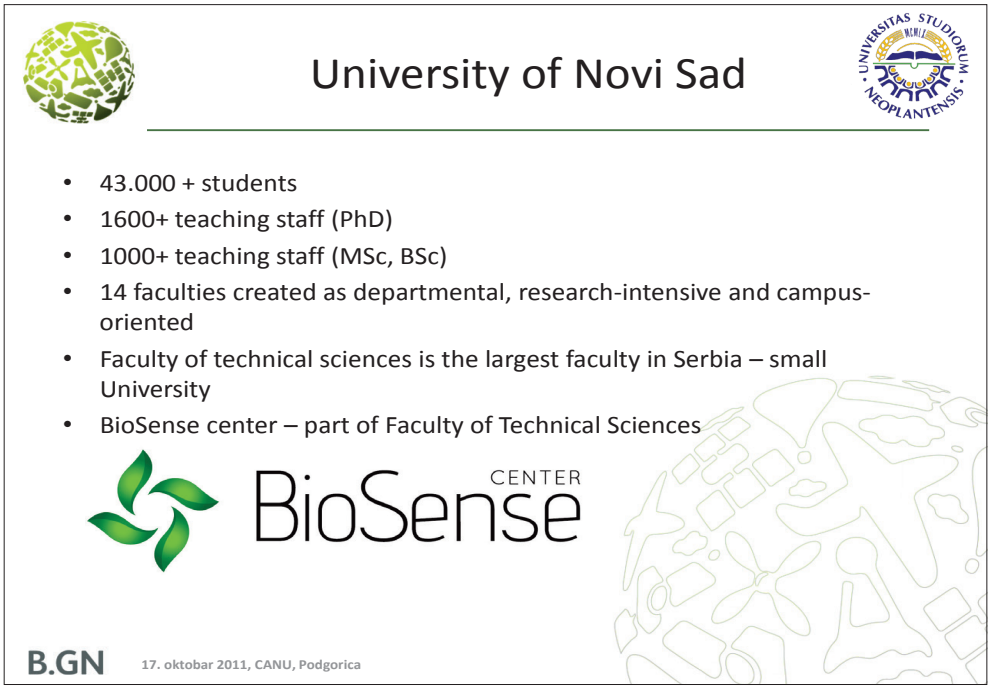
Vladimir CRNOJEVIĆ*

BIOSENSE CENTER AND NETWORKING OF EO INSTITUTIONS IN WBC

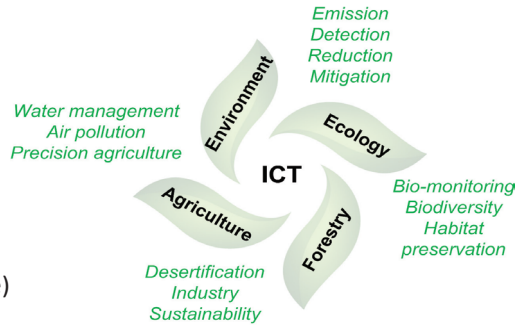


* Univerzitet u Novom Sadu, Srbija

BioSense CENTER

- Multidisciplinary research center devoted to development and application of ICT concepts, methods and tools in agriculture, forestry, ecology and environmental engineering

- Main ICT research fields:
  - Sensor design,
  - Remote Sensing,
  - Wireless Sensor Networks,
  - Geo-referenced databases and geographic information systems,
  - Knowledge discovery (data mining, artificial intelligence)



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Remote sensing

- Imaging from satellites, aircrafts or UAVs
- BioSense Center posseses:
  - Multispectral, thermal and RGB cameras (IR & visible spectrum)
  - 4 UAVs of various ranges and capacities
  - Image analysis and processing tools
- Development of methods for contactless monitoring of crops and ecosystems, assessment of crop yields, analysis of the impact of environmental parameters, etc.

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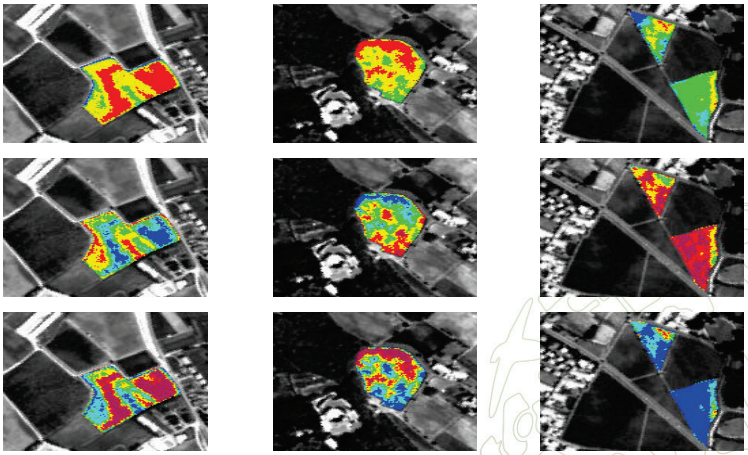
Remote sensing



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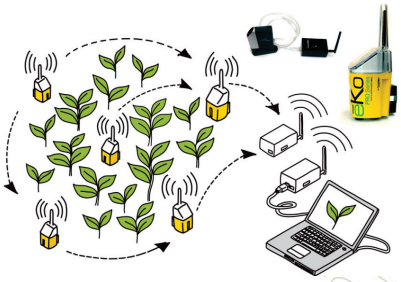
Wireless sensor networks

