

Enhancing Integrated Management of Global Environmental Issues: Lessons learned from development of Common Data Flow System and Indicators in Croatia



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Forward from the Croatian Environment Agency

Dear Sirs and Madams,

It is with great pleasure we would like to present the lessons learned from implementation of the UNEP/GEF project „Croatia – Common Data Flow System and Indicators to Enhance Integrated Management of Global Environmental Issues in Croatia“.

Project was initiated by the Croatian Environment Agency as a follow up of the National Capacity Needs Self-Assessment (NCSA) for management of the global environmental issues in Croatia, particularly related to climate change, desertification and biological diversity.

The Republic of Croatia as a Party to three Rio Conventions, i.e. United Nations Framework Convention on Climate Change (UNFCCC), United Nations Convention to Combat Desertification (UNCCD) and United Nations Convention on Biological Diversity (UNCBD), is obliged to continually develop, implement, evaluate effectiveness and report on national strategies, programmes and actions to combat climate change, soil degradation and loss of biological diversity.

This task requires systematic approach and development of appropriate tools which would allow better decision-making and assessment of effectiveness of past and future policies and measures based on relevant, accurate, internationally agreed and up to date information and indicators.

The main objective of the project was to design a comprehensive data flow system (DFS) and indicator model for the purpose of sustainable collection and management of common UNFCCC, UNCCD and UNCBD data at the national level, and to test this model through a small-scale pilot area located at the Nature Park Učka.

The results of the project are very concrete in terms of building up a new common data flow system model which departs from existing model of information silos in a direction of collaborative and harmonized model which would enable more efficient usage of common set of data, high quality monitoring and reporting according to the Conventions with regard to accuracy, consistency, completeness and timeliness, as well as more efficient planning and implementation of policies and measures for climate change mitigation and adaptation, conservation of biodiversity and reduction of soil degradation in the Republic of Croatia.

We strongly believe that project's results and recommendations could be of benefit to other Parties to the Rio Conventions, particularly developing countries in attempt to streamline, harmonize and integrate monitoring and reporting mechanisms in a cost-effective way.

Finally, we would like to thank to the United Nations Environment Programme and Global Environment Facility for the financial support and guidance in implementation of this important project and the national partners for the technical support.

Neven Voća, Ph.D.
CEA Director

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In its final phase project was coordinated by Hana Mesić, Head of Environmental Monitoring Sector in the Croatian Environment Agency. Project administrative expert was Rene Vukelić and legal expert was Snježana Kadić, both from the Croatian Environment Agency.

We would like to thank the following members of the Project Steering Committee who supervised project implementation: Vlatka Palčić from the Ministry of Environmental and Nature Protection, Goran Gregurović and Srećko Juričić from the Ministry of Agriculture, Krešo Pandžić from the Meteorological and Hydrological Service of Croatia and Aleksandar Žugić from the Croatian Bureau of Statistics.

Following experts from the Croatian Environment Agency were involved in three thematic working groups: Bernarda Rožman and Dino Križnjak (UNFCCC), Andreja Steinberger and Željko Crnojević (UNCCD), Gordana Kolačko (UNCBD). Mira Zovko as a lead indicator expert was involved in all thematic working groups. Development of IT component was supervised by Ivana Lampek-Pavčnik and Robert Labavić.

External assistance was provided by the leading national institutions with following experts involved: Davor Vešligaj, Delfa Radoš, Andrea Hublin, Damir Hotko, Hrvoje Jozinović and Ante Maletić from EKONERG – Energy Research and Environmental Protection Institute; Prof. Oleg Antonić, Zrinka Mesić, Alen Berta, Marija Bajica and Siniša Tkalčec from OIKON Institute for Applied Ecology; Prof. Ivan Martinić from Faculty of Forestry, University of Zagreb.

The Croatian Environment Agency would also like to thank representative of institutions from the pilot area Nature Park Učka, Egon Vasilić from Public institution Nature Park Učka, Elvis Zahtila and Mirjana Herak from Public institution „Natura Histrica“, Christian Gallo and Boris Černeha from Croatian Forests Ltd.

Finally, the Croatian Environment Agency is sincerely grateful to Adamou Bouhari from the United Nations Environment Programme for his guidance and support during the entire project implementation.



Acronyms and abbreviations

CBP	Capacity Building Programme
CEA	Croatian Environment Agency
COP	Conference of Parties
CRF	Common Reporting Format in the UNFCCC
DCP	Developed Country Parties
DFS	Data Flow System
DPSIR	EEA indicator framework, Drivers, Pressures, State, Impact, Response
EEA	European Environment Agency
EIS	Environmental Information System
EPEEF	Environmental Protection and Energy Efficiency Fund
GEF	Global Environment Facility
GHG	Greenhouse gases
HNVF	High Value Nature Farmland
IPCC	Intergovernmental Panel on Climate Change
MEPN	Ministry of Environmental and Nature Protection
NCSA	National Capacity Self-Assessment
NFP	National Focal Point
NLI	National List of Indicators
OG	Official Gazette of the Republic of Croatia
PRAIS	Performance Review and Assessment of Implementation System in the UNCCD
UN	United Nations
UNCBD	United Nations Convention on Biological Diversity
UNCCD	United Nations Convention to Combat Desertification in countries experiencing serious droughts and/or desertification, particularly in Africa
UNFCCC	United Nations Framework Convention on Climate Change
UNEP	United Nations Environment Programme

Section 1. Project background

Project title: Croatia – Common Data Flow System and Indicators to Enhance Integrated Management of Global Environmental Issues in Croatia

Project acronym: GEF/UNEP DFS

Project donors: Global Environment Facility, The United Nations Environment Programme, Croatian Environment Agency

Project budget: 954 000 USD

Executing Agency: Croatian Environment Agency

Project period: 2009-2014

The need for the establishment of a sustainable and common national Data Flow System (DFS) was identified in the GEF/UNEP supported project „National Capacity Needs Self-Assessment for Global Environmental Management - NCSA“¹ as one of the priority future activities in order to efficiently address global environmental issues in Croatia, namely climate change, desertification and biological diversity.

The NCSA project identified five potential areas for achieving synergetic effect in the implementation of the UNFCCC, UNCCD and UNCBD, namely:

- Integrated methodology for organization and development of a convention implementation support system
- Integrated information flows and cross-linked data banks
- Collective training of all participants for the convention implementation
- Joint research and technical activities
- Joint funding

Of these priorities, **integrated information flows and cross-linked data banks combined with a need to establish an environmental indicators system** able to better monitor the status of critical environmental aspects in the Republic of Croatia was determined as an area with the highest priority in the NCSA Action plan.

The integrated information flow was flagged as a priority action for Croatia as the data required for implementation of the Rio Convention are highly inter-related, particularly concerning the methods and timetable for data monitoring, collection and reporting. A valuable opportunity was seen in the fact that the Croatian Environment Agency is developing Environmental Information System (EIS) although data flow is not yet well defined in some areas, nor have uniform methodology been adopted. By expanding the EIS to address global environmental data needs it would be possible to establish a more harmonized and sustainable collection of common UNFCCC, UNCCD and UNCBD data.

Purpose and objective of the DFS project:

The purpose of the project is to safeguard the global environment through improved implementation of the three Rio Conventions in the Republic of Croatia, and the promotion of policy decisions based on technically sound data.

The objective of the project is to build national capacities for integrated global environmental management through the development of a comprehensive Data Flow System (DFS)² and indicator model for the purpose of sustainable collection and management of common UNFCCC, UNCCD and UNCBD data at the national level.

¹ Under the GEF Strategic Approach, a first Pathway of support, the National Capacity Self-Assessment (NCSA), was provided since 2002 to GEF programme countries to make a self-assessment of their capacity needs and prepare a national capacity action plan.

² Data Flow System for the purpose of this project includes legal, institutional and procedural arrangements made within a Party to Rio conventions for collecting and streamlining the data and estimating common indicators covering UNFCCC, UNCCD and UNCBD conventions.



Project outcomes and outputs

<p>Outcome 1: An enhanced EIS that incorporates common set of indicators covering global environmental issues</p>	<ul style="list-style-type: none"> • Output 1.1 Common indicators defined covering all three Rio Conventions with metadata specified • Output 1.2 IT correlation database built taking into account the EIS requirements and using existing GIS and other databases
<p>Outcome 2: A cooperative institutional framework (DFS) that increases information accessibility and reduces redundancy in data collection</p>	<ul style="list-style-type: none"> • Output 2.1 Data Flow System designed for institutions concerned with UNFCCC, UNCCD and UNCBD issues • Output 2.2 Time dynamic institutional responsibilities defined • Output 2.3 Data and information management protocols defined and implemented
<p>Outcome 3: Indicator system and institutional DFS piloted in area with demonstrated convention inter-linkages and complex institutional set-up</p>	<ul style="list-style-type: none"> • Output 3.1 Pilot area defined, required data set identified and existing data collated • Output 3.2 First set of data and information produced on present state conditions in pilot area • Output 3.3 Public awareness activities and materials developed • Output 3.4 DFS web enabled
<p>Outcome 4: A sustainable national capacity building programme for the management of convention data</p>	<ul style="list-style-type: none"> • Output 4.1 Analysis of project outputs and recommendations for policy changes provided to stakeholders • Output 4.2 Capacity building programme developed covering data collection, exchange, dissemination and calculation of indicators

The project assembled all relevant national competent authorities, public institutions and experts that have already participated in the previous NCSA process. The Croatian Environment Agency was the Executing Agency and the following key competent authorities and institutions had participated in the project: the Ministry of Environmental and Nature Protection as a National Focal Point for three Rio Convention, the Ministry of Agriculture as competent authority for developing policies in forestry sector, the Meteorological and Hydrological Service of Croatia responsible for development and management of network of meteorological measurement stations and climate observations in the Republic of Croatia and the Croatian Bureau of Statistics which is responsible for national statistics according to relevant national and the EU laws and regulation.

Project activities were supervised by the CEA as the Executing Agency and the Project Steering Committee (PSC) which was constituted at the beginning of each project phase. In the third phase (2013-2014) members of the PSC were delegated from:

- the Ministry of Environmental and Nature Protection,
- the Ministry of Agriculture,
- the Meteorological and Hydrological Service of Croatia and
- the Croatian Bureau of Statistics.

From the operational point of view, three thematic working groups were established: WG UNFCCC, WG UNCCD and WG UNCBD. Members of the working groups were experts from the Croatian Environment Agency and external national experts from leading Croatian scientific and consulting institutions, namely EKONERG - Energy Research and Environmental Protection Institute, OIKON Institute for Applied Ecology and Faculty of Forestry which are authorized institutions by the Ministry of Environment and Nature Protection.

Section 2. Rio conventions and national commitments

The three Rio Conventions: UNFCCC, UNCCD and UNCBD derive directly from the 1992 Earth Summit. Each instrument represents a way of contributing to the sustainable development goals of Agenda 21. The three conventions are intrinsically linked, operating in the same ecosystems and addressing climate change, desertification and biodiversity issues.

2.1. UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE - UNFCCC

The Republic of Croatia became a party to the United Nations Framework Convention on Climate Change on 17 January 1996 when the Croatian Parliament passed the law on its ratification (OG, International Treaties 2/96). For the Republic of Croatia the Convention came into force on 7 July 1996. As a country undergoing the process of transition to market economy, Croatia has, pursuant to Article 22, paragraph 3 of the Convention, assumed the commitments of countries included in Annex I. By the amendment that came into force on 13 August 1998 Croatia was listed among Parties included in Annex I to the Convention.

The Republic of Croatia ratified the Kyoto Protocol in April 2007 which entered into force on 28 August 2007. By ratifying the Protocol (OG, International Treaties 5/07), the Republic of Croatia, as the Protocol Annex B party, takes over the obligation of limiting the greenhouse gases emission in the period 2008-2012 to 95% of total emission in the base year, i.e. 1990.

Ministry of Environmental and Nature Protection, through its authorized representative is a National Focal Point in Croatia responsible for communication with the Secretariat of the Convention in respect of the implementation of commitments including reporting obligations.

NFP UNFCCC

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The ultimate **objective** of the UNFCCC and any related legal instruments that the Conference of the Parties may adopt is to achieve, in accordance with the relevant provisions of the Convention, is stabilization of greenhouse gas 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 adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.

In stating this objective, the Convention reflects concerns that the earth's climate system is threatened by a rise in atmospheric GHG concentrations, which is caused by increased anthropogenic GHG emissions. The Convention does not state a limit for total anthropogenic GHG emissions which would have to be respected to reach the objective. Nor does it indicate the level of total GHG concentrations beyond which "dangerous anthropogenic interference with the climate system" would occur. Estimates of where these levels lie evolve continually with scientific advances and are complicated by the political need to take into account the changing ability of societies to adapt to climate change. Another important factor is that stabilizing atmospheric concentrations of GHGs near current levels would actually require a steep reduction of current emissions. This is because, once emitted, GHGs remain in the atmosphere for a considerable length of time: carbon dioxide, for instance, stays in the climate system, on average, for a century or more.

In their actions to achieve the objective of the Convention, the Parties shall be guided by the following key **commitments**:

- develop, periodically update, publish and make available to the Conference of the Parties, in accordance with Article 12, national inventories of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, using comparable methodologies to be agreed upon by the Conference of the Parties;
- formulate, implement, publish and regularly update national and, where appropriate, regional programmes containing measures to mitigate climate change by addressing anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montre-



al Protocol, and measures to facilitate adequate adaptation to climate change;

- promote and cooperate in the development, application and diffusion, including transfer, of technologies, practices and processes that control, reduce or prevent anthropogenic emissions of greenhouse gases not controlled by the Montreal Protocol in all relevant sectors, including the energy, transport, industry, agriculture, forestry and waste management sectors;
- promote sustainable management, and promote and cooperate in the conservation and enhancement, as appropriate, of sinks and reservoirs of all greenhouse gases not controlled by the Montreal Protocol, including biomass, forests and oceans as well as other terrestrial, coastal and marine ecosystems;

The ability of the international community to achieve the objective of the Convention depends on accurate knowledge of trends in GHG emissions and

on altering these trends. The most appropriate action can only be taken on the basis of accurate, consistent and internationally comparable data. Communicating relevant information on the most effective ways to reduce emissions and adapt to the adverse effects of climate change also puts the world collectively on the path of sustainable forms of development. Under the Convention therefore, all Parties must communicate certain information to the COP. In accordance with the principle of “common but differentiated responsibilities” enshrined in Article 3 of the Convention, the information submitted by Annex I and non-Annex I Parties differs in scope and content.

The two main elements of the information on implementation are **national inventories of GHGs** and details of the activities a Party has undertaken to implement the Convention. Annex I Parties have to submit information on their national inventories annually. They also have to submit information on their activities to implement the Convention in their **national communications** – documents prepared by the dates decided by the COP.

Key facts – implementation of the UNFCCC monitoring and reporting obligations

The United Nations Framework Convention on Climate Change in Articles 4 and 12 prescribes an obligation to *develop, periodically update, publish and make available to the Conference of the Parties national inventories of anthropogenic emissions by sources and removals by sinks and national communications*, using comparable methodologies to be agreed upon by the Conference of the Parties. Along with the Convention, the Kyoto Protocol prescribes an establishment of *so called national communication system on greenhouse gas emissions*, including all institutional, legal and procedural mechanisms for data preparation and submission, calculation, reporting and storing of data and information on inventory, reports on greenhouse gas inventory and common reporting format, as well as their expert evaluation.

The National Inventory Report represents a sectorally organized database containing data on activities, emission factors and calculated emission values. **Software application CRF Reporter** using the XML technology for data exchange is applied for data input, emission review and reporting towards the Convention Secretariat. MS Access 2000 is used for data storage. A deadline for submission of these data is on 15 April of current year (N) for reporting period from 1990 to N-2. Submitted data are reviewed and evaluated by expert teams and in case of larger inconsistencies, the Party is required to carry out recalculation and to submit corrected data again to the Secretariat.

Selected indicators KP 1, KP 3, KP 4 and KP 5 represent also the main results of emission calculation and greenhouse gas removal, thus there is a strong and uniform relation between the national list of indicators and greenhouse gas inventory. Indicator KP 2, describing the projections of emissions and greenhouse gas removal in the future long-term period (2015, 2020, 2025 and 2030), is reported within the framework of national communications (every four years) and from 2014 within the framework of two-year communications.

So far Croatia has regularly submitted the annual national inventories (last one in April 2014) which are subject to international review process conducted by the Secretariat as well as national communications (The sixth national communication was submitted in February 2014). All reports were prepared in accordance with relevant COP/MOP Decisions.

2.2. UNITED NATIONS CONVENTION TO COMBAT DESERTIFICATION IN COUNTRIES EXPERIENCING SERIOUS DROUGHTS AND/OR DESERTIFICATION, PARTICULARLY IN AFRICA- UNCCD

The Republic of Croatia became a party to the United Nations Convention to Combat Desertification in countries experiencing serious droughts and/or desertification, particularly in Africa on 30 January 2000 when the Croatian Parliament passed the law on its ratification (OG, International Treaties 11/00). For the Republic of Croatia the Convention came into force on 4 January 2001.

The **objective** of this Convention is to combat desertification and mitigate the effects of drought in countries experiencing serious drought and/or desertification through effective action at all levels, supported by international cooperation and partnership arrangements, in the framework of an integrated approach which is consistent with Agenda 21, with a view to contributing to the achievement of sustainable development in affected areas.

Ministry of Environmental and Nature Protection, through its authorized representative is a National Focal Point in Croatia responsible for communication with the Secretariat of the Convention in respect of the implementation of commitments including reporting obligations.

NFP UNCCD

Ministry of Environmental and Nature Protection

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In order to achieve the objective of this Convention and to implement its provisions, the Parties shall be guided, inter alia, by the following **principles**:

- the Parties should ensure that decisions on the design and implementation of programmes to combat desertification and/or mitigate the effects of drought are taken with the participation of populations and local communities and that an enabling environment is created at higher levels to facilitate action at national and local levels;
- the Parties should, in a spirit of international solidarity and partnership, improve cooperation and coordination at subregional, regional and international levels, and better focus financial, human,

organizational and technical resources where they are needed;

- the Parties should develop, in a spirit of partnership, cooperation among all levels of government, communities non-governmental organizations and landholders to establish a better understanding of the nature and value of land and scarce water resources in affected areas and to work towards their sustainable use; and
- the Parties should take into full consideration the special needs and circumstances of affected developing country Parties, particularly the least developed among them.

The Parties shall implement their **obligations** including:

- adopt an integrated approach addressing the physical, biological and socioeconomic aspects of the processes of desertification and drought;
- give due attention, within the relevant international and regional bodies, to the situation of affected developing country Parties with regard to international trade, marketing arrangements and debt with a view to establishing an enabling international economic environment conducive to the promotion of sustainable development;
- integrate strategies for poverty eradication into efforts to combat desertification and mitigate the effects of drought;
- promote cooperation among affected country Parties in the fields of environmental protection and the conservation of land and water resources, as they relate to desertification and drought; strengthen subregional, regional and international cooperation;
- cooperate within relevant intergovernmental organizations;
- determine institutional mechanisms, if appropriate, keeping in mind the need to avoid duplication; and
- promote the use of existing bilateral and multilateral financial mechanisms and arrangements that mobilize and channel substantial financial resources to affected developing country Parties in combating desertification and mitigating the effects of drought.

