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## DELIVERABLE No.4.1.2

# MONITORING OF WATER RUNOFF, WATER SUPPLY AND MOISTURE IN THE SURFACE SOIL LAYER IN THE ENTIRE TERRITORIAL SCOPE OF THE REGIONAL FOREST DIRECTORATE - KARDZHALI

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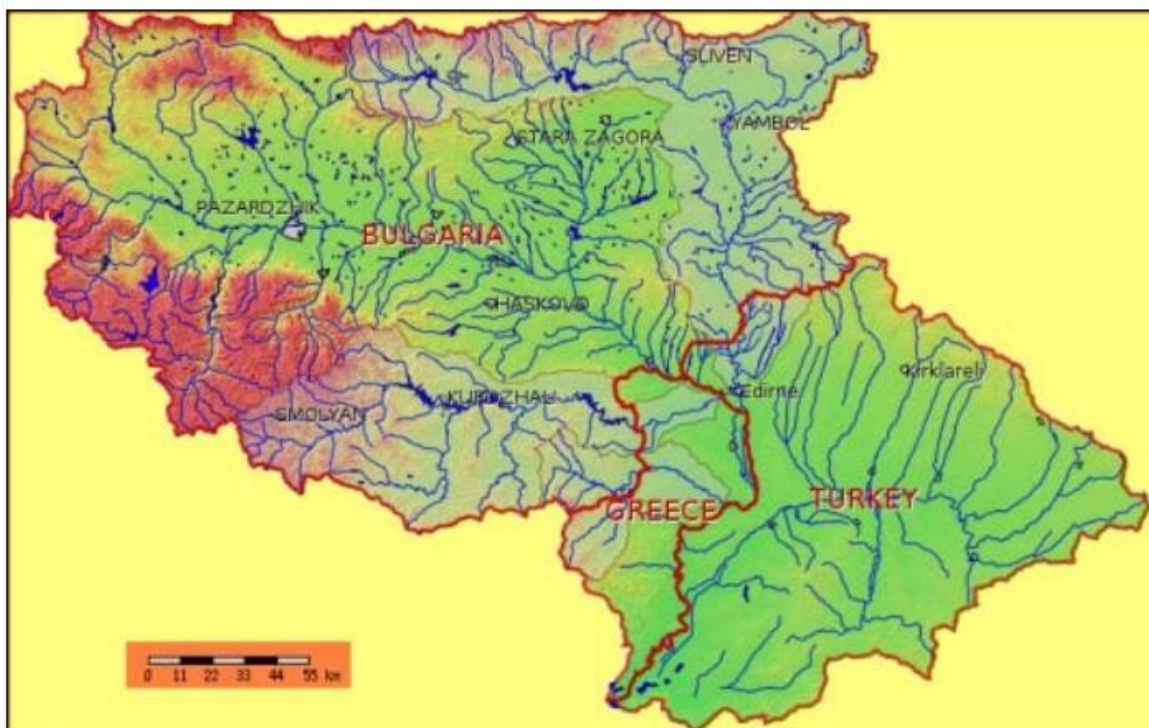
## MONITORING OF WATER RUNOFF, WATER SUPPLY AND MOISTURE IN THE SURFACE SOIL LAYER IN THE ENTIRE TERRITORIAL SCOPE OF THE REGIONAL FOREST DIRECTORATE - KARDZHALI

Within the activity 4.1.2 on Work package 4 – “Monitoring and analysis of abiotic factors' effects”, eight experts of the Lead Beneficiary had to monitor the water runoff, water supply and moisture in the surface soil layer overall territory of the Directorate.

Eight experts for 12 months were designated to complete the task, focused on the 10 Enterprises responsible for the management of the forests and the rivers passing through their territories.

The observed rivers were: Plazishte river, Varbitsa river and its tributaries, Perperек river and its tributaries, Byala river and its tributaries, Olu dere river and its tributaries, Ardinska river and its tributaries, Biserska river and its tributaries, Krumovitsa river and its tributaries, Manastirska river and its tributaries, Levka river and its tributaries. The total length of the observed rivers is over 501 km, and the catchment river area fall under the monitoring is over 3575 km<sup>2</sup>. In the monitoring were excluded the biggest rivers in the area of RFD Kardzhali – Maritsa, Arda and Tundzha as their runoff and water supply is above the average for all other smaller rivers.

**Карта № 1 Карта на международния район за басейново управление**



**Figure 1**

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Figure 2

In the region, there are two categories of surface waters which have been identified - "river" and "lake". The category "river" includes river water bodies and dams formed by blocking a river, which forms an independent water body above the dam. The category "lake" includes natural lakes and dams (reservoirs), which are artificially created outside the existing river basin (artificial water bodies - AWB) or are located at the beginning of the rivers and above them is not a separate river water body.