- Wireless network consisting of spatially distributed autonomous devices
- Sensors cooperatively monitor physical or environmental conditions at different locations
  - Temperature, humidity, sound, vibration, pressure, motion, pollutants, light…
- Small-size, low-consumption devices
- Various sensors can be attached to the communication module



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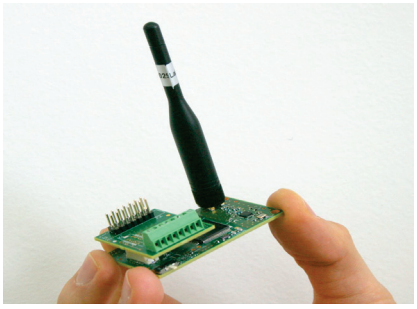
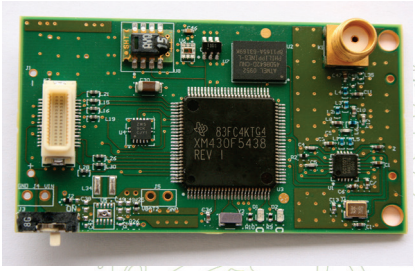
Proprietary WSN solutions

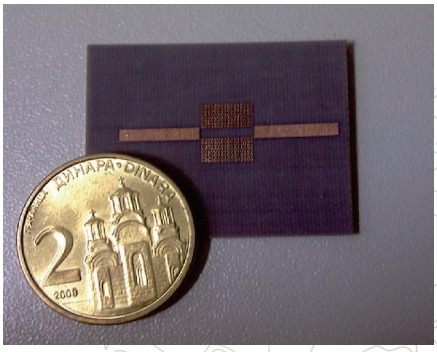
- Custom design of WSN mote
  - In cooperation with Institute Mihajlo Pupin, Belgrade





Sensor design

- Sensors for WSN applications in EO:
  - Small size:
    - *In-situ* measurement with min. disturbance of the sample
    - Easy insertion
  - Small consumption, passive
  - Single-frequency operation
  - Mechanically robust
  - Low-cost
  - Independent measurements from other parameters (e.g. soil chemical content)



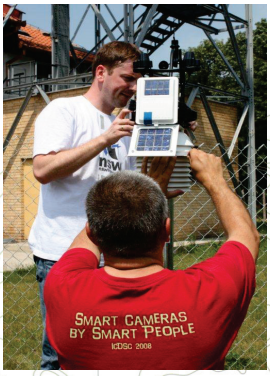
Knowledge discovery

- Extracting information from the obtained data to discover hidden laws and relations
  - Based on the principles of artificial intelligence
  - Development of algorithms that identify the key parameters in the observed data and enable improved modeling of natural processes, their analysis, classification and prediction

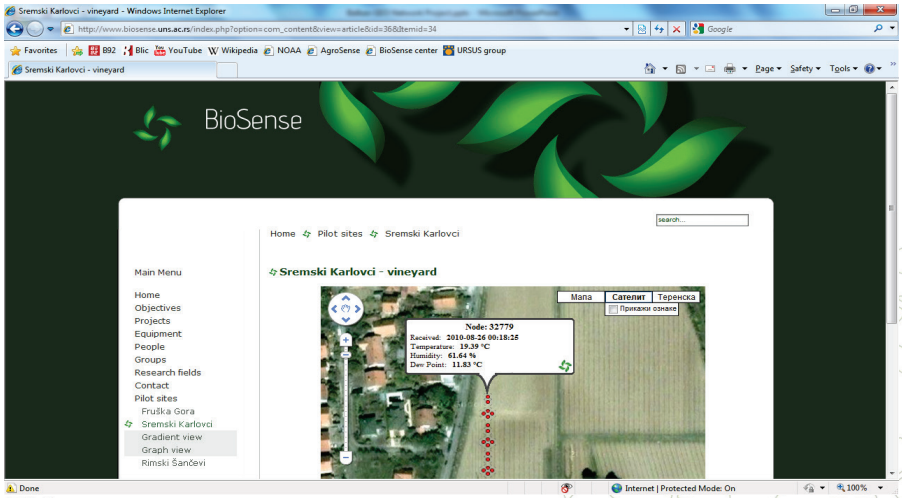
- At the BioSense Center, a new relationship between the yields of soybeans and corn was discovered from monthly atmospheric conditions

Pilot sites

- BioSense Center has developed several pilot sites for EO
  - WSN on a pilot site in the Institute of Viticulture in Sremski Karlovci continuously sends data of interest to researchers
  - Pilot site in the forest of Fruška Gora mountain allows continuous monitoring of various ecosystem parameters
    - One of 30 key European highly instrumented locations for monitoring of ecosystems
    - Part of the EXPEERE FP7 project consortium which brings together 40 leading institutions in the field of monitoring ecosystems in Europe
  - Pilot site in the greenhouse at Rimski Šančevi