Communication of information to the Conference of the Parties is regulated by Article 26 which states that each Party shall communicate to the Conference of the Parties for consideration at its ordinary sessions, through the Permanent Secretariat, reports on the measures which it has taken for the implementation of the Convention. The Conference of the Parties shall determine the timetable for submission and the format of such reports.



Key facts – implementation of the UNCCD monitoring and reporting obligations

In accordance with decision 16/COP.11, the secretariat and the Global Mechanism with financial support of the GEF through UNEP, have implemented a number of improvements to the performance review and assessment of implementation system (PRAIS). The goal of these changes is to make the reporting and review process simpler and more effective and sharply increase the quantity and quality of information to be reviewed by the CRIC.

Reporting requirements for the 2014 reporting exercise include *inter alia*: (1) **reduced number of performance indicators**: in accordance to the feedback provided by Parties on e-smart criteria, some performance indicators have been discarded. As a result of this process, the number of performance indicators has been reduced from 14 to 11 for affected country Parties (ACPs), and from 10 to 8 for developed country Parties (DCPs), and (2) **simplified templates**: reporting templates for country Parties and other reporting entities have been revisited according to the completeness of reports submitted in the last two reporting cycles, the analysis made of the information and its actual use according to the analytical framework, and its utility in the review process at CRIC 9 and CRIC 11. The number of required fields has thus been reduced by 40% in the ACP template, and by 65% in the DCP template.

Online reporting platform was improved: The format of the new reporting templates (fillable Adobe Live PDF) facilitates off-line compilation of reports, and makes the submission more user friendly. Draft reports can be saved and edited off-line if required, and be uploaded by National Focal Points or reporting officers through a new secure online submission facility. It is planned that the new online reporting platform will be open for submissions of reports starting from June 2014, while access to the old PRAIS portal will be discontinued for the time of the reporting.

According to information indicated on UNCCD portal, the Republic of Croatia so far had submitted only the First National Communication in July 2006 to the Convention Secretariat (third reporting cycle). It is indicated in the report that process of determining new indicators is in progress and that it will be determined within the framework of preparation of the National Action Plan to combat the desertification. The fifth reporting cycle is on-going with submission deadline of up to 30 July 2014. The form of report is relatively simple, prepared in .pdf form and submitted in electronic version through PRAIS *online* platform. More detailed instructions and examples of reports are indicated on the Convention webpage:

<http://www.unccd.int/en/programmes/Capacity-building/CBW/Resources/Pages/5RC/Default.aspx>

2.3. UNITED NATIONS CONVENTION ON BIOLOGICAL DIVERSITY - UNCBD

The Republic of Croatia became a party to the United Nations Convention on Biological Diversity on 25 April 1996 when the Croatian Parliament passed the law on its ratification (OG, International Treaties 6/96). For the Republic of Croatia the Convention came into force on 7 October 1996.

The objectives of this Convention are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding.

Ministry of Environmental and Nature Protection, through its authorized representative is a National Focal Point in Croatia responsible for communication with the Secretariat of the Convention in respect of the implementation of commitments including reporting obligations.

NFP UNCCD

Ministry of Environmental and Nature Protection

Sector for nature protection

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Each Party to the Convention shall, in accordance with its particular conditions and capabilities:

- Develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity or adapt for this purpose existing strategies, plans or programmes which shall reflect, *inter alia*, the measures set out in this Convention relevant to the Contracting Party concerned; and
- Integrate, as far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans, programmes and policies.
- Identify components of biological diversity important for its conservation and sustainable use having regard to the indicative list of categories set down in Annex I;
- Monitor, through sampling and other techniques, the components of biological diversity identified, paying particular attention to those requiring urgent conservation measures and those which offer the greatest potential for sustainable use;
- Identify processes and categories of activities which have or are likely to have significant adverse impacts on the conservation and sustainable use of biological diversity, and monitor their effects through sampling and other techniques; and
- Maintain and organize, by any mechanism data, derived from identification and monitoring activities

In regard to reporting process, each Party shall, at intervals to be determined by the Conference of the Parties, present to the Conference of the Parties, reports on measures which have been taken for the implementation of the provisions of this Convention and their effectiveness in meeting the objectives of this Convention.

Key facts – implementation of the UNCBD monitoring and reporting obligation

Pursuant to Article 26 of UNCBD Convention, the objective of reporting is to provide information on measures which has been taken for the implementation of the provisions of the Convention and their effectiveness in meeting the objectives of the Convention.

The measures are adopted within the framework of national strategies, plans and programs and, in accordance to the national circumstances and capacities, they are implemented to other inter-sectoral horizontal plans and programs.

The Republic of Croatia has submitted to the Secretariat all required national communications so far, with the latest Fifth national report submitted in June 2014. Reports are available at the Convention's web page <http://www.cbd.int/reports/>

In Appendix IV.2 of the Fourth National Report of the Republic of Croatia to the UNCBD, the following **indicators** were selected within the framework of DFS project, which would serve as one of the basis for monitoring the measures implementation: ZPV 1 Areas protected based on the Nature Protection Act, BR 1 Areas in ecological network of the Republic of Croatia, BR 12 High nature value farmland, BR 14 Forest: deadwood and BR 17 Financing protection and conservation of biodiversity. Indicator Š 1 Forest and forest land areas is indicated in Appendix IV.3 as related indicator. Indicator BR 18 Public awareness on nature protection has been proposed for the national list of indicators in 2011, thus it was not included into the Fourth National Report.

Within the reporting framework, there is no prescribed electronic form for reporting on indicators, but they are indicated within the framework of national communication itself.



Section 3. Key project achievements: contribution to the synergetic implementation of the Rio conventions in Croatia

3.1. NEW DATA FLOW SYSTEM AND INDICATOR MODEL

The purpose of establishing the common data flow system for preparation of selected group of indicators is to enhance and comply as much as possible the Republic of Croatia reporting according to international UN Conventions on climate change, desertification and biodiversity, as well as to make the process of planning and monitoring of environmental and nature protection policy and measures implementation, based on national indicators system, more efficient. Therefore, new system that is proposed could be considered as the key result of this project.

It should be emphasized that the GEF/UNEP project “Data Flow System and Indicators to Enhance Integrated Management of Global Environmental Issues in Croatia” is the one of few internationally financed projects aiming at research and piloting of potential options for consolidating and integrating reporting on implementation of three UN Conventions, which emphasizes its significance even more.

The analyses carried out in these projects, including this one as well, indicate that there are certain reasons due to which there is no strong connection between these

Conventions with regard to the reporting mechanisms, including³:

- different strategic priorities regarding the fulfilling of obligations towards the Conventions,
- a stage of development of regulatory implementing framework,
- different reporting cycles,
- different reporting forms and their modifications,
- different forms of indicators for the national list of indicators (numerical, spatial, textual/descriptive).

Figure 3.1-1 indicates the existing data and indicators flow system, i.e. in wider sense it is a monitoring and reporting system according to the international Conventions. The analyses carried out in all project phases indicate that a model of information silos has been established functioning independently without horizontal connecting and flow of information and data.

Furthermore, the main preconditions were identified, which should be fulfilled in order to obtain a strong harmonization with regard to reporting, out of which the following could be emphasized:

- establishment or enhancement of information systems supporting the data and indicators flow and exchange,

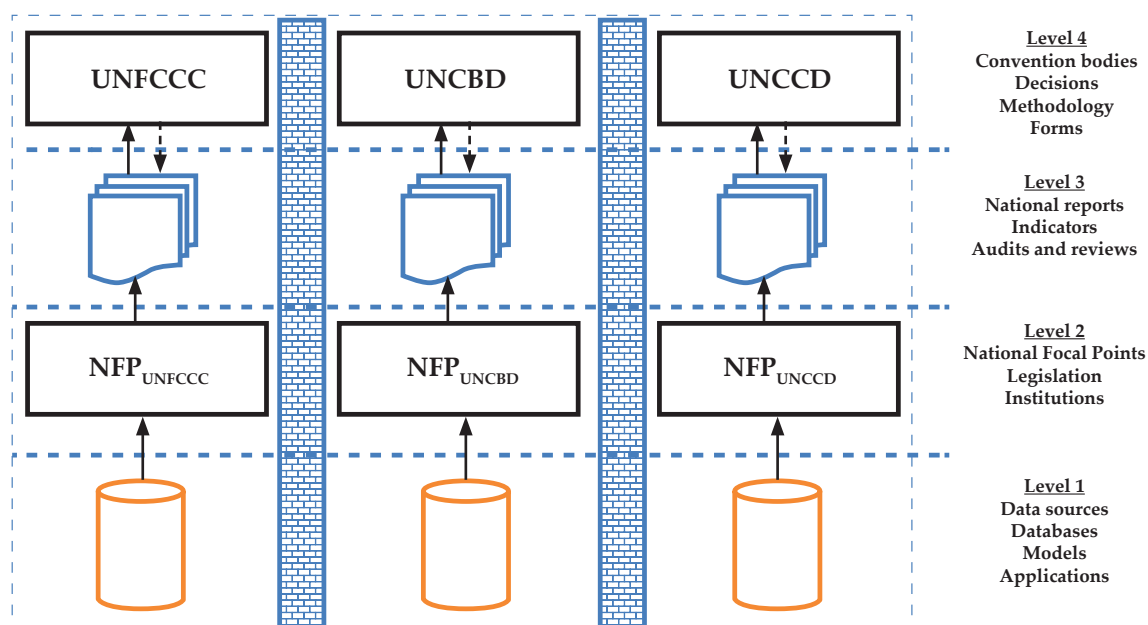


Figure 3.1-1: Existing model of data and indicators flow system for three Conventions (model of information silos)

³ Assessment of potential options for consolidating and integrating national reporting to the three Rio Conventions, A report from the Piloting Integrated Processes and Approaches to Facilitate National Reporting to the Rio Convention project (UNEP/GEF), 2011

- coordinated operation of national focal points for implementation of individual Rio Conventions, as well as entities responsible for data collection,
- existence of clear connection between the indicators monitoring and reporting systems and their usage for the purpose of preparation of action plans and programs for policy and measures implementation,
- existence of consolidated form and cycle of reporting on data and indicators.

Experts and participants in the project made a conclusion that new model of common data and indicators flow should be built “bottom-up”, since the model is now based on three separate data pools, whereat it was established that there were strong relations between individual indicators in all three Conventions as indicated in Fig. 3.1-2.

	KP 1	KP 3	KP 4	KP 5	BR 14	Š 1	P 1	Š 3
KP 1		•	•	•	•	•	•	•
KP 3	•							•
KP 4	•							•
KP 5	•					•	•	•
BR 14	•							
Š 1	•			•				
P 1	•			•				
Š 3	•	•	•	•				

Figure 3.1-2: Matrix of relations between selected indicators (**UNFCCC indicators:** KP 1 – greenhouse gas emissions and removals, KP 3 - N2O emission, KP 4 - CH4 emission, KP 5 - CO2 emission; **UNCBD indicators:** BR 14 – Forest: deadwood, Š 1 – forest and forest land areas; **UNCCD indicators:** P 1 – changes in land use and Š 3 – burnt forest areas

A reconstruction of existing model aiming at designing new collaborative model should take into consideration possibilities of horizontal connection of separate components indicated in Fig. 3.1-1, whereat it is required to separate the levels of system being under responsibility of Parties to the Convention (levels 1, 2 and partially 3) and levels for which change it is required to make decisions on the level of Parties to the Convention (level 4 and partially level 3).

Another element that should be taken into consideration is the relevance of 23 indicators selected for each individual Convention. Performed analyses⁴ indicate that, for example, 29 percent of information from the National Inventory Report is potentially useful for

4 Assessment of potential options for consolidating and integrating national reporting to the three Rio Conventions, A report from the Piloting Integrated Processes and Approaches to Facilitate National Reporting to the Rio Convention project (UNEP/GEF), 2011.

5 The fifth reporting cycle in 2014.

6 The Third National Report pursuant to UNCBD should have been submitted in 2005, the Fourth in 2009

the area of biodiversity and desertification based on the relevance for preserving the ecosystem and sustainable land management. It is concluded as a result of this analysis that 65 percent of reporting applications for UNCBD, 71 percent for UNFCCC and 62 percent for UNCCD is potentially relevant for one or both other Conventions. On the other hand, about one third of the current applications are specific only for individual Conventions. It can be concluded that in the existing frameworks, it is quite unlikely that a unique report could be prepared for all three Conventions. There will always be a need of indicators and information specific for individual Convention. The analyses within the framework of this project indicate that selected indicators are extremely relevant for all three Conventions, i.e. that a percentage of relevance is higher than the one mentioned in the previous paragraph.

In relation to this aspect, global analysis made within the framework of FNR Rio project also financed by the GEF and implemented by UNEP, indicated that “while there is a large number of overlapping elements, relevant to all three conventions, there are also many convention-specific elements not relevant to the other agreements. It is estimated that some two thirds of the information currently requested by reporting formats of the Rio Conventions could be relevant also to one or both of the other conventions. Conversely, about one third of the current reporting requirements are specific to the convention in question. To overcome this problem, a more radical approach could be taken to developing a joint reporting format, which would require more substantive change by conventions in the approach they are taking to reporting. The aim would be to develop a far more integrated approach based on either a number of themes, or on processes, with as few convention-specific questions as possible. Thus, the expected reduction in the reporting burden would likely go well beyond the reduction expected from the approach to a joint reporting format based on the current formats. The problem is that there are various different ways in which this could be done, and given the level of effort likely to be required to instigate change it may not be profitable to explore this further without wider stakeholder involvement”.

The third significant element is a form and cycles, i.e. deadlines of reporting. If we compare all three Conventions, it can be concluded that reporting forms are quite unequal and different platforms and information solutions not being mutually compatible are used. Reporting deadlines are determined based on decisions made by the Parties to the Conference as the main Convention body. Within the framework of UNFCCC Convention, national communications are submitted every four years, national inventory reports every year, and since 2014 a mandatory two-year reporting has been introduced. Reporting within the framework of UNCCD Convention is assumed to be every other year⁵, while reports within the framework of UNCBD Convention are submitted every five or six years⁶. It can be concluded that reporting cycles for individual Conventions are not synchronized, thus representing an additional challenge to designing a common data flow.



Fig. 3.1-3 indicates system levels 1 and 2, which could be in a short term (1-2 years) more strongly or almost completely horizontally connected (designated by green arrows) and level 3, which could be connected through reporting mechanisms in a medium term (3-5 years) primarily due to various reporting cycles. At this moment, it is unknown whether there are any initiatives to connect the reporting systems, particularly as regarding the preparation of common reporting form, on the level 4, but it can be assumed that there is no any stronger coordinated action for now.

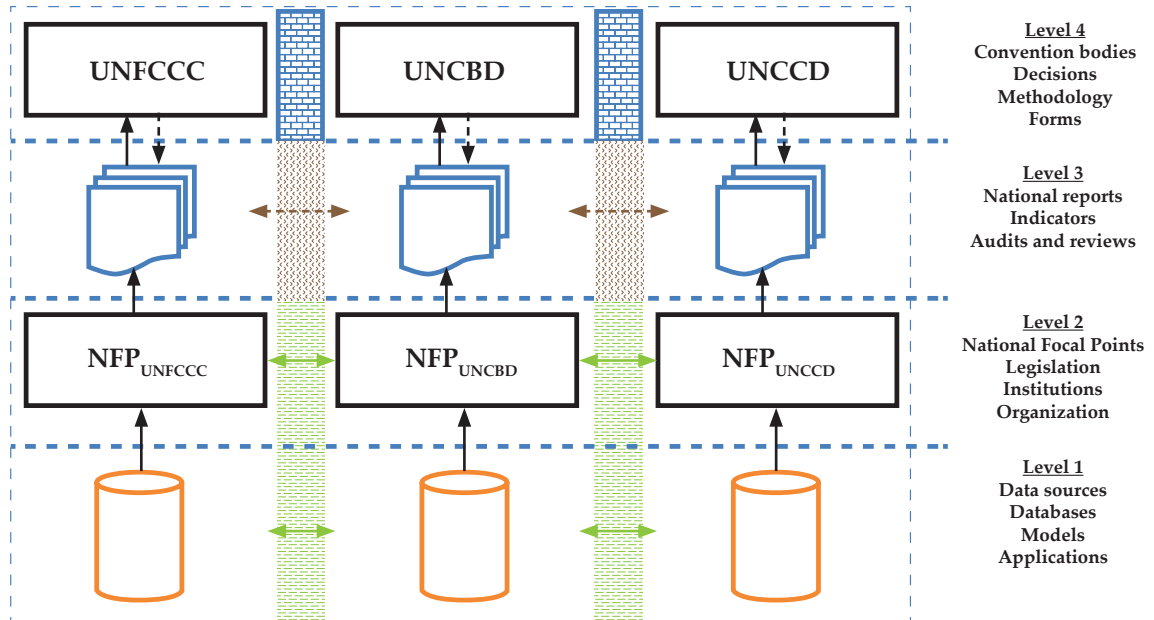


Figure 3.1-3: Possibilities of horizontal connection and development of collaborative model

Finally, it can be concluded that so far in Croatia, as well as in most of other Parties to the Rio Conventions, in regard to data collection and preparation of national reports, including preparation of indicators as well, a model of information silos has been implemented without any stronger horizontal communication between the national focal points as regarding the harmonization and channeling of data flow. The reasons for such situation are elaborated in this subchapter. The analyses within the framework of this project indicate that there is a realistic possibility of connection based on the “bottom-up” principle and development of new collaborative model.

Based on the previous considerations, it is possible to define a new common data flow system model for preparation of indicators, which would enable more efficient usage of common set of data, high quality monitoring and reporting according to the Conventions in regard to accuracy, consistency, completeness and timeliness, as well as more efficient planning and implementation of policy and measures for climate change mitigation and adaptation, preservation of biodiversity and reduction of soil and land degradation in the Republic of Croatia.

In Fig. 3.1-3 it can be seen that there are three levels for which the modalities of stronger horizontal

connection should be elaborated, based on the “bottom-up” principle:

- Level 1 – data sources, databases, models, applications
- Level 2 – NFP, legislation, institutions, organization
- Level 3 – national reports, indicators, audits and reviews

LEVEL 1

This level is primarily of technical, i.e. information and informatical character and as such should provide for: (1) collection, processing, exchange and storage of data and information in regular reporting cycles defined by the Conventions decisions, (2) verification of their accuracy, consistency and completeness and (3) preparation of selected set of indicators based on agreed methodology and good practice.

Connection of separate data flow systems for preparation of indicators could be achieved at this level by developing information tools, which would provide for data collection, processing, exchange and storage, as well as quality control (QA activities) in regard to

their accuracy, consistency and completeness. Due to complexity of methodology for preparation of individual indicators, it is not possible to create an algorithm, which would calculate the indicators, thus they will have to be calculated separately and as such implemented directly to the software application.

