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Hydrology and Earth System Sciences Discussions

Interactive comment on "Development of an Open-GIS decision aid system for ecological and economical management of surface and groundwater resources in the Bistrita River Basin (Romania)" *by* M. C. Trifu et al.

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Authors comment on “Development of an Open-GIS decision aid system for ecological and economical management of surface and groundwater resources in the Bistrita River Basin (Romania)” by M. C. Trifu et al.

We are very grateful for the comments of the referees and we have taken into consideration their suggestions for improvement of the quality of our paper. Regarding the specific comments of both referees we would like to make the fallowing comments: The section 4.4 concern the economical analysis related to the measures presented above.

It was not our intention to explain how the measures computed by the Diminish system were selected. In fact the developed system does not propose measures, but offer the possibility to analyze the intended measures. For this reason the Diminish system does not take into consideration the feasibility to implement the measures (e.g. the whish of the farmers). The water authority is in charge with the choice of the proper measures for diminishing the nutrients concentrations and the further application of the measures is decided by the Basin Committee after a good analysis of all information, using also the Diminish system. The measures on farm level do not take into account the difference of the income due to the fact that the “compensatory system” does not exist in Romania country. In P.2051, r.8-9 we present the results obtained after the analysis of two types of scenarios: change of land-use and improvement of existing treatment stations. The paper show what we can do with the Diminish system, included the economical analysis and it does not propose the application of a certain measure. We can analyze a third scenario related to the application of both measures, meaning change of land-use together with the improvement of existing treatment stations. The decision regarding the applied measures (analyzed scenarios) is taken by the legal authorities. Concerning the figure 6, we make reference to it in the framework of the section 4.2., P. 2043, which concern the Riverstrahler model applied to the Bistrita River Basin. The legend is related to the area analyzed with the Riverstrahler model included in the Diminish system. The total nitrogen and phosphorus budget depend on the hydrological conditions, the quantity of precipitations influence the level of infiltration and finally the quantity of nitrogen and phosphorus transported within the river catchments. In general during a wet year the nutrients budget is greater than in a dry year. As it is mentioned at the page 2048, the budget for the 2002 year, a wet year, is smaller than for the dry year 2000, due to the reduction of point sources. This fact shows that from the point of view of nutrients budget, the economical situation is more important than the hydrological conditions.

Corrections on the base of referee no. 1 comments Taking into account the comments of the anonymous referee no. 1 we have made the fallowing corrections:

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We have added explanations regarding the end-user and the reason for making the Diminish project in P. 2038, L.26 just after “…integrated into the system”. We have added explanations regarding the decision for having a fully linked system accessed via the Internet in P. 2039, L.1 just after “the implementation of WFD”. We have added explanations regarding the necessity for updating the cartographic documents in P. 2040, L19 just after “…this classical mapping support”. With this occasion we have split and reformulated the phrase “Due to the fact that, in most cases, …., wells location, etc.).” In section 4.2 and 4.3, an explanatory statement have been added concerning the reasons for what the models Riverstrahler, MODSUR, MODCOU and NEWSAM were chosen and which are their advantages in comparison with other state of the art models. The new explanations have been added: in P.2043, L.11 after “…variables of the system”; in P.2043, L.22 just before “…The complex network of tributaries….”; in P.2044, L22 just before “…The first step for the groundwater….”.

P. 2037, L. 2: we have made whole sentence out of list in brackets; L. 6: the project reference, which is LIFE03 ENV/RO/000539, is given within the abstract and we consider that it is not necessary to give again the reference in the footnote of this page L. 15: The two basins area are: 1) the upstream and middle part of the Bistrita basin, including the sub-basins Bistrita Superioara, Dorna, Neagra Sarului, Neagra, Bistricioara, Bicaz, Crasna, Cuejdu, Bistrita, as it is mentioned in the figure 6; 2) the downstream part of the Bistrita basin, including the groundwater body GWSI03. L. 26: the references are given within the “Reference “section. P. 2038, L.6: we have added: “... under the EC Nitrates Directive… “; L. 10: we have added: “..., to be able to ...”; L. 14: we have changed: “…public participation of the public….”; L. 23: we have changed: “….information over a long period…”. P. 2039, L. 10: we have changed: “….a population of….”; L. 12: we have changed: “…. nutrient balancing…”; L.

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13: we have changed: “…originating…”; L. 14: we have kept the “localities” word due to the fact that we have in mind all the human agglomerations within the river basin, such as villages and small towns; L. 16 we have reformulated the phrase for being clearer. L. 21: we have changed: “… recreational services…”. P. 2040, L. 12: we have explained the abbreviation (DEM) and all others abbreviations used in the paper; L. 15: Figure 3 is an example of the GIS info-layers included into the Diminish system L. 20: we have changed: “… out of date….”. P. 2041, L. 1 we have added: “… in Bacau….”; L. 2: we have added: “… in Bucharest…”;L. 4f: we have reformulated for being more clear; L. 18: we have modify: “…related…”; L. 18-20: we have split the phrase; L 20 we have modify: “At total” with “Altogether”; L. 20 - 23: we have added explanations concerning the disadvantage of the classical approach after “…value-added information is generated” and we have reformulated the phrase “The distribution of the….”; we have also modify “Internet Web-based” with “Web-based”; L. 26: we have changed: “….three-step…”. P. 2042, L. 5: we have changed: “….downloaded…”; L. 17: we have reformulated for being more clear; L. 19: we have deleted: “core”. P. 2043, L. 17: the “unicity” means the processes are the same for all water bodies; L. 25 we have reformulated for being clearer. P.2044, L. 13: we have deleted: …“the specialists from”…;L. 25ff: we have changed “limits” with “borders” for being more clear; L. 27f: we have reformulated for being clearer. P. 2045, L. 3f: we have put whole sentence out of list in brackets, for better readability L. 10: we have changed: “….The input data for the groundwater model were….”; L.11: we have changed: “…potential evaporation….”; L. 12: we use the word “wells”; L. 28: we have changed: “…input

