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Evidence integration for coherent policy: perspectives on managing soil-forest-water-climate interactions

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All-IUFRO Conference 2022
Plenary Session "Forests and Water" organised by Task Force and Division 8

Advancing a Nexus Approach to the Sustainable Management of Environmental Resources

Outline

- ❑ Forests for sustainable development
- ❑ Interactions with soil, water and climate
- ❑ Summary

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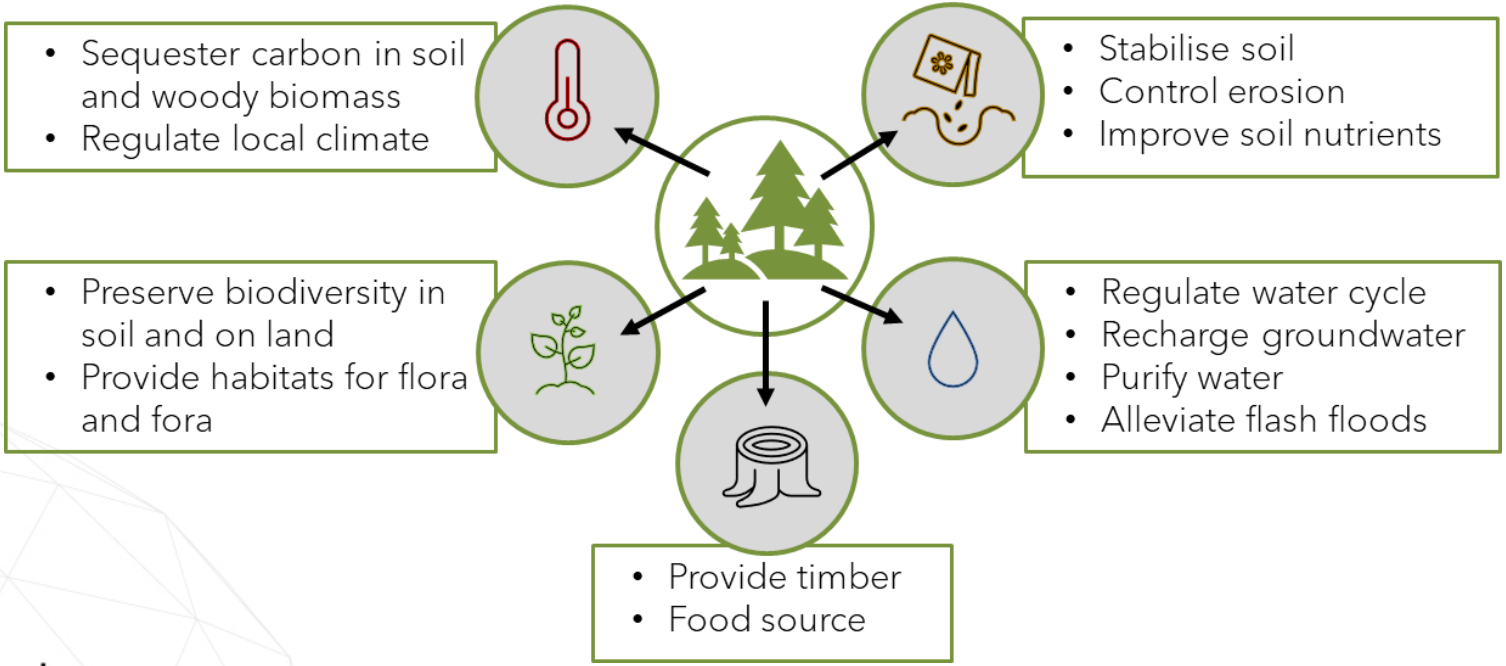
Forest System and Sustaianble Development



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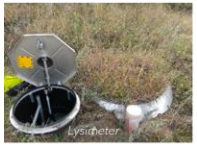
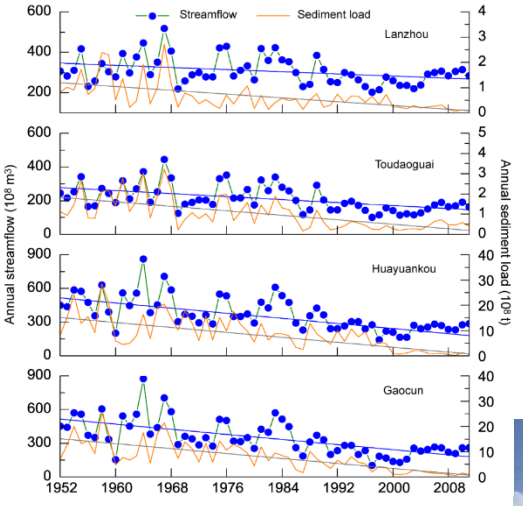
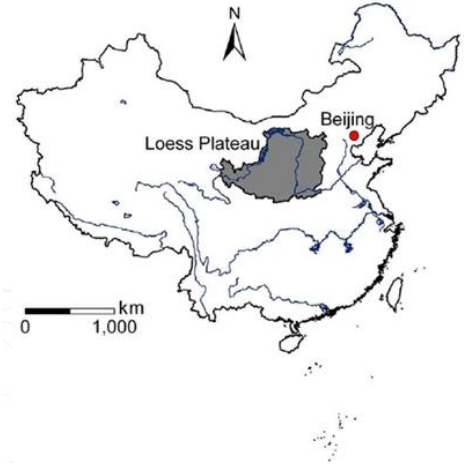
Loess Plateau, dryland China

