

NIGGG-BAS SWAN team activities

REPORT 2013



National Institute of
Geophysics, Geodesy and
Geography



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1. Meeting at the NIGGG in May 28, 2013.

The meeting took place at the National Institute of Geophysics, Geodesy and Geography – Bulgarian Academy of Sciences. At the meeting were present Prof. Mariyana Nikolova, Dr. Stoyan Nedkov, Dr. Romyana Vatsseva, PhD students Kremena Boyanova, Tanya Trenkova, Yoanna Milanova, Rositsa Yaneva, Yordan Dimitrov. The meeting had agenda of 3 points:

- 1.1. “Sustainable Water ActioN (SWAN) a four year collaborative project funded by the European Commission” by Stoyan Nedkov.



Stoyan Nedkov – Team Leader

Dr. Nedkov is Senior Researcher in Physical Geography and Landscape Ecology & Head of Section GIS. His research area is landscape ecology and application of GIS in environmental assessment. His current research is focused on assessment and accounting of ecosystem services at landscape level as well as use of GIS and spatial modeling for integrated assessment of the dynamics of hazardous processes in mountain catchments and mapping of flood regulation ecosystem services. His international work includes participation in “Use of Landscape Sciences for Environmental Assessment” and “CEEPUS”. Dr. Nedkov has lectured at Salzburg University (Austria) and University of Joensuu (Finland). He is a member of the International Association of Landscape Ecology and manages the mapping section at the Ecosystem Services Partnership.

The topic to his presentation was “Sustainable Water ActioN (SWAN) a four year collaborative project funded by the European Commission”, aiming to introduce the project to the new team members and PhD students at the Department of Geography. He presented shortly the project partners, the structure and the main goals and objectives. While going through the Work Packages he put special attention on the parts of main occupation for the Bulgarian team. He also presented the deliverables in which the team should participate, as well as the preliminary schedule of occupation of the team members.

- 1.2. “Interdisciplinary Approach for Sustainable Water Action – stay at the UofA for the period January - May 2013” by Kremena Boyanova.



Kremena Boyanova – PhD Student

Since 2011 she has a master degree in Geodetic Engineering with specialization in Cartography from the University of Architecture, Civil Engineering and Geodesy, Sofia, Bulgaria. She became a PhD student at the Department of Geography, National Institute of Geophysics, Geodesy and Geography - Bulgarian Academy of Sciences in the beginning of 2012 with the research topic ‘Quantification, assessment and mapping of ecosystem services in watersheds using GIS’. Her main interests are in the

implementation of different spatial analysis techniques, models and other analysis tools and data sources for the spatial assessment of ecosystem services with special attention on the water-related ones. Her work in SWAN includes ecosystem services analysis and assessment, development of an interdisciplinary approach for sustainable water action and comparative case study analysis.

Kremena presented her stay and work at UofA for the period January - May 2013. The main focus of her presentation “Interdisciplinary Approach for Sustainable Water Action – stay at the UofA for the period January - May 2013” was the introduction of the working process and the results of the weekly SWAN meetings that took place at the UofA with the representatives of the local team, members of the USE team, herself as representative of the Bulgarian team and independent interested sides. The main purpose of the meetings was the development of interdisciplinary approach for sustainable water action through combining the methods and results of the participants in a common case study. Each participant was representing the methodology he uses together with his idea of integration to the others. Kremena presented the conceptual framework of ecosystem service and how it can be applied in the analyses and management of human-environmental systems (*Image 1*). Uncertainty issues were also discussed. As result of the meetings was made a common poster which was presented on the SWAN workshop “Challenges of Integrating Science into Urban(+) Decision Making” that took place in Tucson in April 29 – May 3, 2013. A common paper on the interdisciplinary approach of water management is under development (*Image 2*). On the workshop Kremena also presented another poster, related to her work and case study in Bulgaria – “Quantifying and mapping of ecosystem services in case study Yantra river basin, Bulgaria”.

