Introduction

Dragash is the southernmost municipality in Kosovo, covering an area of 435.8 km², sharing borders with the neighbouring countries of North Macedonia to the east and south, and Albania to the west. The Dragash municipality comprises 36 settlements with the small town of Dragash as the municipal centre. Dragash is rich in freshwater resources, with numerous water springs from the lowest altitudes to the highest areas above 2500 m, and on average 1130 mm/m² rainfall per year. The average density for the municipality is 2.1 km of water courses per km² of surface area, with 0.4 km of large permanent water courses and 1.7 km of smaller often temporary ones. Approximately 76% (700 km) of water courses in the Dragash municipality are located in the mountainous Gorë region, where river valleys and postglacial lakes contribute to the high number of waterways. About 24% of Dragash waterways are located in Opojë (215 km). Large water courses in Dragash are approximately 170 km in length. The two main lakes are Lake Shutman and Lake Brezna (Bank et al., 2014; Hajredini et al., 2013).

Basic structural information, together with the results of rapid water quality assessment, are aiming to give the initial overview regarding the quality and quantity of surface water resources in the Dragash Municipality, where sewage and domestic waters are discharged directly into freshwater ecosystems and where the waste management system is dysfunctional in many parts of this municipality.

The Impact of Inhabited Areas on the Quality of Streams and Rivers of a High Alpine Municipality in Southern Kosovo

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ABSTRACT

During the spring of 2011, forty-five macrozoobenthos samples were taken from streams and rivers all over the Dragash Municipality in order to assess the impact of inhabited areas in these freshwater ecosystems, considering the fact that there is no sewage treatment and waste management is dysfunctional in many parts of this Municipality. On the basis of the habitat structure evaluation, basic physical and chemical analysis and Family Biotic Index according to Hilsenhoff and EPT Index (Ephemeroptera Plecoptera Trichoptera), this study shows that the freshwater ecosystems in the Dragash Municipality are heavily polluted and impacted by human activities in their midstream and downstream segments. The main sources that deteriorate their natural ecological conditions in these segments are: load of all kinds of waste directly into the rivers and streams, industrial discharge into the freshwater ecosystems and the direct sewage discharge into the rivers and streams all over the municipality. This study also shows that the freshwater ecosystems of the area in their upper reaches are home to very interesting and rare composition of aquatic fauna. Several species and many potential ones which live only in this area and nowhere in Kosovo or abroad, or their distribution elsewhere is very limited, have been found.

Keywords: benthic macroinvertebrates, water quality, high alpine municipality, Kosovo

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The goal of this study was to assess the ecological conditions of running waters in the Dragash Municipality inside the area designated to be National Park and close to it. The main objective of the study was to assess the impact human settlements and existing factories have in freshwater ecosystems in the Dragash Municipality. In this regard, two categories of sampling sites were chosen: 1) those above human settlements, i.e. villages (i.e. pollution sources) and 2) those below human settlements, within or close to pollution sources.

MATERIAL AND METHODS

Data sampling and processing

During the period of 20.05.2011-30.06.2011 forty-five macrozoobenthos samples were taken in streams and rivers all over the Dragash Municipality. At the same time, the physical and chemical habitat assessment analyses were conducted at the same investigation places. All collected samples and data were analyzed in laboratory; they were statistically processed and together with the calculated parameters form the basis of the findings of this investigation. The macrozoobenthos specimens were collected by means of the Surber net with the dimensions of 30×20 cm (600 cm²) diameter. The collected material was fixed in 4% formaldehyde. In the laboratory, the material was sorted out and the specimens were identified and preserved in 75 ethanol (Cummins, 1962).

A rapid water quality assessment is used when identifying macro-invertebrate taxa to family level and calculating Family Biotic Index according to Hilsenhoff (Hilsenhoff, 1988) and EPT (Ephemeroptera, Plecoptera, Trichoptera) percentage through standard procedures. In addition to this, basic physical and chemical habitat assessment parameters were measured and recorded in every investigated site, such as: water temperature, air temperature, stream width, stream depth, discharge, stability of the stream banks, the gradient of the stream, the amount that the stream is shaded by riparian vegetation, the composition of bottom substrata, the complexity of microhabitats, the amount of dissolved oxygen, pH, BOD. The physical habitat parameters were assessed according to Barbour and Stribling (1991).