For that purpose, new Database of Environmental Indicators in Croatia has been developed. This three-layer web application with GIS browser and database is available for all users having access to Internet, emphasizing the data safety so that only specific data are available to specific user groups. The Database of Environmental Indicators in Croatia is available on the Croatian Environmental Agency website and it is a part of the Environmental Information System (see home page of application below).



Republika Hrvatska je punopravna stranka međunarodnih sporazuma u području zaštite okoliša i prirode – Okvirne konvencije UN-a o promjeni klime (UNFCCC) i Kyotskog protokola, Konvencije UN-a o biološkoj raznolikosti (UNCBD) i Konvencije UN-a o suzbijanju dezertifikacije (UNCCD).

Učinkovita provedba ovih međunarodnih sporazuma zahtjeva uspostavljen sustav praćenja i izvještavanja o ključnim pokazateljima i njihovim promjenama u vremenu kako bi se utvrdili pritisci i stanje pojedinih sastavnica okoliša te planirale i provodile odgovarajuće mjere za sprječavanje, ublažavanje ili prilagodbu štetnim utjecajima na okoliš.

Agencija za zaštitu okoliša je s ciljem jačanja i optimizacije sustava protoka zajedničkih podataka i pokazatelja za praćenje provedbe sve tri konvencije u Republici Hrvatskoj pokrenula u suradnji s Programom za okoliš Ujedinjenih naroda (UNEP) projekt „Jačanje sustava protoka podataka i pokazatelja vezanih za pitanja zaštite okoliša u Republici Hrvatskoj“. Projekt je financiran od strane Globalnog fonda za okoliš (GEF).

The application distinguishes three user groups and each group has certain rights to data access. In that way, a quality of data is maintained in the application. Due to the base design and belonging web application, a redundancy of data has been avoided, thus one data is introduced only once and it is registered in only one place in application. It is particularly related to the common set of data required for preparation of various indicators (refer to Fig. 3.1-2), whereby a liability of competent bodies as regarding data delivery has been simplified and facilitated.

The application in digital form integrates all data describing selected indicators, inputs required for defining the aforementioned indicators, as well as data on users authorized for data input and/or update. Further information on web application functionalities can be found in special technical documents prepared within the framework of component 2 of DFS project.

LEVEL 2

Activities at level 2 should be focused on coordination of National Focal Points (NFP) for all three Conventions aiming at improving the planning of deadlines and resources required for preparation of indicators and reports organization. Table 3.1-1 indicates National Focal Points for individual Conventions.

Table 3.1-1: National Focal Points for UNFCCC, UNCCD and UNCBD (level 2)

UNFCCC	UNCCD	UNCBD
Ministry of Environmental and Nature Protection	Ministry of Environmental and Nature Protection	Ministry of Environmental and Nature Protection
Sector for Atmosphere, Sea and Soil	Sector for Atmosphere, Sea and Soil	Sector for Nature Protection
Mrs. Jasenka Nećak	Mrs. Marija Vihovanec	Mrs. Ana Kobašlić
jasenka.necak@mzoip.hr	marija.vihovanec@mzoip.hr	ana.kobaslic@mzoip.hr

Since all three National Focal Points are located in the same Ministry, Ministry of Environmental and Nature Protection, from the legislation and institution point of view, it is not required to adopt or change the existing regulations, not to establish special inter-institutional permanent or temporary operating bodies.

It is required to improve inter- and inner-sectoral

communication outside the Ministry of Environmental and Nature Protection, along with inclusion of Croatian Environmental Agency representatives as entity responsible for Environmental Information System management and preparation of the National List of Indicators. The first step is to prepare the Ministry Coordination programme for the Rio Conventions with unique time schedule for the following reporting cycle in the period 2016-2019 (7th National Report pursuant to UNFCCC, 6th National Report pursuant to UNFCBD and 6th Reporting Cycle pursuant to UNCCD).

Coordination program for “Rio” Conventions would represent a program platform that would define objectives, activities, deadlines, activity performance holders, common elements of reporting arising from forms and contents of national reports, with emphasis to the model of indicators being established by this project and cooperation institutions that collect and submit data. The coordination program represents also a measure of active policy regarding the inter-sectoral connection as one of the Conventions objectives.

established and maintained. The first step is to establish the practice of regular annual preparation of selected 23 indicators using web application with database (level 1). Furthermore, two new integral indicators have been proposed within the project (refer to next chapter): P3 – Productivity of land cover and change of productivity of land cover and BR – 19 Potential of land cover for biodiversity, connecting all three Conventions and could be considered as innovative approach in finding potential options of connecting three thematic areas.

For that purpose, an introduction of new chapter to the national reports is proposed in a part of policy and measures, which would be related to coordination of sectoral policies and measures regarding the combat against climate change, desertification and preservation of biodiversity.

LEVEL 3

Connection at level 3, which in practice represents a reporting level (national reports, indicators, audits and reviews of reports by the Conventions’ expert teams), could be achieved in a medium term of 3 to 5 years, under condition that connection of levels 1 and 2 is

DIAGRAM OF NEW COMMON DATA FLOW SYSTEM MODEL

New common data flow model for preparation of indicators changes the current state at levels 1, 2 and 3 as indicated in Fig. 3.1-1 and 3.1-3, in accordance with previous argumentation and vision of the future integral data and indicator flow system for the purpose of sustainable data collection and management, required for implementation of UNFCCC, UNCCD and UNCBD Conventions.

New model is presented in Fig. 3.1-4.

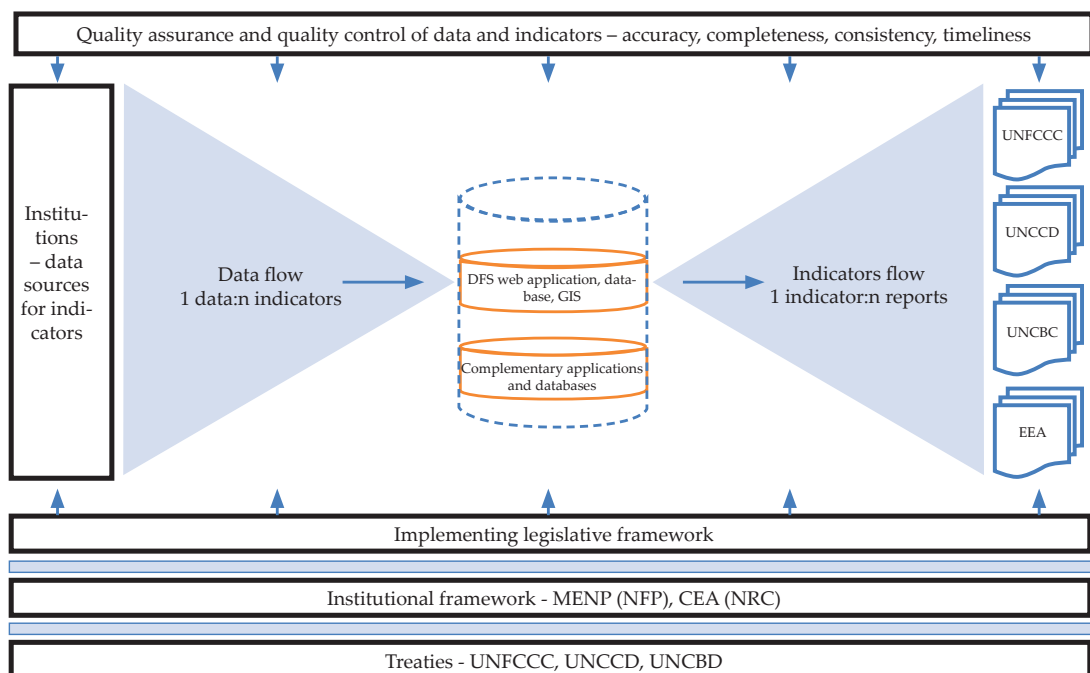


Figure 3.1-4: New common data flow system model

New common data and indicators flow system model has been established horizontally unlike the existing vertical silos model, whereat the focus of new model is on the environmental protection information system, in which the DFS application represents one of the EIS modules.

Another significant system component is legislative and institutional framework, which supports data and indicators flow in all the points, from data source to reports. Institutional framework consists of the Ministry of Environmental and Nature Protection as the national body authorized for implementation of three Conventions and Croatian Environmental Agency as body responsible for EIS development and management. Along with the Agency, the future national reference centers were mentioned as well, which basic role is defined by the Environmental Protection Act.

New system model assumes more significant role of QA/QC in all the points, flowing from left to the right side of diagram. The quality assurance requirements are related to accuracy, completeness, consistency and timeliness of data and indicators. The QA/QC system developed within the framework of national inventory report could be used as an example for development of this part, containing QA/QC program, annual plan with quality improve objectives and audit control lists.

Institutions – primary and secondary data sources for preparation of indicators are indicated on the left side of diagram. A detailed list of institutions is indicated in indicator cards. It should be emphasized that DFS application, into which the data are being stored, assumes one data input used for preparation of more indicators, which is described as 1:n ratio in diagram. On the other hand, after calculating one indicator, it is used for more reports. In that way, a redundancy of data and indicator collection, submission and calculation at the model inlet and outlet is completely avoided. Finally, calculated indicators are used for preparation of national reports pursuant to Conventions and reporting pursuant to the European Environmental Agency according to prescribed forms and deadlines.

3.2. UNFCCC, UNCCD AND UNCBD INDICATORS

The concept of environmental indicators

In brief, indicators quantify information by aggregating different discrete and periodical measurement or calculated data to obtain a numerically representative value. The resulting information is therefore synthesized. Indicators are an efficient tool

for the monitoring of changes and the realization of objectives by sectoral policies and measures. They facilitate understanding of complex environmental issues and present quantitative information in a relatively simple and transparent form.

Indicator model is based on so called DPSIR framework. Drivers (D) are basic driving forces of the environmental impact (for instance energy, agriculture, transport), pressure (P) are negative or positive effects caused by the drivers (emissions, waste, congestion), state (S) is a current quality of environment (air quality, water, temperature), impact (I) is effect of pressure (eutrophication, acidification, sea level rise) and response (R) is measure or instrument in dealing with particular type of impact taking into account drivers (regulation, economic instruments, international treaties).

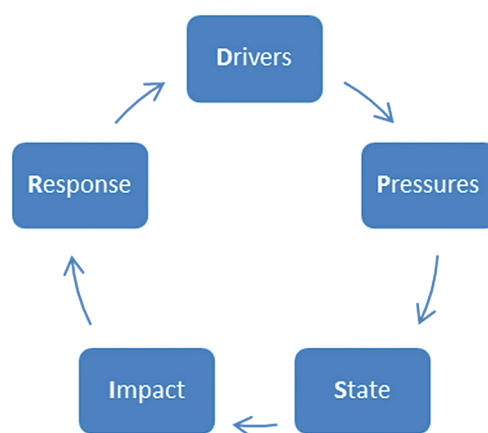


Figure 3.2-1: DPSIR indicator framework

Selection of a common set of indicators

One of the project outputs was to analyze how operative are the indicators from the National List of Indicators (2009), and to assess the probability of their selection to the common set of indicators for all of the three conventions (UNFCCC, UNCCD, UNCBD).

In regard to the UNFCCC or climate change indicators a set of 17 indicators related to climate change and ozone layer depletion have been defined. Further analysis had a goal of defining the current level of operability of each of the indicators, and also to assess the probability of choosing it to the common set of indicators for all of the three conventions.

The analysis had included a review of availability of data on its source, estimation of reliability, number of the persons included in its collection, number and types of actors included in its transfer, review of possibilities for annual changes registering (considering the type and the periodic nature of data collecting), place of data processing and indicator calculation process. Finally, a



set of 5 climate change indicators has been selected as applicable for this project:

Selected UNFCCC indicators:

KP 1	Emission and removals of greenhouse gases
KP 2	Projections of emissions and removals of greenhouse gases with policies and measures
KP 3	Emissions of nitrous oxide (N ₂ O)
KP 4	Emissions of methane (CH ₄)
KP 5	Emissions and removals of carbon dioxide (CO ₂)

The NLI contains 19 indicators related to the UNCCD or soil and land protection as entitled in the NLI. In addition, analysis showed that there are two other indicators indirectly connected to soil degradation which are causing drought, erosion, acidification and pollution, i.e. (1) deposition of oxidized (NO_x) and reduced (NH_x) nitrogen compounds, and deposition of oxidized sulphur compounds (SO_x), (2) mean annual air temperature trend. Finally, a set of 11 climate change indicators has been selected as applicable for this project:

Selected UNCCD indicators:

KZ 11	Deposition of oxidized and reduced N compounds (NO _x and NH _x), and deposition of oxidized sulphur compounds (SO _x)
KP 7	Trend of mean annual air temperature
KP 16	Trend of annual frequency of dry and rainy periods with annual assessment by means of standardized precipitation index (SOI)
KP 18	Assessment of aridity during 30-years period and monitoring of aridity trend
P 1	Land use and land use change
TP 1	Land take due to land use change
GO 18	Remediation of contaminated sites (Hot spots)
Š 3	Burnt forest areas
Š 6	Use of pesticides in forestry
IM 1	Exploitation of mineral resources
IE 1	Accidents with adverse effects on the environment by location and by cause

The NLI contains 18 indicators related to the UNCBD or biological diversity and protected nature values as entitled in the NLI. Due to the very strong influence of the status of forest ecosystems on the level of biological diversity, all of the indicators from the NLI – Chapter

Forestry have been additionally analyzed. Finally, a set of 7 biological diversity indicators has been selected as applicable for this project:

Selected UNCBD indicators:

ZPV 1	Protected areas under the Nature Protection Act
BR 1	Areas in the ecological network of Croatia
BR 12	High nature value farmland
BR 14	Forest: deadwood
BR 17	Financing protection and conservation of biodiversity
BR 18	Public awareness on nature protection
Š 1	Forest and forest land cover

DESCRIPTION OF INDICATORS

UNFCCC

KP 1 Emissions and removals of greenhouse gases

The earth's climate system is threatened by a rise in atmospheric greenhouse gas concentrations, which are caused by increased anthropogenic greenhouse gas emissions. KP 1 indicator is related to historical trend of GHG emissions by sources and removals by sinks from 1990 onwards of which the largest contributor is carbon dioxide (CO₂) followed by methane (CH₄), nitrous oxide (N₂O) and fluorinated gases (HFCs, PFCs and SF₆). The global warming potential (GWP) values, which indicates

how much an individual gas contributes to global warming compared to carbon dioxide over a 100-year period, are used to normalize all GHG to CO₂ equivalent emission. KP 1 indicator provides key information needed for planning and monitoring of implementation of policies and measures related to climate change. Figure 3.2-2 shows emissions and removals of greenhouse gases in the period 1990-2012.

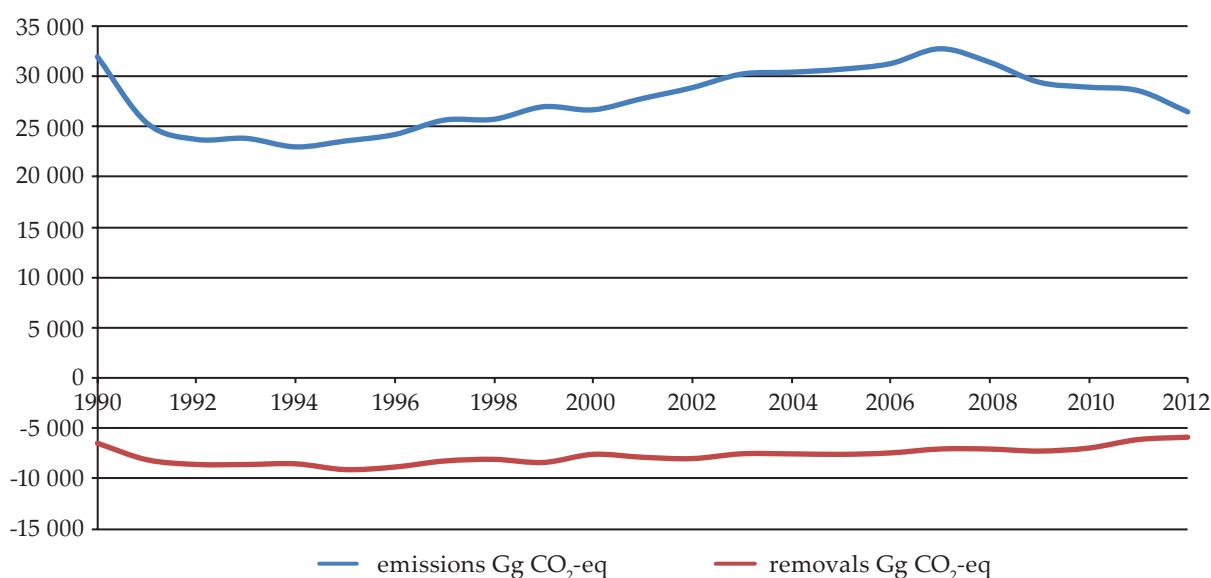


Figure 3.2-2 Emissions and removals of greenhouse gases in the period 1990-2012 in the Republic of Croatia

The total GHG emissions in 2012, excluding removals by sinks, amounted to 26,385 million tonnes of CO₂-eq, which represents 16,7 percent emission reduction compared to year 1990. Overall decline of economic activities and energy consumption in the period 1991-1994, which was mainly the consequence of the war in Croatia, had directly caused the decline in total emissions of greenhouse gases in that period. With the entire national economy in transition process, some energy intensive industries reduced their activities or phased out certain productions, which was considerably reflected in GHG emissions reduction. Emissions have started to increase from 1995 till 2008 at an average rate of 2,8 percent per year due to steady economic recovery but after 2008 they have started to decrease again at an average annual rate of 4,2 percent as a result of economic crises which had affected almost all EU countries.

In Croatia, the LULUCF sector is a net sink, that is, the amount of GHG emissions it removes from the atmosphere is higher than what it emits. In 2012 net sink amounted to 5,9 million tonnes of CO₂-eq. The average value of net sink in the LULUCF sector in the period 1990-2012 equals 28,5 per cent of the total annual emissions in other sectors. Most of the removals in the LULUCF sector come from tree biomass growth.

The shares of GHG emission have not significantly changed during the entire period. The CO₂ is the largest anthropogenic contributor to total national GHG emissions. In 2012, the shares of GHG emissions were as follows: 72,9 percent CO₂, 12,9 percent CH₄, 12,3 percent N₂O, 1,7 percent HFCs and 0,04 percent SF₆.



KP 2 Projections of emissions and removals of greenhouse gases with policies and measures

The primary objective of the projections section of the national communication is to give an indication of future trends in GHG emissions and removals, given current national circumstances and implemented and adopted policies and measures, and to give an indication of the path of emissions and removals without such policies and measures. At a minimum, Parties shall report a 'with measures' projection, in accordance with paragraph 29 and may report 'without measures' and 'with additional measures' projections. A 'with measures' projection shall

encompass currently implemented and adopted policies and measures. If provided, a 'with additional measures' projection also encompasses planned policies and measures. If provided, a 'without measures' projection excludes all policies and measures implemented, adopted or planned after the year chosen as the starting point for this projection.

