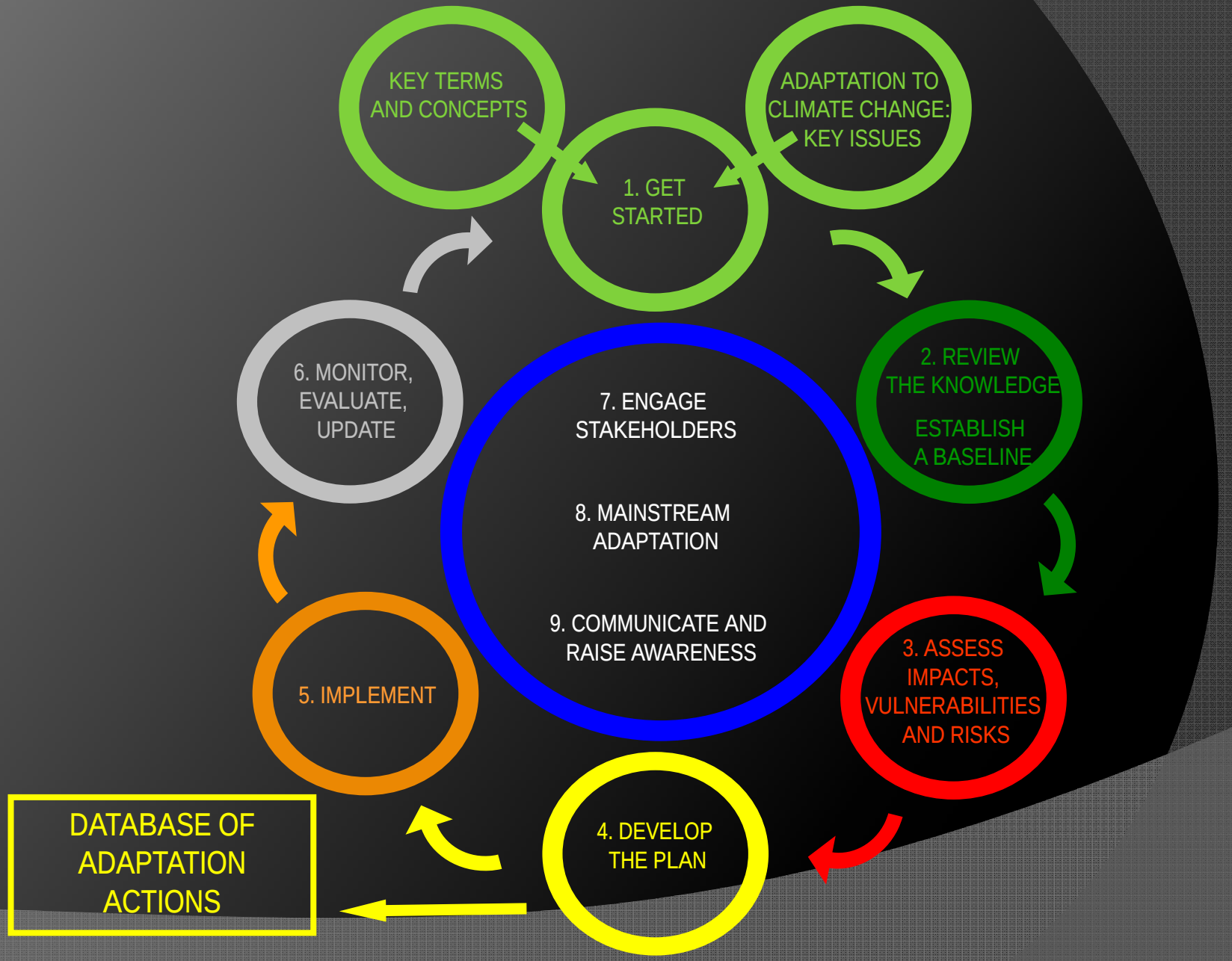
OBJECTIVES OF THE GUIDELINES

• to offer mayors and other city officials a guidance on how to respond to the challenges of climate change adaptation in their cities



• to assist local communities in formulating Local Adaptation Plans (LAPs) or implementing some steps of it, by providing useful theoretical elements together with practical processes deriving by empirical experiences.