Study area

D1 – Zaplluxhe is located above the village on the right branch of the Zaplluxhe stream. D2 – Zaplluxhe is located on the second branch of the Zaplluxhe stream about 400 m above the last house. D3 – Zaplluxhe is located on the second stream of the village, just above the last house. D4 – Zaplluxhe is located below the village at the point where two afore mentioned streams join together and after the sewage of the village is discharged directly on the stream. D5 – Blać is located inside the village in the river coming from Zaplluxhe. D6 – Bresane is located in a stream passing through the Bresane village, few meters above the last house. D7 – Bresane down, is located below the last houses of the Bresane village. D8 – Bellobradë is located inside the Bellobradë village, next to the Bresane village. D9 – Bellobradë is located beyond the Bellobradë village, close to the bridge. D10 – Kuk is located in a stream above the village of Kuk. D11 – Buzez is located below the village of Buzez in a stream coming from Kuk village. D12 – Brezne is located in a streamlet, few hundred meters before it flows into the lake. D13 – Pllajnik is located in a river above the village of Pllajnik. D14 – Kosavë is located below the village of Kosavë in a river coming from the Pllajnik village. D15 – Plavë is located in a streamlet above the village of Plavë. D16 – Plavë meat factory is located below the Plavë village after the Meka meat factory. D17 – Rrenc up is located above the Rrenc village, few hundred meters close to the source of the Rrenc stream, nearby the village school. D18 – Brod is located in the Brod River several kilometres beyond the Arxhena Hotel towards the Shutman Lake. D21 – Brod up is located above the Brod village nearby Arxhena Hotel. D22 – Brod II is located above the Brod village on the second river of the village. D23 – Brod down is located below the Brod village and after the two rivers join together after flowing through the village. D24 – Dikance is located in the Brod River past the Dikanca Hydro Power Plant. D25 – Mlika up is located above the village on Mlika stream. D26 – Mlika down is located in the Mlika stream, beyond the village. D27 – Brod River in Mlika is located in
Brod River after the Mlika stream flows into it. D28 – Rapče up is located in Rapče stream above the village. D29 – Rapče down is located in the Rapče stream below the village. D30 – Radesha up is located in Radesha River above the village. D31 – Radesha down is located below the Radesha village. D32 – Dragash is located in the river coming from the Radesha village. D33 – Restelica up is located in the Restelica River above the village. D34 – Restelica down is located in the Restelica River below the village. D35 – Krushevë up is located in the Restelica River above the Krushevë village about 5 kilometers after the previous site. D36 – Krushevë down is located in the Restelica River below the Krushevë village. D37 – Gilloboçica up is located in the Restelica River above the Gilloboçica village which is next to Krushevë. D38 – Zlipotok up is located in the Zlipotok River above the village. D39 – Zlipotok down is located in the Zlipotok River below the village. D40 – Zlipotok middle is located in another stream passing on through the Zlipotok village. D41 – Orçusha up is located in a stream above the Orçusha village. D42 – Orçusha middle is located inside the Orçusha village. D43 Krstec is located in a stream above the Krstec village. D44 – Wool Factory up is located above the Wool Factory. D45 – Wool Factory down is located just below the wool factory, few hundred meters below the previous site.

RESULTS

During this investigation, a total of 5637 macrozoobenthos specimens were found, belonging to 47 families classified in the following macrozoobenthos classes, subclasses and orders: Turbellaria, Gastropoda, Bivalvia, Hirudinea, Oligocheta, Isopoda, Amphipoda, Coleoptera, Megaloptera, Diptera, Trichoptera, Odonata, Plecoptera and Ephemeroptera. The highest number of specimens found during this investigation, belongs to three insect orders: Ephemeroptera, Plecoptera and Trichoptera. The specimens from these insect orders are found in highest percentage, especially in the stations located above settlements and inhabited areas. The lowest EPT percentage is found in the following stations: D19 (9%), D8 (12%) and D5 (14%) while the highest percentage is found in D21 (99%) and D22 (98%). The species of insect order Ephemeroptera are absent from station D19, the species of order Trichoptera are absent from stations: D4, D7 and D8, and species of order Plecoptera are absent from the following localities: D5, D6, D7, D8, D13, D16, D20, D21, D22, D24, D25, D26 and D38 (Table 1). According to the Hilsenhoff Family Biotik Index (Hilsenhoff, 1988) excellent water quality was found in 15 sites, very good water quality in 9 sites, good water quality in 5 sites, fair water quality in 1 site, fairly poor water quality in 1 site, poor water quality in 7 sites and very poor water quality in 7 sites (Table 1).

