4. Conclusions – In the future occurrence of low-water and extremely low-water periods is likely to increase considerably. That is why probable flow reduction in summer and autumn can be even more significant than during the last 50 years. It is a negative vulnerable factor for environmentally sustainable regime of small rivers.

5. References

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Assessment of Waterpower Potential of Rivers in the Yaselda Catchment

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1. Introduction – Nowadays, generating renewable energy from hydropower sources (which are constituent elements of all power sources in a region) is becoming a top-priority task. Development of waterpower potential is one of the segments of renewable power industry in Belarus. According to the data from the Ministry of Energy of the Republic of Belarus, the potential power capacity of all water streams in the country is estimated at 850 MW of which 520 MW is technically permissible while 250 MW is economically reasonable. The purpose of this report is to assess the waterpower potential of the Yaselda River in current climate changes.

2. Experimental – The data used in the report come from long-term observations over discharges and water levels in the Yaselda catchment. These data are provided by Gidromet (The Center of Hydrometeorology, Radioactive Contamination Control and Environmental Monitoring of the Republic of Belarus) of the Ministry of Natural Resources and Environmental Protection of the Republic of Belarus.

The total number of potential hydropower resources in the area includes waterpower from stream runoffs, and slope runoffs. All hydropower resources are estimated with the use of hydrographic curves of the catchments. The curves are based on hypsographic curve of the catchment $A=f(H)$ and the curve of influence of the flow rate on elevation $M=f(H)$. These resources can be expressed in the units of average-annual power capacity or the energy of a runoff in an average-water year. The potential capacity of the rivers $L \geq 10$ km is defined as $N=9.81 \cdot Q \cdot H$, where N is power capacity, kW; Q·is discharge, m^3/s; H is head, m.

3. Results and Discussion – The number of rivers with various potential and total capacities in the Yaselda catchment is presented in the Table.

Table – **the number and total capacity of the rivers in the Yaselda catchment**

Criteria	River Length, km				
	0 – 10	**10.1 – 100**	**100.1 – 1000**	**1000.1 – 5000**	**Total**
Number of rivers, pcs/%	36/58.2	21/33.8	4/6.4	1/1.6	62/100
Total capacity, kW/%	128/3.0	502/11.8	616/14.6	2999/70.6	4245/100

The analysis of waterpower potential of the rivers in the Yaselda catchment showed the following results: a) a lot of rivers have stretches with kilometric capacity less than 1 kW/km. But as the power-weight ratio of the stretches increases, their number decreases; b) 77.4 % of the rivers have stretches with discharges less than 0.5 m^3/s; c) 45 % of the rivers have stream gradient up to 5 m.

Comparing particular flow rates of the rivers with other catchments of the country proves that the rivers in the Yaselda catchment are poor in hydropower resource as there is criterion variation within the following limits: from 0.03 to 0.52 kW/km^2 for a particular flow rate; from 0.06 to 0.74 kW/km^2 for total flow rate.

4. Conclusions – Although the Yaselda catchment area is located within Polesian Lowland where ground elevations hover insignificantly and the catchment has little power potential (total power capacity of the rivers is 4,245 kW), it is possible to construct small hydropower facilities to provide local industries, farms, and population with electricity. However, it is necessary to take into consideration possible flow changes caused by climate fluctuations or human influence, as well as detailed environmental and economic grounding to choose a location for small hydropower stations.

Management of slurry in Gran Canaria with full-scale Natural Treatment Systems for Wastewater (NTSW). One year's experience in livestock farms.

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Abstract

The objective of this work is to describe the performance of three full-scale Natural Treatment Systems for Wastewater (NTSW) [1] operating with livestock farms (1,200-1,500 pigs) during one year. Slurry management is performed within these systems, which are operated under normal conditions of livestock farms [2], and based on elements such as, first generation biodigesters, subsurface flow constructed wetlands (SSFCW) and facultative ponds [3].

The facilities, located in The Island of Gran Canaria, have allowed us to study viable alternatives of management of effluents from livestock farms with a low-cost based treatment and also to validate these systems according to the removal rates, behavior under changes of load and/or flow, low cost energy and operation. Chemical oxygen demand (COD) removal efficiency obtained was between 70-90%. Likewise, it have been possible to compare the operation of first-generation cascade flow digesters (<76% COD removal) versus complete mixing digesters (<50% COD removal) and facultative ponds when combined with SSFCW, removed a higher percentage of COD compared with ponds (92%).

Finally, it has been verified that when the NTSW combine different elements, they have better COD removal and better response to load and/or flow changes [4], [5].

Keywords: Natural systems, biodigester, slurry management, wastewater treatment, constructed wetlands, ponds, COD removal, low-cost treatment.