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## Service WaterPUCK – a new method for investigation influence of agricultural holdings and land-use structures on coastal waters of the southern Baltic Sea [www.waterpuck.pl](http://www.waterpuck.pl)

Lidia Dzierzbicka-Głowacka<sup>1</sup>, Dawid Dybowski<sup>1</sup>, Maciej Janecki<sup>1</sup>, Artur Nowicki<sup>1</sup>, Stefan Pietrzak<sup>2</sup>

<sup>1</sup>Institute of Oceanology Polish Academy of Sciences, Powstańców Warszawy 55, 81-712 Sopot, Poland, [dzierzb@iopan.gda.pl](mailto:dzierzb@iopan.gda.pl)

<sup>2</sup>Institute of Technology and Life Sciences, al. Hrabka 3, Falenty, 05-090 Raszyn, Poland

A new method as 'Integrated information and prediction Web Service WaterPUCK' for investigation influence of agricultural holdings and land-use structures on coastal waters of the southern Baltic Sea is presented. WaterPUCK Service is focused on determination of the current and future environmental status of the surface water and groundwater located in the Puck District (Poland) and its impact on the Bay of Puck (the southern Baltic Sea) environment. It will highly desired tool for land-use and environment management. WaterPUCK combines several different components and methods such as retrospective analyses of existing monitoring data sets, in situ measures and the application of various models to estimate main mechanisms and threats responsible for the pollution transport from the agricultural holdings and land-use structure to the surface and groundwater and potential predictability of environment change of the Puck District and the Bay of Puck ecosystem. WaterPUCK Service (Figures 1, 2) is integrate several models, such as a surface water model based on SWAT, a groundwater flow model based on MODFLOW, a 3D-ecohydrodynamic model of the Bay of Puck called EcoPuckBay and an agriculture calculator called CalcGosPuck. The WaterPUCK Service is constructed as part of the project with the same name 'WaterPUCK' ([www.waterpuck.pl](http://www.waterpuck.pl)) [1].

The CalcGosPuck calculator is working as an independent application by which will can be to plan the fertiliser usage by farmers in order to obtain the best harvest policy. Preparation of the nutrient balance at farm level by the "at farm gate" method involves determination of input and output streams on the farm (Figure 3).

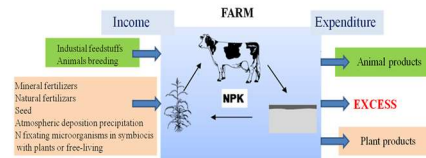


Figure 3: Components of the "at farm gate" nutrient balance method (CalcGosPuck) [2]

3D EcoPuckBay ecohydrodynamical model (Figure 4) consists of active ocean, ecosystem and ice modules, coupled together with active land module (SWAT plus ModFlow) which provide data, such as freshwater inflow and nutrient discharge from rivers and ground, and passive atmospheric module which provide data such as weather forecasts from external sources (UM ICM). From the side of the open sea, boundary conditions will be fed from the three-dimensional model of the ecosystem for the Baltic Sea 3D CEMBS ([www.cembs.pl](http://www.cembs.pl)). The model horizontal resolution is 1/960', which corresponds to ca. 115 m grid. Vertically model is divided into 23 layers. The first of 5 layers is 0.4 meters thick. 3D EcoPuckBay model will generate 72-hour forecast which include currents, temperature, salinity and ice parameters. In addition, the model will forecast ecological parameters i.e. nutrients, pesticides, dissolved oxygen concentration and biomass of phytoplankton and zooplankton in the entire water column.

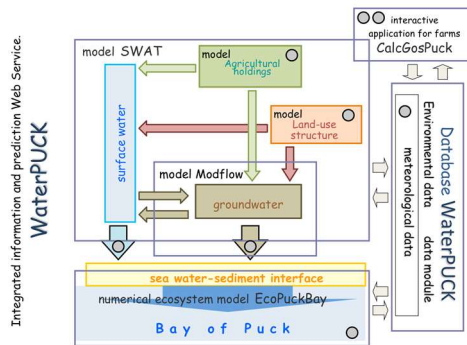


Figure 1: The shape of water and contaminant fluxes covered in WaterPUCK [1]

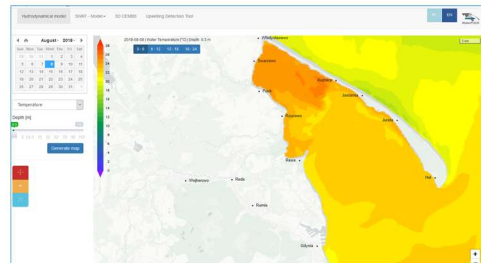


Figure 4: The page of 3D EcoPuckBuy model in Service WaterPUCK [3]

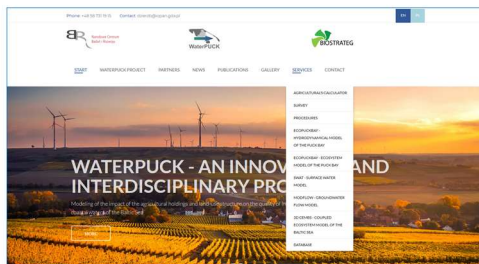


Figure 2: The page of Service WaterPUCK ([www.waterpuck.pl](http://www.waterpuck.pl))

SWAT model (Soil and Water Assessment Tool) (Figure 5) has a river basin structure and will be used to predict the influence of changes in the way of farming for: water balance, erosion degree, nitrogen and phosphorus compounds pollution, pesticides, bacteria and heavy metals. SWAT model is a physically based, time continuous simulation model that operates on a daily time step at catchment scale.

### References

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