Small water bodies in landscape: their functions and barriers to their construction

Summary for public and private entities

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Change of water management in landscape is necessary

Higher temperatures and higher frequencies of drought periods, torrential rain and local floods require a change in managing water resources. One of the possible strategies is to improve the ability of Czech landscape to retain precipitation as close as possible to its impact point, thus slowing down water runoff from the catchment area. Among other things, this can be implemented by restoring or building new small water bodies in the landscape.

What are small water bodies?

They are various types of pools, pool systems and wetland ecosystems, which are also formed by gradual silting up of former pools (Fig. 1 and 2). Small water bodies need not be filled with water permanently and they have no technical runoff regulation (dam, outlet). According to some definitions, small water reservoirs fall in the category of larger-scale water bodies; according to others, some of them can still classify as small water bodies. Reservoirs are further divided into fishponds (intended primarily for fish keeping), landscaping and retention reservoirs, etc. Many of the small water bodies mentioned have registered an unprecedented decrease in numbers and geographical extent in the last century (Table 1).

Functions of small water bodies in landscape

Small water bodies perform a number of interrelated functions in landscape (Table 2, Fig. 3). The degree of performance of these functions depends on type of the water body. The type affects primarily the depth of water (greater in fishponds), water flow (essentially only in mountain stream cascades), water level oscillation (less so in fishponds, more in other types), edge sharpness and structural design (artificial in cascades, partly artificial in fishponds, natural in wetlands and pools), as well as intensity of human interventions (intensive production in some fishponds, spontaneous evolution in some wetlands and pools, etc.).

Fig. 1: The newly established pool in Prokopské valley in Prague is used actively by the critical endangered marsh frog (Photo: Jan Macháč, 2019)

Wetlands	indirect drying by climate change and vegetation cover change, land cultivation for agriculture and development
Pools	insufficient maintenance, land cultivation for agriculture
Mountain stream cascades	insufficient maintenance versus new construction on inappropriate sites
Fishponds	insufficient maintenance, disuse (ownership changes, etc.), rupture, changes in inflow

Table 1: Main causes of changes in number, extent and functions of small water bodies in Czech landscape

Function	Wetlands	Pools	Small water reservoirs	
			Mountain stream cascades	Fishponds
microclimatic (energy loss by evaporation)	√	√	√	√
hydrological (natural water retention	√	√	X	√
hydrological (flood protection)	√	√	X	X
hydrological (water quality)	√	√	X	X
ecological (habitat diversity)	√	√	√	√
biological (species diversity)	√	√	√	√
material and substance cycle	√	√	X	√
production (fishery, plant production)	√	√	X	√
water management (supply of drinking and service water)	√	√	√	√
recreation and education	√	√	√	√
aesthetic	√	√	√	√

Table 2: Functions of selected small water bodies. Green: rather suitable for provision of function; yellow: partly suitable; red: unsuitable. The specific effect of a small water body always depends on local conditions and management. (Source and detailed explanation: Raška and Slavíková, 2019).

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Fig. 2: Small pool at an advanced stage of evolution, Central Bohemian Uplands (photo: Pavel Raška, 2018)

Fig. 3: The pool underneath the Panská skála rock near Kamenický Šenov underlines the prominent appearance of the rock outcrop and is an excellent example of aesthetic function of small water bodies. (Photo: Pavel Raška, 2008)

Barriers to implementation of small water bodies in landscape

Pools (and partly wetlands too) are perhaps the cheapest type of small water bodies in landscape and easiest to implement in the administrative sense, particularly if they are small water bodies without technical structures regulating outflow, up to 1.5 m deep and under 300 m2 in size. Their successful implementation, as with other small water bodies, depends on selection of a suitable site, technique used for making and designing the pool and the number of stakeholders and their ability to cooperate. They include (see also Fig. 4):

(a) ownership relationships in the territory,
(b) development of expert documents and their consultation with affected entities,
(c) source of funding the measures.

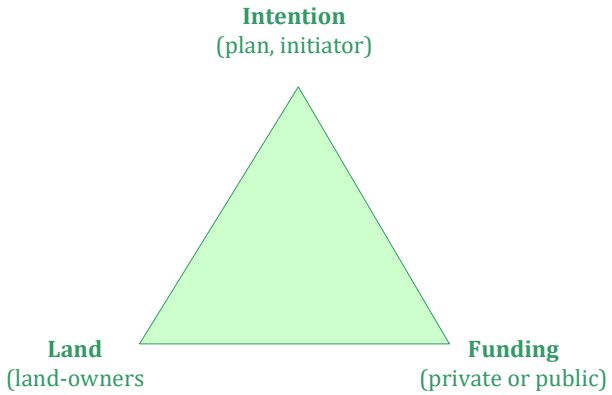

Fig. 4: Diagram depicting the fundamental prerequisites for implementing small water bodies in landscape (Slavíková et al., 2019)

References

Raška P, Slavíková L (2019) Drobné vodní plochy v krajině. Geografické rozhledy 29(2): 12–15.
Slavíková L, Raška P (2019) Drobné vodní plochy v krajině jako komplexní nástroj k retenci vody v ploše povodí. Výsledky institucionální analýzy. Ústí nad Labem: IEEP. Výstup z projektu STRIMA II, 12 s.

The following situations may occur in terms of the three aspects mentioned in the diagram.

High level of accordance: The easiest situation occurs when the measure initiator, the land-owner and the funding provider is one and the same entity. Examples are activities of farmers or other private owners who want to build a small water body on their land and do not need public resources for it. A regional authority may be in the same position, establishing a small water body on its land (e.g., a nature reserve) within its autonomous powers, using operating funds for management of specially protected areas.
Low level of accordance: Agreement is more difficult to reach if all the sides of the imaginary triangle are three different entities. These are situations, for instance, where primary hydrological conditions, runoff conditions in the area and a plan of possible measures are mapped by public administration (regional authority, national park administration). They then arrive at the land-owner(s) with this documentation and negotiate the implementation conditions with them. If the owners are won for the idea, they are often offered assistance in preparation for the permitting proceedings, which the owner has to undergo, and in obtaining the subsidy. The subsidy can be applied for by the measure initiator as well, if it has contractual security over the land.

Even in cases of high level of accordance among the actors, implementation of small water bodies may be complicated by other regulations, resulting in more expensive implementation of measures and potentially not obtaining permission. They include:
• agricultural land fund protection - when establishing a small water body in an area that is registered as agricultural land fund, it has to be registered as a prominent landscape feature. Only then is it possible to avoid payment of fees for exempting the land from the agricultural land fund;
• requirement for soil analyses in case it is transported outside the site (pursuant to the Building Act, the soil can be regarded as waste);
• requirement of catchment managers for small water bodies not affecting water quantity in existing watercourses (expert assessment has to be paid for);
• requirement of nature and landscape protection authorities for ecosystem functioning (e.g., frog migration corridors), etc.

The above examples show clearly that only accord of all three aspects, or entities representing them, can lead to efficient implementation of small water bodies in landscape.

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