Projections are prepared for each IPCC sector including: energy including transport, industry, agriculture, forestry and waste and then aggregated as total projections.

Figures 3.2-3 and 3.2-4 shows projections of emissions and removals of greenhouse gases in the period till 2030 for abovementioned three scenarios.

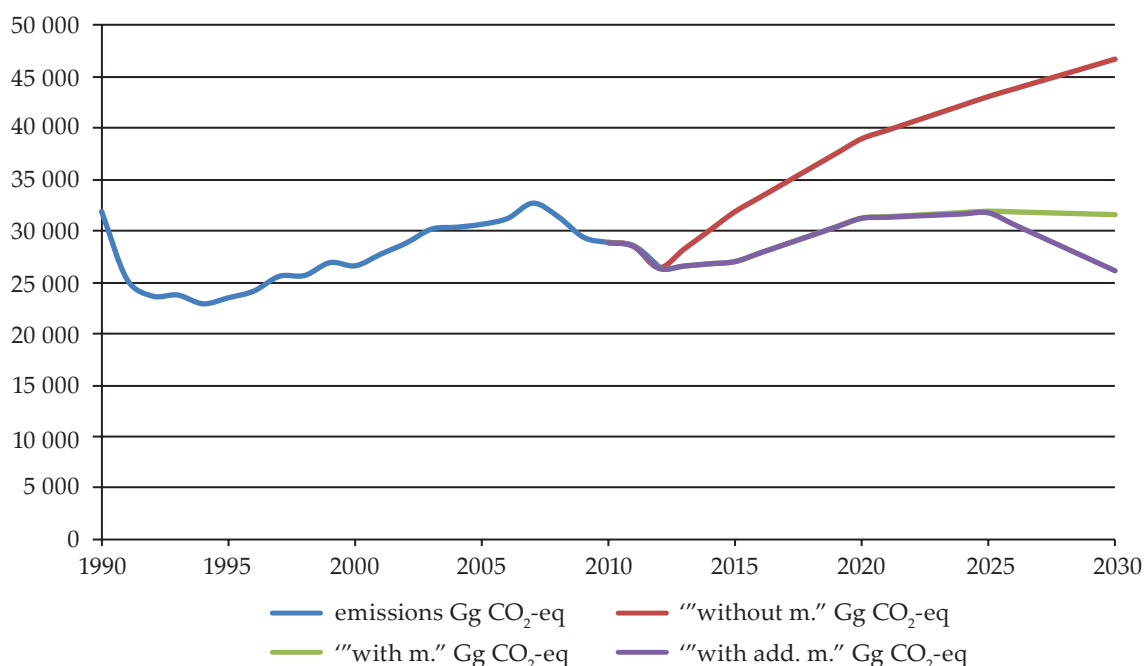


Figure 3.2-3 Projections of emissions in the Republic of Croatia till year 2030

The largest contribution to emission projections has energy sector including transport. In the 'without measures' scenario, the emission increases, particularly in the electricity production sub-sector. Reasons for the increase are the increase in energy demands, reduced dependency on electricity imports and the assumption that all new demands for electricity in this scenario are being covered by fossil fuel power plants. In electricity production, the renewable energy sources are at the same level as during 2010, with the production mostly from the existing large hydropower plants. After 2015, liquid fuel will no longer be in use for electricity production. It is also planned that after the year 2020, Croatia will no longer import electricity, which significantly increases the production in Croatian power plants since import amounted to approximately 30%. The 'with measures' scenario represents a group effect of the measures that are under implementation and adopted with enforcement of existing instruments and measures arising from the

transfer of the EU acquis particularly related to energy efficiency and renewable energy sources. The 'with additional measures' scenario is based on the application of the above 'with measures' scenario and shows the effect of additional measures that are planned, including installations for the capture and geological storage of CO₂ (CCS) in new coal-fired and gas-fired power plants larger than 300 MWe after the year 2025 and implementation of CO₂ injection technology for enhanced oil recovery (EOR). Projections show a decline in emissions until the year 2015 due to the economic and financial crisis. A sudden increase in emissions after 2015 is expected to occur primarily due to the strengthening of economic activity and the consequent increase in energy demands, with the reducing dependence on imported electricity. Stagnation of the increase in emissions is expected after the year 2020 in 'with measures' scenario and decrease in emissions in 'with additional measures' scenario.

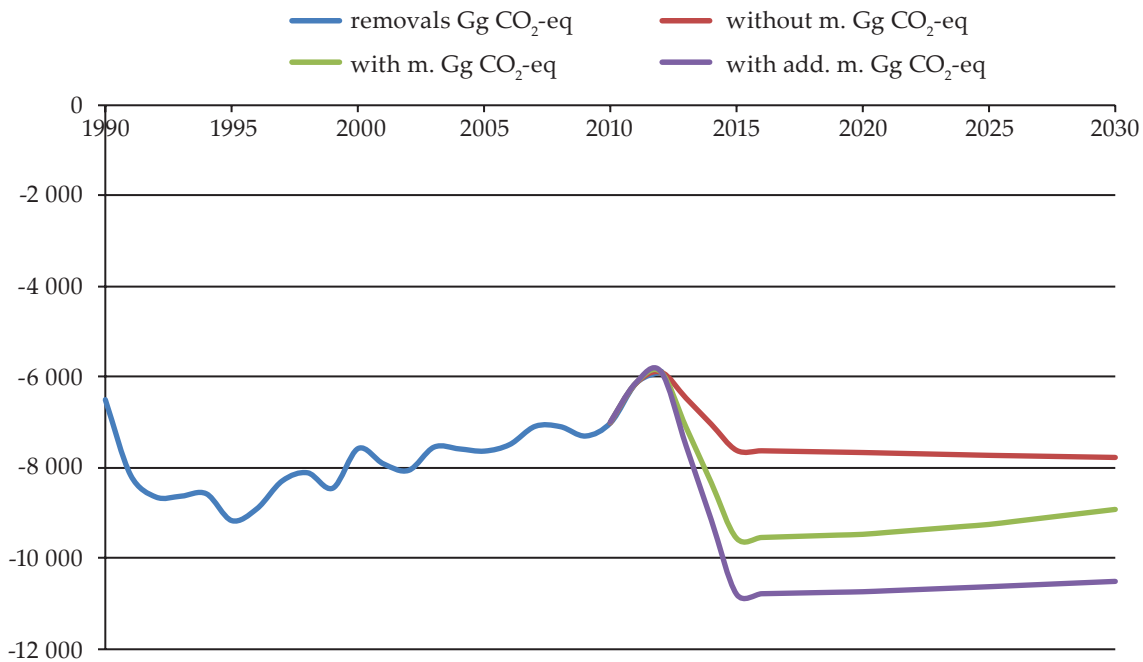


Figure 3.2-4 Projections of removals by sinks (forestry) in the Republic of Croatia till year 2030

In the forestry sector, projections are made for the activities defined in Article 3.4 (Forest management) and Article 3.3 (afforestation, reforestation and deforestation) of the Kyoto Protocol. In 'without measures' scenario, for the Forest management activity it is assumed that the change in forest area under each category of forests and forest ownership categories will follow the current trend of land areas in the period 1990-2012 year. In the case of increment, for all forests ownership categories, it is assumed that in the period up to the 2030 increase in increment will not occur as the management system will remain unchanged. In the category of state owned forests and private forests, it is assumed that the harvesting will have the same intensity as it is in 2012, while in the category of state forests managed by other legal bodies it was assumed that harvesting operations will be the average value of the last five years in this category of ownership. In relation to the afforestation, reforestation and deforestation activities, in case of afforestation, applied assumption is that afforestation on new areas will follow the trend in period 1990-2012, and except that, there will be no additional increase in forest areas. For the deforestation, it is assumed that this activity will be carried out on areas equal to an average of areas deforested in last five years. Projected sinks of greenhouse gases for the Kyoto Protocol do not include sinks from maqui and shrub forests since so far sinks in these forests were not estimated in Croatia.

In the 'with measures' scenario are used the same assumptions as in the 'without measures' scenario for forest increment and harvest in each forests category

and forest ownerships, in case of the Forest management activity. In the case of forest areas, the assumption is that some areas that are estimated and reported under the Forest Management activity are reported under the afforestation, reforestation and deforestation activity. In this case it was assumed that 10% of the area difference (area under the Forest Management and area under the Forest land remaining Forest land) should be reported as afforestation caused by human induced activity to support the natural expansion of forests on new areas. In this scenario, a contribution of sinks from maqui and shrub forests to total sinks was taken into account. It is not foreseen an additional increase in afforestation areas, other than prescribed by official forest management plans and which is in this scenario assumed to be in line with the trend in period 1990-2012. Also, by this scenario further significant increase in deforestation of forest areas is not foreseen. The applied procedure in case of determining deforestation areas is the same as the procedure described in the 'without measures' scenario.

When preparing 'with additional measures' scenario all assumptions of the 'with measures' scenario were kept. New assumption applied refers to the afforestation on new forest areas exercising greater intensity than before. Also, this scenario does not foresaw any further significant increase in deforestation of forest areas and applied procedure for determining deforestation areas is the same as in the 'without measures' scenario.



KP 3 Emissions of nitrous oxide (N₂O)

KP 3 indicator is related to historical trend of anthropogenic emissions of nitrous oxide in all sectors.

Global warming potential of N₂O equals 310 over a 100-year period according to IPCC 2ndAR.

Figure 3.2-5 shows emissions of N₂O in the period 1990-2012.

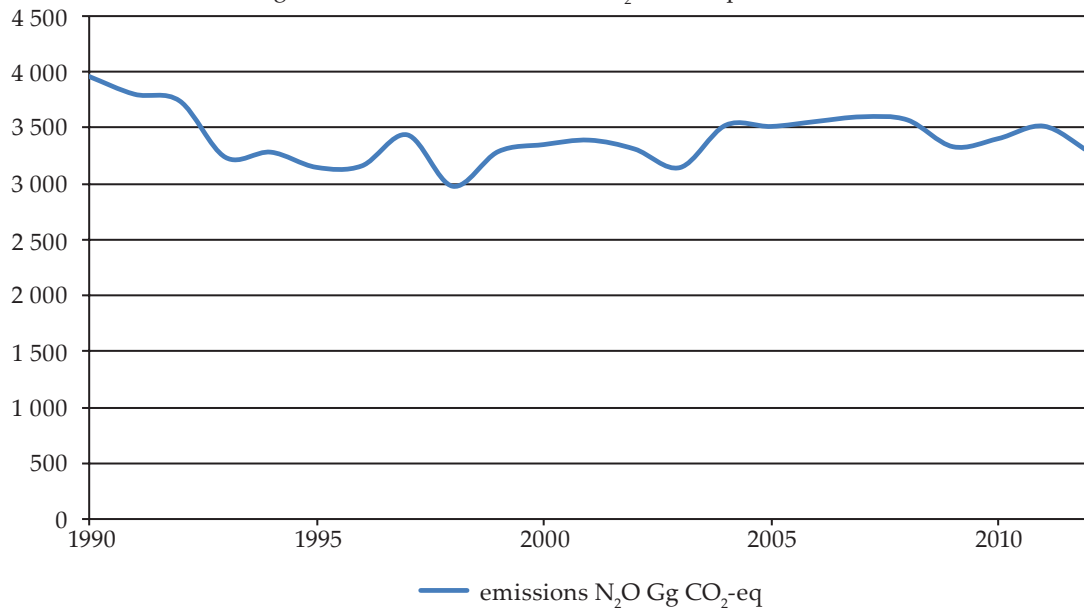


Figure 3.2-5 N₂O emissions in the period 1990-2012 in the Republic of Croatia

The most important sources of N₂O emissions in Croatia are agricultural activities, nitric acid production, but as well, the N₂O emissions occur in energy sector and waste management. In the Agricultural sector, three N₂O emission sources are determined: direct N₂O emission from agricultural soils, direct N₂O emission from livestock farming and indirect N₂O emission induced by agricultural activities. In Industrial Processes sector, the N₂O emission occurs in nitric acid production, which is used as a raw material in nitrogen mineral fertilizers and in solvent and other product use. The major sources

of N₂O emission in Energy sector is use of three-way catalytic converters in road transport motor vehicles. N₂O emission from the Waste sector indirectly occurs from human sewage.

KP 4 Emissions of methane (CH₄)

KP 4 indicator is related to historical trend of anthropogenic emissions of methane in all sectors. Global warming potential of CH₄ equals 21 over a 100-year period according to IPCC 2ndAR.

Figure 3.2-6 shows emissions of CH₄ in the period 1990-2012.

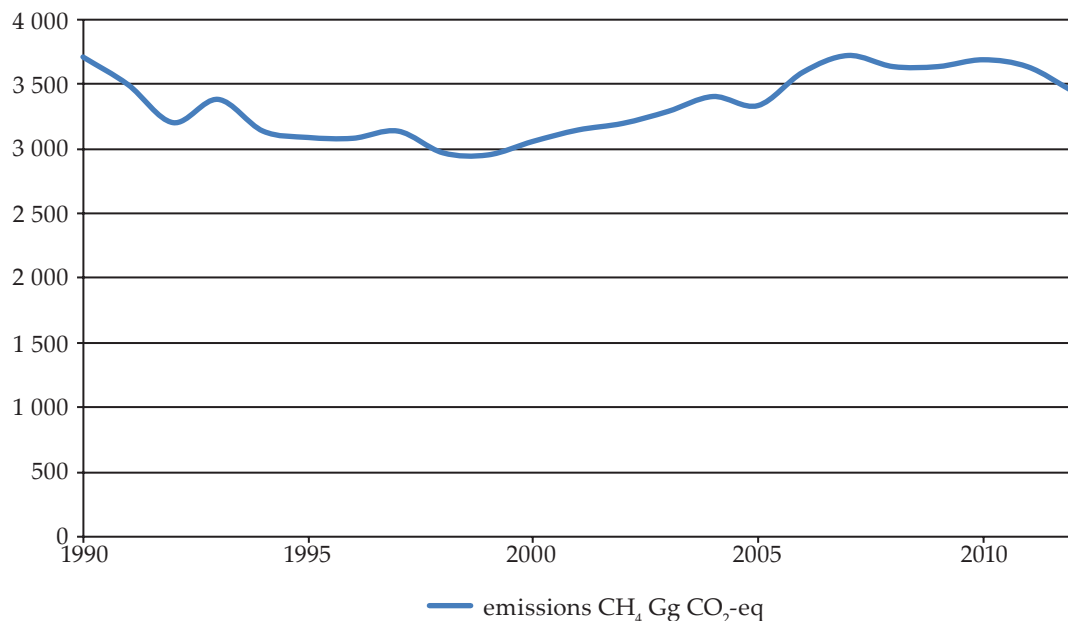


Figure 3.2-6 CH₄ emissions in the period 1990-2012 in the Republic of Croatia

The major sources of methane emission are fugitive emission from production, processing, transportation and activities related with fuel use in Energy sector, Agriculture and Waste Disposal on Land. Fugitive methane emission is mainly the result of exploration, production, processing, transportation and distribution of natural gas (about 93.9 percent). In the Agricultural sector there are two significant methane emission sources present: enteric fermentation in the process of digestion of ruminants (dairy cows represent the major source) and different activities related with storage and use of organic fertilizers (manure management). Methane emission from solid waste disposal sites (SWDSs) is a

result of anaerobic decomposition of organic waste by methanogenic bacteria. The CH₄ emission in 2012 was 7.4 percent lower than in 1990, largely due to emission trend in Agriculture sector.

KP 5 Emissions and removals of carbon dioxide (CO₂)

KP 5 indicator is related to historical trend of anthropogenic emissions and removals of carbon dioxide in all sectors. Global warming potential of CO₂ equals 1 (reference value) over a 100-year period according to IPCC 2ndAR.

Figure 3.2-7 shows emissions and removals of CO₂ in the period 1990-2012.

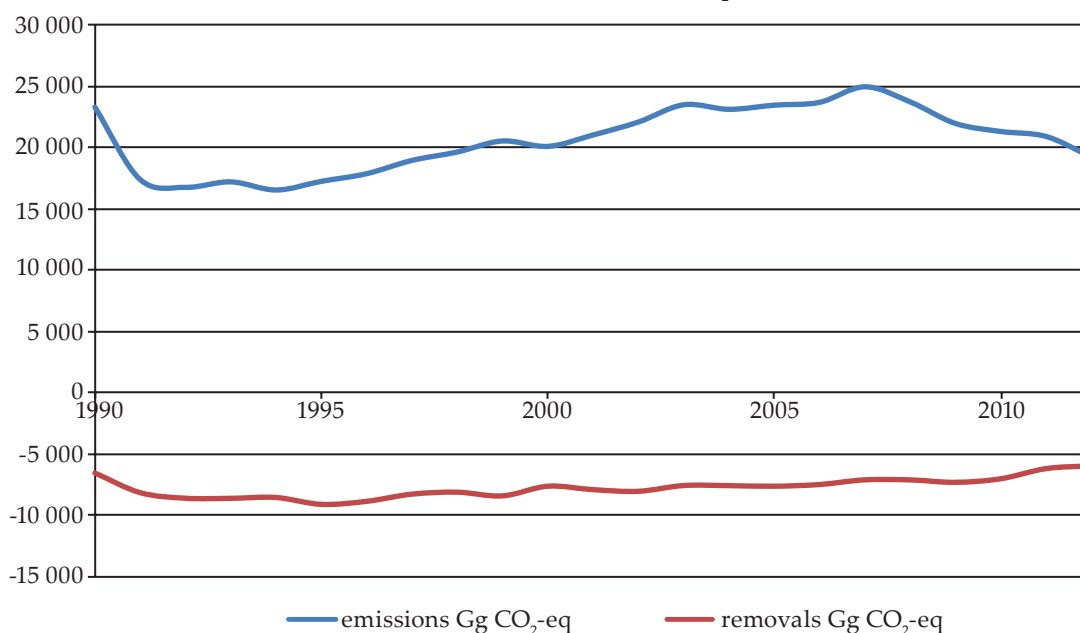


Figure 3.2-7 CO₂ emissions in the period 1990-2012 in the Republic of Croatia

Carbon dioxide is the most significant anthropogenic GHG. The most significant anthropogenic sources of CO₂ emissions in Croatia are the processes of fossil fuel combustion for electricity or/and heat production, transport and industrial processes (cement and ammonia production). The energy most intensive stationary sub-sector is Energy Industries (electricity and heat production, refineries and oil and gas field combustion). Transport sector is also one of more important CO₂ emission sources. This sector includes emission from road transport, civil aviation, railways and navigation. In the year 2012, the CO₂ emission from Transport sector contributed with 29.3 percent to the national total CO₂ emission. The most significant CO₂ industrial processes

emission sources are production of cement, ammonia and lime. In 2012, cement production contributes in total sectoral CO₂ emission with 59.6 percent, lime production with 6.8 percent and ammonia production with 30.0 percent. In 2012, CO₂ emission was 17.6 percent lower than in 1990. The largest CO₂ emission decrease was in Industrial Processes (Metal Production) and Energy (Manufacturing Industries and Construction) sectors. There was a permanent increase in mobility (number of road vehicles) and therefore an increase in motor fuel consumption. Large CO₂ emission growth is present in Solvent and Other Product use.



