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New Insights for Understanding and Predicting Desertification

A team of researchers has developed a new integrated conceptual framework and operational scheme that takes into account the wide range of factors influencing changes that can result in desertification. This new approach could help to better understand and forecast spatial and temporal variations in desertification dynamics, thus improving our capacity to better target mitigation options.

Desertification is a worldwide phenomenon in arid and semi arid regions. Almost 40% of the Earth's surface and a fifth of the world's population are found in regions that are susceptible to desertification. It has important local, regional and global consequences including changes in the global carbon cycle, loss of biodiversity, spread of invasive exotic species, changes in the hydrological and nutrients cycle, and increased water and wind erosion of soils. Numerous studies have previously provided information on the dynamics of desertification in particular sites and their results have been extrapolated to a greater scale. However, desertification is a very complex issue, and the high spatial and temporal variations in ecosystem patterns and dynamics across different scales can not be properly explained using current conceptual frameworks. It is probably for this reason that researchers and land managers have not yet been successful in developing sustainable strategies to combat desertification and the options for mitigating or reversing current desertification trends remain limited.

American researchers recently developed an integrated conceptual framework and operational scheme that takes into account the wide range of factors influencing changes that can result in desertification. This new approach could help increase understanding and forecast spatial and temporal variations in desertification dynamics across a range of scales. It includes five interacting elements to explain the dynamics of these variables:

- Historic legacies
- Environmental driving variables
- Soil typography and patterns
- The influence of wind, water and animals as they transport water, nutrients, soil particles, plant litter and seeds
- The redistribution of resources within the landscape units

The researchers propose a six-step operational scheme to clear up the complex influences of these variables. The first step is to "look up" to assess the broad scale variation in environmental drivers and their connections. The second step is to "look back" in time to determine the role of past events on the present landscape. The third is to "look around" to determine the spatial properties of the landscape units and the influence of wind, water and animals as connecting transport vectors. The fourth step is to "look down" to determine the key local properties (fast and slow moving variables) and processes (plant, animal and soil) that influence patterns and dynamics of the landscape. The final step is to "look forward" in time to the effects of variable environmental factors from the current landscape structure to the future dynamics.

The current study provides new insights into previously unexplained patterns and dynamics regarding desertification. It could help to improve researchers' ability to forecast future dynamics, and to guide management decisions by selecting locations on the landscape that are most likely to respond to mitigation actions.

Source: Peters D. et al. (2006) "Disentangling Complex Landscapes: New Insights into Arid and Semiarid System Dynamics", BioScience 57 (6): 491-501.

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