Pilot sites



BioSense center staff

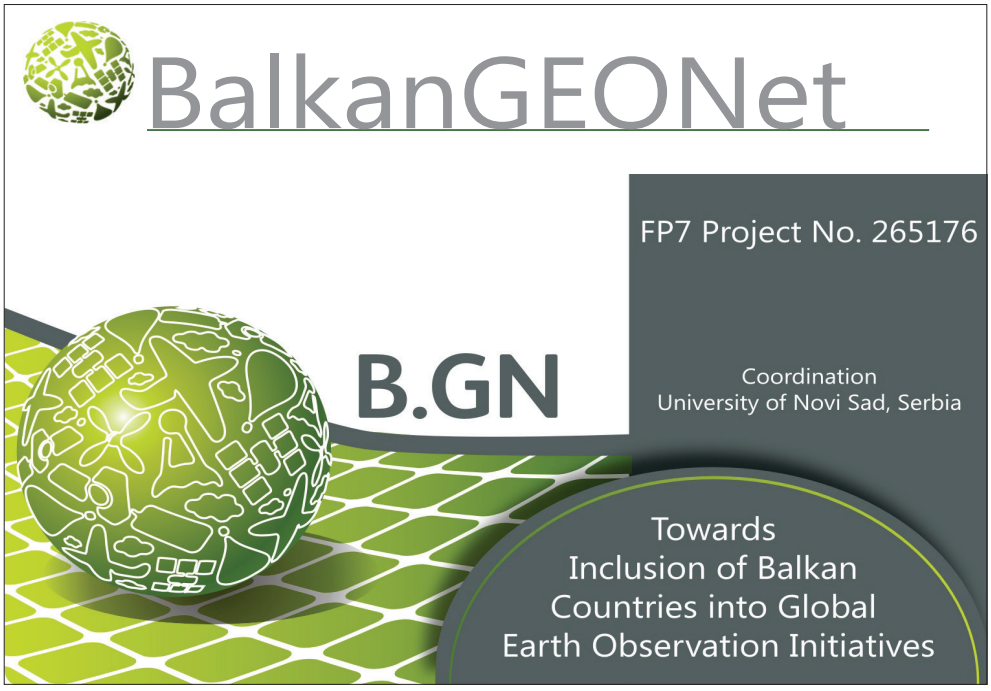
- The BioSense center gathers 20+ researchers from the Faculty of Technical Sciences
  - 9 hold the title of Doctor of Science
  - Special attention is given to the employment of young researchers - average age of researchers at the BioSense Center is under 32
- The Center also brings together 20+ researchers from:
  - Faculty of Natural Sciences, Dept. for Biology and Ecology, and Dept. for Physics
  - Faculty of Agriculture
  - Institute for Lowland Forestry and Environmental Protection

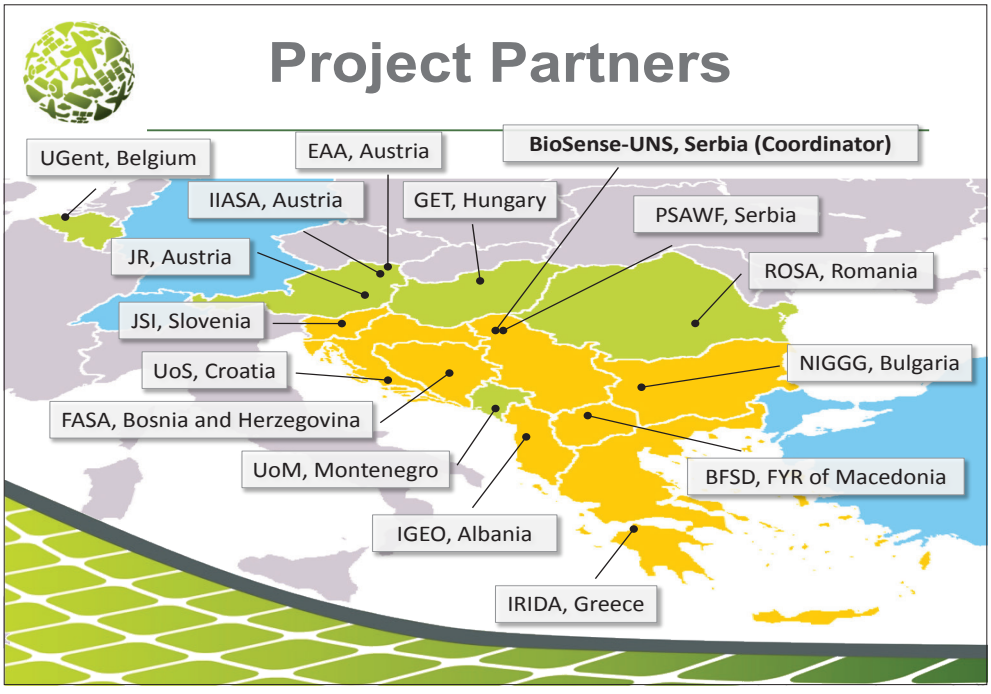
Research activities

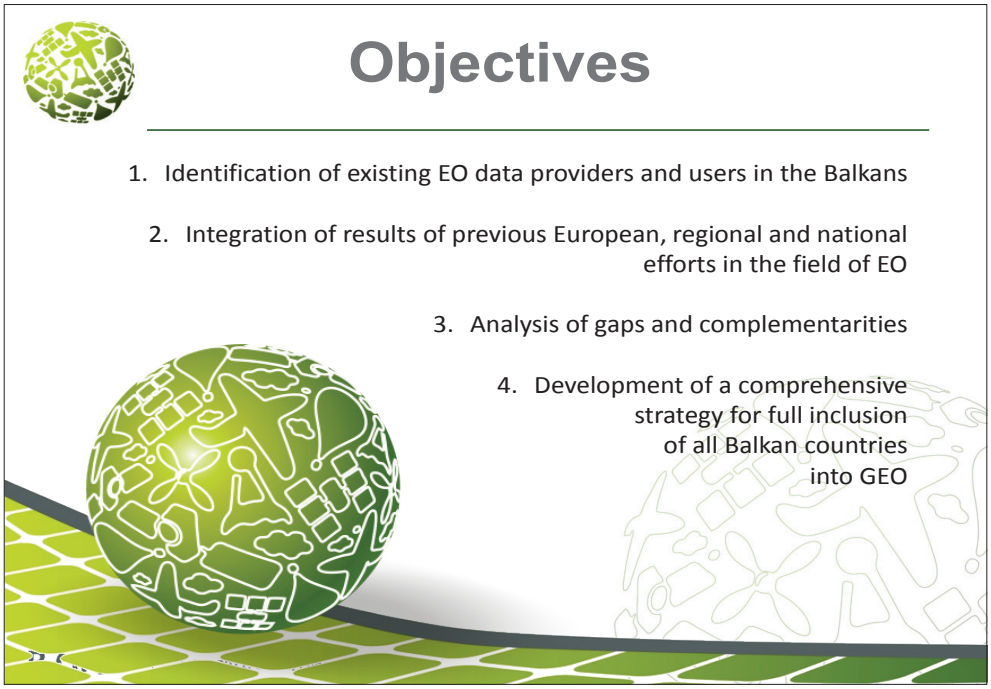
- 20+ research papers published in top scientific journals in the last five years
  - IEEE Journal on Selected Areas in Communications (2 papers in 2010, impact factor 3.76)
  - IEEE Transactions on Image Processing (impact factor 2.85)
- International patent on proprietary WSN protocol
- Number of research projects