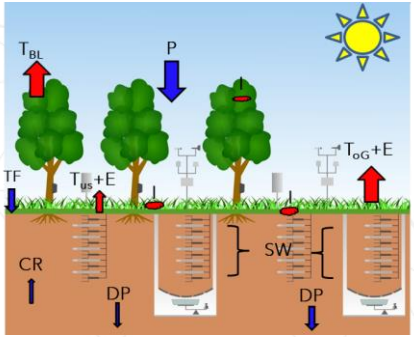
P = 510 mm & T = 10.2 ℃
~ 30-year plantation





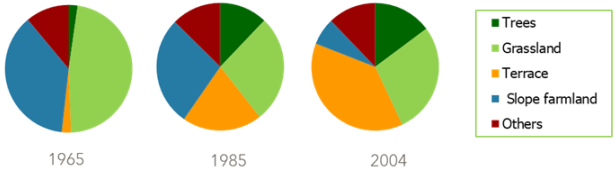
Source: Wang et al. 2016





Black locust plantation with understory
versus
adjacent natural grassland

P = precipitation
TF = throughfall
T_{BL} = black locust transpiration
T_{us} = understory transpiration
T_{oG} = open grassland transpiration
E = evaporation
I = Interception
SW = soil water storage
DP = deep percolation
CR = capillary rise



Forest-Soil-Water Interactions

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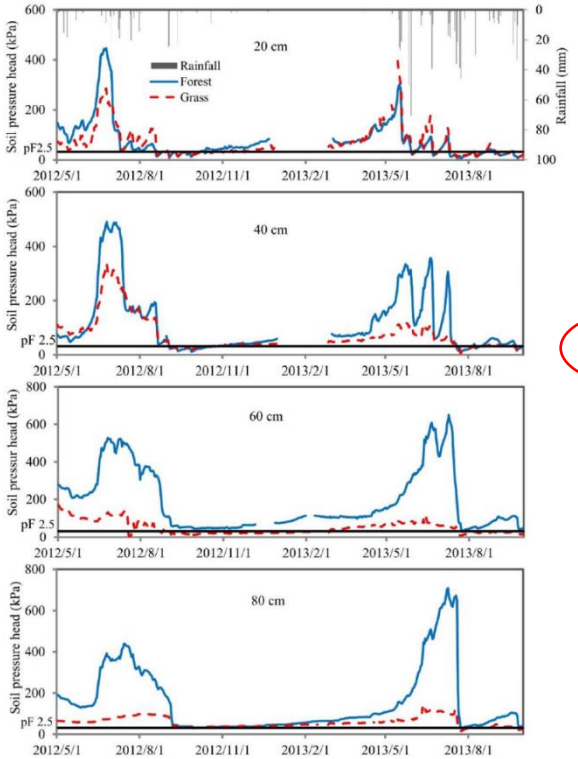
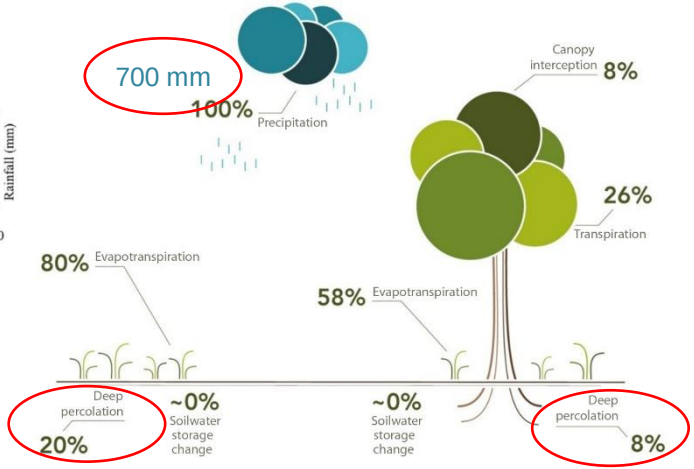
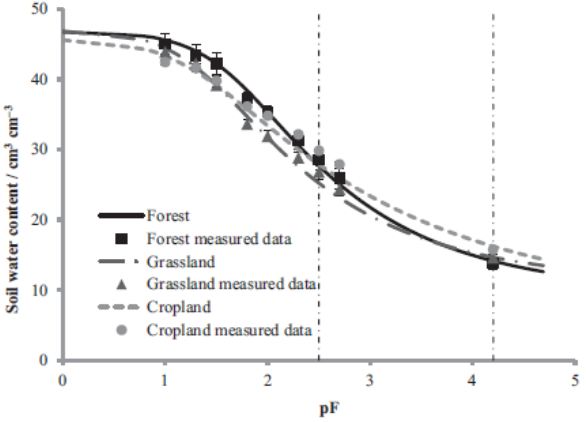
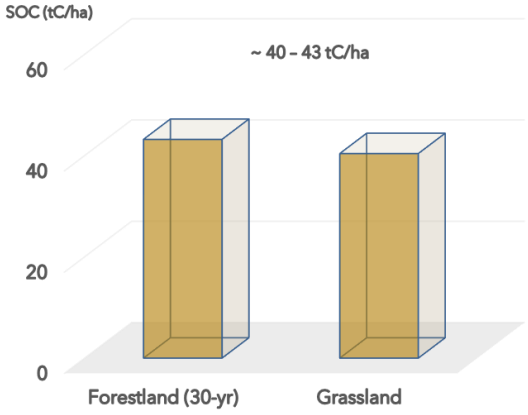
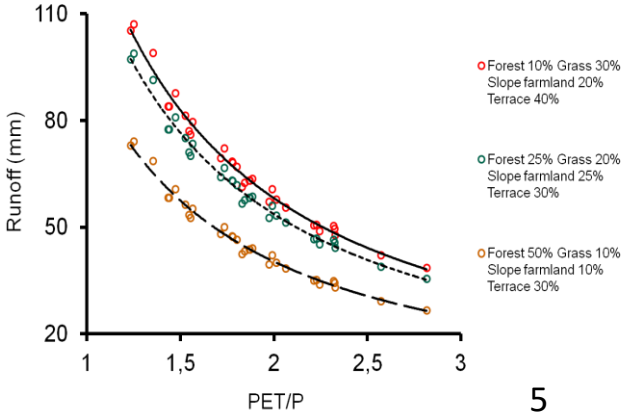