Many of the investigated stations, especially those inside, around or below human settlements are characterized by a considerable load of garbage of all kinds: animal remains, animal dung, fruits, vegetables, all kinds of food, plastic bags, plastic pots, metallic pots, empty bottles, metallic remains of household equipment, bricks, remains from construction demolition and all other things which are usually deposited from a typical household in the area. Usually, all this waste is thrown directly into the stream or river, sometimes in stream and river banks creating a huge pile of waste. In several cases, the waste is deposited in streams and rivers above the villages as well (for example in D3, D13, and D30). Although in some villages the waste disposalcontainers were visible inside the village (for example in Bresane village), the waste was still seen inside and around the rivers and streams only few meters away while these containers were empty. These are the stations where the waste loads were seen during the field visits inside the rivers or on river banks: D3, D4, D5, D7, D8, D9, D11, D13, D14, D16, D23, D26, D27, D29, D30, D36, D37, D41, D44 and D45.

DISCUSSION

In general, basic assessed physical habitat parameters in the stations upstream from villages are within natural conditions. The river/stream bed and banks are not altered, neither upstream nor downstream, with the only exception of few cases (Blaç, Buzez and Bresane down) where the river banks are altered in terms of wall barriers of houses which are located in the vicinity. All sites with excellent score of water quality are located above human settlements and are out of anthropogenic impact. However, three of the investigated sites, although located above villages (D17, D30 and D28), are scored with very good water quality
category even though these stations would be expected to have excellent water quality. The reason for this could be the temporary circumstances in these stations as a result of emergence period for some pollutant intolerant taxa. A large number of adults (mostly Plecoptera), who are noted for being intolerant to organic pollution, was noticed around these stations. In cases of emergence period (when larvae from water are transformed in flying adults) the FBI may give slightly inadequate overview of

| Code | Sampling site | FBI  | Water quality | % EPT |
|------|---------------|------|---------------|-------|
| D1   | Zaplluxhë     | 2.97 | Excellent     | 87    |
| D2   | Zaplluxhë     | 2.83 | Excellent     | 85    |
| D3   | Zappluxë      | 1.88 | Excellent     | 98    |
| D4   | Zaplluxhë     | 7.29 | Very poor     | 29    |
| D5   | Blać          | 8.59 | Very poor     | 14    |
| D6   | Bresanë up    | 3.48 | Excellent     | 80    |
| D7   | Bresanë down  | 7.56 | Very poor     | 24    |
| D8   | Bellobrad     | 7.86 | Very poor     | 12    |
| D9   | Bellobradë    | 8    | Very poor     | 20    |
| D10  | Kuk           | 3.66 | Excellent     | 71    |
| D11  | Buzez         | 6.77 | Poor          | 49    |
| D12  | Brezne        | 6.69 | Poor          | 16    |
| D13  | Pllajnik      | 3.6  | Excellent     | 45    |
| D14  | Kosavë        | 7.11 | Poor          | 44    |
| D15  | Plavë up      | 1.65 | Excellent     | 91    |
| D16  | Plavë (Meka factory) | 6.98 | Poor | 27 |
| D17  | Rrenc Up      | 3.85 | Very good     | 86    |
| D18  | Rrence        | 4.09 | Very good     | 41    |
| D19  | Rrencë (River Plava) | 7.79 | Very poor | 9 |
| D20  | Brod Camp     | 3.39 | Excellent     | 94    |
| D21  | Brod Up       | 2.87 | Excellent     | 99    |
| D22  | Brod II       | 3.35 | Excellent     | 98    |
| D23  | Brod Down     | 3.77 | Very good     | 88    |
| D24  | Dikanca       | 4.59 | Good          | 81    |
| D25  | Milka up      | 3.52 | Excellent     | 87    |
| D26  | Milka Down    | 3.91 | Very good     | 25    |
| D27  | Milka (River Brod) | 3.96 | Very good | 96 |
| D28  | Rappë up      | 3.83 | Very good     | 87    |
| D29  | Rappë down    | 4.95 | Good          | 26    |
| D30  | Radesha Up    | 3.8  | Very good     | 91    |
| D31  | Radesha       | 6.93 | Poor          | 34    |
| D32  | Dragash       | 5.86 | Fairly poor   | 56    |
| D33  | Restelica Up  | 2.47 | Excellent     | 86    |
| D34  | Restelica Down| 6.63 | Poor          | 48    |
| D35  | Krushevë Up   | 4.77 | Good          | 82    |
| D36  | Krushevë Down | 4.76 | Good          | 85    |
| D37  | Gлибоফica Up  | 4.06 | Very good     | 83    |
| D38  | Zli Potok Up  | 3.53 | Excellent     | 89    |
| D39  | Zli Potok Down| 3.54 | Excellent     | 88    |
| D40  | Zli Potokë Middle | 4.27 | Good | 68 |
| D41  | Orqushë Up    | 3.99 | Very good     | 54    |
| D42  | Orçushë Middle| 5.31 | Fair          | 38    |
| D43  | Krstlec       | 3.04 | Excellent     | 95    |
| D44  | Wool factory Up | 7.45 | Very poor    | 37 |
| D45  | Wool factory  | 6.58 | Poor          | 54    |
existing water quality (Table 2). This is the reason why FBI must be calculated accordingly during all four seasons in order to have an average result and a real view of the existing situation. The stations inside, around or below human settlements are scored in most of the cases with very poor water quality according to FBI and only in some cases with poor category of water quality.
The oxygen concentration values are in line with the Family Biotic Index according to the Hilshenhoff values. The highest values of oxygen are found in the stations located upstream from villages while low values are registered inside or below the villages where the organic load is high. The pH values are within the allowed limits in the investigated stations with the exception of the station D45 close to a wool factory, where the lowest pH value of 5.2 was registered, which makes the habitat there unsuitable for normal life of living organisms. High values of pH close to 8 or more are registered in several stations belonging to Restelica River and Brod River but this seems to be natural condition in these rivers, since high values of pH are registered from the very upstream stations, where there is no significant human activity.

