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Increasing green infrastructure ecosystem services in urban areas

A new model has been developed that could help metropolitan areas adapt to climate change by increasing ecosystem services provided by green spaces and farmland through calculating the percentage of evapotranspiring surface for different types of land use and the degree of fragmentation between ecosystems. To demonstrate how it works, researchers have applied this 'land use suitability strategy' model to an Italian municipality.

Non-urbanised areas (NUAs) are outdoor places within built-up areas that have significant amounts of vegetation. They preserve biodiversity and provide ecosystem services, such as reducing air pollution and greenhouse gas (GHG) levels in cities. This means they could have an important role to play in urban adaptation to climate change, especially if they contain ecosystems that are well connected to allow water to easily escape into the atmosphere to produce a cooling effect. However, an increasing level of urban sprawl and densification, often the result of poor planning, is threatening NUAs.

The study presented a method that could guide land use planning of NUAs in metropolitan regions (consisting of dense, built-up urban areas and the surrounding, less built-up areas) to optimise adaptation to climate change.

The method informs policy by assessing two land features: the degree of fragmentation between the ecosystems and the level of water that escapes through evapotranspiration (a combination of evaporation of water and release of water vapour by plants). It was applied to a municipality of Mascalucia in the metropolitan area of Catania, Sicily, which is undergoing extensive urban sprawl.

For Mascalucia, parks/public gardens and farmlands had the highest percentage of evapotranspiring surfaces (92% and 83% respectively), whilst land used for manufacturing and trading had the lowest levels (8% and 12% respectively). The areas with the most dispersed ecosystems tended to be where residential areas had fragmented farmland, whereas the most connected ecosystems appeared in the areas where there was large parkland and more 'pure' agricultural use.

The study took this information on evapotranspiration and fragmentation to model the most suitable use of land for improving adaptation to climate change for Mascalucia. For example, areas with low evapotranspiration, irrespective of fragmentation levels, would benefit from urban green spaces to increase vegetation cover, whereas areas with high levels of evapotranspiration combined with high fragmentation would benefit from small gardens and playgrounds. In general, areas with well connected ecosystems would be better used for natural parks as part of an overall green grid. For this municipality, urban green spaces and community supported agriculture (food production partnerships between farmers and local residents) would be particularly beneficial.

The researchers suggest that the model represents a 'considerable improvement' in land use planning, and is particularly relevant for planning NUAs, which are often considered generic farmland or undefined urban green space.

Source: La Greca, P., La Rosa, D., Martinico, F. & Privitera, R. (2011) Agricultural and green infrastructures: The role of non-urbanised areas for eco-sustainable planning in a metropolitan region. *Environmental Pollution.* 159:2193-2202.

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