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The State Of Development of Hydropower in the Bóbr River Catchment in Poland

Paweł Tomczyk[1], Mirosław Wiatkowski[1]
[1]Wroclaw University of Environmental and Life Sciences
Norwida 25, 50-375 Wrocław, Poland
pawel.tomczyk@upwr.edu.pl; miroslaw.wiatkowski@upwr.edu.pl

Extended Abstract

Hydropower is one of the important renewable energy sources and is responsible for about 47% of global electricity produced from renewable energy sources [1].

The paper focuses on the analysis of the development of hydropower in the Bóbr River catchment located in the southwestern part of Poland [2, 3]. This catchment has been used for hydropower since the 13th century due to favorable hydrographic and geomorphological conditions [4].

The analysis, based on documentation provided by the State Water Holding Polish Waters, revealed the existence of 71 operating hydropower plants with a total installed capacity of almost 150 MW. The oldest of them has been operating since 1898, and the newest - since 2019. The largest of them is Dychów on the Bóbr River with a capacity of 79.5 MW.

The dynamics of the growth of hydropower plants in this area indicates that the largest number of facilities were put into operation during the Third Polish Republic - after 1989 (an average of 1.2 per year), while the largest increase in terms of installed capacity was recorded during the Polish People's Republic - 1945-1989 (an average of 1.8 MW per year). These changes result from differences in the energy policy pursued in the indicated periods [4, 5, 6].

The facilities in operation are located mainly on the Bóbr River (46.5%) and Kwisa River (16.9%). The dominant types are run-of-river hydropower plants (90.2%), with Kaplan turbines (45.7%), with medium head height (49.3%), in derivation channels (70.4%), and small - with installed capacity less than 10 MW (97.2%).

The presented results are important from the point of view of sustainable development goals, adaptation to climate change and environmental policies.

References

[1] International Energy Agency (IEA), "Renewables – Energy System". Accessed May 22, 2024. https://www.iea.org/energy-system/renewables

[2] Olearczyk D., Stodolak R., "Regional relationships of maximum outflow in the Upper Bóbr River Basin", *J Ecol Eng.*, vol. 16, no. 5, pp. 206–212, 2015. http://dx.doi.org/10.12911/22998993/60479

[3] Malczewska B., "Variability of water energy resources on example of Bóbr River", *Infrastructure and Ecology of Rural Areas*, vol. 13, pp. 167-177, 2010.

[4] Krajniak W., "Między młynarstwem a elektryfikacją. Społeczno–gospodarcze uwarunkowania wykorzystania potencjału energetycznego rzeki Bóbr od średniowiecza do 1945 roku". *Rocz Dziejów Społecznych i Gospod.,* vol. 76, pp. 121–163, 2016. http://dx.doi.org/10.12775/RDSG.2016.05

[5] Krajniak W., "Zarys dziejów energetyki dolnośląskiej w latach 1945–1989". *Rocz Ziem Zachodnich*, vol. 2, pp. 55–75, 2018. http://dx.doi.org/10.26774/RZZ.238

[6] Chavance B., "The transformation of communist systems: Economic reform since the 1950s". *Transform Communist Syst Econ Reform Since 1950s*. Routledge, pp. 1–225, 2019. http://dx.doi.org/10.4324/9780429315404

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