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REPORT ON THE INTERNATIONAL MEETING *PAYMENT FOR ECOSYSTEM SERVICES - FOREST FOR WATER* (COST ACTION 15206 PESFOR-W), ALBENA, BULGARIA

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Abstract. The paper reports on the meeting of the Payment for Ecosystem Services Cost Action/18.10.2016-17.10.2020 (CA 15206 PESFOR-Water), which took place from 25th to 27th September, 2018 in the Congress Center of the Flamingo Grand Hotel, Albena, Bulgaria. The meeting was related to the European scientific program COST (European Co-operation in Science & Technology). COST Action PESFOR-W includes representatives of 39 countries.

A meeting related to the European scientific program COST (European Co-operation in Science & Technology) and in particular to the Payment for Ecosystem Services Cost Action/18.10.2016-17.10.2020 (CA 15206 PESFOR-Water) took place from 25th to 27th September, 2018 in the Congress Center of the Flamingo Grand Hotel, Albena, Bulgaria **(Figs. 1-4)**.

COST Action PESFOR-W includes representatives of 39 countries, out of which the following 32 are COST countries: Austria, Belgium, Bosnia and Her-

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Figs. 1-4: Meeting of the Cost Action/18.10.2016-17.10.2020 (CA 15206 PESFOR-Water) in the Congress Center of the Flamingo Grand Hotel, Albena, Bulgaria.

zegovina, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Finland, France, FYROM, Germany, Greece, Hungary, Ireland, Italy, Latvia, Luxembourg, Montenegro, the Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom. Representatives of institutions from Ukraine, Jordan, Morocco, Tunisia, China, Japan, New Zealand, as well as of international organizations, including the European Forest Institute and the United Nations Economic Commission for Europe/FAO, also participate in the Action. The Chair of the Action is Dr Gregory Valatin (United Kingdom), and the Vice Chair is Prof. Gebhard Shueler (Germany) (http://www.cost.eu/COST_Actions/ca/CA15206)

The scientific activities in Action CA15206 are divided into four working groups: 1) Design and Governance (leaders Prof. Paola Gatto and Dr Alessandro Leonardi); 2) Environmental Effectiveness (leaders Dr Tom Nisbet and Dr Yiying Cao); 3) Cost-Effectiveness (leaders Dr Alexander Shikalanov and Paola Ovando), and 4) Communication, Dissemination & Marketing (leaders Prof. Dr Lars Högbom and Dr Rik De Vreese; http://www.forestresearch.gov.uk/research/pesforw).

The main objective of this international scientific cooperation is to synthesize knowledge and promote research in order to improve Europe's capacity to use Payments for Ecosystem Services (PES) to achieve the Water Frame Directive (WFD) objectives and other policy goals through initiatives for planting forests to reduce diffuse pollution from agriculture. Gathering and synthesizing information on existing developing woodlands for water PES schemes will help the design of a user manual to aid the development of future schemes. Look-up tables on the effectiveness of planting trees at reducing agricultural diffuse pollution to watercourses are under development, and a common approach to calculating the cost-effectiveness of woodlands for water PES schemes is also currently under discussion.

The meeting in Albena reported on the Action progress. A focus of the field visit organised as part of the meeting was on the forest belts created in the agricultural areas to reduce nitrate, phosphate, pesticide and sediment pollution as the main pollutants causing water eutrophication, as well as for demonstration of the irrigation role of the forest belts on the adjacent territories and agricultural lands. Further studies on the effects of planting different tree species, as well as on the effects of species mix, woodland structure, age, area, management, etc. are needed to identify the most efficient and cost-effective ways to increase surface water quality. Demonstrations on exploring the potential of trees in helping to preserve the water quality of regionally important wetlands for biodiversity protection was a further focus of the visit.

The hosts of the meeting were Prof. Dr MARIANA LYUBENOVA from the Faculty of Biology, Sofia University and Assoc. Prof. ALEXANDER SHIKALANOV from the Faculty of Information Sciences, University of Library Studies and Information Technologies, who are members of the Management Committee of the Action.

The meeting was held with the assistance of: Director of the Basin Directorate *Black Sea Region* Eng. D. KONSULOVA, Director of the Regional Inspectorate of Environment and Water - Varna Eng. H. GENOVA, Executive Forestry Agency in the person of Assoc. Prof. D. PANDEVA (Director of Science and International Activities Directorate), Director of the Northeastern State Enterprise Eng. V. NINOV, Director of the Forest Protection Station, Varna Eng. M. KIRILOVA, Director of the Forestry Institute (BAS) Assoc. Prof. M. ZHIANSKI, Director of State Hunting Farm, Balchik Eng. K. TODOROVA and Eng. R. RADEV, Director of State Forestry Farm, General Toshevo Eng. Y. STOYANOVA and Eng. Dr. J. PETROV, Institute for Economic Research (BAS) Dr Y. KIRILOVA and Dr D. VELKOVA, WWF in Bulgaria V. KAVRAKOVA (Director) and G. STEFANOV, National Archaeological Institute with Museum (BAS) with Dr. I. WEISSOV as Head of Archeological Studies of the Eneolithic Settlement Mound - The Big Island (Durankulak Lake Protected Area), Director of the Vitosha Nature Park Directorate Landsc. arch. S. PETROVA and Senior Specialist and Coordinator Visitor Center and Museum A. STANEVA, Director of the Green Educational Center at Shabla Municipality Dr. D. TODOROVA, and experts from Shabla Municipality - Chief Expert Ecology G. CAMBEROVA and Senior Expert Cultural