With regard to the aspects of desertification that are being focused on, the selected UNCCD indicators can be divided into three main groups:

1. Indicators related to the climatological aspect
2. Indicators related to the aspect of land cover
3. Indicators related to the other aspects of desertification

Indicators related to the climatological aspect

Within this group of indicators, the following indicators are selected in the early stages of the project:

- a. KZ 11 - Deposition of the oxidized (NO_x) and reduced (NH_x) nitrogen compounds and deposition of oxidized sulfur compounds (SO_x)
- b. KP 7 - Trend of mean annual air temperature
- c. KP 16 - Trend of annual frequency of dry and rainy periods with annual assessment by means of standardized precipitation index (SOI)
- d. KP 18 - Assessment of aridity during 30-years period and monitoring of aridity trend

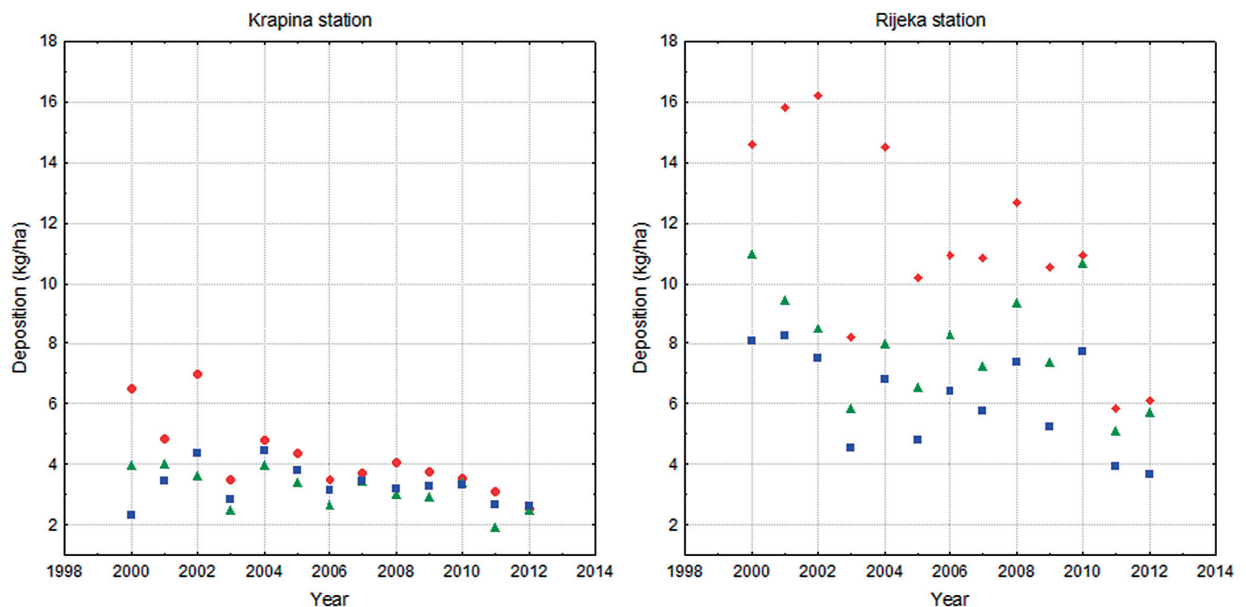
KZ 11 - Deposition of the oxidized (NO_x) and reduced (NH_x) nitrogen compounds and deposition of oxidized sulfur compounds (SO_x)

With the help of an indicator, the load of the environment with NO_x , SO_x and NH_x compounds deposited by precipitation per unit area is monitored annually. The indicator is used for calculation of the critical load of the individual components of environment ecosystems (forests, vegetation, soil, water, etc.) and determining the degree of acidification / eutrophication of the environment.

In addition, critical load indicator is used for calculation of the limit values and emission reduction in Europe (CLRTAP Protocols), as well as to calculate the emission limit values in the EU member states (NEC Directive). The deposition is calculated by multiplying the annual precipitation and medium volume mass concentration of individual ionic components for this year and is expressed in kilograms per hectare (kg / ha).

Deposition is currently measured and calculated at 17 stations in Croatia, and within the perspective by using spatial interpolation (taking into account the climatic and geomorphological variability) it will be evaluated on the entire national territory. Figure 3.2-8 shows depositions for two meteorological stations in the period 1998-2014.

Figure 3.2-8 Depositions (green triangles - NO_x , blue quadrats - NH_x , red circles - SO_x) for two meteorological stations (Krapina and Rijeka) in the period 1998-2014.



KP 7 - Trend of mean annual air temperature

By the indicator the trend of mean monthly and mean annual air temperature is measured at the standard height of 2 meters above the ground for an extended period (at least 30 years). The increase secondary air temperature is a result of climate change. The indicator is calculated from the mean daily temperature data for meteorological stations with longer time series of these data (length of at least 30 years) in accordance with

the Manual of the World Meteorological Organization climactic practice (*WMO Guide to Climatological Practice*).

Temperature trends are currently measured and calculated at 11 stations in Croatia (on the basis of multi-annual measurements of air temperature). In the future, spatial interpolation will be used (taking into account geomorphological variability) for evaluation on the entire national territory.

Figure 3.2-9 shows linear trends of mean annual temperature during the 30-year periods (since 1946) for three representative meteorological stations in Croatia (Gospić – inland Dinaric area, Osijek – Pannonian eastern area, Hvar – Mediterranean area), where significant increase of temperature can be recognized since the end of 20th century.

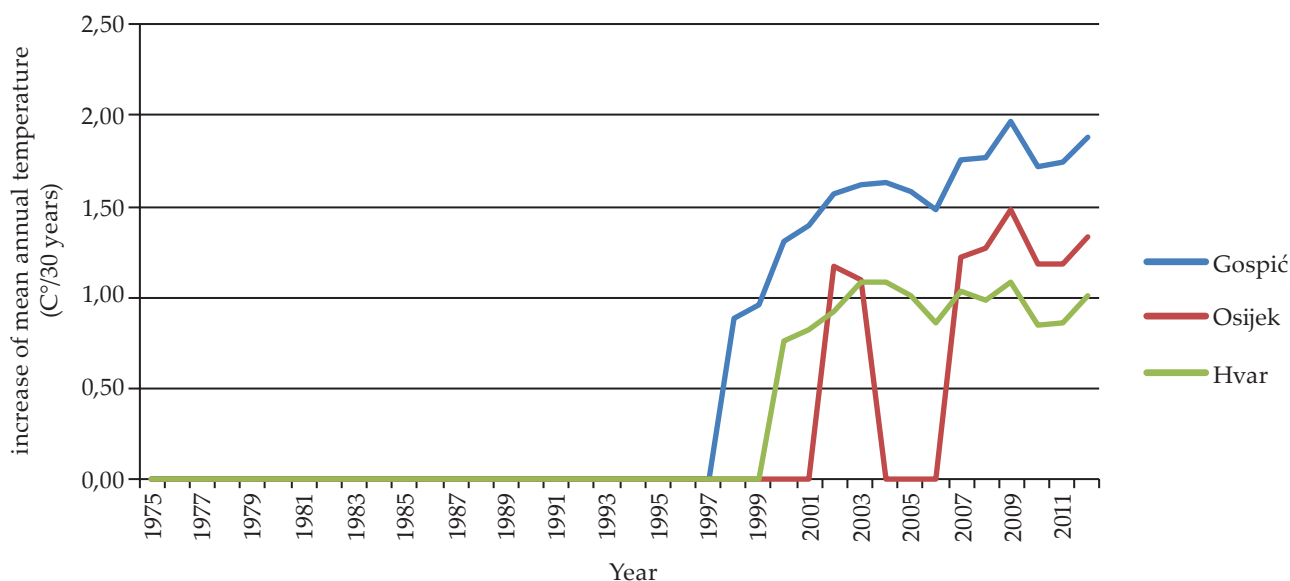


Figure 3.2-9 Increase of mean annual temperature (linear temperature trends) during the 30-year periods (since

1946) for three representative meteorological stations in Croatia. Results which was non-significant at the probability level of $p=0.01$ were set to zero.

temperature), and in the perspective spatial interpolation will be used (taking into account geomorphological variability) for evaluation on the entire national territory.

KP 16 Trend of annual frequency of dry and rainy periods with annual assessment by means of standardized precipitation index (SOI)

The indicator follows the trend of annual frequency of dry and rainy periods and evaluates months with respect to the amount of precipitation using the standardized precipitation index (SPI). The indicator is calculated in accordance with WMO recommendations on the basis of the ratio of monthly precipitation for weather stations with longer time series (at least 30 years) and monthly precipitation for the reference period. The calculation is carried out for 1-, 3-, 6- and 12- monthly precipitation.

Trends of annual frequency of dry and rainy periods are currently measured and calculated at 11 stations in Croatia (on the basis of multi-annual measurements of air

KP 18 Assessment of aridity during 30-years period and monitoring of aridity trend

Indicator (index) of aridity (dryness) has been defined by UNEP in 1992. The degree of aridity is defined by the value of the index of aridity (border aridity categories are presented in tabular form in the part for the description of the procedure for calculating the indicators). The trend of aridity is monitored over years (at least 30 years). Given that it indicates the availability of water in the soil, is a useful tool for analyzing the impact of climate elements on soil degradation. Aridity index is calculated on the basis of data from annual precipitation and annual potential evapotranspiration, which is calculated using the mean monthly air temperature and



mean monthly relative humidity using the Egleman method (1967).

Aridity index is currently calculated at 11 stations in Croatia (on the basis of measurements of precipitation and potential evapotranspiration), and in the perspective

by using spatial interpolation (taking into account the climatic and geomorphological variability) it will be evaluated on the entire national territory.

Figure 3.2-10 shows temporal variability of aridity index (since 1946) for three representative meteorological stations in Croatia (Gospić – inland Dinaric area, Osijek – Pannonian area, Hvar – Mediterranean area), where increase of aridity (decrease of aridity index values) during the last three decades can be recognized for Gospić.

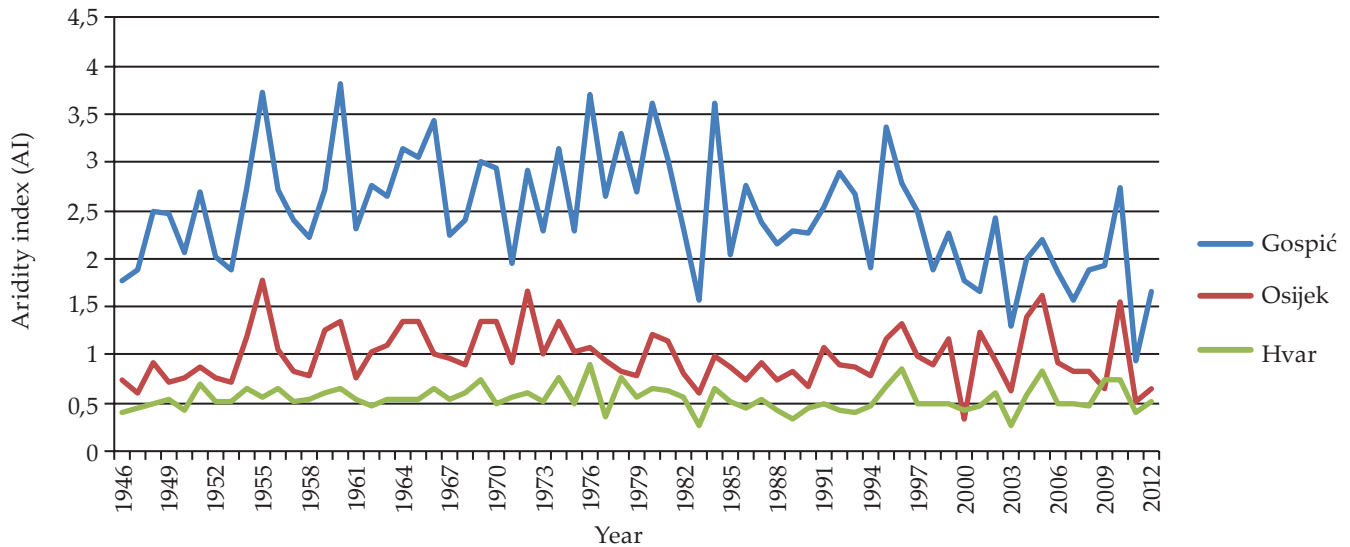


Figure 3.2-10 Temporal variability of aridity index for three representative meteorological stations in Croatia.

Indicators related to the aspect of land cover

Within this group of indicators, the following indicators are selected in the early stages of the project:

- a. P 1 - Land use and land use change
- b. TP 1 – Land take due to land use change
- c. S 3 - Burnt forest areas

P 1 Land use and land use change

Land use and land use change are the main drivers of environmental change and significantly affect the quality of life, ecosystems and economic activity. Significant are changes in land use of agricultural areas, and forest and semi-natural areas due to the expansion of artificial surfaces (settlements, construction of infrastructure and industrial facilities, landfills, planning urban green areas and sports and recreational facilities).

The Indicator is fully in line with the IPCC guidelines (GPG 2006) for Sector Agriculture, forestry and other land use (AFOLU abbreviation) and LULUCF land use matrix.

The indicator is taken from the Report of the National Inventory on Croatian territory which is made pursuant to the IPCC methodology (Good Practice Guidance for Land Use, Land -Use Change and Forestry (2003), 2006 IPCC Guidelines for National Greenhouse Gas Inventories).

Figure 3.2-11 shows spatial distributions of land cover types (following LULUCF land matrix) in the pilot area (Nature Park Učka) in 1980 and 2006. Figure 3.2-12 shows transitions between forest and non-forest land areas from 1980 to 2006 at the same area, illustrating stability and dominance of forest cover as well as secondary succession of crops and grasslands to forests during entire time interval.

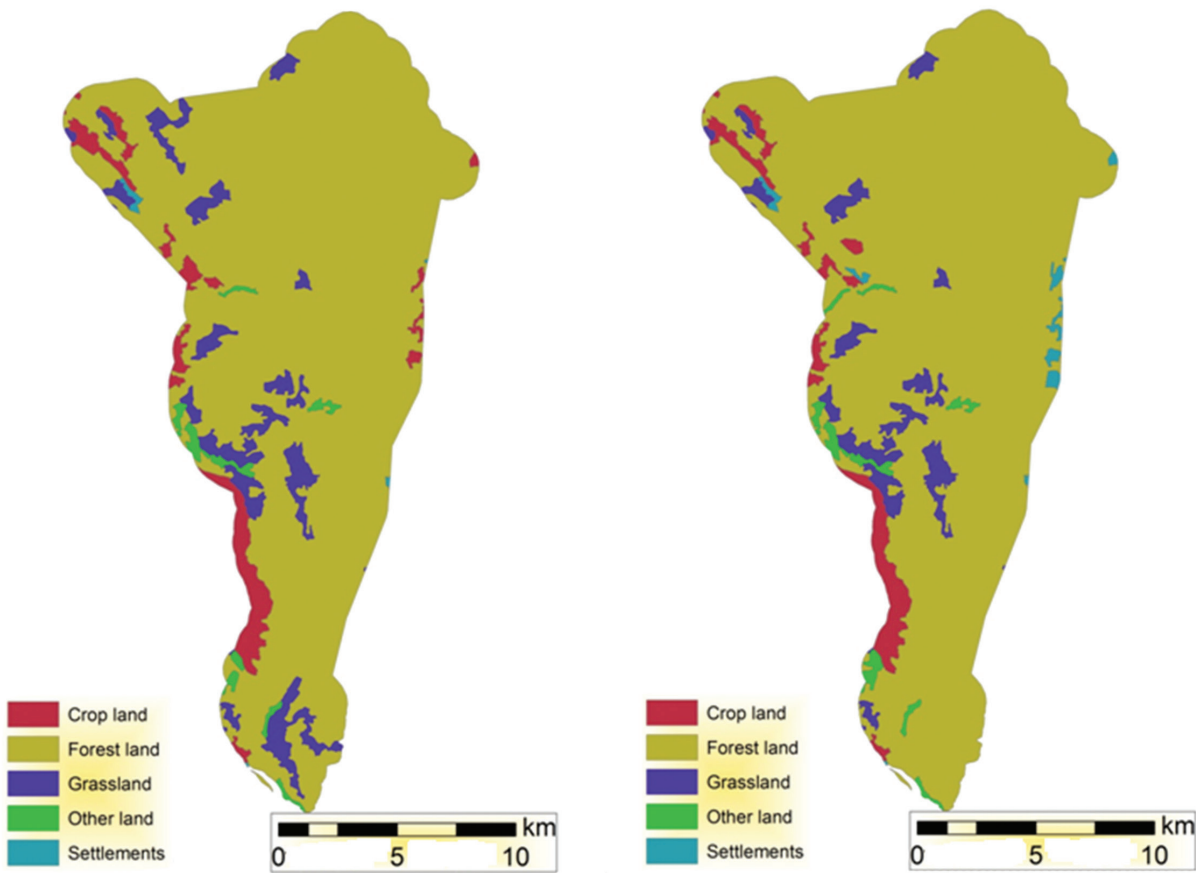


Figure 3.2-11 Spatial distributions of land cover types (following LULUCF matrix) at the pilot area (Nature Park Učka) in 1980 (left) and 2006 (right).

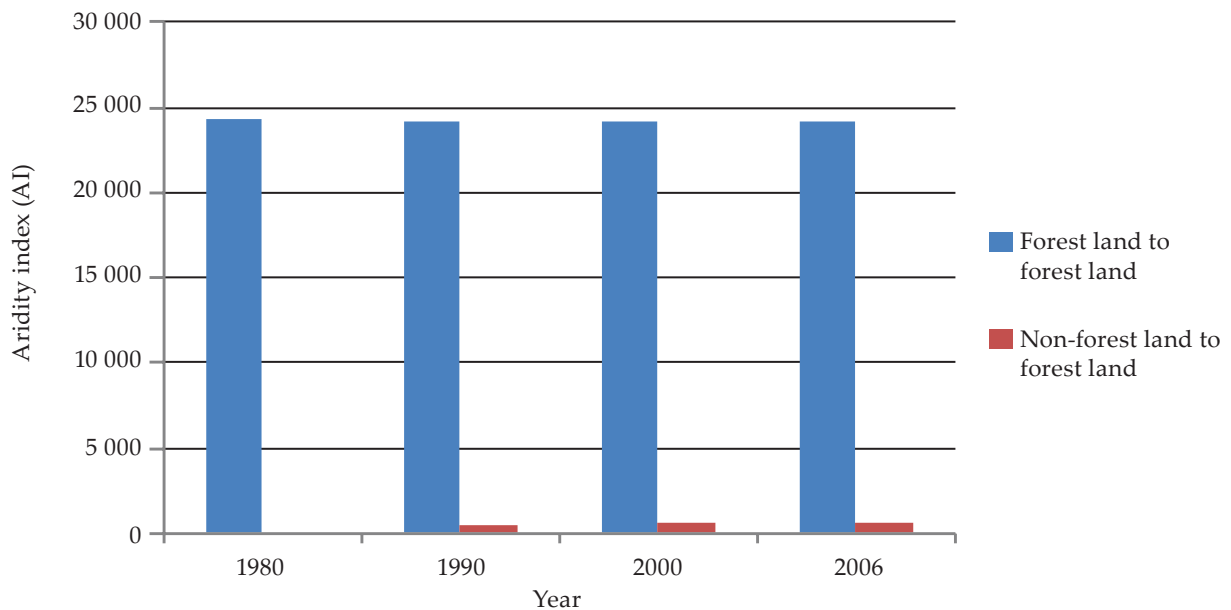


Figure 3.2-12 Transitions between forest and non-forest land areas from 1980 to 2006 at the pilot area (Nature Park Učka).



