CSQ-58 Summary

Question	Knowledge Advancement Objectives	Geophysical Observables	Measurement Requirements	Tools & Models	Policies / Benefits
Are nature-based solutions delivering on multiple benefits?	A) Monitoring the implementation and progress of different type of nature-based solutions including various activities of restoration (i.e. forests, peatlands), sustainable supply chains (for different commodities) and certification schemes	• Vegetation structure and cover • Land surface temperature, albedo, soil moisture, water vapor • Related dynamics over time	• Landsat, Sentinel 2 time series, • Very high resolution data • ROSE-L, BIOMASS, GEDI • ENMAP/CHIME • S1/SMOS	• Various EO time series analysis methods • Interoperability • Ground networks covering different nature-based solutions	- UNCBD - IPBES - EU policy (i.e. nature restoration law, climate law, EUDR) - National action plans/policies - Nature-based solution and restoration efforts frameworks (i.e. private sector, NGOs) - UNFCCC and climate science
	B) Monitor and assess the local and regional impacts considering different nature-based solution and different areas of “benefits” (i.e. climate, biodiversity, livelihoods)	• Vegetation structure and cover • Land surface temperature, albedo, soil moisture, water vapor • Related dynamics over time	• Landsat, Sentinel 2 time series, • Very high resolution data • ROSE-L, BIOMASS, GEDI • ENMAP/CHIME • S1/SMOS • Several ECV products	• Various EO time series analysis methods • Interoperability • Ground networks covering different nature-based solutions	

CSQ-58 Narrative

Are nature-based solutions delivering on multiple benefits?

Activities for improving ecosystems are stimulated by various international and national policy frameworks. These are commonly referred to as “nature-based solutions” and proposed and implemented by countries, private sector actors, NGO’s etc.. They include various landscape/ecosystem restoration efforts, the establishment of sustainable supply chains (for commodities, raw materials), different environmental certification schemes, and pursuing environmental/economic assessment frameworks. Nature-based solutions serve different purposes including benefits for climate, biodiversity, livelihoods etc. An important scientific question is whether these activities are actually providing the impacts and benefits they were set out to achieve; in particular whether they create synergies or trade-offs given their multiple objectives. Any independent and comparative scientific assessments require quality monitoring data that allow for tracking these activities, their impacts and performance over time. Such data can help to answer questions whether the activities are actually doing the right thing, at the right time and in the right place, and underpin up to date and robust scientific analysis and synthesis for future IPBES assessments for example.

The observation needs depend on type of activity and ecosystems characteristics but using Landsat, Sentinels and related data provide a good base for tracking activities. Different data streams can be useful for assessing impacts on climate (i.e. carbon), biodiversity (i.e. structure, conditions) . Essential is to time series that provide information on the scales where these activities are happening on the ground. Providing data in free and open manner should ensured to enhance transparency for the multiple stakeholders concerned with nature-based solutions. Geographically, the implementation and impact of nature-based solution can be clustered in areas where humans are most active (like in cities or production landscape) and these regions would need to receive specific attention.

References:

Hansen et al., 2021. Toward monitoring forest ecosystem integrity within the post-2020 Global Biodiversity Framework, Conservation Letters, 14,: 4, DOI: (10.1111/conl.12822)

IPBES (2019): Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. E. S.

Hollings, T. M. Burgman, M. van Andel, M. Gilbert, T. Robinson, A. Robinson (2018). How do you find the Green Sheep? A critical review of the use of remotely sensed imagery to detect and count animals, Methods in Ecology and Evolution, https://doi.org/10.1111/2041-210X.12973

Brondizio, J. Settele, S. Díaz, and H. T. Ngo (editors). IPBES secretariat, Bonn, Germany. 1148 pages. https://doi.org/10.5281/zenodo.3831673

Jaureguiberry et al. (2022) The direct drivers of recent global anthropogenic biodiversity loss, Science Advances, 8, eabm9982

Junker et al., (2023). List and specifications of EBVs and EESVs for a European wide biodiversity observation network, https://doi.org/10.3897/arphapreprints.e102530

Moersberger et al., (2023). Europa Biodiversity Observation Network: User and Policy Needs Assessment, https://doi.org/10.3897/arphapreprints.e84517

Senf C. (2022). Seeing the System from Above: The Use and Potential of Remote Sensing for Studying Ecosystem Dynamics, Ecosystems 25: 1719–1737, https://doi.org/10.1007/s10021-022-00777-2

Skidmore, A. et al., (2021). Priority list of biodiversity metrics to observe from space, Nature Eco Evo, 5, 896–906, https://doi.org/10.1038/s41559-021-01451-x

Ustin & Middleton (2021). Current and near-term advances in Earth observation for ecological applications, Ecological processes 10:1, https://doi.org/10.1186/s13717-020-00255-4

Verbesselt J. et al. (2016). Remotely sensed resilience of tropical forests. Nature Climate Change 6:1028–1031.

Xue, Y, Wang, Y., & A. Skidmore (2017) Automatic Counting of Large Mammals from Very High Resolution Panchromatic Satellite Imagery, Remote Sens. 2017, 9(9), 878; https://doi.org/10.3390/rs9090878