Running projects

- 7 FP7 projects:
  - AgroSense (Capacities), coordinator
  - EXPEER (Infrastructures)
  - MultiWaveS (Marie Curie), coordinator
  - MMSTREAM (Marie Curie), coordinator
  - BalkanGEONet (Cooperation), coordinator
  - QoSTREAM (Marie Curie), coordinator
  - ENORASIS (EcoInnovation)
- 3 EUREKA! Projects
- 3 national project
  - TR-11022, III-43002, III-44003


BalkanGEONet
FP7 Project No. 265176
B.GN
Coordination
University of Novi Sad, Serbia
Towards
Inclusion of Balkan
Countries into Global
Earth Observation Initiatives


Project Partners
UGent, Belgium
EAA, Austria
BioSense-UNS, Serbia (Coordinator)
IIASA, Austria
GET, Hungary
PSAWF, Serbia
JR, Austria
ROSA, Romania
JSI, Slovenia
UoS, Croatia
NIGGG, Bulgaria
FASA, Bosnia and Herzegovina
UoM, Montenegro
BFSD, FYR of Macedonia
IGEO, Albania
IRIDA, Greece


Objectives
1. Identification of existing EO data providers and users in the Balkans
2. Integration of results of previous European, regional and national efforts in the field of EO
3. Analysis of gaps and complementarities
4. Development of a comprehensive strategy for full inclusion of all Balkan countries into GEO