TP 1 Land take due to land use change

Indicator expresses the changes in land use of agriculture, forest and other semi-natural and natural areas that result in land take by artificial land development (settlements, infrastructure, landfills, industrial, commercial and transport facilities). Land take is generally irreversible and results in removal of soil, soil sealing, soil compaction and other processes that leads to adverse effects and/or complete loss of soil functions; especially biomass production, biodiversity and habitat, and environmental functions of soil. Converted areas supports only physical and cultural soil functions related to socio-economic activities.

This indicator is fully compliant with the EEA indicator "CSI 014 Land take."

Data are derived from the classification of land cover according to the CLC methodology; a way to quantify changes in the categories of agricultural, forest and semi natural / natural land cover (CLC2 to CLC5) in the category of artificial surfaces (CLC1).

Š 3 Burnt forest areas

Fires of open space have a number of negative effects on the environment: loss and degradation of habitat, the occurrence of surface soil erosion, increasing CO₂ emissions, threats to life and health, the disappearance of plant and animal species, and a decrease in the quality of people's lives. Fires also have a negative effect on the economy and the reduction of carbon drain to the forests. The methodological framework and associated definitions of the indicators are in line with the guidelines of the Intergovernmental Panel on Climate Change (IPCC Guidelines) and the Kyoto Protocol, with accompanying data for the period from 1990 onwards.

Indicator is used for the monitoring of spatial-temporal distribution of wildfires in the Republic of Croatia, including classification of burnt areas by land cover types and forest management indicators. The methodological framework and associated definitions of the indicator are in line with the guidelines of the Intergovernmental Panel on Climate Change (IPCC Guidelines) and the Kyoto Protocol.

This complex indicator is composed of many subindicators showing the exact location of the fire, records and analysis of burned areas in satellite images as compared to the loss of certain classes of land cover, and the relative impact of wildfires on forest management.

Figures 3.2-13, 3.2-14 and 3.2-15 illustrate implementation of this indicator at the the pilot area of Nature Park Učka.

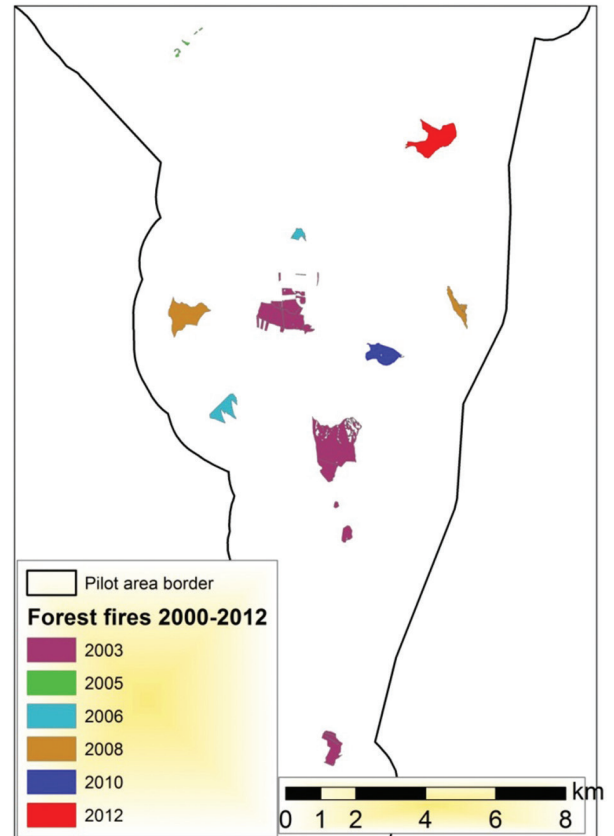


Figure 3.2-13 Forest management compartments at the pilot area of Nature Park Učka where forest fires occurred during the period of 2000-2012.

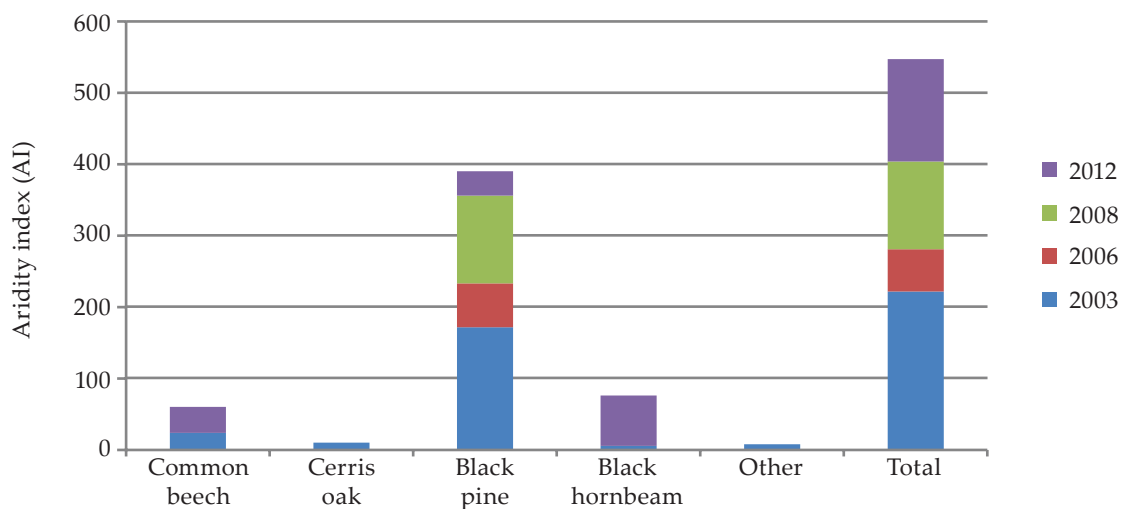


Figure 3.2-14 Burnt wood volume at the pilot area of Nature Park Učka during the period of 2000-2012.

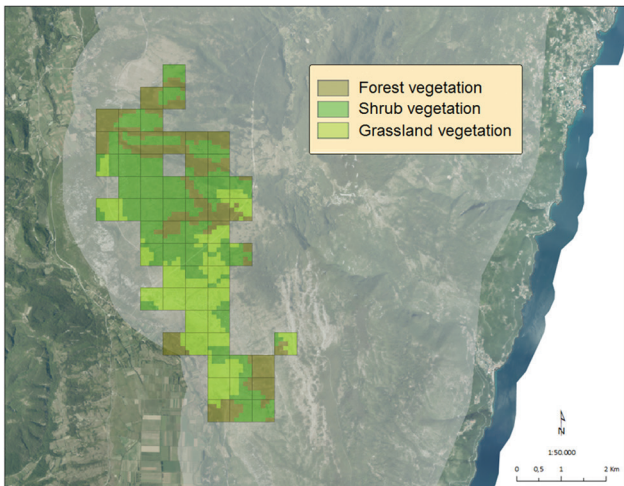


Figure 3.2-15 Land cover loss during the wildfire at the pilot area of Nature Park Učka (2003) recognized on MODIS satellite images.

Indicators related to other relevant aspects of desertification

This group comprises all other indicators that have an impact on desertification and through which impact on soil and land can be monitored (degradation, pollution, etc.).

GO 18 - Remediation of contaminated sites (Hot spots)

This indicator monitors remediation of historical contaminated sites (so-called "Hot spots"). These sites are determined by the Strategy and Plan of Waste

Management in the Republic of Croatia as areas in the environment that have become highly burdened through long term inappropriate management of industrial (technological) waste and which represent threat to the environment and human health. Indicator monitors status and funding/co-funding of remediation of contaminated sites by the EPEEF.

Š 6 Use of pesticides in forestry

This indicator will be logically consolidated in the next short-term period (presumably 1-2 years) (as part of the revision of the National List of indicators of the state of the environment) with an indicator PO 9 "Consumption of pesticides" and linked to ongoing data from the newly created Phytosanitary information system in the Ministry of Agriculture. On that occasion a new card of integrated indicators will be created (Š 6 + PO 9), which will then be included in the Database of Environmental Indicators in Croatia. At this point it is not possible to make this card, due to the necessity of future logical alignment with the Phytosanitary information system at the Ministry of Agriculture Republic of Croatia.

IM 1 Exploitation of mineral resources

Indicator is used to monitor the exploitation of mineral resources taking into account that the exploitation of natural resources is damaging to the environment. The first part of the indicator shows the total reserves of mineral resources and the annual exploitation of mineral resources. The second part of indicators shows the number, locations and areas of the permitted exploitation fields and research areas of mineral resources, while the third part of the indicators monitor fees for concessions for exploitation and/or research of mineral resources.

Figure 3.2-16 shows spatial distribution of mineral resources exploitation and research fields in Republic of Croatia.

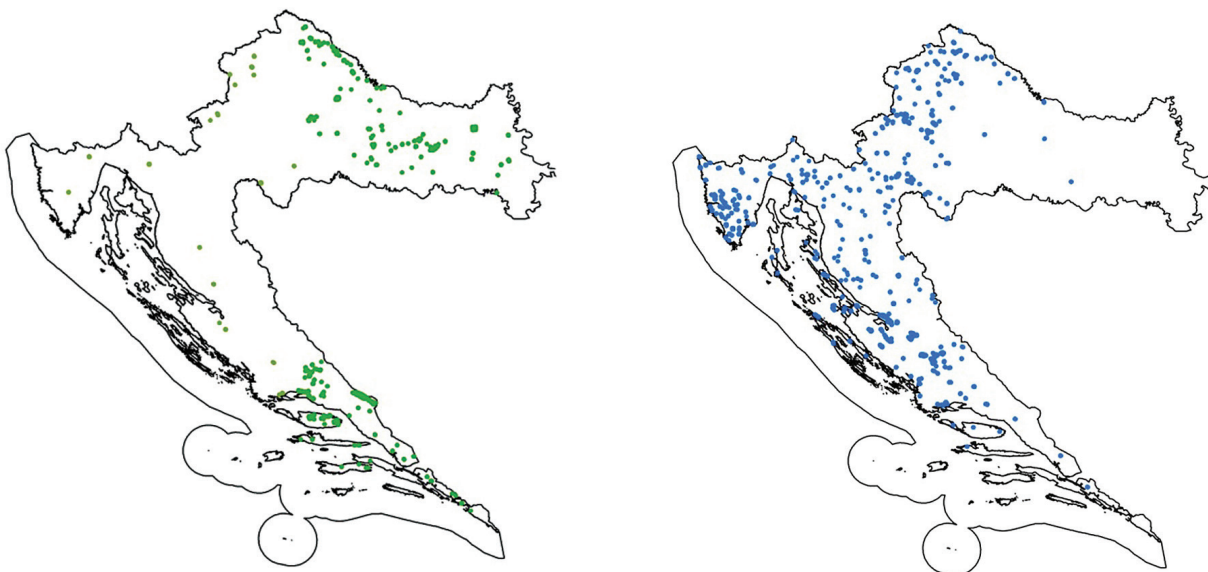


Figure 3.2-16 Spatial distribution of mineral resources exploitation (left) and research (right) fields in the Republic of Croatia.

The calculation of indicators has established that since the founding of the Concession Register in 2006 a total fee of 853,153,417 kn fee has been paid to the Ministry of Finance for exploitation of mineral resources, while a total of 2,319,444 kn has been paid for spatial explorations.

Analysis according to the types of mineral resources shows the dominance of the exploitation of materials used in the construction sector, where annual 1-2 % of current reserves are exploited. It is in the last years (2009-2012) that exploitation has been reduced up to 50 % compared to 2007 (when maximum exploitation was recorded), which can be understood as a consequence of the global crisis and its impact on the state of the economy and the construction sector in the Republic of Croatia.

IE 1 Accidents with adverse effects on the environment by location and by cause

Indicator presents the number of accidents with adverse consequences on the environment and threat to human life and health, sorted by location and by cause. The indicator is developed by independently classifying accidents according to four criteria and displays a number of events throughout the year within each combination of these criteria. The criteria are as follows:

- a. location of accident,
- b. cause of the contamination,
- c. degree of nature protection at the location of the accident and
- d. land cover class on the location of the incident.

UNCBD

ZPV 1 Protected areas under the Nature Protection Act

The indicator shows the change in number and areas of the Protected Areas in the Republic of Croatia based on the Nature Protection Low (NN 80/2013) through the years. The Register of Protected Areas is under supervision of the Ministry of Environmental and Nature Protection. According to the Register of Protected Areas of the MENP there were 419 protected areas divided into 9 categories in the Republic of Croatia on the 14th of October 2013.

There are significant differences in the number of Protected Areas comparing the data from the year and 2008 and 2013. In the year 2008 there were 459 protected areas (9.88 % territory of the Republic of Croatia) while in the 2013 there were 418 protected areas (8.19 % territory) which is a result of detailed Register revision which resulted in elimination of some protected areas which actual properties did not fulfil the protection criteria of the Nature Protection Act.

Table 3.2-1: Overview of protected areas in the Republic of Croatia for 2008 and 2013

Category	Number 2013	% of HR	Number 2008	% of HR
Strict reserve	2	0.03	2	0.03
National park	8	1.09	8	1.09
Special reserve	78	0.50	83	0.97
Nature park	11	4.79	11	4.84
Regional park	2	1.17	2	1.82
Nature monument	84	0.002	116	0.003
Significant landscape	84	1.23	79	1.00
Park-forest	28	0.03	36	0.10
Monument of park architecture	121	0.01	122	0.01
Total protected areas in the CRO	418	8.19	459	9.88

All data from NLP set of data for expression of ZPV 1 indicators are an integral part of GIS database of the MENP Protected Areas Register. Data are fully available and data flow has been established. An additional instruction for improving the data flow relates to the date for comparison. The suggestion is that data from the Register of Protected Areas should be compared on the 31st of December of each year.

BR 1 Areas in the ecological network of Croatia

The indicator shows the number and areas in the Republic of Croatia which are included in the ecological network. All data from the ecological network data set are an integral part of the National Ecological Network GIS database CRONEN database which is under supervision of the State Institute for Nature Protection. **The National Ecological Network Database** contains cartographic layout of NEN areas in the scale 1:100,000, as well as an overview of basic data for each of 1538 areas (name, international importance mark, preservation objectives and protection measures) – as indicated in Figure 3.2-17.

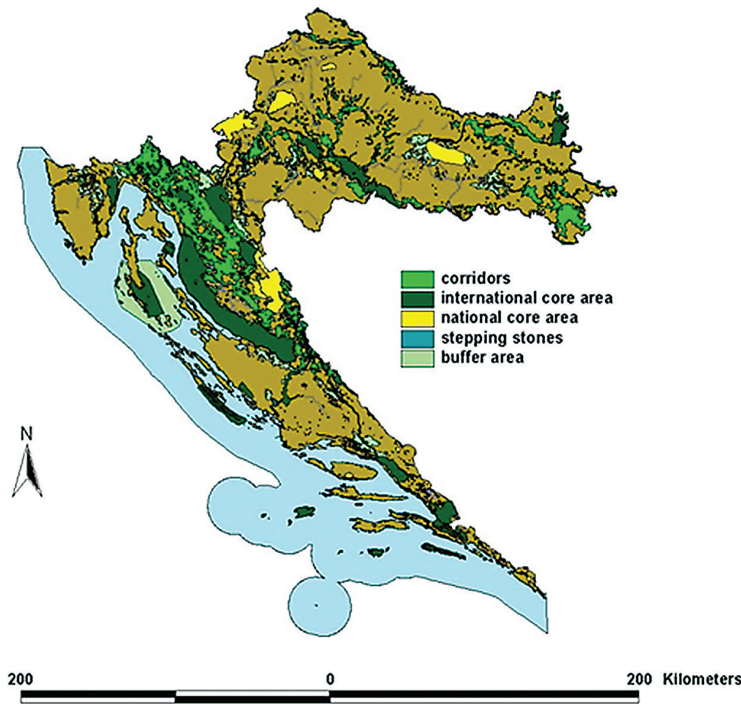


Figure 3.2-17: Structure of the Republic of Croatia National Ecological Network

By accession of the Republic of Croatia to the European Union on the 1st of July 2013, the Ecological Network Natura 2000 was established in the Republic of Croatia based on ecological network. The Ecological network Natura 2000 covers 36,67% of terrestrial territory

and 16,39 % of maritime territory or total of 29,38 % of entire territory of the Republic of Croatia and composes of 742 pSCI (Special areas of Conservation) and 38 SPA areas (Special protection areas).

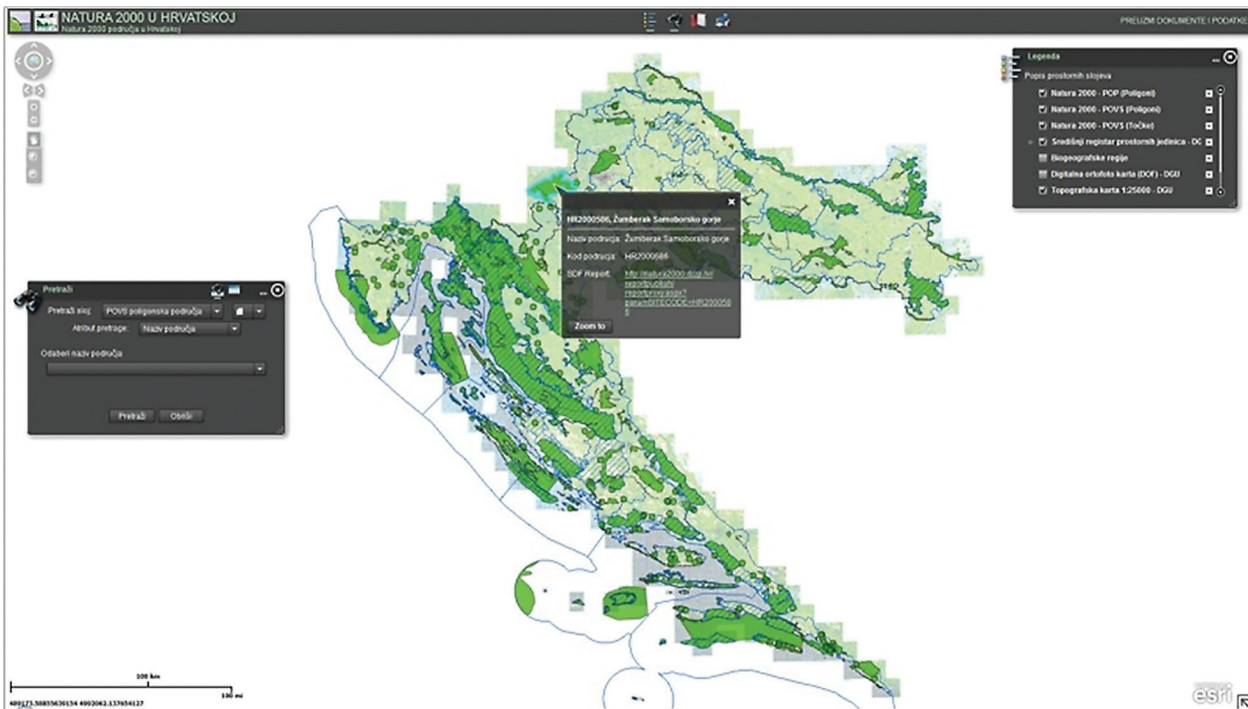


Figure 3.2-18: Web portal of Natura 2000 ecological network in the Republic of Croatia (SINP 2013)



BR 12 High nature value farmland

The indicator indicates a trend of share of high nature value farmland (HNVF) in total used agricultural areas within the periods of five years. The existing map of the Republic of Croatia habitat types with related GIS database on distribution of individual habitat types in the Republic of Croatia has no all habitat types mapped in detail. A cartographic layout is in a scale of 1:100,000, while the minimum mapping unit is 9 hectares.

