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## Implementation and upscaling of nature-based solution in protected areas and pathways to providing human well-being and biodiversity benefits

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Human activities have changed ecosystems and today ≈ 60% of the world's ecosystems are already degraded. These changes have caused growing environmental costs, including biodiversity loss and land degradation, which in turn has resulted in many economic, social and cultural losses. Protected areas (PAs) are the key tool in biodiversity conservation, moreover they may help to maintain water supplies and food security, strengthen climate resilience and improve human health and well-being. International Union for Conservation of Nature (IUCN) defined PA as „a clearly defined geographical space, recognized, dedicated, and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services (ES) and cultural values“. Such areas represent Earth systems in which influence of human interactions with preserved ecosystems are readily evident. The coverage of PA is a widely used indicator of sustainable development, because the loss of biodiversity is recognized as one of the most serious global environmental threats. The “Big Five” threats to global biodiversity are fragmentation, habitat loss, overexploitation of natural resources, pollution, and the spread of invasive alien species. New interventions for governing nature are captured by the umbrella of nature-based solutions (NBS) in the European Union (EU) policy context. NBS can offer accessible, sustainable, and feasible benefits via a range of areas affecting public health and social well-being. According to IUCN NBS are defined as “actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits“. NBS address these societal challenges over the delivery of ES. The main objective of this study is to use the effect of NBS to enhance the sustainability of management of the PAs that would have environmental, social and economic benefits. The methodology includes determination of heavy metals in soils and needles of *Picea alba*, and quantification and qualification of PAs benefits based on Protected Areas Benefits Assessment Tool + (PA-BAT+) in six sites: Zlatibor, Golija, Tara, Đerdap, Stara planina, and Fruška gora. Zlatibor, Golija, and Stara planina are protected as a Nature Park – protected areas of international, national, i.e., exceptional importance Category I (first) in accordance with the Law on Nature Protection ("Off. Gazette of RS", No. 36/2009, 88/2010, 91/2010 and 14/2016). By the decision of the UNESCO commission within the MAB program in 2001, Golija was declared as

Biosphere Reserve "Golija - Studenica". Tara, Đerdap, and Fruška gora are protected as National Parks – protected area of international, national, i.e., exceptional importance Category I (first) in accordance with the Law on National Parks ("Off. Gazette of RS", No. 39/1993, 44/1993-correction, 53/1993, 67/1993, 48/1994, 101/2005 and 36/2009). According to categorization of the IUCN Zlatibor, Golija, and Stara planina are classified in Category V, while Tara, Đerdap, and Fruška gora are classified in Category II. Based on heavy metals content in soils and needles, different interventions in managed ecosystems are proposed.