There are three factories operating in the Dragash Municipality: Meka Meat Factory, Milk Factory and Wool Factory. The processed water from these industries is directly discharged into the streams and rivers either through the sewage system of the area where they are located (Meka Factory and Milk Factory) or directly into the river (Wool Factory). In first two cases, it was impossible to assess the direct impact from these factories in the water quality of streams and rivers around, since their industrial water is mixed with the sewage waters from the area, while in the case of the wool factory, the impact is direct and catastrophic for river biota where their processed is discharged, and thus for water quality. During the end of May field visit, there was no sign of industrial water discharge from the wool factory into the river although two pipes, about 30 meters apart from each other, coming directly from the Factory were seen and registered. During the mid-July field visit at the same place, the authors sampled and analyzed the site in the moment when the process of industrial water discharge into the river was taking place. It was obvious that the industrial water is released into the river without any prior treatment. The water was violet in colour with pH 5.2 and there was no sign of living organisms in vicinity of the place where the water is discharged. The pH of water from the river was measured during that time in several places downstream from the factory and it was significantly lower than upstream from the factory. It is a well-known fact that this low value of pH makes it impossible for all macro-organisms in the rivers to thrive (pH) (Table 3).

The importance of freshwater (river and streams) ecosystem conservation and protection is highlighted in a number of Global and European Union conventions and resolutions and is a precondition to be met for Kosovo either in a process of EU preassociation or from the legal perspective for the areas aiming to have protected zones. Rivers and streams are the basic structure of natural water circulation and their conservation and good maintenance provides not only sustainable resources for drinkable water, but also gives an excellent perspective for tourism and good economic perspective. The research into relevant international agreements, such as the UN Convention, the SADC Protocol, Agenda 21, the Convention of Biological Diversity and the Ramsar Convention, shows that the need for integrated water resource management strategies that ensure protection of ecosystems has gained wide recognition in international Water Law and Policy.