Figs. 5-10: Presentation of Meeting Reports: **1** - *Control and management of surface water Assessment indicators. Management and Payment Schemes* (K. Kusheva & S. Ivanova); **6** - *The Costs Directive and the Floods Directive - the Bulgarian example* (Y. Kirilova & D. Velkova); **7, 8** - *Forest and water resources in Bulgaria. Estimation of Ecosystem Services from Forests* (D. Pandeva); **9** - *Soil related ecosystem services provided by natural, urban and suburban forest ecosystems - assessment and mapping* (M. Zhianski); **10** - *Cost-efficiency assessment of forest ecosystem services for water protection and research in Bulgaria* (A. Shikalanov & M. Lyubenova).

and historical heritage I. Hristakiev.

The representatives of Bulgarian institutions introduced their achievements related to the management of water resources, development of payment schemes, management of forest resources in Bulgaria, mapping and assessment of forest ecosystem services, and legislative developments (*e.g.* the Article in the Forests Act concerning the forest ecosystem services and an Ordinance providing for their valuation). These included the following reports: *Control and management of surface water Assessment indicators. Management and Payment Schemes* (K. Kusheva & S. Ivanova) – **Fig. 5**; *The Costs Directive and the Floods Directive - the Bulgarian example* (Y. Kirilova & D. Velkova) – **Fig. 6**; *Forest and water resources in Bulgaria. Estimation of Ecosystem Services from Forests* (D. Pandeva) – **Figs. 7, 8** and *Soil related ecosystem services provided by natural, urban and suburban forest ecosystems - assessment and mapping* (M. Zhianski) – **Fig. 9**.

The first results from the Bulgarian project *Development of an ecosystem services assessment scheme, their effectiveness for purification and protection of water and other natural components in the regions* (Contract DCOST 1/30/20.12.2017 of the National Scientific Fund, Ministry of Education and Sciences as addition to the COST Action Payment for Ecosystem services (Forest for Water)/ CA 15206 PESFOR; http://www.e-ecology.org were presented under the title *Cost-efficiency assessment of forest ecosystem services for water protection and research in Bulgaria* (A. Shikalanov & M. Lyubenova) – **Fig. 10**. This project includes some of the implementations of the first dendrometers in natural forests, which will scan 24-hour radial growth of *Quercus frainetto* Ten. and *Quercus cerris* L. to help monitor the state of oak forests and the sustainability of ecosystem service provision, and develop more robust growth forecasts (**Figs. 11, 12**). Long-term observations will help create a useful database to underpin future participation in international projects.

Achievements related to the development of PES schemes as part of different projects carried out by WWF, Bulgaria (http://www.wwf.bg) were presented by G. Stefanov (*Development of PES schemes for wetlands and forests for water*).

Professor Margaret Shannon of Baldy SUNY Buffalo Law School gave an insightful presentation on *Critical transformational deliberative science: A critical element for PESFOR - W*.

The Bulgarian experience of the construction, maintenance and management of field forest protection belts in the Bulgarian part of Dobrudzha was reported. The large-scale network of belts is considered a unique phenomenon in forest/agricultural practice as reported in the following presentations: *The system of protection forest belts in Dobrudzha. Meaning, status, perspectives and management issues. Possible ways of financing the activities* (R. Radev) – **Fig. 13** and *Coastal forest belts in Dobrudzha. Design, construction, schemes for creation, growth, condition and efficiency* (Y. Petrov) – **Fig. 14**. Some background on the development of forest protection belts in Bulgaria is provided below.

Figs. 11-16: **11, 12** - The implementations of dendrometers in natural forests for scaning of 24-hour radial growth of *Quercus frainetto* Ten. and *Quercus cerris* L.; **Meeting Reports: 13** - *The system of protection forest belts in Dobrudzha. Meaning, status, perspectives and management issues. Possible ways of financing the activities* (R. Radev); **14** - *Coastal forest belts in Dobrudzha. Design, construction, schemes for creation, growth, condition and efficiency* (Y. Petrov); **15, 16** - visit of the system of forest belts in Balchik municipality.

