

**Draft Report:**

**ASSESSMENT OF ENVIRONMENTAL FLOW OF THE  
CRNOJEVIĆ RIVER**

Water Working Group

PHASE I: REPORT ON TESTING METHODOLOGIES FOR THE PURPOSE  
OF DRAFTING THE RULEBOOK ON ENVIRONMENTAL FLOW

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## **PROJECT: Dinarich Arch Sustainable Hydropower Initiative (DASHI)**

### PHASE I

Water Working Group

#### **ASSESSMENT OF ENVIRONMENTAL FLOW FOR THE CRNOJEVIĆA RIVER:**

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## 1. Introduction and Project Goals

This report represents one of the components of the project Dinaric Arch Sustainable Hydropower Initiative (DASHI), funded by MAVA foundation and implemented by the WWF Mediterranean Programme and NGO Green Home.

It was prepared for the purpose of establishing the methodology for determining environmental flow in Montenegro. After analysing different comparative methods which were tested on two pilot water bodies (the Cijevna river and the Crnojević river), experts in the areas of hydrology, biology and chemistry selected the most suitable method. This method, which is known as the MM method, should be transposed to the Rulebook on Environmental Flow (the current Rulebook on the manner of determining guaranteed minimum flow downstream of the intake structure) and further harmonised with the laws regulating waters.

Main project goals:

- 1) At least four investors for hydropower facilities active in priority areas officially implement standards laid down by the Framework Water Directive (WFD);
- 2) Key water management structures in Bosnia and Herzegovina (BH), Montenegro, Croatia and Albania developed understanding of the impacts of hydropower facilities and potential solutions and implementation of sustainable principles of hydrology;
- 3) At least two international or national financial institutions, actively engaged in dams building in the priority areas, comply with the obligations of sustainable operations.

In the initial planning phase, the NGO Green Home organised an interview on 07 March 2012 with representatives from the water management and environmental protection departments to assess the possibility of implementation of the environmental flow (EF) in the legislation and to evaluate institutional capacities for its implementation. Training was organised for representatives from these groups on 19-20 June 2012 in Podgorica, with the support of the EU Delegation in Podgorica, with the aim of conveying knowledge and experience related to the understanding of the environmental flow (EF), feasibility of implementation of the EF in Montenegro based on regional experience and further planning of steps to be taken. Participants in both events expressed clear view that it was necessary to determine the EF for Montenegro, as well as the methodology for its calculation which will be used in planning and operations of hydropower facilities and other types of facilities on rivers.

On the basis of recommendations from the workshop and the training, the working group was formed in September 2012 comprising experts from Montenegro whose activities were coordinated by international experts from Slovenia and Bosnia and Herzegovina. The working group included experts in the areas of hydrology, hydrogeology, biology and chemistry. Six local experts were trained by the leading experts to work together on the testing, including data collection, in the field and during analysis of samples. The first meetings were held on September 2012 and the first sampling was carried out in the Cijevna river in early October.

By using the existing hydrological data and samples collected in the field, the EF was assessed on the basis of five different methodologies of which one, the MM methodology, was developed by the working group itself and presented separately in the report. Phase I was completed with preparation of the report on environmental flow in the Cijevna river and the Crnojević river. Phase II, which is to be carried out in 2013, will include preparation of the Proposal for the Rulebook on environmental flow which is to be based on the methodology which was analysed and largely accepted during phase I in consultation and cooperation with a group of stakeholders.

## 2. Methods for the EF Assessment

Taking into account fundamental idea of the environmental flow, which is to preserve river ecosystem, the EF on the Cijevna river and the Crnojević river was determined on the basis of the following four methods:

1. GEP method,
2. Matthey method,
3. Slovene method,
4. MNQ method.

Holistic approach represents functional analysis which considers a broad area of environmental and hydrological aspects of river systems and oftentimes includes convening of the panel of experts. All steps in the EF assessment should be explained in detail and substantiated by arguments in the experts' report. In the EF assessment process, it is necessary to select the most vulnerable and most sensitive biological/ecological elements on which the intake structure has major impact. The EF should be determined in a way which enables structures and functions of the river and coastal ecosystem to be preserved, which also includes the most vulnerable elements of rivers and coastal ecosystems, while pursuing goals set to be achieved. The sampling should be carried out during the periods of the lowest flows when impact of the intake structure on the ecosystem is the biggest.

In order to achieve goals set for the river and coastal ecosystem, the basic components of the EF regime should include the following flows:

- flows maintaining riverbeds, which maintain form and size, shape and structure of the river;
- flows maintaining habitats, which maintain habitats and eliminate silt and organic sediments;
- flows preserving water and coastal ecosystems, and maintaining connection between the habitats;
- minimum acceptable flows that enable maximum habitats for selected target species of flora and fauna;
- flows enabling seasonal river flooding;
- flows that will not deteriorate good chemical and environmental status or good environmental potential of the river.

In adoption of the environmental flow regime in a specific year (average dry, dry, long dry periods), one should take into account hydrological conditions in the basin and any other conditions relevant for management.

### 3. Description of the Area

#### 3.1. Geography

The Crnojević river springs from the Crnojević cave which is located on the south-west from the Lake Skadar, in the vicinity of the Crnojević river settlement. Its lower flow was given a new name and nowadays the subject water flow is mainly known as the Obodska river (rarely is it known as the Crnojević river).

Figure 3.3.1: Catchment area of the Crnojević river