CONCLUSIONS

This study showed that the freshwater ecosystems in the Dragash Municipality are heavily polluted and impacted by human activities in their midstream and downstream segments. The main sources that deteriorate their natural ecological conditions in these segments are: discharge of all kinds of waste directly into the rivers and streams, industrial discharge into the freshwater ecosystems and the direct sewage discharge into the rivers and streams all over the municipality. This study also shows that freshwater ecosystems of the area in their upper reaches are home to very interesting and rare composition of aquatic fauna. Several species and many other potential ones which live either only in this area and nowhere in Kosovo or abroad, or their distribution elsewhere is very limited, were found. In this regard, conservation of biodiversity is an effective tool for prosperous economic and touristic development of an area especially in the case of Dragash Municipality where the sustainable future economic profile of the municipality will be heavily based on its nature and ecosystem values. This study is in line with other recent similar investigations reflecting the increased anthropogenic impact on freshwater ecosystems in Kosovo during the last decades (Dauti et al., 2007; Gashi 1993, 2006; Ibrahimi, 2007; Ibrahimi et al., 2007; Musliu et al., 2018; Shukriu 1979; Zhushi-Etemi 2005).
Table 3. Physico-chemical parameters

| Code | Sampling site       | Air temperature °C | Water temperature °C | pH  | O₂ mg/l | BOD mg/l |
|------|---------------------|--------------------|----------------------|-----|---------|----------|
| D1   | Zaplluxhë           | 21                 | 14                   | 7.3 | 11.4    | 4.1      |
| D2   | Zaplluxhë           | 21.5               | 13.5                 | 7.72| 10.2    | 4.4      |
| D3   | Zaplluxhë           | 21                 | 13                   | 7.62| 11      | 4        |
| D4   | Zaplluxhë           | 21                 | 15                   | 7.3 | 6.4     | 8.1      |
| D5   | Blaç                | 22                 | 14                   | 7.36| 5.1     | 8.9      |
| D6   | Bresanë up          | 22                 | 9                    | 7.42| 12.3    | 4.9      |
| D7   | Bresanë down        | 21                 | 11                   | 7.5 | 6.3     | 3.7      |
| D8   | Bellobrad           | 22                 | 12                   | 7.4 | 7.8     | 11.9     |
| D9   | Bellobradë          | 22                 | 10.5                 | 7.4 | 5.1     | 9.1      |
| D10  | Kuk                 | 21.5               | 10.5                 | 6.8 | 10.6    | 4.7      |
| D11  | Buzez               | 20                 | 11                   | 6.8 | 9.4     | 10.6     |
| D12  | Brezne              | 23                 | 14                   | 6.48| 11      | 7.5      |
| D13  | Pilajnik            | 19.5               | 8.5                  | 7.05| 12.5    | 3.3      |
| D14  | Kosavë              | 19                 | 9                    | 7.35| 6.5     | 6.2      |
| D15  | Plavë up            | 22                 | 15                   | 7.1 | 13.1    | 3.4      |
| D16  | Plavë (Meka factory)| 22                 | 15                   | 7.3 | 7.5     | 11.1     |
| D17  | Rrenc Up            | 22                 | 11                   | 7.67| 12.1    | 4.9      |
| D18  | Rrence              | 21.5               | 10.5                 | 7.3 | 10.3    | 5.1      |
| D19  | Rrencë (River Plava)| 21                 | 12                   | 7.5 | 6.3     | 10       |
| D20  | Brod Camp           | –                  | –                    | –   | –       | –        |
| D21  | Brod Up             | 18                 | 8.5                  | 7.86| 14.5    | 3.4      |
| D22  | Brod Midle          | 18                 | 9                    | 7.95| 13.3    | 4.1      |
| D23  | Brod Down           | 21                 | 10                   | 8.05| 10.9    | 8.3      |
| D24  | Dikanca             | 21                 | 10.5                 | 7.75| 10.3    | 8.9      |
| D25  | Milka               | 19                 | 12                   | 7.5 | 12.4    | 5        |
| D26  | Milka Down          | 19                 | 11                   | 7.58| 10.8    | 5.3      |