A development of BR 12 indicator is in progress and only by evaluating the HNMF areas through current SINP projects related to development of GIS databases on wild taxa distribution (along with thematic databases of CRO-fauna and CRO-flora), as well as through the project Mapping of the Republic of Croatia Habitats and establishment of CRO Habitats database, individual agricultural areas could be addressed as "arge natural value", whereby the conditions of expression of this indicator would be acquired.

BR 14 Forests: deadwood

The indicator shows the amount of standing and lying deadwood in forests. The input data for indicator are the number of standing and lying deadwood and their volume. The result is expressed for the periods of five years, per forest management units, departments and sectors.

At this moment there are no field data available, due to a lack of obligation regarding the collection, undefined methodology of comprising the source data in the field and data flow as per administering points (processing, verification, storage and forwarding). For the purpose of indicator realization, the amendments to the Regulation on the Forest Management were initiated, whereby the forestry services will be obliged to collect data on deadwood during regular forests surveying. By adopting new Regulation on the Environmental Information System, the participants (Ministry of Agriculture, Croatian Forests Ltd., Croatian Forest Institute, public institutions of national parks, etc.) will be defined, as well as their tasks/obligations in all the elements of data flow for this indicator.

BR 17 Financing protection and conservation of biodiversity

The indicator shows a trend of funds provided for biodiversity protection and conservation in the Republic of Croatia per years. Data are collected from the annual financial plans according to the following financing sources: state budget, counties and City of Zagreb budget, own incomes from protected natural values management institutions, EU funds and other international funds.

A trend of reduction of funds spent for biodiversity protection and conservation is indicated in an example

of calculating the indicator for pilot area for the period 2006-2010. Such trend is primarily a result of reduced financing of Učka Nature Park activities, as the main biodiversity conservation stakeholder in the pilot area.

BR 18 Public awareness on nature protection

The indicator shows a change of public awareness level on nature protection in the Republic of Croatia and public readiness to get involved to the biodiversity conservation. As it concerns a quite interesting indicator, for which there is still no reporting obligation nor methodology have been adopted yet. In this project, the indicator values were determined by the telephone survey in October 2011 at the level of pilot area.

The following 3 questions were asked to a random sample of 302 examinees living within the pilot area:

- Are you familiar with a term "biodiversity"?
- Are you familiar with a term "Natura 2000"? and
- Would you be ready to pay a single ecological fee in amount of HRK 30 per year if that would be strictly intended for preservation of threatened species and habitats in your county?

The results of answers referred to the question "Are you familiar with a term "biodiversity"?" are indicated in table below. According to the sample structure, these are mostly examinees of younger and medium age and of secondary and university education.

Are you familiar with a term "Biodiversity"	Per cent
Yes, I'm familiar with a term and I know the meaning	32
Yes, I'm familiar with a term but I don't know the meaning / I am not sure about the meaning	33
No, I'm not familiar with a term	35

Are you familiar with a term "Natura 2000"	Per cent
Yes, I'm familiar with a term and I know the meaning	7
Yes, I'm familiar with a term but I don't know the meaning / I am not sure about the meaning	21
No, I'm not familiar with a term	72

Willigness to pay a single ecological fee of 30 HRK	Per cent
Yes	54
No	42
I don't have opinion	4

NEW INTEGRATIVE INDICATORS

A total of 23 indicators were chosen in the earlier stages of this project, taken into consideration together, they represent a very diverse set according to multiple criteria. All of these indicators, each in its own segment, deal with the same answer to the fundamental question "How do we contribute to global warming and what are the (possibly already realized) the consequences of these changes?". At the same time, the answer to that question that arises when "summing up" information from all selected indicators, although it is, partial viewed, multiply informative, still it remains essentially disintegrated, making it difficult to complete its understanding which is a prerequisite for optimal action.

Therefore, it is desirable that the totality of the information from the partial indicators simplify the smaller number of integrative indicators that can provide integrated and representative picture of the overall state of the environment. Generally speaking, the ideal integrative indicator should be in this case to meet the following criteria:

1. Content correspondence with all three conventions (UNFCCC, UNCCD and UNCBD).
2. Cover the entire national territory of Croatia in sufficient spatial resolution.
3. Sufficient time resolution allowing track changes continuity in the environment.

These criteria of all indicators (from all three conventions) examined in this project are fulfilled only by the indicator **Š3 Burnt forest areas**. In addition, as part of the project two new integrative indicators are designed and implemented on the test area: 1) **P3 Productivity of land cover and land cover changes in productivity** and 2) **BR19 Land cover potential for biodiversity**. Both indicators fully meet all three criteria for integrative indicators listed in the previous section and at a much higher level than is the case with the indicator Š3, because they provide relevant information on the entire national territory (while Š3 gives information only on the burned areas).

Figure 3.2-19 schematically shows logical links between the three integrative indicators (Š3 and newly proposed P3 and BR19) and a basic set of logical groups of 23 indicators.

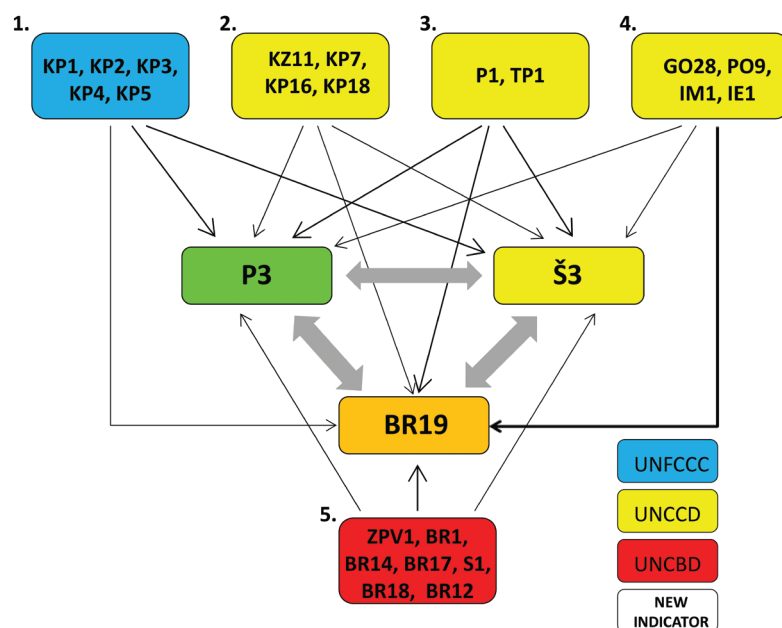


Figure 3.2-19 Scheme of logical links (bold arrows - strong direct links, solid arrows - direct links, dashed arrows - indirect links, gray arrows – content and methodological compatibility) between the three integrative indicators (Š3 and newly proposed P3 and BR19) and a basic set of logical groups of 23 indicators.

P 3 Land cover productivity and land cover productivity change

Integrative indicator P3 indicates the current status (in the current year) of organic production during the

growing season, as well as a change in the production over time (the deviation of the current year of the multi-year average, trend). The main results show the mapping of the entire national territory of the Republic of Croatia,



and from this statistics are calculated according to the main classes of land cover.

The indicator is calculated on an annual basis from the time series of satellite images of great temporal and possible higher spatial resolution (e.g. MODIS-based), and can be directly used 1) in the analysis of spatial and temporal variability of carbon sequestration by certain classes of land cover, 2) the assessment of vitality (health status) of plant species as primary producers dominate

the ecosystem (edificators), 3) to estimate biomass production (agriculture, forestry, energetics), and 4) the risk assessment of surface soil erosion (which is all linked to the recognition of potential drivers and pressures). The indicator will be used for the annual interpretation of the state (vitality, productivity, quantification of carbon sinks) of land cover overgrown with vegetation, through combined groups of LULUCF categories (bioclimates, geomorfometric classes) on the entire national territory of Croatia.

Figure 3.2-19 shows spatial distribution of MODIS-based annual vegetation activity at the pilot area of Nature Park Učka, illustrating temporal variability of vegetation activity which is influenced by interannual dynamics of macroclimate.

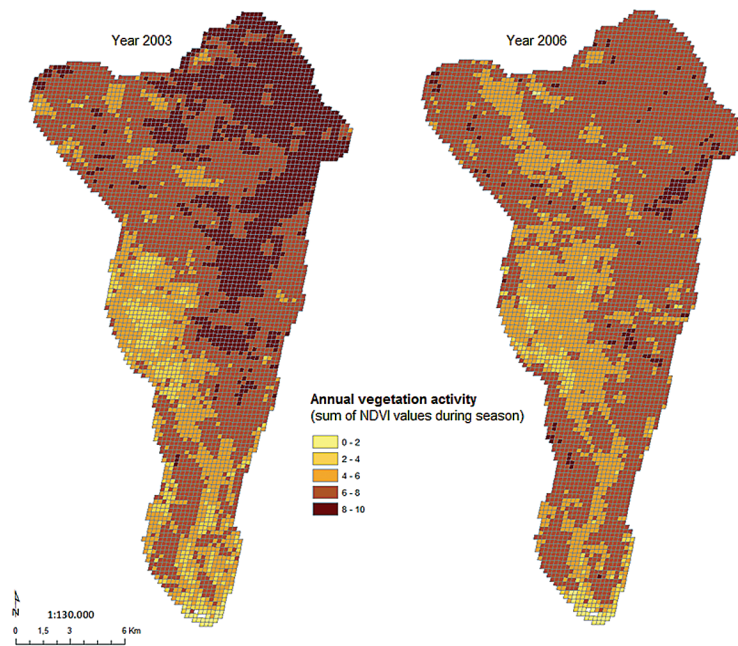


Figure 3.2-19 Spatial distribution of MODIS-based annual vegetation activity (sum of NDVI values) at the pilot area of Nature Park Učka.

BR 19 Land cover potential for biodiversity

Integrative BR 19 indicator quantifies the fundamental characteristics of land cover that impact biodiversity: 1) share classes of land cover that significantly increase or reduce biodiversity (naturalness), 2) the spatial fragmentation of land cover classes that significantly increase biodiversity (integrity) and 3) the spatial variability in the productivity of land cover classes that enhance biodiversity (variety).

The indicator is calculated and displayed spatially (on quadrant grid 1 x 1 km) for the entire national territory of Croatia. It is expected that at some point in time within a particular quadrant 1 x 1 km biodiversity increases if within this quadrant exists:

1. greater naturalness, and a greater proportion of land cover classes that significantly increase biodiversity, and a smaller proportion of land

cover classes that can significantly reduce biodiversity,

2. greater integrity or greater complete (unfragmented) areas under classes of land cover that increase biodiversity and
3. greater diversity i.e. greater variability in the productivity of land cover classes of land cover that enhance biodiversity (which indicates a greater number of natural and by-natural ecological niches, or greater variability in habitat conditions in natural and semi-natural landscapes).

Figure 3.2-19 shows spatial distribution of balance of land cover classes which increase or decrease biodiversity as well as spatial distribution of fragmentation of natural and semi-natural areas at the pilot area of Nature Park Učka. It can be recognized that high level of naturalness occurs in entire Park, while areas with minimum fragmentation occupy its northern part.

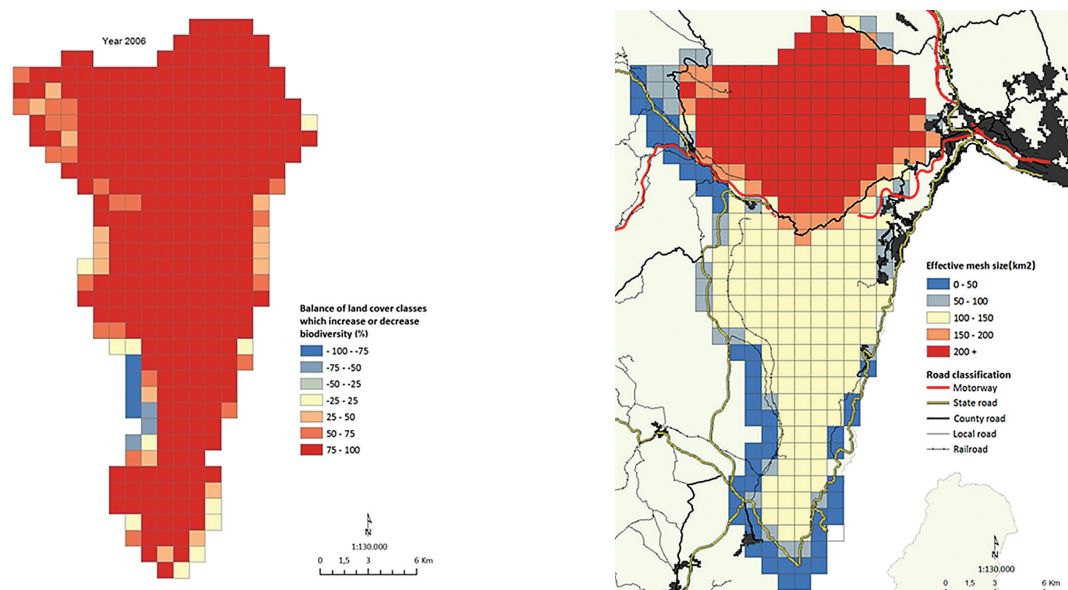


Figure 3.2-19 Spatial distributions (2006) of 1) balance of land cover classes which increase or decrease biodiversity (left) and 2) fragmentation (estimated by effective mesh size) of natural and semi-natural areas at the pilot area of Nature Park Učka.

3.3. THE PILOT AREA

Important component of the project implementation was to analyse and test possible options of data flow system and indicator model on a smaller scale i.e. the pilot area, where the thematic areas of climate change, desertification and biological diversity converge.

The main objective of this piloting exercise was to assess optimal data collection process as a combination of bottom-up and top-down approach taking into account available resources and roles of different stakeholders on the pilot area.

Entire piloting exercise was divided in three phases:

1. selection of the location of the pilot area based on multi-criteria analysis,
2. assessment of existing availability of data for indicators on the pilot area and capacity building of local stakeholders in regard to data collection and methodological issues,
3. inclusion of findings and results of piloting exercise in the national data flow system model.

Selection of the pilot area

Multi-criteria analysis (MCA) of the potential pilot areas has been based on the comparison of 28 locations which have been formed around protected areas on the northern and southern part of Croatia's Mediterranean. The basis for the comparison were the desired attributes

of the pilot area that came from the basic and additional criteria defined by the working groups for all of the three respective conventions (UNFCCC, UNCCD and UNCBD) and presented in the box below.



Basic criteria for the pilot area:

- ✓ Physical structure of the location contains settlements, forested and agricultural land, industrial objects, traffic infrastructure and waste disposal sites;
- ✓ Location contains protected natural areas according to the Nature Protection Act, including areas of National Ecological Network and EU endangered habitat types and species;
- ✓ Location contains at least one representative meteorological station under supervision of the Meteorological and Hydrological Service;
- ✓ Boundaries of location overlap with forestry division on local forest offices or several forest management units;
- ✓ Location contains at least one plot on which in the last five years at least one forest fire larger than 10 ha has occurred;
- ✓ The measurements which can be used as a basis for the calculation of the respective indicators are available at the location;
- ✓ That the location contains at least one location designated for permanent soil monitoring in Croatia;
- ✓ That at least annual measurements are taken at the location by the relevant institutions, and that the location is subject to research programs and monitoring activities by local or regional institutions for nature protection;
- ✓ Location contains protected areas with organized system of visits;
- ✓ That there is up-to date information on the location regarding land use on the level of respective territorial-administrative unit.

Additional criteria for the pilot area:

- ✓ Existence of spatial planning documentation (spatial plan) and management documentation (management plan) for the protected area;
- ✓ Positive evaluation results of the level of logistical support of organizations and institutions on the broader surrounding of the potential pilot area in terms of compatibility of piloting exercise with the respective institution's activities and the number of qualified potential associates.

Out of 17 locations in the northern region and 11 locations in the southern region (28 in total), two locations had satisfied basic and additional criteria – Nature Park Učka in the northern region and Nature Park Biokovo in the southern region. Taking into account logistical arrangements needed it was finally decided to select **Nature Park Učka** as a location of the project pilot area (see figures 3.3-1 and 3.3-2 below).