Topsoil 0-6 cm







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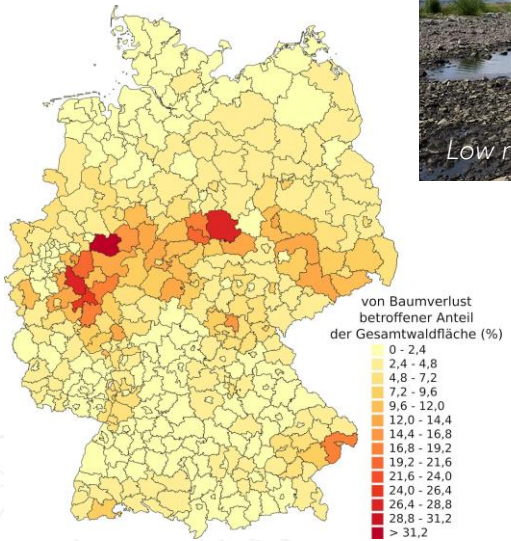
Drought: Germany's forest and water issues



Source: DLR

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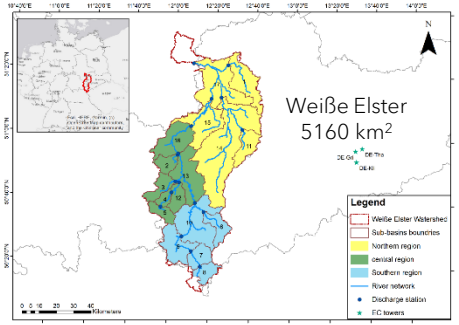

