

Supplementary Materials

Table 1 How geodiversity and Essential Geodiversity Variables (EGVs) can help implement and monitor the UN Sustainable Development Goals and the Sendai Framework for Disaster Risk Reduction Priorities for Action

SOCIETY		EARTH SYSTEM	Geology			Geo-morphology	Soil		Hydrology		
			Hardrock/Fossils /Minerals	Unconsolidated deposits	Geophysical Activity	Landform Distribution	Chemistry	Physical State	Surface Water	Ground water	
Sustainable Development Goals (SDGs)	1	No Poverty									
	2	Zero Hunger									
	3	Good Health and Wellbeing									
	4	Quality Education ^[1]									
	5	Gender Equality									← Better access to clean water aids completion of education by girls ¹ (4.1/4.5)
	6	Clean Water and Sanitation									
	7	Affordable and Clean Energy									
	8	Decent Work and Economic Growth									
	9	Industry, Innovation and Infrastructure ^[2]									Scientific innovation to improve resource extraction efficiency ² (12.2)
	10	Reduced Inequalities									
	11	Sustainable Cities and Communities ^[3]	←								
	12	Responsible Consumption and Production ^[4]									
	13	Climate Action (see also Paris Agreement)									Geomorphology provides habitats and disturbance regimes supporting biodiversity ³ (14.2/14.5)
	14	Life Below Water				←					
	15	Life on Land (see also Aichi Biodiversity Targets)									
	16	Peace, Justice, and Strong Institutions									
	17	Partnerships									
Sendai Framework for DRR	1	Understanding Disaster Risk									
	2	Strengthen Disaster Risk Governance									
	3	Invest in DRR for Resilience	←								Disaster risk assessment integration into resource extraction industries ⁴ (30n)
	4	Recovery, Rehabilitation, Reconstruction									

Examples are given to the right of the table. Raising awareness of the role of all the EGVs in sustainable development is needed to achieve SDGs Targets 4.7. and 12.8. Enhanced scientific research on all the EGVs, and strengthened capacity in the Global south, are needed to achieve

SDGs Target 9.5.

References:

1. Njoh, A. J. et al. Electricity Supply, Access to Water and Improved Sanitation as Determinants of Gender-Based Inequality in Educational Attainment in Africa. *Soc. Ind. R.* 135, 533-548 (2018).
2. Gumulya, Y. et al. In a quest for engineering acidophiles for biomining applications: challenges and opportunities. *Genes* 9, 116-123 (2018).
3. Moore, C. et al. Submerged oceanic shoals of north West Australia are a major reservoir for marine biodiversity. *Coral Reefs* 36: 19-734 (2017).
4. Sharma, V., Franks, D. M. In situ adaptation to climatic change: mineral industry responses to extreme flooding events in Queensland, Australia. *Soc. & Nat. Res.* 26, 1252-1267 (2013). For a detailed version, see table S2

Table 2 Non-exhaustive list of proposed Essential Geodiversity Variables (EGVs), their definition, examples, and policy relevance.

EGV class	EGV	Definition	Examples	Policy relevance
Geology	Hardrock, fossil & mineral distribution	Geological materials and their spatial distribution	- Natural resources (e.g. coal, gas, ore)	- Economy - Geo/nature conservation - Environmental impact assessment - Pollution management
	Un-consolidated Deposits	Surface distribution of parent materials resulting from geomorphological processes	- Distribution / scarcity of materials (e.g. sand) - Dynamics of surface materials (e.g. sedimentation)	- Economic values of resources - Coastal defence - Combatting erosion - Hazard/risk assessment - Land use planning
	Geophysical processes	Variability of the intensity of geophysical processes	- Earthquakes - Volcanic eruptions - Earth radioactivity - Thermal energy - Land subsidence	- Early warning systems - Hazard mitigation - Hazard/risk assessment - Building regulations - Nature conservation

Geo-morphology	Landform distribution	Landforms and their spatial distribution	- Distribution of landforms resulting from erosion, transport, sedimentation - Dynamics of geo-hazards	- Hazard/risk assessment - Combatting erosion - Conservation - Evacuation plans - Flood regulation
Soil	Chemistry	Distribution and quantity of chemicals in the pedosphere	- Fertility - Soil salinization - Pollutants - Minerals	- Sustainable soil use directives - Pollution, environmental impact assessment - Agriculture
	Physical state	Distribution and quality of soil structure and texture	- Formation and degradation of soils - Soil erosion	- Soil conservation - Combatting desertification - Agriculture
Hydrology	Surface water	Distribution, permanence and quality of surface water and ice	- River dynamics - Drinking water quality / irrigation water volume - Dam construction	- Flood risk management - Irrigation planning - River training (dikes) - Sustainable water policies - Energy generation
	Ground water	Subsurface (ground) water resources	- Aquifer size and quality	- Sustainable groundwater policies - Land use planning - Groundwater rise - Agriculture - Drainage