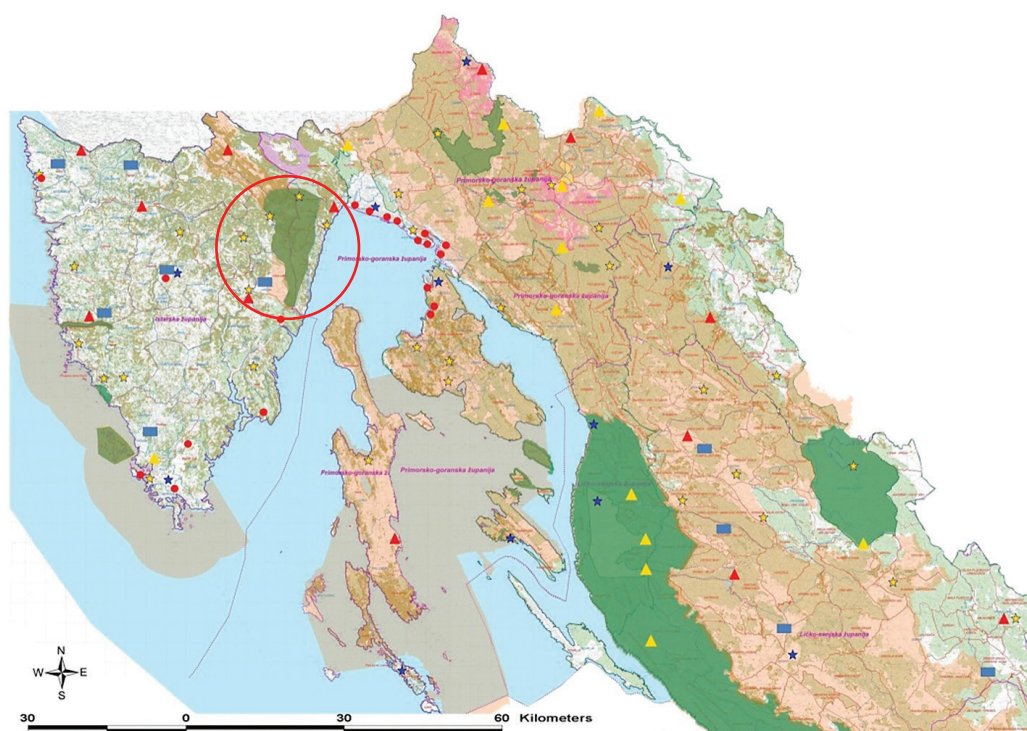


Figure 3.3-1: Location of the pilot area – Nature Park Učka (marked with red circle)

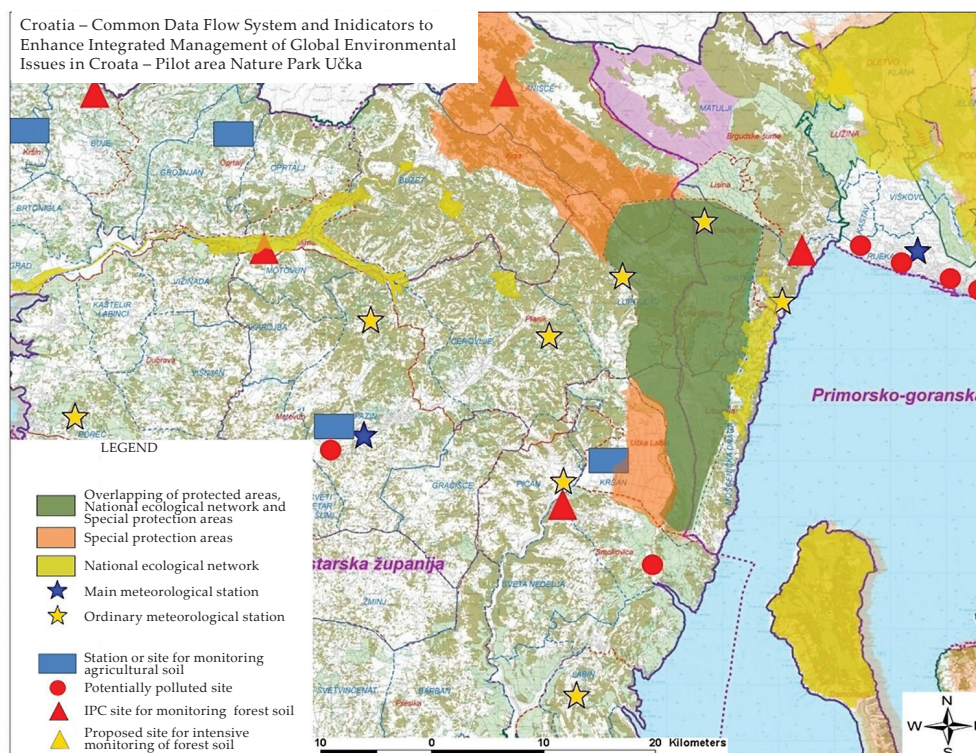


Figure 3.3-2: Location of the pilot area – Nature Park Učka – closer look

Overall assessment of availability of data for selected indicators at the pilot area

Data availability at the pilot area was assessed through a detailed and customized questionnaires that were disseminated to the local stakeholder’s organizations in order to survey the current status of data availability and data flow, if such exists. The questionnaires had following key questions related to:

- mandatory or voluntary obligation to collect activity data needed for preparation of selected indicators
- data collection and archiving process
- processing and interpretation of data
- usage of data

Stakeholders at the pilot area:

- Public institution „Nature Park Učka“
- Public institution „Natura Histrica“
- Public institution „Priroda“
- State Institute for Nature Protection
- Croatian Forests Ltd., Forest district Buzet
- Primorje Gorski Kotar county

Although there are some specifics and differences between thematic areas, i.e. climate change,

desertification and biological diversity, based on the results of the survey and follow-up briefings with the local stakeholders one could conclude that existing system of data collection and management for selected indicators is to a large extent outside of the stakeholder’s scope at the local level.

In some cases, for instance data collection of annual increment and fellings in managed state forests which are the key parameters for estimation of greenhouse gas removals in the AFOLU sector (KP 1 and KP 5 indicators) is vertically structured and centralized in state owned company Croatian Forests. Another example is KP 7 desertification and soil degradation indicator related to mean annual air temperature trend which is measured on main meteorological stations on or adjacent to pilot area by Meteorological and Hydrological Service as part of national network of measurement stations. These findings implies that data flow system should take into consideration different individual bottom-up and top-down streams of data and information which are relevant for indicators.

In a box below a summary of analysis of BR 14 biological diversity indicator on dry trees in the forests is given to illustrate current situation regarding data collection and availability.



Theme: Biological diversity (UNCBD)

Indicator BR 14: Forests: deadwood

Activity data definition: Number and the quantity of dry trees per unit of surface based on the representative samples in 5 years time.

Obligatory data collection: Not defined. Croatian Forests Ltd. which are responsible for forest management do not have an obligation to collect data on dry trees according to existing legislation nor there is recommended methodology. Alternative estimation methodology is proposed by GEF DFS project (see report on Data Flow System Model). There is no coverage of data on pilot area.

Data flow: Not regulated. Data flow is not arranged since legislative framework is missing. There is no data collection on pilot area since methodology is not provided.

Usage of indicator: Indicator is not in use because of the lack of preconditions for its estimation.

Improvement measures: Deadwood counting based on representative samples and related methodology should be stipulated in national regulation covering forest management as obligatory element in measuring of the forests.

In the framework of the project a new web based software application with GIS viewer and special module for pilot area was developed which was used for testing data flow system on local level. The results of testing at the pilot area shows that without mandatory data collection system in place with clearly defined roles, responsibilities and timing, potential to utilize local capacities remains untapped. Another issue which turned out during piloting exercise is lack of human resources and knowledge at a local level for deeper data analysis, including estimation of uncertainties, missing data and modeling parameters. This represents an important area for improvement and follow-up activities are prioritized in that respect.

Inclusion of findings and results of piloting exercise in the national data flow system model

Piloting exercise was very useful for better understanding of the current data flow and estimation of potential for bottom-up approach in data collection. Evidently, there are number of gaps identified and challenges ahead, some of which were addressed in the framework of this project, in stronger utilization of local capacities in the national data flow system in general.

The key role of local stakeholders according to our finding is to take more active role in improvement and development of country-specific methodologies and parameters for calculation of indicators according to national priorities in reporting towards UNFCCC, UNCCD and UNCBD conventions which although discrete could significantly contribute to some breakthroughs in the quality aspect of reporting.

This should be done in cooperation with Croatian as well as cross-boarder research and scientific institutions. The data flow system itself should be build from top down since legal, institutional and organizational arrangements are already set and are maintained and monitored at the national level.

3.4. CAPACITY-BUILDING AND EDUCATION

Climate change, desertification and loss of biological diversity is affecting almost everyone on the planet, so it is vital that everyone, particularly decision makers, are aware of the risks they face and of the role they can play in combating it. Rio conventions recognize that the success of strategies to address climate change, desertification and loss of biological diversity depends on fully involving individuals and communities, interest groups and stakeholders, including businesses and local policy makers. It therefore directly addresses education, training and public awareness, as well as access to information, public participation and international cooperation in these areas.

In the framework of the project a *Capacity Building Programme (CBP)* was developed with a purpose to improve knowledge and good practice, to raise awareness and to impart specific skills in a medium to long term on general and cross-cutting themes as well as on specific convention and indicator related topics.

What is capacity-building?

Capacity-building can be taken as „the actions needed to enhance the ability of individuals, institutions and systems to make and implement decisions and perform functions in an effective, efficient and sustainable manner“⁶.

For **individuals**, capacity-building refers to the process of changing attitudes and behaviours, imparting knowledge and developing skills while maximizing the benefits of participation, exchange of knowledge and ownership.

For **institutions**, capacity-building focuses on the overall organizational performance and functioning capabilities, as well as the ability of an organization to adapt to change.

For **systems**, capacity-building addresses the overall framework within which institutions and individuals operate, as well as the relationships of institutions.

There are three groups of stakeholders identified during the project implementation which are targeted for capacity building programme:

- Competent authorities and collaborating public institutions at national level responsible for monitoring and reporting of indicators as well as for development of environmental information system (EIS)
- National Focal Points for UNFCCC, UNCCD and

UNCBD (although part of competent authorities they are the key stakeholders for transition to new data flow system)

- Organizations at the local level and regional authorities which could contribute to development of data flow system



Capacity-building training at the pilot area Nature Park Učka in October 2013

Capacity building programme is designed to cover all relevant themes according to agreed priorities but at the same time it remains flexible and open for new topics since it is well known that science of climate change, desertification and biological diversity is constantly evolving.

Capacity-building activities are to be guided by:

- a country-driven, phased approach, integrated into existing climate change, soil degradation and biological diversity programmes and strategies;

- cost-effective operation;
- the promotion of partnerships, networks and synergies, in particular synergies between conventions;
- an interdisciplinary, holistic and systematic approach; and the principles of sustainable development.

Capacity building programme in the first phase is focused on strengthening of data flow system for common climate change, biodiversity and desertification indicators. In that respect following capacity-building

⁶ A Guide for Self-Assessment of Country Capacity Needs for Global Environmental Management, Global Environment Facility, September 2001



topics, divided in two groups, were identified with indication whether they fell in short-, medium- or long-term planning.

CPB - General and cross-cutting topics	Short < 1 yr	Medium 1-3 yr	Long > 3 yr
Raising awareness of climate change, desertification and biological diversity issues within all stakeholder groups	•		
Bridging the communication gap between national focal points for UNFCCC, UNCCD and UNCBD	•		
Development of Environmental Information System (EIS) and inclusion of new DFS software application	•	•	
National core set of indicators and DPSIR reporting scheme	•		
Increase the availability and flow of information on climate change, desertification and biological diversity		•	•
Follow-up plan for sustainability of data flow system in terms of organizational, procedural, training and financial resources and needs		•	
Research projects for improving quality of common indicators and new indicators		•	
Ensuring the critical evaluation of policy options by means of indicator model			•

CBP - Convention- and indicator-specific topics	Short < 1 yr	Medium 1-3 yr	Long > 3 yr
UNFCCC, UNCCD and UNCBD monitoring and reporting requirements	•	•	•
Methodology and activity data for preparation of common UNFCCC, UNCCD and UNCBD indicators	•	•	
Functionality of DFS software application and database for activity data collection and presentation of indicators	•		
Key elements of quality assurance and quality control (QA/QC) procedures for improving the quality of data and indicators		•	

3.5. LESSONS LEARNED AND KEY RECOMMENDATIONS

Lessons learned

The main objective of the project was to design and implement a comprehensive Data Flow System (DFS) and indicator model for the purpose of sustainable collection and management of common UNFCCC, UNCCD and UNCBD data at the national level, and to test this model through a small-scale GIS supported pilot project where issues of climate change, soil degradation and biological diversity converge.

From strategic perspective the project has addressed the key legislative, institutional, organizational,

procedural and technical measures aimed at improvement of data flow for preparation of selected indicators and better streamlining, harmonization and integration of information from different data sources.

The analyses indicate that there are certain reasons due to which there is no stronger connection between UNFCCC, UNCCD and UNCBD conventions with regard to the reporting mechanisms, including:

- different strategic priorities regarding the fulfilling of obligations towards the Conventions,
- a stage of development of regulatory implementing framework,
- different reporting cycles,
- different reporting forms and their modifications,
- different forms of indicators for the national

list of indicators (numerical, spatial, textual/descriptive).

Furthermore, the main preconditions were identified, which should be fulfilled in order to obtain a strong harmonization with regard to reporting, out of which the following could be emphasized:

- establishment or enhancement of information systems supporting the data and indicators flow and exchange,
- coordinated operation of national focal points for implementation of individual Rio Conventions, as well as entities responsible for data collection,
- existence of clear connection between the indicators monitoring and reporting systems and their usage for the purpose of preparation of action plans and programs for policy and measures implementation,
- existence of consolidated form and cycle of reporting on data and indicators.

It can be concluded that so far in Croatia, as well as in most of other Parties to the Rio Conventions, in regard to data collection and preparation of indicators, a model of information silos has been implemented without any stronger horizontal communication and connections between the national focal points as regarding the harmonization and streamlining of data flow. The reasons for such situation are elaborated in this report. The analyses within the framework of this project indicate that there is a realistic possibility of connection based on the “bottom-up” principle and development of new collaborative model.

Based on the previous considerations, it is possible to define a new common data flow system model for preparation of indicators, which would enable more efficient usage of common set of data, high quality monitoring and reporting according to the Conventions in regard to accuracy, consistency, completeness and timeliness, as well as more efficient planning and implementation of policy and measures for climate change mitigation and adaptation, preservation of biodiversity and reduction of soil degradation in the Republic of Croatia.

For that purpose, new three-layer web application with GIS browser and database has been developed. The application is available for different types of users having access to Internet, emphasizing the data safety so that only specific data are available to specific user groups. The application is available on the Croatian Environmental Agency website and it will constitute a part of the Environmental Information System.

Another important lesson learned is that there is a need for stronger flow of information between National Focal Points. Since all three National Focal Points are

located in the Ministry of Environmental and Nature Protection, from the legislation and institution point of view, it is not required to adopt or change the existing regulations, not to establish special inter-institutional permanent or temporary operating bodies. New common data and indicators flow system model has been designed horizontally unlike the existing vertical silos model, whereat the focus of new model is on the environmental protection information system, in which the DFS application represents one of the EIS modules.

Another significant system component is legislative and institutional framework, which supports data and indicators flow in all the points, from data source to reports. Institutional framework consists of the Ministry of Environmental and Nature Protection as the national body authorized for implementation of three Conventions and Croatian Environmental Agency as body responsible for EIS development and management. Along with the Agency, the future national reference centers were mentioned as well, which basic role is defined by the Environmental Protection Act.

It is generally required for most indicators to legally designate the competent institutions and amend relevant sublegal acts to allow direct access to data (eg HSFond –Croatian forest ltd database, Register of concessions). Furthermore, the indicators processed by this project in the framework of this convention often connect multiple industries and institutions. Therefore, it is extremely important to institutionally connect and organise the strengthening of all those involved in the process of collecting and processing data. Without their extra effort, harmonization and sharing it will not be possible to collect quality data to draw conclusions about the degree of desertification throughout the country, nor to assess the potential impact on local people and their way of life. It will be able to contribute to the exchange of certain methods of calculating and monitoring proposed on the basis of the latest scientific and technical achievements (eg the use of satellite imagery), the adoption of which will receive the output quality in terms of spatial and temporal resolution.

New system model assumes more significant role of QA/QC in all the points. The quality assurance requirements are related to accuracy, completeness, consistency and timeliness of data and indicators. The QA/QC system developed within the framework of national inventory report could be used as an example for development of this part, containing QA/QC program, annual plan with quality improve objectives and audit control lists.

Piloting exercise was very useful for better understanding of the current data flow and estimation of potential for bottom-up approach in data collection. Evidently, there are number of gaps identified and challenges ahead, some of which were addressed in the



framework of this project, in stronger utilization of local capacities in the national data flow system in general.

The key role of local stakeholders according to our finding is to take more active role in improvement and development of country-specific methodologies and parameters for calculation of indicators according to national priorities in reporting towards UNFCCC, UNCCD and UNCBD conventions which although discrete could significantly contribute to some breakthroughs in the quality aspect of reporting. This should be done in cooperation with Croatian as well as cross-boarder research and scientific institutions. The data flow system itself should be build from top down since legal, institutional and organizational arrangements are already set and are maintained and monitored at the national level.

Particular attention should be given to capacity building in the next period. In general, capacity-building can be taken as the actions needed to enhance the ability of individuals, institutions and systems to make and implement decisions and perform functions in an effective, efficient and sustainable manner. In a more practical way, a capacity building programme was developed with a purpose to improve knowledge and good practice, to raise awareness and to impart specific skills in a medium to long term on general and cross-cutting themes as well as on specific convention and indicator related topics.

There are three groups of stakeholders identified during the project implementation which are targeted for capacity building programme:

- Competent authorities and collaborating public institutions at national level responsible for monitoring and reporting of indicators as well as for development of environmental information system (EIS)
- National Focal Points for UNFCCC, UNCCD and UNCBD (although part of competent authorities they are the key stakeholders for transition to new data flow system)
- Organizations at the local level and regional authorities which could contribute to development of data flow system

Capacity-building activities are to be guided by:

- a country-driven, phased approach, integrated into existing climate change, soil degradation and biological diversity programmes and strategies;
- cost-effective operation;
- the promotion of partnerships, networks and synergies, in particular synergies between conventions;
- an interdisciplinary, holistic and systematic approach; and the principles of sustainable development.

Finally, two new integrated indicators were developed in the framework of this project which could be used as a platform for further integration of reporting and development common set of policies and measures for management of global environmental issues.

Key recommendations

- ✓ Selected 23 UNFCCC, UNCCD and UNCBD indicators from National List of Indicators including two new integrating indicators developed in the framework of this project shall be continually updated and upgraded in regard to emerging issues (e.g. SDG, Aichi Targets Indicators, UNCCD performance and impacts indicators, etc.) common set of activity data, data sources, methodology and quality assurance and quality control, as well as their interoperability, interoperability and intercomplementation.
- ✓ Ministry of Environment and Nature Protection and its National Focal Points should prepare Coordination programme for the Rio Conventions as a platform that would define objectives, activities, deadlines, activity performance holders, common elements of reporting arising from reporting forms and contents of national reports, with emphasis to the model of indicators being established by this project and cooperation institutions that collect and submit data. The coordination program should represent also a measure of active policy regarding the inter-sectoral connection as one of the Conventions objectives.
- ✓ Web application with GIS browser and database should be appropriately embedded in the Environmental Information System managed by the Croatian Environmental Agency.
- ✓ Introduction of new chapter to the national reports and communications is proposed in a part related to policy and measures, which would be related to coordination of sectoral policies and measures regarding to combat against climate change, desertification and preservation of biodiversity.
- ✓ Harmonize legislation in order to ensure the data flow and the appointment of the national reference centers
- ✓ The key role of local stakeholders is to take more active role in improvement and development of country-specific methodologies and parameters for calculation of indicators according to national priorities in reporting towards UNFCCC, UNCCD and UNCBD conventions which although discrete could significantly contribute to some breakthroughs in the quality aspect of reporting.
- ✓ Capacity building programme for key stakeholders shall be implemented in a short term with focus on strengthening of data flow system for common climate change, biodiversity and desertification indicators.
- ✓ Croatian Environment Agency should consider the modalities for transfer of knowledge and good practice gained in this project to other, particularly developing, countries according to common Rio Convention principle of capacity building and technology transfer.