Objectives
5. Dissemination to the entire EO community and raising governmental and public awareness
6. Harmonization of EO players in the region
7. Identification of mechanisms for leveraging, development and coordination of EO capacity building initiatives in the region
8. Contribution to Balkan countries' compliance with the INSPIRE directive and their integration into SEIS
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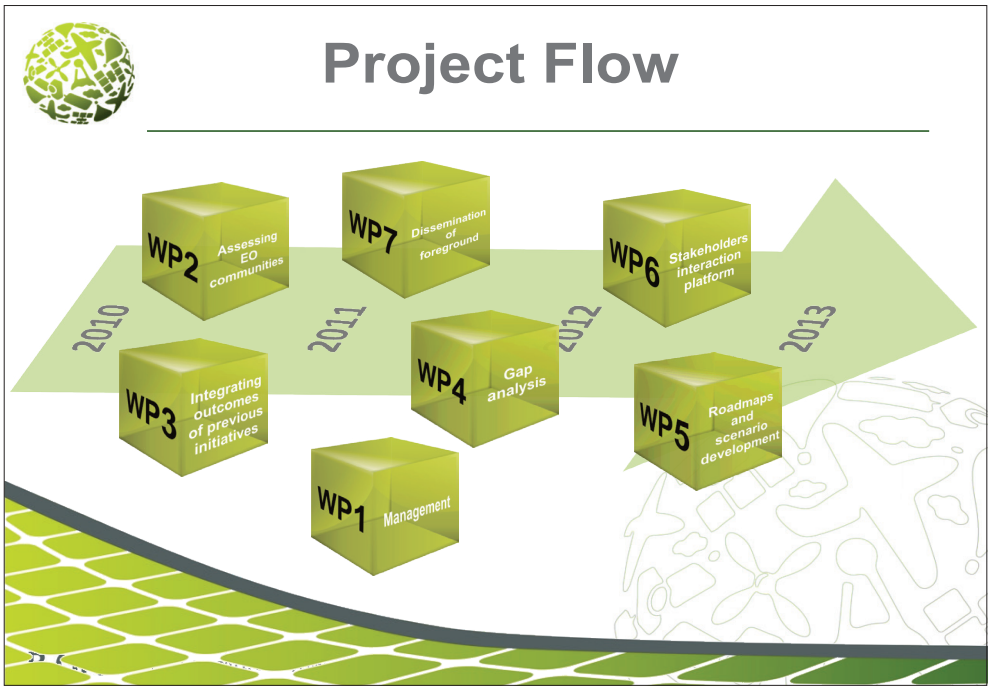
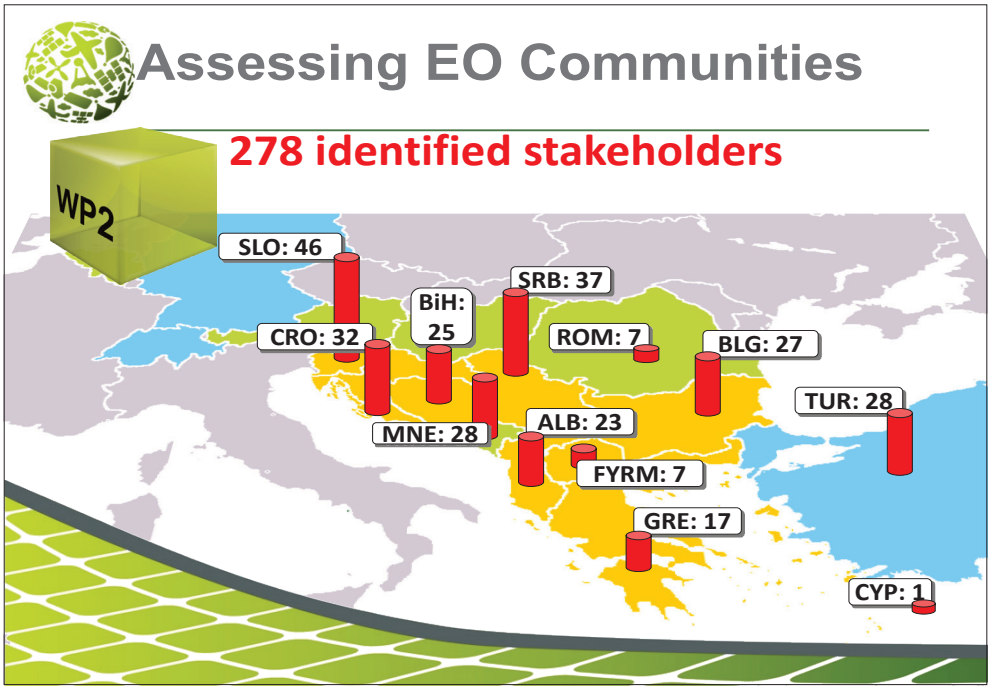
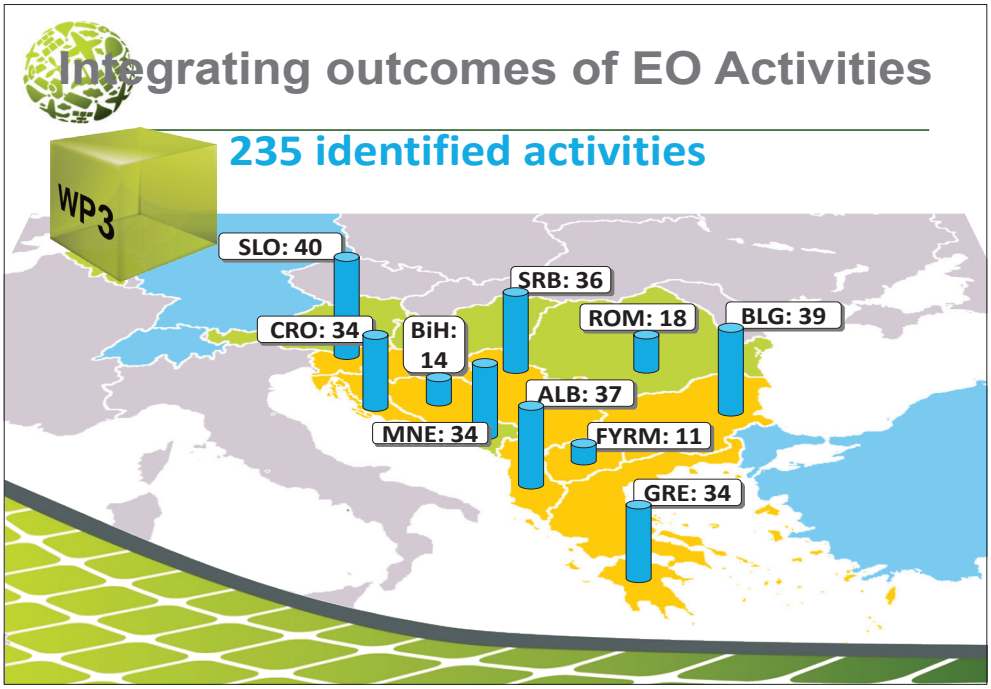
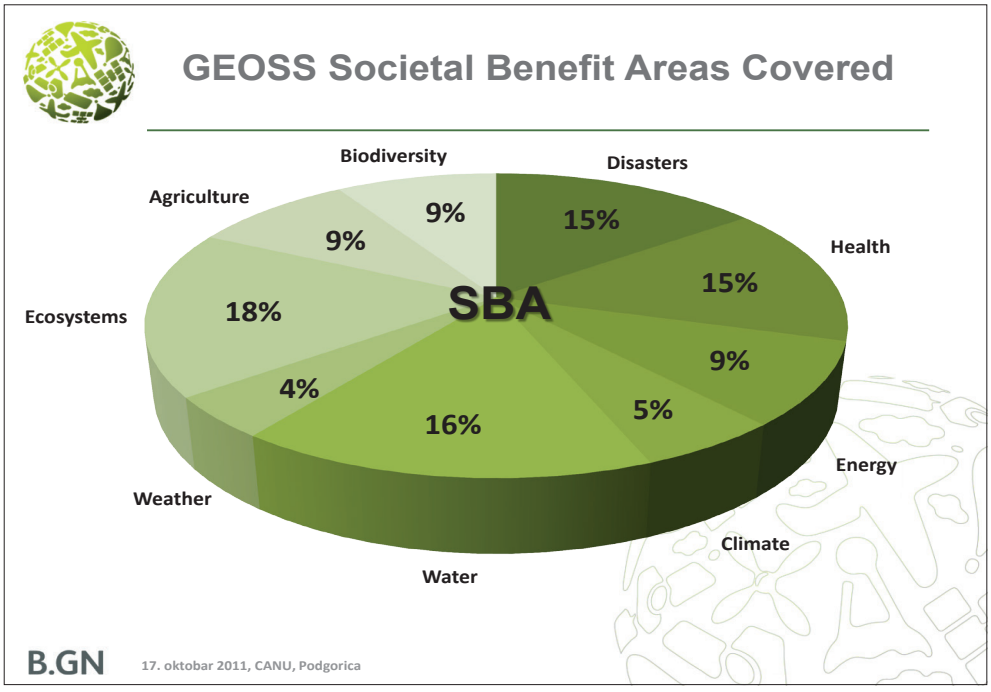