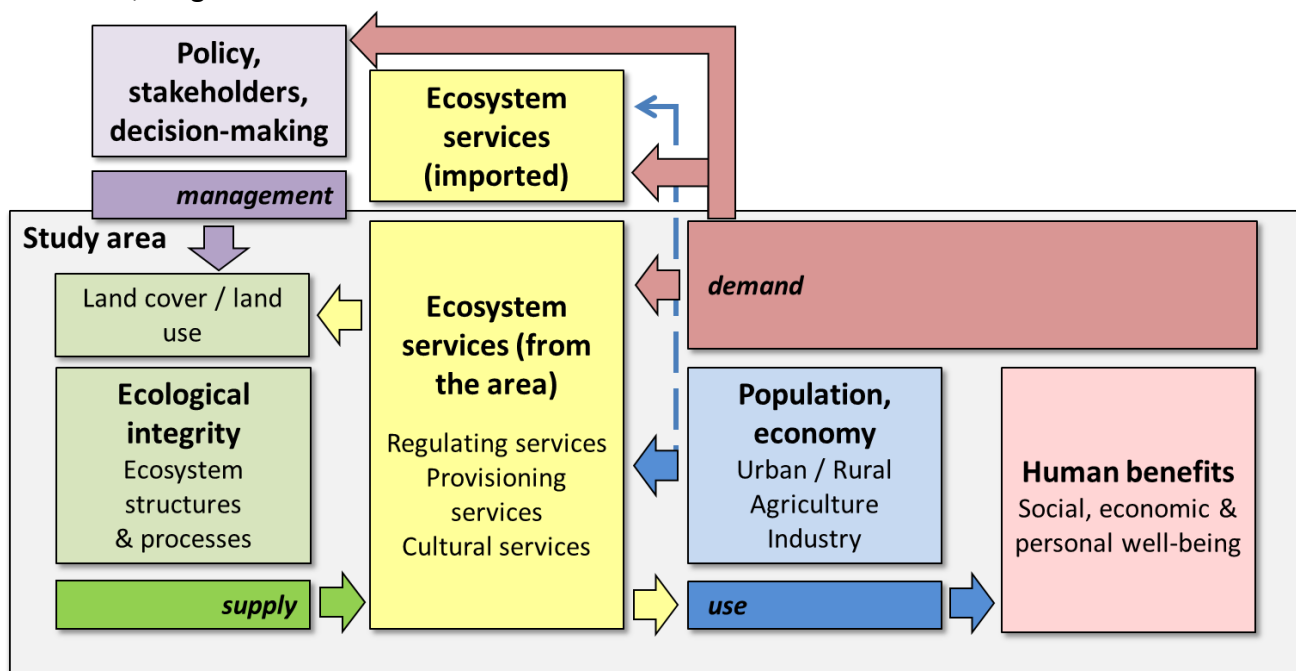


Image 1. Conceptual framework linking ecosystem integrity, ecosystem services and human well-being as supply, use and demand sides in human-environmental systems. Adapted after Burkhard et al., 2012.