| D27  | Milka (River Brod)  | 19.5               | 10.5                 | 7.6 | 10.2    | 7.1      |
| D28  | Rappë up            | 19                 | 10                   | 7.5 | 10.9    | 4.1      |
| D29  | Rappë               | 19                 | 11                   | 7.6 | 8.5     | 4.6      |
| D30  | Radesha Up          | 21                 | 8.5                  | 7.1 | 14.2    | 3.8      |
| D31  | Radesha             | 21                 | 9                    | 7.06| 10.3    | 10.3     |
| D32  | Dragash             | 22.5               | 12                   | 6.9 | 10.1    | 5.2      |
| D33  | Restelica Up        | 17                 | 8                    | 7.89| 13.7    | 3.1      |
| D34  | Restelica Down      | 18                 | 9                    | 8   | 6.8     | 9.9      |
| D35  | Krushevë Up         | 19                 | 11                   | 8.26| 11.2    | 8.1      |
| D36  | Krushevë Down       | 19                 | 11.5                 | 7.84| 9.4     | 7.3      |
| D37  | Glloboçica Up       | 20.5               | 12                   | 7.68| 9.1     | 7.4      |
| D38  | Zii Potok Up        | 20.5               | 14                   | 7.85| 11.8    | 5.9      |
| D39  | Zii Potok Down      | 19                 | 12                   | 8.26| 10.1    | 4.2      |
| D40  | Zii Potokë Middle   | 20                 | 15                   | 6.96| 11.3    | 6        |
| D41  | Orçusha Up          | 21                 | 13                   | 7.55| 13.1    | 9        |
| D42  | Orçushë Middle      | 21                 | 14                   | 7.46| 10.2    | 9.3      |
| D43  | Krstec              | 19                 | 14                   | 7.5 | 13.6    | 8.6      |
| D44  | Wool factory        | 22                 | 15                   | 5.2 | 5.1     | 14.9     |
| D45  | Wool factory Up     | 22                 | 15                   | 7   | 6.2     | 12.1     |
| Code  | Sampling site | Bottom substrate | Bottom stability | Habitat complexity | Pool quality | Bank stability | Bank protection | Canopy |
|-------|---------------|------------------|------------------|-------------------|-------------|---------------|----------------|--------|
| D1    | Zaplluxhë     | Optimal          | Optimal          | Optimal           | Poor        | Suboptimal    | Optimal         | Optimal |
| D2    | Zaplluxhë     | Suboptimal       | Suboptimal       | Suboptimal        | Poor        | Suboptimal    | Suboptimal      | Optimal |
| D3    | Zaplluxhë     | Optimal          | Optimal          | Optimal           | Poor        | Suboptimal    | Suboptimal      | Optimal |
| D4    | Zaplluxhë     | Suboptimal       | Optimal          | Optimal           | Suboptimal  | Marginal      | Suboptimal      | Optimal |
| D5    | Blaç          | Marginal         | Suboptimal       | Poor              | Marginal    | Suboptimal    | Suboptimal      | Suboptimal |
| D6    | Bresanë up    | Optimal          | Optimal          | Optimal           | Suboptimal  | Optimal       | Optimal         | Optimal |
| D7    | Bresanë down  | Suboptimal       | Suboptimal       | Marginal          | Suboptimal  | Marginal      | Suboptimal      | Suboptimal |
| D8    | Beleobrad    | Suboptimal       | Suboptimal       | Marginal          | Suboptimal  | Marginal      | Suboptimal      | Suboptimal |
| D9    | Beleobradë    | Suboptimal       | Suboptimal       | Marginal          | Suboptimal  | Marginal      | Suboptimal      | Suboptimal |
| D10   | Kuk           | Optimal          | Optimal          | Optimal           | Marginal    | Optimal       | Optimal         | Optimal |
| D11   | Buzez         | Suboptimal       | Suboptimal       | Suboptimal        | Poor        | Suboptimal    | Optimal         | Optimal |
| D12   | Brezne        | Marginal         | Suboptimal       | Suboptimal        | Optimal     | Optimal       | Optimal         | Optimal |
| D13   | Pilajnik       | Optimal          | Optimal          | Optimal           | Suboptimal  | Optimal       | Optimal         | Optimal |
| D14   | Kosavë        | Suboptimal       | Suboptimal       | Suboptimal        | Optimal     | Suboptimal    | Suboptimal      | Suboptimal |
| D15   | Plavë up      | Suboptimal       | Suboptimal       | Suboptimal        | Poor        | Suboptimal    | Suboptimal      | Suboptimal |