Project Flow
WP2 Assessing EO communities
WP7 Dissemination of foreground
WP6 Stakeholders interaction platform
2010
2011
2012
2013
WP3 Integrating outcomes of previous initiatives
WP4 Gap analysis
WP5 Roadmaps and scenario development
WP1 Management


Assessing EO Communities
278 identified stakeholders
WP2
SLO: 46
SRB: 37
BiH: 25
CRO: 32
ROM: 7
BLG: 27
TUR: 28
MNE: 28
ALB: 23
FYRM: 7
GRE: 17
CYP: 1


Integrating outcomes of EO Activities
235 identified activities
WP3
SLO: 40
CRO: 34
BiH: 14
SRB: 36
ROM: 18
BLG: 39
ALB: 37
MNE: 34
FYRM: 11
GRE: 34


GEOSS Societal Benefit Areas Covered
Biodiversity
Disasters
Agriculture
Health
Ecosystems
Energy
Weather
Climate
Water
SBA
9%
15%
9%
15%
18%
9%
4%
5%
16%
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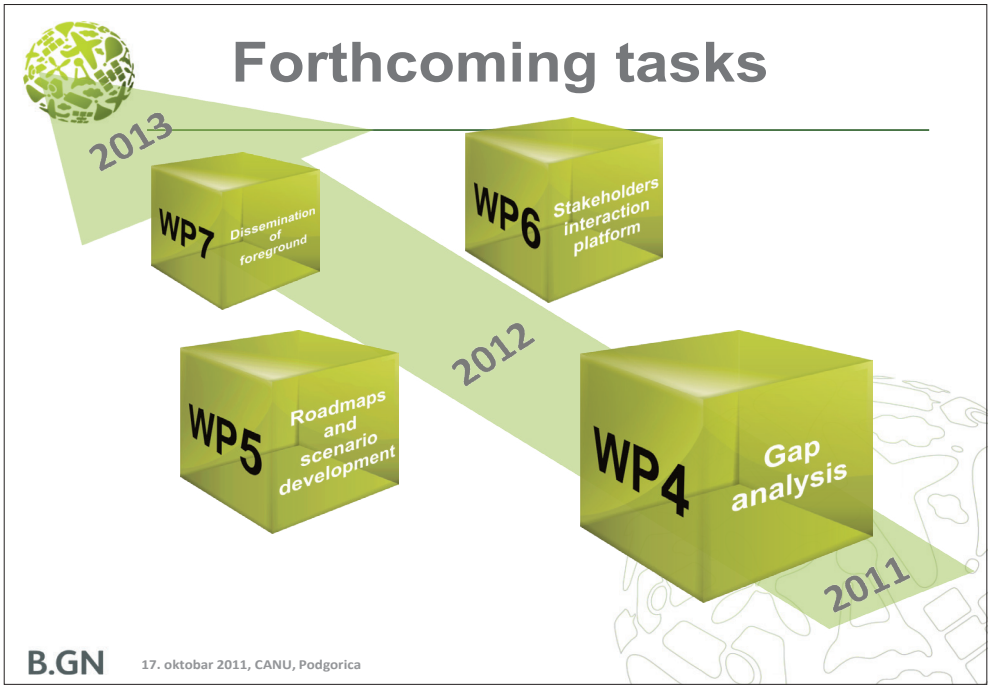
Forthcoming tasks
2013
WP7
Dissemination of foreground
WP6
Stakeholders interaction platform
2012
WP5
Roadmaps and scenario development
WP4
Gap analysis
2011
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Permanent Networking Facility
• Balkan EO Directory with partner and expertise search
• Connecting data providers and users in the region after the lifetime of the project
Split,Croatia

BalkanGEONet

- Only an all-inclusive EO initiative can unlock the full potential of Balkans in EO and result in advances across all GEOSS societal benefit areas
  - Better understanding and more intelligent utilization of the resources
  - Protection of the environment
  - Increased quality of life and faster economic development