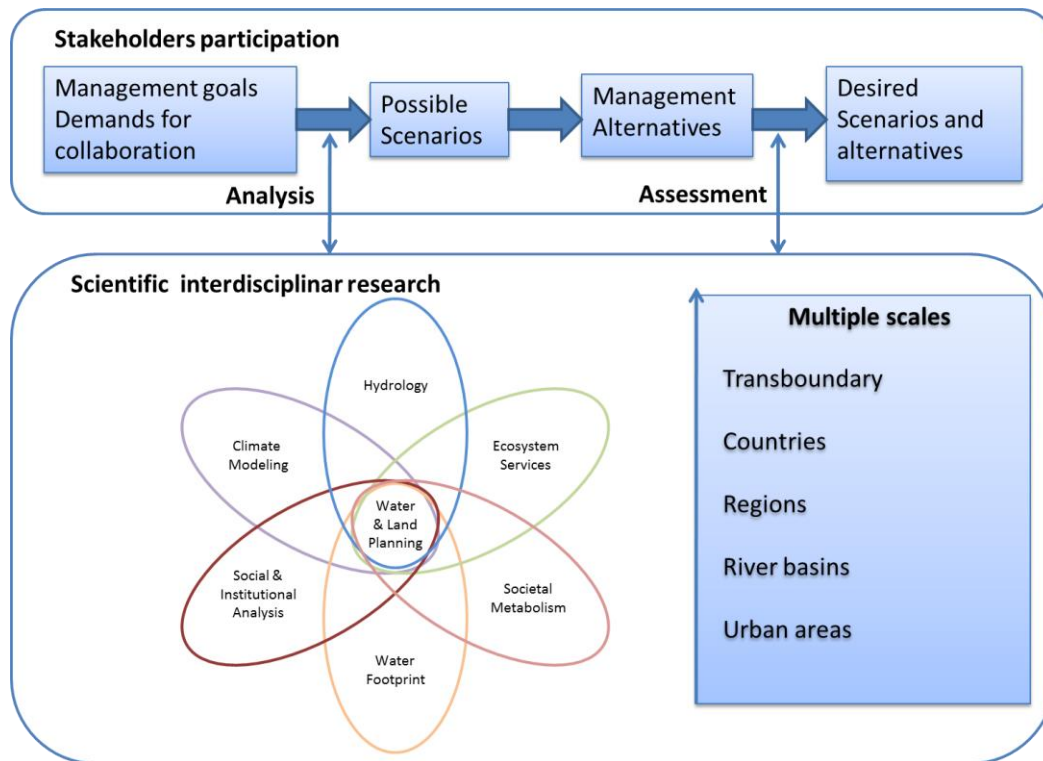


Image 2. An interdisciplinary approach of water management.

During her stay Kremena also participated in “Geographic Applications of Remote Sensing” class of Prof. Stuart Marsh as part of her work and collaboration in SWAN WP4 and the UofA. Additionally she also audited the classes of Prof. Phillip Guertin - “Spatial Analysis and Modeling” and “Beginning German I” with instructor Kristin Lange as part of the collaboration with the UofA.

1.3. Others.

Questions about accommodation, possibilities for participation in classes and work and social conditions in Tucson were also discussed in order the future visiting scholars to get aware of the working and living environment. Kremena gave some basic information about Tucson, AZ and University of Arizona as hosting institution.

2. Meeting at the NIGGG in July 9, 2013.

The meeting was attended by Prof. Mariyana Nikolova, Dr. Stoyan Nedkov, PhD students Kremena Boyanova, Tanya Trenkova, Rositsa Yaneva. The agenda had 2 points:

- 2.1. “Web-based GIS applications forwarding the integrative water management under climate change” by Tanya Trenkova.



Tanya Trenkova – PhD Student

Tanya Trenkova has a master degree in Ecology from the Naval Academy in Varna, Bulgaria. Since May 2013 she is a PhD student in GIS section, Geography Department at the Institute of Geophysics, Geodesy and Geography. The topic of her research is “Web-based GIS applications supporting the integrated water management”. The main fields of her research interests are water management, web-based GIS applications and climate change impact on water demands. In SWAN project she will work on the development of geovisualization tools.

Tanya is the next visiting scholar at the UofA from Bulgaria. She will spend there the fall semester of 2013. She started her PhD in May 2013. Her presentation “Web-based GIS applications forwarding the integrative water management under climate change” introduced her plan for future work and the SWAN project Work packages and Tasks it is related to. Her work includes development of web-based GIS application for visualization of hydro-climatic data in watersheds, as well as analyzing the influence of climate change on the water resources using Regional Climate Models and downscaling. (*Image 3*)