The first field protective forest belts (shelter belts) in Bulgaria were created in 1925. Their wider application in agroforestry dates back to the beginning of the 1950s. According to the Northeastern State Enterprise - Shumen, a system of forest belts covering area of 14 631 ha exists within the territory of Dobrich Region, 8 110 ha of which are state protective belts (with a length of about 1000 km in total) and 6 522 ha are non-state protective belts (with a length of over 4000 km). The area of existing forest belts today is only half of the planned area and 2/3 of the area that existed in the 1960s, and only 53% of the belts are currently in good condition, with 22% satisfactory and 25% in poor condition (PETROV ET AL. 2002). In addition to water quality benefits, the system of forest shelterbelts provides a set of ecosystem services, including wildlife habitats and biodiversity, soil protection from the strong winds, microclimate improvements, protection of water supplies in the soil, and humidity of the air. In drought conditions, relative humidity in protected areas is 5-7% higher, absolute humidity is 12-15% higher, and soil temperature at 20 cm depth in protected areas is 2-3 to 7-8% lower. Improving the conditions for growth of agricultural crops has been found to increase crop yields. For example, at an altitude of 8 to 17 m, the average increase in yields for the period 1956-1995 was as follows: 9.8%, 15.5%, 10.6% and 8% respectively for wheat, maize, sunflower and common beans (*e.g.* IVANOV ET AL. 1995; TONEV ET AL. 1996, 2002; TONEV & ILIEV 2005).

The participants in the meeting visited the system of forest belts in Balchik municipality. Eng. R. RADEV and Eng. Dr J. PETROV showed belts formed from different main species with different structures and in different phases of development and management. They highlighted existing problems with the financing, creation, exploitation and management of the belts and answered a number of questions of great interest to the participants, as many of them had not seen such an agro-forestry system previously (**Figs. 15, 16**). The forest belt system in Dobrudzha can be considered a national asset, because of its uniqueness and the complex of benefits (services) it offers. In order to preserve, maintain and develop the network of forest belts, it is useful to consider how PES schemes can provide funding for their sustainable management, as well as for the reconstruction and creation of new belts. The experience of creating forest belts in Bulgaria is worthy of wider consideration as creating forest belts may potentially play an important role in other European countries, where similar to those in Bulgaria financing issues may arise.

Furthermore, the participants in the meeting visited the Green Educational Center at Shabla Municipality (http://www.shabla-greencenter.info), where Dr. D. TODOROVA presented the purpose and activities of the Center for the environmental education in relation to the sustainable development of local wetlands, as well as potential to develop PES schemes; the project activities of the center and the opportunities for cooperation – **Figs. 17, 18**.

The biodiversity of wetlands in the Shabla Municipality and the ecosystem services that the wetlands provide were presented by G. CAMBEROVA (*Ecosystem*

Figs. 17-22: **17, 18** - Visit of the Green Educational Center at Shabla Minicipality; **19, 20** - visit of the protected area of the lake Durankulak; **21, 22** - visit of the *Baltata* Managed Reserve, located in close proximity to the *Albena* resort, which hosts the northernmost longoz forests at the lower part of Batova river.

Services of Wetlands in Shabla Municipality).

The meeting participants visited also the protected area of the lake Durankulak **(Fig. 19, 20)**, which is one of the most significant coastal wetlands in Bulgaria, registered under the Ramsar Convention (Michev & Stoyneva 2007) and included in

the Natura 2000 network. During the field trip, the meeting participants also visited the Big Island in Durankulak Lake and the Museum Collection in the Green Educational Center. Mr. I. ILLIEV talked about the rich cultural and historical heritage of Dobrudzha, which is an attractive center for cultural and archaeological tourism.

In addition, the participants in the meeting visited the *Baltata* managed reserve, located in close proximity to the *Albena* resort, which hosts the northernmost longoz forests at the lower part of Batova river (**Figs. 21, 22**). These forests are unique communities in the vegetation of Bulgaria with significant biodiversity and species of importance for conservation (ANONYMOUS 2004; MICHEV & STOYNEVA 2007).

The reserve *Baltata* contributes significantly to the unique conditions that *Albena* offers to its guests - a combination of preserved nature and a modern tourist resort providing various forms of recreation and ecotourism (**Figs. 20, 21**). The reserve provides a natural example of the role of forests in surface water purification. The river Batova flows through five villages and resorts: Dolishte (Ahtopol municipality), Batovo (Municipality of Dobrich), Tsurkva, Obrochishte, Kranevo, Balchik and Albena (Balchik region). During the summer the large part of the area is a massively used recreational destination, while its other part is occupied by agricultural lands. Two roads of the national road network pass through the river valley: between Obrochishte and Kranevo - a section of 5.1 km of road I-9 (Durankulak - Varna - Burgas - Malko Turnovo), and, between the villages of Batovo and Obrochishte, a section of 9.5 km from the road II-71 (Silistra - Dobrich - Obrochishte). Although very high pollution of the surface water flowing into the river Batova could be expected, the national monitoring data indicate that it is characterized by medium to low water pollution, with very pure water flowing into the Black Sea. The regulating and supporting ecosystem services that the longoz forests provide are of great importance to maintain the good ecological status of the surface waters in the Batova basin and the coastal seawater.

As it could be seen from the report above, the field trip elaborated on the Bulgarian experience in creation of forest protecting belts as providers of important ecosystem services, and on the good practices in nature conservation with focus on the significant role of the wetlands and their ecosystem services. Together with the successful theoretical sessions, they contributed to the meeting work in developing ideas for further proceeding of the COST Action.

CONFLICT OF INTERESTS

The authors declare that there is no conflict of interests regarding the publication of this article.

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