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BALKAN
GEO
NET

BALKANS IN GLOBAL EARTH OBSERVATION

CENTER
BioSense

www.biosense.uns.ac.rs

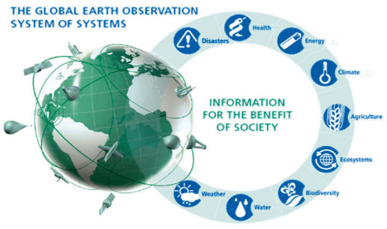
Earth Observation

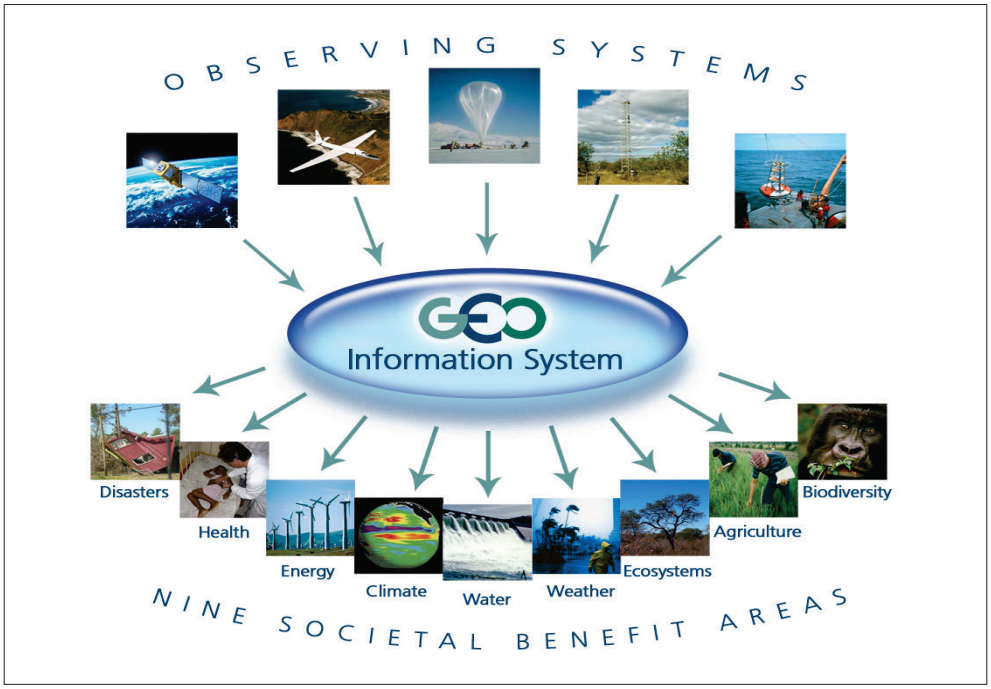
- GEO – Group on Earth Observation
  - Launched by the 2002 World Summit on Sustainable Development and by the G8 leading industrialized countries
  - A voluntary partnership of governments and international organizations with the aim to advance „the understanding of the Earth system—its weather, climate, oceans, atmosphere, water, land, geodynamics, natural resources, ecosystems, and natural and human-induced hazards"
  - Current members: 84 countries worldwide and the European Commission

GEO GROUP ON EARTH OBSERVATIONS

GEOSS

- Earth observation presents a critical input to the better understanding of the Earth system
- GEO is coordinating the efforts to build a Global Earth Observation System of Systems (GEOSS)
- Nine societal benefit areas of GEOSS





GEOSS

- **Observe, Share, Inform**
  - GEO Beijing Declaration adopted at Ministerial summit two weeks ago
  - GEOSS 10-Year Implementation Plan by 2015 is "**to realize a future wherein decisions and actions for the benefit of humankind are informed via coordinated, comprehensive and sustained Earth observations and information**"

The Balkans

- Very diverse terrain:
  - Marine environments (Adriatic, Black, Ionian and Aegean sea)
  - Rich agricultural land (Pannonian plain)
  - Dense wild forests (Slovenia)
  - Deserts (Deliblato sands)
  - High mountains (Alps, Dinarids, Rhodopes mountains)
  - Big rivers (Sava and Danube)
  - Europe's highest precipitation point (Crkvice in BiH)
  - One of the Europe's driest areas (Ovce Polje in FYRoM).
- Global observation of such diverse ecosystems calls for deep understanding and deployment of a wide range of different EO methods and technologies

The Balkans in GEO/GEOSS

- GEO members: Croatia, Greece, Romania, and Slovenia
- Albania, Bosnia and Herzegovina, Bulgaria, FYR Macedonia, Montenegro and Serbia - not yet members of GEO
- Territories and ecosystems of all Balkan countries present an inseparable part of the Earth system
- All-inclusive EO initiative is needed to unlock the full potential of GEO and result in advances across all GEOSS societal benefit areas
  - Better understanding and more intelligent utilization of the resources, protection of the environment, increased quality of life and faster economic development

Balkans in GEO/GEOSS - challenges

- Some Balkan countries are not yet members of GEO
- Existing EO activities in many Balkan countries are not well known and poorly connected to the wider community
- Stakeholders in Balkan countries are not aware of options and possibilities which lie in the coordinated use of EO

Balkans in GEO/GEOSS - challenges

- Recent historical context of the wider Balkan region made a potential cooperation between certain EO-data end-users difficult
  - In particular, this holds for cooperation between certain governmental institutions
  - Fortunately, this does not hold for research institutions from the wider Balkan region which have already proven their ability to carry out joint initiatives

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BalkanGEONet Project

- Many EO players in the Balkans are beginning to recognize benefits of a joint approach to EO
- *Balkan GEO Network – Towards Inclusion of Balkan Countries into Global Earth Observation Initiatives*
  - FP7-ENV-2010 4.1.4 call
- BalkanGEONet Project strives to answer these challenges by directly involving respectful EO players from EVERY country in the wider Balkan region
  - It brings together EO-data providers and EO-data users, research and governmental institutions, SMEs and international organizations, as well as a number of world leading experts in the field of EO

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BalkanGEONet Approach

- Specific characteristics in the Balkans:
  - Different cultural backgrounds and attitudes towards the environment and natural resources
  - Economies of Balkan countries developed to a different degree
  - Specific relations between some countries in the region
- The project heavily relies on Balkan institutions, fully aware of all specific circumstances in the region
  - All countries from wider Balkan area are included
  - The key players in EO activities from the region are identified at the proposal stage and included in the Project with active roles
  - EU partners are included to offer expertise missing in the region