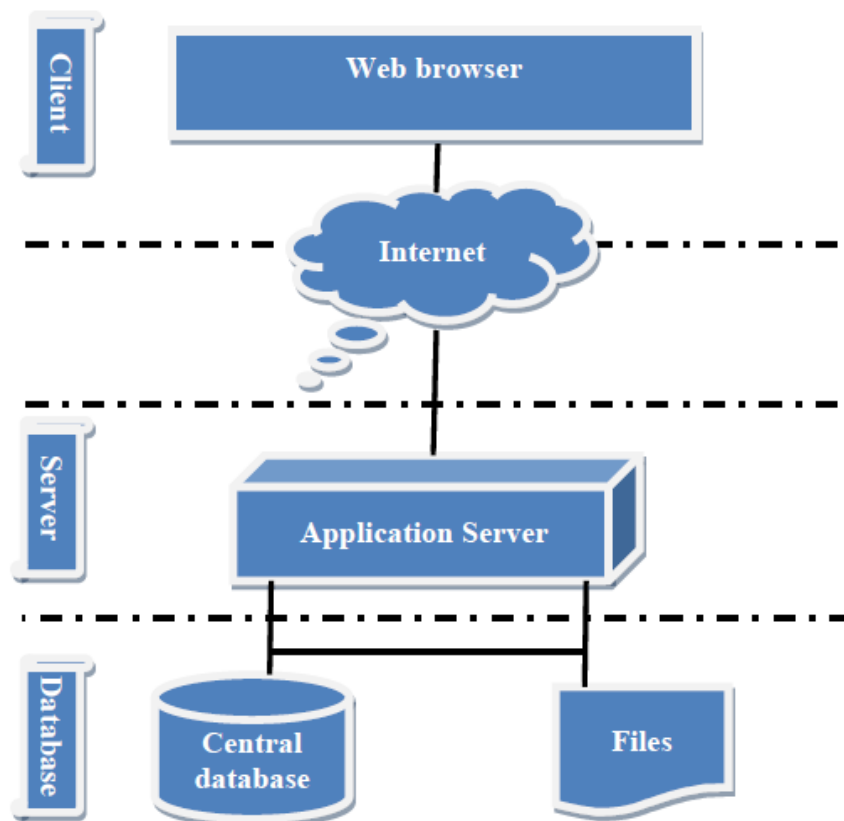


Image 3. Structure of an web-based GIS application (Lan et al. 2009; Hossack et al. 2004).

2.2. Others.

Dr. Stoyan Nedkov presented the SWAN project web site and the accounts of the members for access were tested.

He also presented the preliminary programs for the 3rd and 4th SWAN progress meeting which will be hosted respectively by the UMI in Tucson, AZ in October 2013 and by the USE team in Seville, Spain in June 2013. For the meeting in Tucson this year Tanya Trenkova will be representative of the Bulgarian team, since it will take part during her stay at UofA. The other team members will join the meeting on-line, if possible.

3. Meeting at the NIGGG in August 14, 2013.

The meeting was attended by Prof. Mariyana Nikolova, Dr. Stoyan Nedkov, PhD students Kremena Boyanova, Tanya Trenkova, Yoanna Milanova and Yordan Dimitrov. The agenda had 2 points:

3.1. "Searching correlation between climate and agriculture using remote sensing" by Yoanna Milanova.



Yoanna Milanova – PhD Student

She has a MS in geodesy with a focus on Cartography and GIS (2011) from the University of Architecture, Civil Engineering and Geodesy, Sofia, Bulgaria. Since 2013 she became a PhD student at the National Institute of Geophysics, Geodesy and Geography, Bulgarian Academy of Science. Her research topic is related to the correlations between climate and agriculture using remote sensing. Her interests are in the fields of GIS technology, image processing and spatial analysis tools.

The time period of Yoanna's stay as a visiting scholar at the UofA is not fixed yet. Her presentation "Searching correlation between climate and agriculture using remote sensing" aimed to present the main task of her research - to create better understanding of the interactions between agriculture and climate by improving and refining the spatial and temporal scales of the assessments of expected climatic impacts as well as crop monitoring. For this she will apply integration of several technologies - remote sensing data, GIS tools and analysis and crop modeling (Image 4(a)). She has chosen to analyze the correlation between NDVI, NDWI and climate data to fulfill her task (Image 4(b)).