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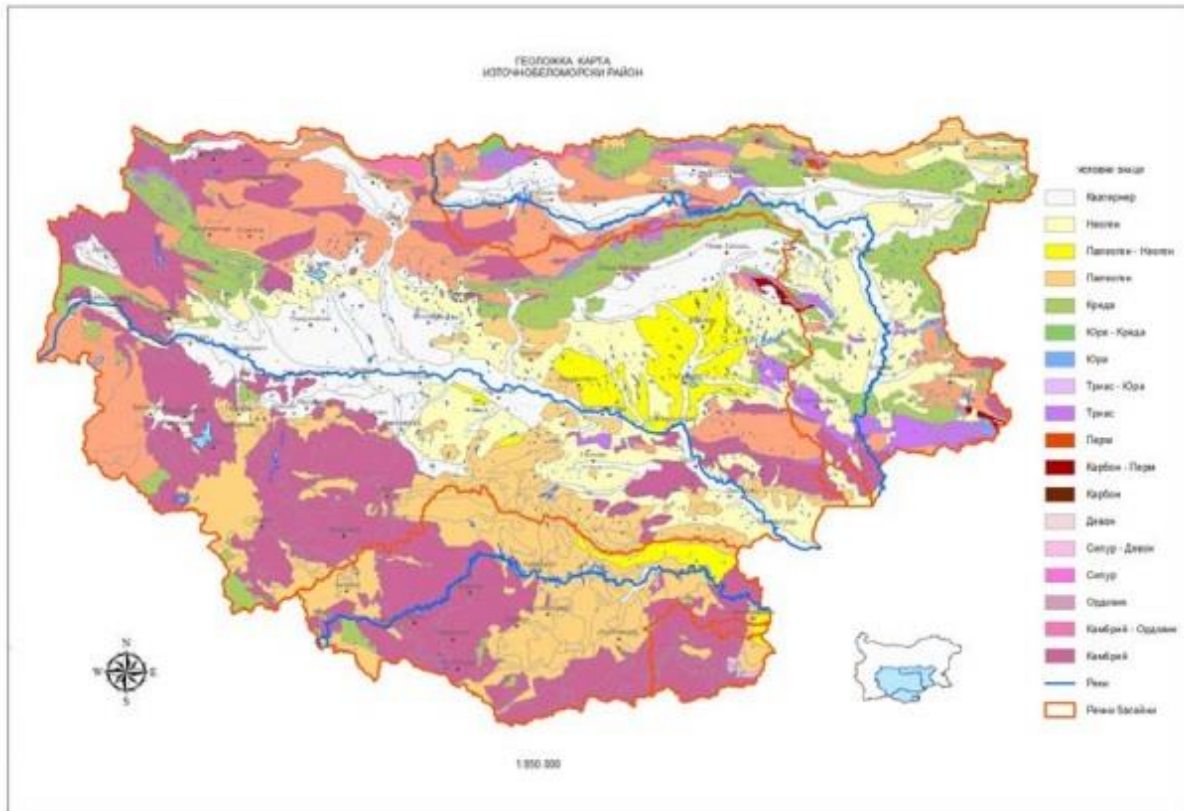
**Figure 3**

The presented Summary of the monitoring of the water runoff, water supply and moisture in the surface soil layer is out of the scope of the regular monitoring of surface waters in the Eastern-Aegean River Basin Directorate.

The geological composition of the riverbeds and the route of each river is very important, as there are many bentonite and perlite deposits in the area, which absorb a large part of the moisture and water. This is a fact which indirectly is affecting the water quantity and especially the moisture in the upper soil layer.

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**Карта № 2 Геоложки строеж – ИБР**



**Figure 4**

Conclusion of the monitoring: as a result of the surveys and observations made, the levels of all rivers and their tributaries falling within the scope of the survey are highly volatile and volatile. This new is extremely dependent on the frequency and amount of rainfall. In almost all rivers there is a minimum runoff and even drying in a few months - especially in Summer and early Autumn.



**Figure 5**



**Figure 6**

Prolonged drought due to high summer temperatures leads to a decrease in moisture in the surface soil layer. All these facts in combination together lead to a weakening of the physiological status of the stand. That

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is why there is an increase in attacks by fungal pathogens and insect pests in the first autumn months, when the trees are much more vulnerable and with weakened self-defense reactions due to prolonged drought.



**Figure 7**



**Figure 8**

When monitoring the sanitary condition of the forests, it was established that in the spring until the end of May they are in good health. But at the end of August and September there is an increase in attacks by bark beetles and fungal pathogens on conifers, after a long period of drought.

All reports of the experts on activity 4.1.2. shown that it is imperative to take measures to reduce timber losses. During the Summer months, when the soil dries out and the moisture is insufficient, there is a physiological weakening of the trees. This physiological weakening of the trees leads to a deterioration of their health, making them more vulnerable to all pests.



**Figure 9**



**Figure 10**

It is recommendable to carrying out sanitary logging due to drying, and the free- open areas should be afforested only according to the regulation.

Due to the fact that the situation with surface waters will worsen - periods without precipitation are longer, and summer temperatures rise, which leads to constant warming and climate change, it is necessary to recommend measures and the use of other silvicultural methods.

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**Figure 11**



**Figure 12**

The conclusion for afforestation is to recommend all samplings used to be natural tree species, more drought-resistant for every specific area.

This material has been made by the fruitful work of dipl. eng. Katya Karpacheva, dipl. eng. Marusya Pashova, dipl. eng. Svetlan Staykov, dipl. eng. Yusein Efendiev, dipl. eng. Antoaneta Stoyanova, Ms. Dzhanan Yusein, Mr. Georgi Markov and Mr. Petar Kartalov – all are staff of the Regional Forest Directorate Kardzhali.

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