How humans affect local climate by landscape management

The distribution of solar energy in different types of land

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Introduction

Humans substantially affect the distribution of solar energy and water fluxes in landscape. In the temperate zone during a clear sunny day an area of 1ha receives up to 10 MW of solar energy. Less than 1% of this energy is used for photosynthesis, some of the incoming solar energy heats the ground (G) and some of it is reflected back to the atmosphere (R). However, the main part of this energy is converted into sensible (H) and latent heat (ET); the distribution between these two depends on the availability of water and type of land cover. In a relatively dry landscape solar energy heats the surface (pavement, dry soil) and warm air rises up to the atmosphere. On the contrary, in a landscape well stocked with water, the energy is mostly used for evaporation from surfaces and evaporation of water by plants (transpiration). From 100ha, on a sunny day every second at least 100 litres of water evaporates; nonvisible fluxes of water in form of water vapour can be much larger than visible fluxes of liquid water in streams, rivers etc.. However, the more the vegetation cover is vertically structured, the more water is kept in the short/local water cycle and the less is the landscape being heated.



Trees and forest play a large role in regulating the fluxes of atmospheric moisture and consequently also rainfall patterns over land and planetary cooling. Radical anthropogenic land use transformations have far-reaching implications for the climate, ecosystems, the sustainability of livelihoods and the survival of species, raising concerns about the long-term damage to natural Earth system functions (Ellison et al., 2016).

What can we do?

- protect the existing forests, decrease their fragmentation and keep their vertical structure
- mimic the functional forests in agricultural landscape by smaller tree stands with diverse structure and abundant shrub layer
- agricultural landscape should be more diverse, with smaller crop fields separated by hedgerows, with small structured tree stands and wetlands in order to keep as much water in the landscape on a local level as possible
- keep our towns green parks, hedges, tree avenues, lawns and even individual trees in urban areas are important for preventing overheating and the loss of water

References

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