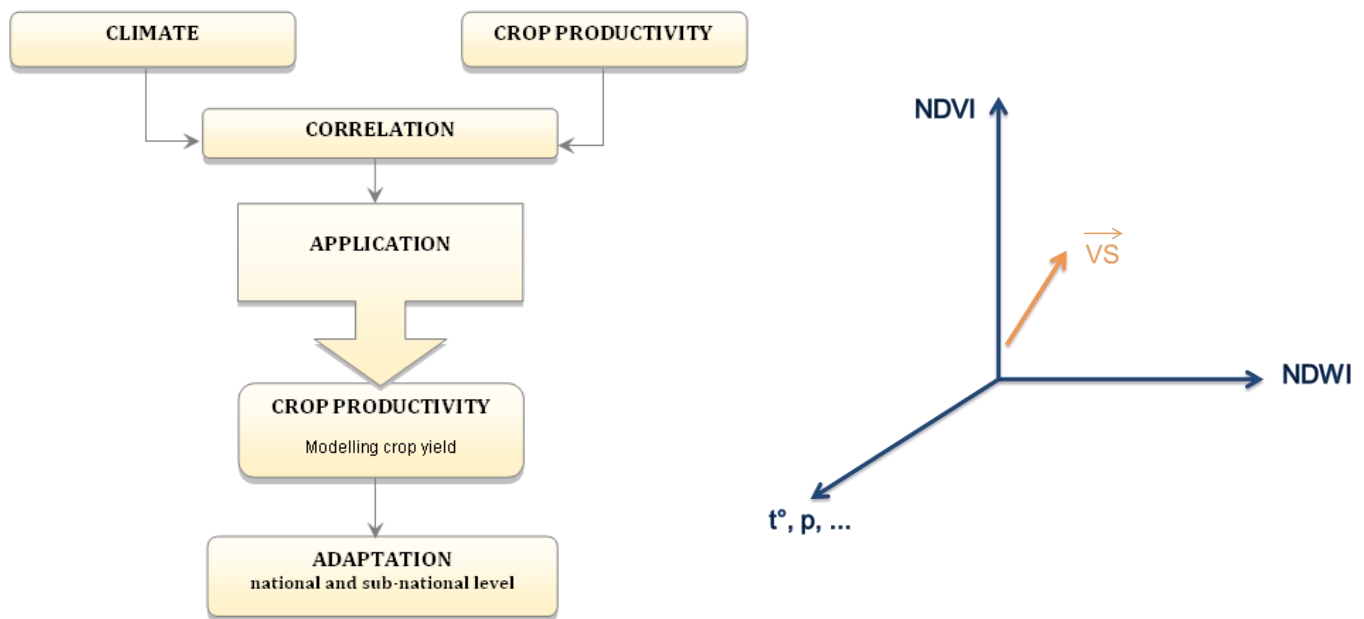


Image 4. (a) Conceptual model

(b) the correlation

3.2. Others.

Different issues for the integration of the research areas of the PhD students in the SWAN project context were discussed. Up to now all the areas show high capacity to enrich and fulfill the project tasks and for creating transatlantic dialogue on water.

4. Meeting at the NIGGG in October 10, 2013.

The meeting was attended by Dr. Stoyan Nedkov, PhD students Kremena Boyanova, Rositsa Yaneva and Yordan Dimitrov. The agenda had 2 points:

- 4.1. "Sustainable management of the catchment area of a dam – adaptation to floods, droughts and decreased water quality" by Yordan Dimitrov



Yordan Dimitrov – PhD student

He has a MS in "Management of hydro-climatic resources" since 2007 from the Sofia University. Since then he is working in the National Institute of Meteorology and Hydrology - Bulgarian Academy of Sciences (NIMH – BAS), as scientific researcher. His work is in the field of riparian zone hydrology, isotope hydrology and drought mitigation. In 2012 he began a PhD in National Institute of Geophysics, Geodesy and Geography, but still works in NIMH – BAS. The topic of his thesis is "Management of river water resources in north-west Bulgaria in conditions of drought".