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BalkanGEONet Approach

- Identify and integrate players who use different observation technologies within various societal benefit areas
- Raise awareness of their complementarities
- Pave the way for future networks and collaborations among different disciplines
  - The consortium comprises experts from in-situ, remote sensing, airborne and space-borne monitoring as well as with different analysis and modeling capacities
  - A very important focus of the Project will be identification of EO-data end-users in the region, of their needs and requirements

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BalkanGEONet Consortium

Participant No.	Participant organization name	Country
1 Coord.	BioSense Center - University of Novi Sad	Serbia
2	Jozef Stefan Institute	Slovenia
3	Joanneum Research	Austria
4	IRIDA Labs Ltd	Greece
5	University of Split	Croatia
6	Geonardo Environmental Technologies Ltd	Hungary
7	Environment Agency Austria	Austria
8	International Institute for Applied Systems Analysis	Austria
9	Ghent University	Belgium
10	Romanian Space Agency	Romania
11	Geophysical Institute – Bulgarian Academy of Sciences	Bulgaria
12	Faculty of Agriculture and Food Science, University of Sarajevo	Bosnia and Herzegovina
13	University of Montenegro	Montenegro
14	Polytechnic University of Tirana	Albania
15	Balkan Foundation for Sustainable Development	FYR Macedonia
16	Provincial Secretariat for Agriculture, Water Economy and Forestry	Serbia

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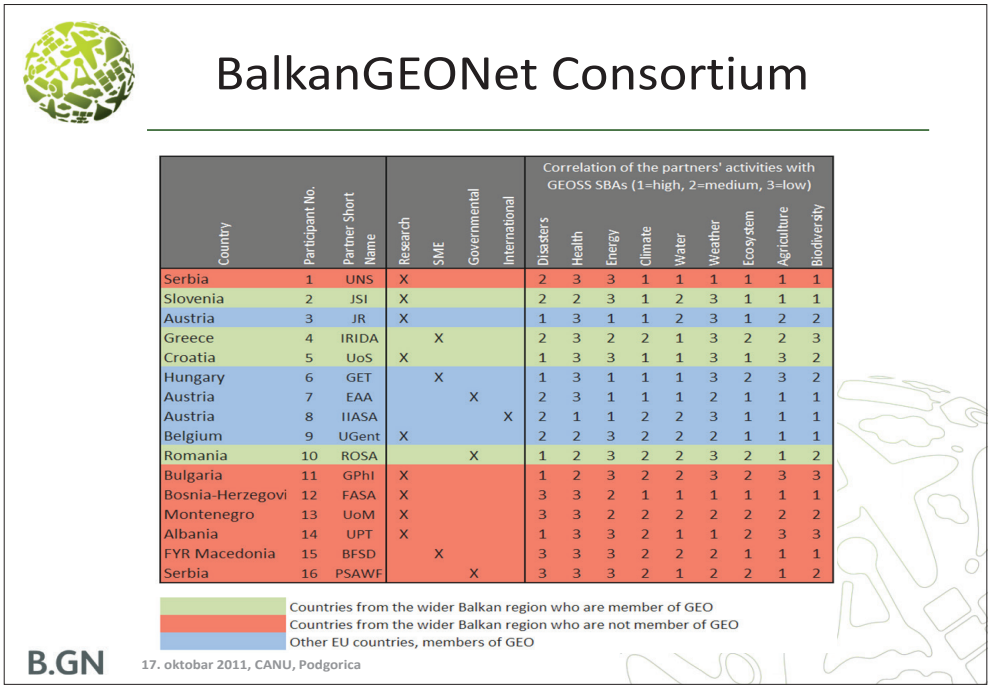

BalkanGEONet Consortium

Country	Participant No.	Partner Short Name	Research	SME	Governmental	International	Disasters	Health	Energy	Climate	Water	Weather	Ecosystem	Agriculture	Biodiversity
			Correlation of the partners' activities with GEOSS SBAs (1=high, 2=medium, 3=low)												
Serbia	1	UNS	X				2	3	3	1	1	1	1	1	1
Slovenia	2	JSI	X				2	2	3	1	2	3	1	1	1
Austria	3	JR	X				1	3	1	1	2	3	1	2	2
Greece	4	IRIDA		X			2	3	2	2	1	3	2	2	3
Croatia	5	UoS	X				1	3	3	1	1	3	1	3	2
Hungary	6	GET		X			1	3	1	1	1	3	2	3	2
Austria	7	EAA			X		2	3	1	1	1	2	1	1	1
Austria	8	IIASA				X	2	1	1	2	2	3	1	1	1
Belgium	9	UGent	X				2	2	3	2	2	2	1	1	1
Romania	10	ROSA			X		1	2	3	2	2	3	2	1	2
Bulgaria	11	GPhI	X				1	2	3	2	2	3	2	3	3
Bosnia-Herzegovi	12	FASA	X				3	3	2	1	1	1	1	1	1
Montenegro	13	UoM	X				3	3	2	2	2	2	2	2	2
Albania	14	UPT	X				1	3	3	2	1	1	2	3	3
FYR Macedonia	15	BFSD		X			3	3	3	2	2	2	1	1	1
Serbia	16	PSAWF			X		3	3	3	2	1	2	2	1	2

Countries from the wider Balkan region who are member of GEO
Countries from the wider Balkan region who are not member of GEO
Other EU countries, members of GEO

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