| D16   | Plavë (Meka factory) | Poor | Marginal | Suboptimal | Poor | Suboptimal | Suboptimal | Suboptimal |
| D17   | Renc' Up       | Suboptimal       | Suboptimal       | Suboptimal        | Suboptimal  | Suboptimal    | Suboptimal      | Suboptimal |
| D18   | Rencë         | Suboptimal       | Optimal          | Optimal           | Suboptimal  | Optimal       | Optimal         | Optimal |
| D19   | Rencë (River Plava) | Suboptimal | Suboptimal | Suboptimal | Marginal | Suboptimal | Poor |
| D20   | Brod Camp      | Optimal          | Optimal          | Suboptimal        | Optimal     | Suboptimal    | Optimal         | Suboptimal |
| D21   | Brod Up        | Optimal          | Optimal          | Suboptimal        | Suboptimal  | Suboptimal    | Suboptimal      | Poor |
| D22   | Brod Midle     | Suboptimal       | Suboptimal       | Suboptimal        | Suboptimal  | Suboptimal    | Suboptimal      | Suboptimal |
| D23   | Brod Down      | Optimal          | Optimal          | Suboptimal        | Suboptimal  | Suboptimal    | Suboptimal      | Poor |
| D24   | Dikanca        | Optimal          | Optimal          | Optimal           | Suboptimal  | Optimal       | Optimal         | Suboptimal |
| D25   | Mlika          | Optimal          | Optimal          | Suboptimal        | Suboptimal  | Optimal       | Optimal         | Suboptimal |
| D26   | Mlika Down     | Suboptimal       | Suboptimal       | Suboptimal        | Suboptimal  | Suboptimal    | Suboptimal      | Suboptimal |
| D27   | Mlika (River Brod) | Suboptimal | Suboptimal | Suboptimal | Suboptimal | Suboptimal | Suboptimal | Suboptimal |
| D28   | Rapçë up       | Optimal          | Optimal          | Suboptimal        | Suboptimal  | Marginal      | Suboptimal      | Optimal |
| D29   | Rapçë          | Suboptimal       | Suboptimal       | Suboptimal        | Suboptimal  | Optimal       | Suboptimal      | Suboptimal |
| D30   | Radesha Up     | Optimal          | Optimal          | Marginal          | Suboptimal  | Suboptimal    | Suboptimal      | Suboptimal |
| D31   | Radesha        | Optimal          | Optimal          | Suboptimal        | Marginal    | Suboptimal    | Suboptimal      | Suboptimal |
| D32   | Dragash        | Suboptimal       | Suboptimal       | Suboptimal        | Suboptimal  | Optimal       | Optimal         | Suboptimal |
| D33   | Restelica Up   | Optimal          | Optimal          | Suboptimal        | Suboptimal  | Suboptimal    | Suboptimal      | Suboptimal |
| D34   | Restelica Down | Optimal          | Optimal          | Suboptimal        | Suboptimal  | Suboptimal    | Suboptimal      | Suboptimal |
| D35   | Krushevë Up    | Suboptimal       | Suboptimal       | Suboptimal        | Suboptimal  | Suboptimal    | Suboptimal      | Suboptimal |
| D36   | Krushevë Down  | Suboptimal       | Suboptimal       | Suboptimal        | Suboptimal  | Suboptimal    | Suboptimal      | Suboptimal |
| D37   | Gillobocica Up | Marginal         | Suboptimal       | Suboptimal        | Suboptimal  | Suboptimal    | Suboptimal      | Suboptimal |
| D38   | Zë Potok Up    | Suboptimal       | Suboptimal       | Marginal          | Suboptimal  | Optimal       | Suboptimal      | Suboptimal |
| D39   | Zë Potok Down  | Optimal          | Optimal          | Suboptimal        | Suboptimal  | Suboptimal    | Suboptimal      | Suboptimal |
| D40   | Zë Potokë Middle | Suboptimal | Optimal | Suboptimal | Suboptimal | Suboptimal | Suboptimal | Poor |
| D41   | Orçushë Up     | Optimal          | Optimal          | Marginal          | Suboptimal  | Optimal       | Suboptimal      | Suboptimal |
| D42   | Orçushë Middle | Suboptimal       | Suboptimal       | Marginal          | Suboptimal  | Optimal       | Suboptimal      | Suboptimal |
| D43   | Krstec         | Optimal          | Optimal          | Suboptimal        | Suboptimal  | Suboptimal    | Suboptimal      | Suboptimal |
| D44   | Wool factory   | Suboptimal       | Suboptimal       | Suboptimal        | Suboptimal  | Suboptimal    | Suboptimal      | Suboptimal |
| D45   | Wool factory Up | Suboptimal | Suboptimal | Suboptimal | Suboptimal | Suboptimal | Suboptimal | Suboptimal |
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