Yordan was invited like guest speaker on the regular SWAN meetings of the Bulgarian team, since his work is strongly related with the objectives of the project. He presented part of his background research with his presentation “Sustainable management of the catchment area of a dam – adaptation to floods, droughts and decreased water quality”. He is interested in the application of sustainable water management and supplementing the natural synergy in the system. In this sense not only engineering constructions should be considered as possible input in the system. Building barrages and shoots built by rocks covered with wire mesh can significantly decrease the water flows. This can be combined with the introduction of appropriate vegetation species in the different areas of the catchment in order to increase the infiltration coefficient and water quality. High wave can be deflected by digging channels around the river bed and different kinds of storm water detention ponds. Erosion can be decreased by building wattles on the shores which would also prop up the vegetation (Image 5). These approaches are applicable for sustainable water management in urban and semiurban areas.

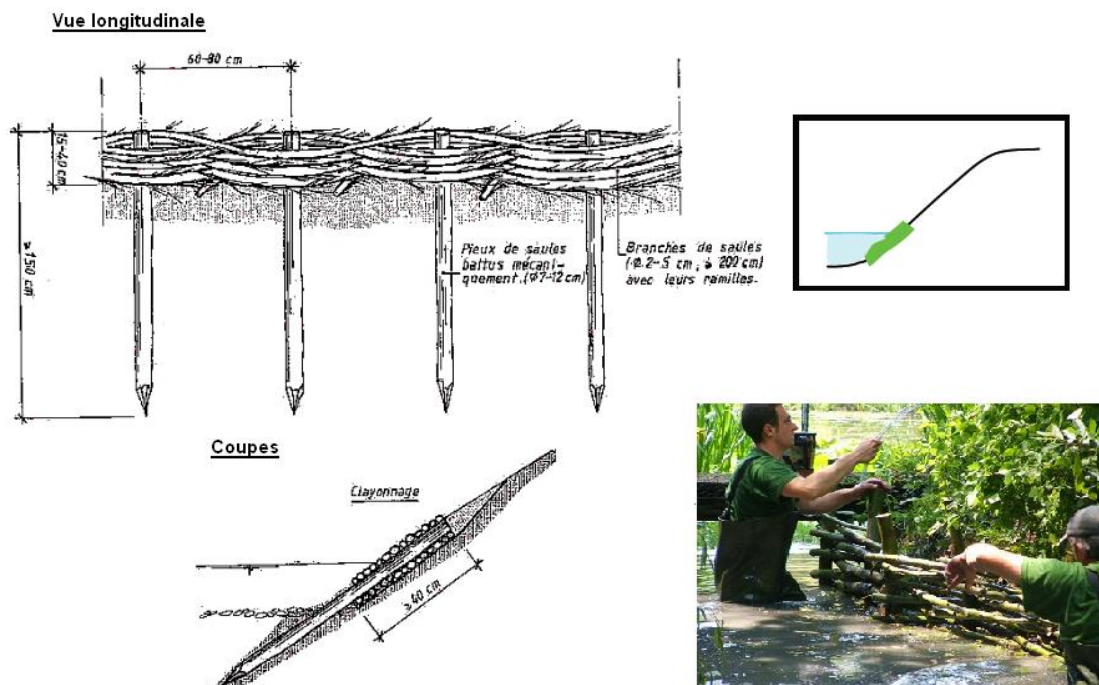


Image 5. Shore wattles.

4.2. Others.

It was discussed that Yordan’s work can be integrated in the SWAN project, considering the presentation of Santiago Urrestarazu from the UNESCO-IHE team - “Sustainable drainage systems as ecosystem services. Case study: urban catchment in the city of Montevideo, Uruguay” at the SWAN workshop “Challenges of Integrating Science into Urban(+) Decision Making” that took place in Tucson in April 29 – May 3, 2013. The overlapping fields and scales of interest indicate that collaboration with the UNESCO-IHE team can be appropriate.

5. Meeting at the NIGGG in December, 2013.

The meeting was attended by Prof. Mariyana Nikolova, Dr. Stoyan Nedkov, Dr. Georgi Zhelezov, Ph.D students Kremena Boyanova, Rositsa Yaneva and Yordan Dimitrov. The agenda had 2 points:

5.1. “Ecosystem and landscape services of Danube valley between rivers Timok and Iskar” by Rositsa Yaneva.