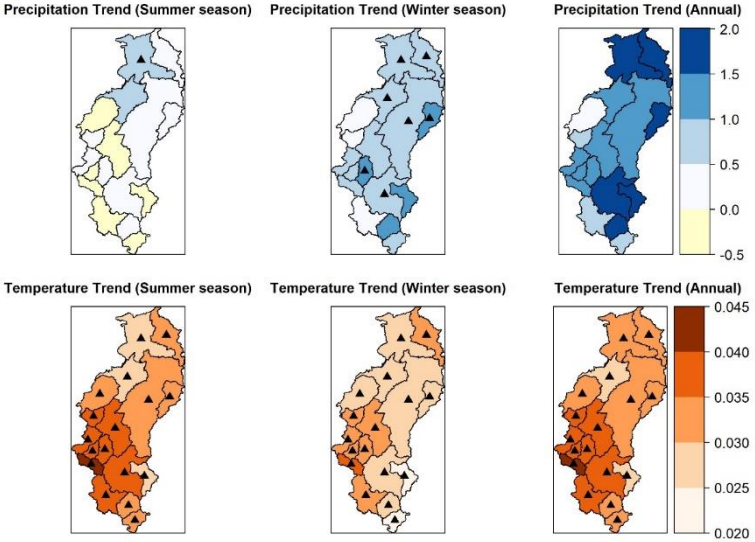

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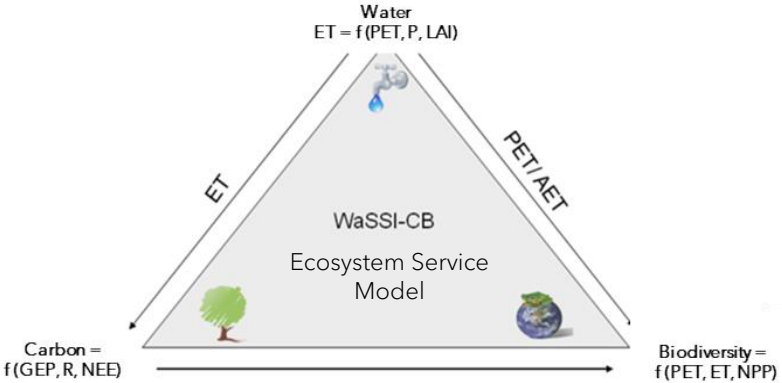
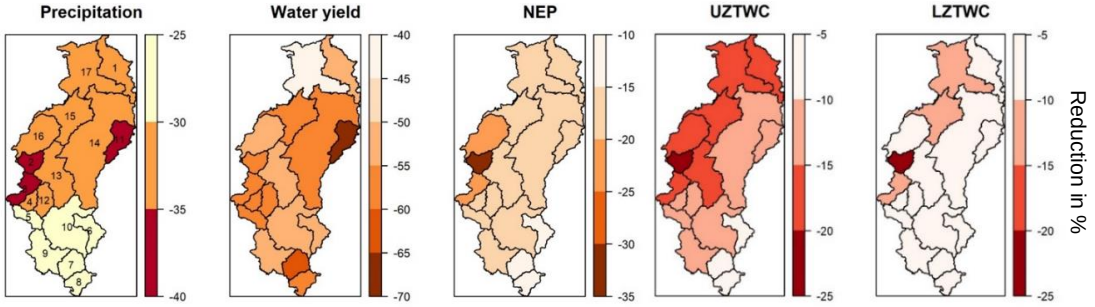
Forest-Water-Climate Interactions

Key issues under changing climate conditions

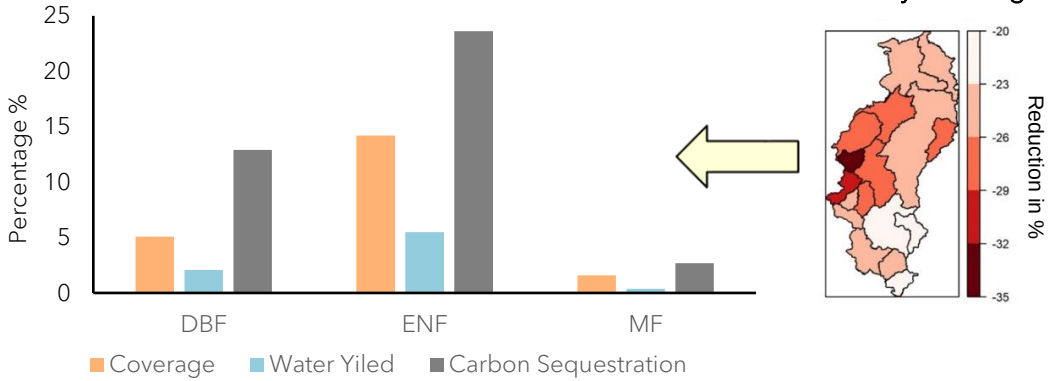
- ❑ Adaptation to increase water availability, including soil water and water yield
- ❑ Mitigation to enhance carbon sequestration
- ❑ Tradeoffs between managing forests for water and carbon services



Anomalies of summer drought events



Vulnerability to drought



Source: USDA Forest service

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Summary

- Forestation alters water cycle and may result in trade-off in water availability, but possible to increase water supply services by direct forest management measures!
- Forest management and structure transformation are a critical linkage to achieve multifunctionality and balance different ecosystem services
- More attention should be paid to stimulate soil carbon sequestration
- Re- and afforestation efforts require integration of Resource Nexus perspective and thinking beyond sectors for sustainable development
- Holistic understanding and comprehensive evaluation of interactions between forests, climate, soil and water, as well as their interactions with other sectors create adequate science base for deriving coherent policy

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