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data …”. P. 2046, L. 4: we have changed the name of the section 4.4. in accord with the referee comments:… “Approach to determining environmental costs…”; L. 7: we have used capital letter for “WATECO”; L. 13.: we have changed: “… to environmental costs…”; L. 14: we have changed: “…until reaching…”; L. 22: we think that the sentence is clearer if we use the reference in the text; L. 26: the sentence is clearer if we use in the text the reference related to the European program; L. 27 we have added explanations concerning the abbreviation (ISPA). P. 2047, L. 3: “composting” means to make a compost from the animal manure; L. 11: we have added: “…computing the difference…”; L. 16: we have reformulated the phrase; L. 19: we have changed with: “…nutrients…”; L. 25 we have added: “…. input/output data…”. P. 2048, L. 1 we have changed with: “kilometer”; L. 8: we have modify : “…show….”; L. 10: we have changed with: “nutrients”; L. 12f.: we have modify: ….”Each scenario created using ….”; L.20: we have changed with: “deteriorate”. P.2049, L. 3: we have replaced with: “inhabitants equivalents” (we have replaced also in the following sentences) P. 2050, L. 16: we have changed with: …”CORINE”… P. 2052, L. 2 we have changed with:…”EC WFD”; L. 8: we have changed: “…simulated …”; L.19f.: we have changed “:..source of nitrates concentration..”. P. 2053, L. 7: we have changed with: ”….pressure changement…”. P. 2057, L. 1: we have changed with :…”Evolution of inhabitants equivalents….” (inhabitants equivalents represent a parameter and we present in the table its evolution) P. 2058 3rd column: we have changed : “….Unitary costs “. P. 2066: we have added: …”Total nitrogen (TN) and phosphorous (TP) ...”. P. 2071: we have reformulated :” ….nitrate concentration

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within the aquifer under potato crops….”. Figures: we have added the references: ….”Capture from the Diminish system”….. Fig. 7: represent a capture from the Riverstrahler model interface; Fig. 10: Even if it is not a colored map we can easily observe the differences for the situations a and b, for the analyzed basins; Fig. 11: this figure represent the result of the Diminish system for a scenario related to the change of land-use, which is different from the scenario represented in the figure 9.

Corrections on the base of referee no. 2 comments Taking into account the comments of the anonymous referee no. 2 we have made the fallowing corrections:

In section 4.2 and 4.3, an explanatory statement have been added concerning what processes are modeled and what are the main variables of the Rive model in P.2043, L.11 after “…variables of the system”.

P. 2037 - r. 1-2: we have replaced “tributary” with “sub-basin”; - r. 3-4: we have added: “….affluent of the Danube River Basin....”; - r. 8 : we have replaced “combat” with “diminish”. P. 2038 - r. 12: we have replaced “improving” with “supervising” P 2039 - r. 4-5: we have reformulated;- r. 5 – we have moved “(Fig. 1) after “at the Eastern part of Romania”;- r. 18: we have replaced “hydrological management” with “water resources management”; - r. 24 – we have moved “(Fig. 2)” after “Bistrita basin”. P. 2040 - r. 1 – we have reformulated taking into account the referee’s suggestion;- r. 8-9 –we have changed “hydrological parameters” with “hydrological data”;- r. 5 – we have reformulated: “….GIS database has been planned for the evaluation and….”; - r. 19-25 – we have split the phrase and we have reformulated. P. 2041 - r. 4-9. we have reformulated the phrase; - r. 18-20 we have reformulated for being clearer . P. 2042 - r. 5: we have replaced “download” with “downloaded”. P. 2043 - r.20

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– we have replaced: …” hydro-meteorological inputs and morphological characteristics…”. P. 2044- r. 26 – Taking into consideration the borders of the modeled area we have modify the title of the paragraph 4.3. by replacing “…to the groundwater bodies of the Bistrita basin” with “…to the groundwater body GWSI03 of the Bistrita basin”; - r. 28 – we have reformulated the phrase for being clearer. P. 2045 - r. 11 we have changed: “….potential evapotranspiration…”. P. 2046 - r.11-14 – we have moved the last two sentences (“Costs related to the improvement…… is an environmental one”) immediately after the first sentence of the paragraph 4.4 (ending with “Wateco, 2002”) - r. 11 – we have replaced “… and pollution rights” with “….and wrong notification for pollutant concentrations emissions”. P. 2047 - r. 16 – we have reformulated the phrase for being clearer; - r. 20-23 – we have reformulated: “….middle part of the basin, which was divided into……” P. 2053 - r. 3: we have replaced “geological” with “hydro-geological”. P. 2058 - Table 2 – in the last column we have changed “Inv” with “Inv”. P. 2060- Fig. 2 – we have indicated the main cities in the basin P. 2061 - Fig. 3 – we have modify: “….Bistrita River basin”.

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