Rositsa Yaneva – PhD Student

Rositsa Yaneva is a Master engineer in Geodesy, University of Architecture, Civil engineering and Geodesy in Sofia. During her master studies in the same university she specialized in Applied Surveying, based on spatial planning and landscape design. In the period February-June 2010 she was Erasmus exchange student in Universiteit Gent (Belgium) where followed GIS and Landscape sciences courses.

Currently Rositsa is a PhD student at the National Institute of Geophysics, Geodesy and Geography, Bulgarian Academy of Sciences in the field of Physical geography and Landscape studies. Her PhD research work is “Landscape and ecosystem services in the Danube Plain between rivers Timok an Iskur”. Rositsa’s main interests are focused over landscape ecology, ecosystem services, spatial planning and spatial analysis.

Her work in SWAN will be implemented in the ecosystem analysis and assessment in relation to the water resources and land management.

Rositsa will spend the period from beginning of February to end of April 2014 in Tucson for research and work on the SWAN project at the University of Arizona. With her presentation “Ecosystem and landscape services of Danube valley between rivers Timok and Iskar” she introduced to the team the topic of her research. Through differentiation and classification of the landscape elements she will assess the potential of the area and the optimal sustainable use of certain resources. The variety of landscape elements is premise for the potential supply of big range of ecosystems services (Image 6). Those services will be assessed through monetary approaches.



Image 6. Analysis scheme for the assessment of the landscape’s potential supply of ecosystem services.

5.2. Others.

The discussion continued with comments on the integration of Rositsa's methodology within the SWAN project. It was concluded that the monetary valuation of ecosystem services may be very useful for the project objectives, since the academic and practical experience shows high applicability of the approach. It supplements decision making by providing unified unit for environmental and social values.

6. "Payment for Ecosystem Service" workshop in Bristol, September 13, 2013, hosted by the UWE team.

A workshop with title "Payment for Ecosystem Services" was hosted in September 2013 by the UWE SWAN team. On the workshop were present:

- 3 guest speakers:
 - **Chris Short** - *Countryside and Community Research Institute (CCRI) Senior Research Fellow* – presenting "Upper Thames 'Payments For Ecosystem Services' PES Pilot Project"
 - **Mark Everard** – *UWE Associate Professor of Ecosystem Services*
 - **Benjamin Burkhard** - *Institute for Natural Resource Conservation, University of Kiel* – presenting "Spatial Modeling of Ecosystem Service Supply and Demand"
- 2 participants from the UWE SWAN team:
 - **Chad Staddon** - *UWE Associate Professor of Resource Geographies*
 - **Lorraine De Souza** – *UWE Research Associate, Sustainable Water Management*
- 2 participants from the NIGGG-BAS team:
 - **Stoyan Nedkov** – *National Institute of Geophysics, Geodesy and Geography Associate Professor* – presenting "Ecosystem services studies in Bulgaria and the relation to SWAN project"
 - **Kremena Boyanova** – *National Institute of Geophysics, Geodesy and Geography PhD student* – presenting "Interdisciplinary Approach for Assessment and Mapping of Water-related Ecosystem Services"

The workshop concluded in a vivid discussion on the different "measures" of ecosystem services and their applicability. The exchange of methodology increased the awareness on the topics and revealed research possibilities.

7. Activities plan for 2014.

The planned stays for PhD students in Tucson are as follows:

- February – April 2014 – Rositsa Yaneva;
- September – November 2014 – Kremena Boyanova.

The team will continue its regular meetings for discussions of the work on the project. The weekly meetings in Tucson will be attended through Skype by the interested and available team members, as it was up to now.

The participants in the 4th SWAN Progress meeting that will be hosted by the University of Seville in June 2014, are still not fixed, but it is considered that since the meeting is in Europe, the chance for more team members to participate in it should be used.

Kremena Boyanova will take part in the 5th Progress Meeting in November 2014 in Tucson, since it coincides with her research stay there. The other participants in the meeting will be decided in future.