STRUCTURE OF THE GUIDELINES



STRUCTURE OF THE GUIDELINES

EACH CHAPTER:

- KEY MESSAGES
- THEORETICAL CONCEPTS
- PRACTICAL EXAMPLES from the ACT Project
- PRACTICAL EXAMPLES selected among the initiatives of cities in Europe
- CHECK LIST

1. GET STARTED

Before starting it is important to take the right INITIAL DECISIONS in order to pave the way to the further future steps and build the critical foundation on which the later stages of the adaptation effort will be based.

Organizational and technical management

Political interest and commitment

Vision and guiding principles

Financial resource

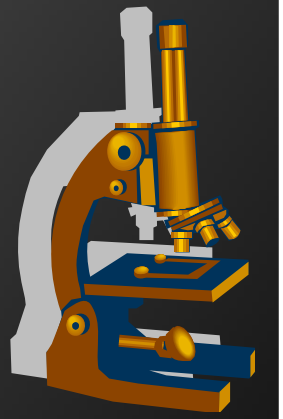
Take the first decisions

Identify the barriers to adaptation

2. REVIEW THE KNOWLEDGE AND ESTABLISH THE BASELINE

Reviewing the available KNOWLEDGE and establishing a BASELINE will provide the basis for setting PRIORITIES and monitoring of PROGRESS in adaptation.

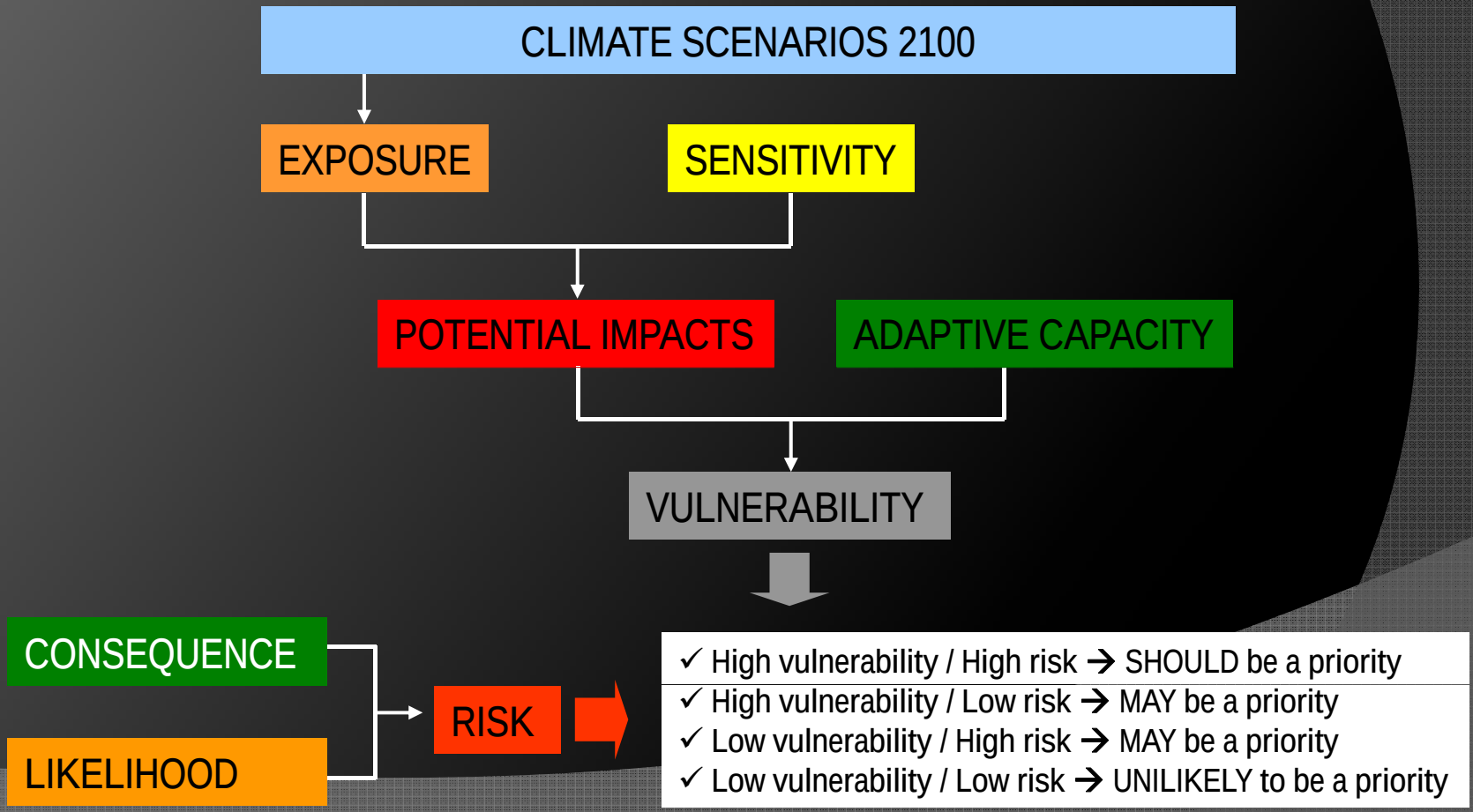
A BASELINE can be considered as a reference against which future data will be compared.



