

Ecosystem services of natural versus modified rivers: a perception-based study in Romania

Les services écosystémiques des rivières naturelles et modifiées : une étude de perception en Roumanie

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RÉSUMÉ

Afin de mieux comprendre la relation entre rivières et sociétés, une enquête a été menée auprès des résidents, en Roumanie, portant sur la perception des services écosystémiques associés aux rivières. Les réponses ont été divisées en deux grands groupes : 114 concernant les masses d'eau naturelles (NWBs) et 142 concernant les masses d'eau fortement modifiées (HMWBs). En utilisant le test non-paramétrique de Mann-Whitney, nous avons trouvé que plus d'exemples de services écosystémiques ont été associés aux HMWBs qu'aux NWBs (moyenne de 36,7% pour les HMWBs vs 25,5% pour les NWBs du nombre de réponses par catégorie, à $p < 0,05$ niveau de significativité). Pour les deux types de masses d'eau fluviales, la plupart des réponses ont concerné les services d'approvisionnement, suivis des services culturels, de régulation et de soutien. Le public semble ignorer l'impact majeur des altérations hydrologiques et morphologiques sur la régulation du climat, la purification de l'eau et le maintien de la biodiversité. Ces résultats suggèrent la nécessité d'améliorer l'information et l'éducation du grand public sur les avantages des services écosystémiques des rivières.

ABSTRACT

In order to contribute at comprehending the relation between rivers and societies, we conducted a survey on local residents in Romania on the perception of river-related ecosystem services. Responses were separated in two main groups: 114 concerning Natural Water Bodies (NWBs) and 142 concerning Heavily Modified Water Bodies (HMWBs). By using Mann-Whitney non-parametric test, we found that more examples of ecosystem services were associated to HMWBs than to NWBs (average of 36.7% for HMWBs against 25.5% for NWBs out of the number of responses per category, at $p < 0.05$ level of significance). For both types of river water bodies, most of responses referred to provisioning services, followed by cultural, regulating and supporting ones. The public appears to ignore the high impact of flow and hydromorphological alterations on climate regulation, water purification and maintaining biodiversity. These findings suggest the need to enhance public information and education on benefits provided by river-related ecosystem services.

KEYWORDS

Ecosystem services, Heavily Modified Water Body, Natural Water Body, perception, river

1 INTRODUCTION

In the context where many efforts are made to restore rivers to their near-natural functioning, understanding how people perceive ecosystem services of natural versus modified rivers is of crucial importance for implementing measures to restore rivers at local scale. In Romania, approximately 29% of river Natural Water Bodies (NWBs) and 58% of river Heavily Modified Water Bodies (HMWBs) would require restoration (NARW, 2016). Previous studies in Romania showed that such projects were somehow obstructed by local communities, which ignore the integrality of benefits of river restoration and improvements after their implementation (Ioana-Toroimac and Salit, 2016).

2 METHODOLOGY

In order to contribute at understanding the relation between rivers and societies, we conducted a survey on local residents mostly in southern Romania (256 respondents from 111 localities) in order to identify the perception on river-related ecosystem services. The survey consisted in 31 questions asking respondents to associate examples of ecosystem services from a given-list to the near-by river (47 rivers). Examples of ecosystem services were grouped in three main categories: provisioning (e.g. water and fish supply, sediment, wood and reed exploitation, hydropower, and navigation), cultural (e.g. educational, recreational and spiritual role of a water body, esthetics), and regulating & supporting services (e.g. flood mitigation, water purification, climate regulation, carbon sequestration, biodiversity production and refuge, and soil formation). The Mann-Whitney non-parametric test was used to find statistical significant differences between ecosystem services associated to NWBs and HMWBs, as well as between types of ecosystem services.

3 RESULTS

Responses were separated in two main groups: 114 concerning NWBs and 142 concerning HMWBs. We found that more examples of ecosystem services were associated to HMWBs than to NWBs (average of 36.7% for HMWBs against 25.5% for NWBs out of the number of responses per category, at $p < 0.05$ level of significance) (Fig. 1a). For both types of river water bodies, most of responses referred to provisioning services, followed by cultural, regulating and supporting ones (Fig. 1b). The overall difference between these two types of river water bodies is mostly due to cultural services associated to HMWBs (average of 39.2% for HMWBs against 22.3% for NWBs out of the number of responses per category, at $p < 0.05$ level of significance). Concerning responses for provisioning, regulating and supporting services, we found no statistical difference between NWBs and HMWBs.

Among questions with a high rate of answers ($> 50\%$ of all responses), we noticed: water supply for population, for industry and agriculture as provisioning services; landscape esthetics, leisure activities such as boating and swimming as cultural services; and biodiversity formation as supporting services. The lowest number of responses ($< 5\%$) was counted for water purification among regulating services.

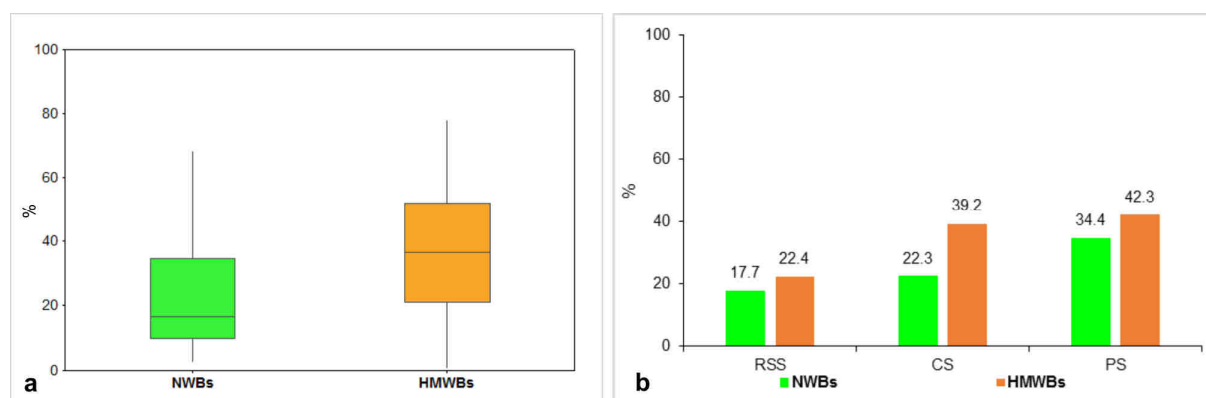


Figure 1. Weight of responses for river-related ecosystem services in our survey: a) variation of responses per group of river water body; b) variation of responses per type of ecosystem services; NWBs = Natural Water Bodies; HMWBs = Heavily Modified Water Bodies; RSS = regulating and supporting services; CS = cultural services; PS = provisioning services

4 DISCUSSION AND CONCLUSION

We concluded that the public perceives mostly direct services (e.g. water supply, leisure activities, biodiversity) to the detriment of indirect ones (education, water purification, soil formation), appreciates HMWBs and generally ignores the major role of regulating and supporting services especially of NWBs. This finding suggests that the public disregard the high impact of flow and hydromorphological alterations on climate regulation, water purification and maintaining biodiversity (Grizzetti et al., 2016). Consequently, we consider necessary to enhance public information and education on benefits provided by regulating and supporting ecosystem services of rivers in order to ease further negotiation for the implementation of river restoration projects.

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