# A multilayer framework for Archipielago sustainability

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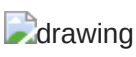
https://github.com/melian009/muas.git



## References

### Multilayer networks

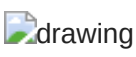

- Buldyrev, SV., Parshani, R., Paul, G., Stanley, HE., and Havlin, S. (2010). Catastrophic cascade of failures in interdependent networks, Nature, 464:1025–1028
- Gao J., Liu, X., Li, D., and Havlin, S. (2015). Recent Progress on the Resilience of Complex Networks. Energies, 8:12187-12210
- Melián, CJ, Matthews, B, Andreazzi, CS, Rodríguez, JP, Harmon, LJ, and Fortuna MA (2018). Deciphering the interdependence between ecological and evolutionary networks, TREE, 33:504-512
- Danziger, MM, and A-L, Barabási. (2022). Recovery coupling in multilayer networks. Nature comms, 13:955.

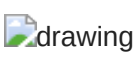

# Outline

## How can multilayer networks help to build a quantitative model for integrating resilience and sustainability?

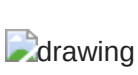
## Which states should an archipielago cross to connect global resilience to local sustainability?

In [4]:
```
from IPython.core.display import display, HTML
display(HTML("<style>.container { width:100% !important; }</style>"))
```





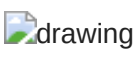
## How can multilayer networks help to build a quantitative model for integrating resilience and sustainability?

## Which states should an archipielago cross to connect global resilience to local sustainability?

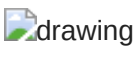
## Narrow sense sustainability

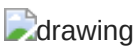
Usually one layer of interest, i.e., transition from external to internal energy sources or local temporal-dependent maps of biodiversity to detect sensitive areas or hot spots.



## Broad sense sustainability

Explicitly account for decentralization within and between layers, i.e., map decentralized hybrid PV-WT stations to data centers and to hot spots of biodiversity





## Take home message

- Most approaches in multilayer have detected extreme sensitivity to cascade failures in interdependent networks regardless their topology.
- The connection between global resilience and local sustainability requires the understanding of the interdependence at local, regional, and global scales of at least N-coupled networks, i.e., energy, water, distribution, regulatory frameworks, biodiversity and function maps.
- Multilayer networks might help as a framework to transition from narrow to broad sense sustainability: for example to connect decentralized hybrid PV-WT stations to data center networks to map biodiversity function hotspots