- local climate trends
- local climate change impacts including economic assessment
- local vulnerabilities
- risks and opportunities
- existing local policies, plans, programmes related to adaptation
- existing actions directly or indirectly related to adaptation

3. ASSESS IMPACTS, VULNERABILITIES AND RISKS

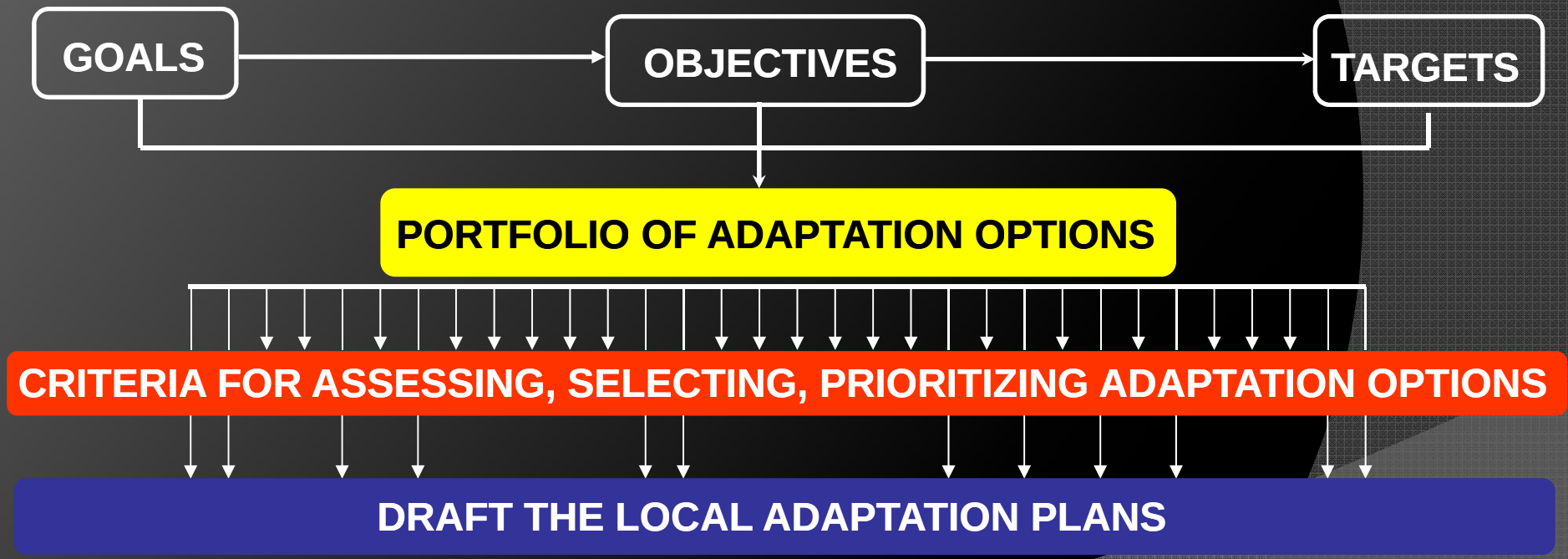
The extent to which climate change have an IMPACT on human and natural systems is strictly conditioned by the interaction between VULNERABILITY and RISK and represents the key input for targeting, formulating and evaluating adaptation policies.



4. DEVELOP THE PLAN

Planning can be defined as the process of setting GOALS, OBJECTIVES and TARGETS and developing the appropriate strategies to accomplish them.

At this stage it will be determined how best to address those risks, by identifying a range of ADAPTATION OPTIONS and then selecting preferred adaptation options using specific criteria.



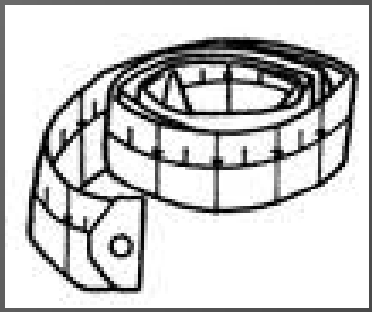
5. IMPLEMENT

An implementation plan should set out what needs to be done by whom and by when to convert your adaptation strategy into PRACTICAL ACTION. The development of an implementation plan converts adaptation options into action by listing the operational objectives, assigning roles and responsibilities and setting the deadlines for completion.

KEY FACTORS:

- ✓ Set a clear and robust leadership identifying roles and responsibility for the individuals involved
- ✓ Describe how preferred adaptation actions should be implemented
- ✓ Ensure that your organization has the right implementation tools (including financial ones)
- ✓ Identify opportunities that could be exploited to synergize climate adaptation actions with other planning and development activities
- ✓ Identify what resources will be required to implement the adaptations and monitor their effectiveness
- ✓ Identify potential barriers and constraints to action and mechanisms to overcome these

6. MONITOR, EVALUATE, UPDATE



Adaptation is an ITERATIVE PROCESS that requires regular review in order to verify if the community is adapting well in a dynamic world, to assess what is working well, what is not working and why, and finally to provide regular feedbacks to stakeholders on the PROGRESS being made.

IMPLEMENTATION OF THE LAP

MONITOR & EVALUATE THE PROGRESS
Process-based and outcome-based indicators

PERIODICALLY REVIEW THE ASSUMPTIONS

UPDATE THE PLAN

7. ENGAGE STAKEHOLDERS

The adaptive ability of a city is influenced by the political and societal WILLINGNESS to deal with climate change.

The success of this step relies on the ability to make the community "BEING PART OF" the change instead of "taking part" to it.

WHY?

Need to join the efforts, commitments and knowledge of different groups and individuals

Achievement of a common goal: the development of a resilient community and territory

2. WHO?

Public Administrations play a key role but need the support and the collaboration of private sector that is influenced by the planning solutions developed.

3. WHEN?

Stakeholder engagement must be realised during the whole process, in order to get relevant subjects joint to the process since the very beginning.

4. HOW?

The main stages of the creation of a Public-Private Partnership are described.

8. MAINSTREAM ADAPTATION

In most cases adaptation measures will need to be implemented as part of a broader suite of measures within existing development processes and decision cycles. Adaptation to climate change is a challenge of POLICY INTEGRATION.

KEY SECTORS:

physical land use plans or community plans, infrastructure plans, environmental plans, policies and programs, disaster response and management plans, community health and social development programs, economic development programs or projects, corporate plans and strategies, etc.

TOOLS AND STRATEGIES:

✓ planning processes;

✓ adjustment of local regulatory and service provision frameworks;

✓ adjustment of local government accountability mechanisms;

✓ engagement of private-sector, civil society organisations and processes.

9. COMMUNICATE AND RAISE AWARENESS

SHARING INFORMATION is an essential pre-condition for good adaptation.
Information on climate change and impacts and possible adaptation actions collected during the previous steps should be organized in order to reach different audiences.

Communications options and rates the pros and cons of each

- ✓ Community events
- ✓ Press release
- ✓ Issue brief
- ✓ Reporting

CONCLUSIONS: NEXT STEPS

CONCLUSIONS: NEXT STEPS

- The experience gained through the Covenant of Mayors (2642 signatories, the highest number in Europe, with 56% of the popultion covered, but only 66% of the municipalities have submitted their SEAPs and much lower implementation) indicates that preparation and implementation of a local adaptation plan can be a real challenge for most Italian municipalities, both as concerns technical capabilities and financial resources

- Therefore the Italian Environment Ministry will take action to co-ordinate the process by providing technical support (common guidelines, climate change related data and scenarios to facilitate impact assessment, data-base of best practices) and promoting co-operation between municipalities and between them and private actors for joint implementation of the commitments of the Covenant of Mayors, both current ones concerning mitigation and future ones concerning adaptation

THANK YOU VERY MUCH!
HVALA!
GRAZIE!

Web sites

SNAC project:
http://www.cmcc.it/projects/snac-elements-to-develop-a-national-adaptation-strategy-to-climate-change
Lombardy adaptation guidelines:
http://www.alpconv.org/en/organization/groups/WGWater/workshopplanalp/Documents/ballarindenti2.pdf
ACT project:
http://www.actlife.eu

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