

Global warming threatens plant diversity

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Senecio inaequidens, a plant native to the mountains of South Africa, has been spreading rapidly along the roads and railway embankments in Germany since the 1950s. According to the study, climate change could provide habitat space for additional species in cool and temperate regions worldwide, which may then become strong competitors for native species. © W. Barthlott, University of Bonn

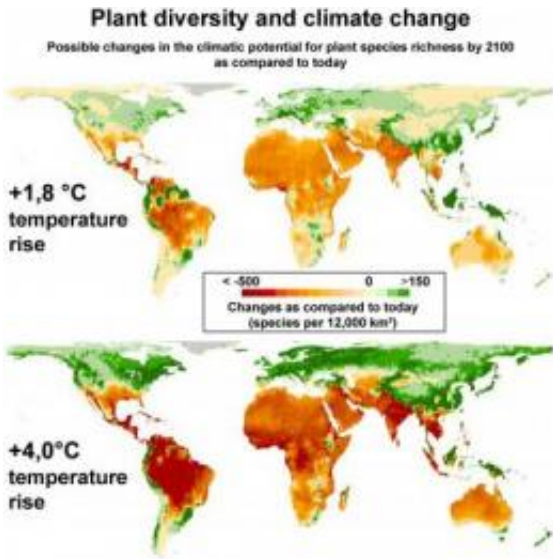
In the coming decades, climate change is set to produce worldwide changes in the living conditions for plants, whereby major regional differences may be expected to occur.

Thus today's cool, moist regions could in future provide habitats for additional species, and in arid and hot regions the climatic prerequisites for a high degree of [plant diversity](#) will deteriorate. This is the conclusion reached in a new study by scientists at the Universities of

Bonn, Göttingen and Yale, and published in the [Proceedings of the Royal Society](#) London.

Dr. Jan Henning Sommer of Bonn University's Nees Institute for Biodiversity of Plants asserts, "[climate change](#) could bring great confusion to the existing pattern of plant diversity, with scarcely predictable consequences for our ecosystems and mankind". The potential impact of climate change on global plant diversity has now, for the first time, been quantified and modeled on a regional basis. The researchers have investigated the numbers of [plant species](#) to be found in different regions under current climatic conditions, and the subsequent interrelationship they uncovered has now been applied to 18 different climate change scenarios for the year 2100.

However, the study does not permit any predictions regarding the degree to which the biodiversity of any given region will, in fact, adapt to new conditions or, in other words, whether additional species will migrate into favoured regions, or whether disadvantaged areas will in reality suffer mass losses of species. "That would be fortune-telling. The adaptability of species and their interactions in the ecosystem can, like human landuse, exert great influence on their distribution. This is a field about which we still know far too little", Sommer explains. Nevertheless, the published results do provide an important pointer to the likelihood of the scales of immigration or losses to be expected in given areas.



Climate change will have a clear impact on plant diversity worldwide. Today's cool and moist areas could in future offer habitats for additional species (green areas on the maps), in arid and hot regions the climatic prerequisites for a high species richness will deteriorate (orange-red areas on the maps). The illustration shows a comparison of the conservative 1.8°C scenario (IPCC B1) and a 4.0°C scenario (IPCC A1FI) which, if present climate policy is maintained, is clearly the more likely. (c) University of Bonn

Globalization in the Plant Kingdom

It is possible that the worst effects of global warming on plant species numbers could be felt in the tropical Amazonian rain forests in South America. For Germany and other temperate regions worldwide, on the other hand, scientists are expecting future climatic conditions which will promote the provision of habitat space for an increased number of species. "But this can scarcely be described as a gain as the intensified redistribution of plant species will promote worldwide uniformity in the regional composition of species at the expense of unique species which have adapted to special habitat conditions", says Sommer. And as a result, globalisation would also come to the plant kingdom.

In their study, the researchers have emphasised the clear division of our planet into two parts as regards the impact of climate change on plant diversity. "Additional capacity for plants species richness could be created everywhere where today cool and moist climatic conditions prevail", says Dr. Holger Kreft, the young research scientist from Bonn and co-author of the study, who has meanwhile assumed an appointment as junior professor at Göttingen University." On the other hand, in areas which today have a hot tropical or sub-tropical climate the prerequisites for high species numbers will deteriorate".

The main Originators of Climate Change less affected

This division also has a political dimension: favoured areas coincide largely with the industrialised nations, who are responsible for the majority of global warming due to their high amount of greenhouse gas emissions. The study also points clearly to the consequences of a half-hearted climate policy. Should the global temperature rise by 1.8°C with respect to the year 2000, then the proportion of favoured and disadvantaged regions in terms of species richness would still remain in balance. "Even if the climate protection goals agreed in Copenhagen are achieved, we would still tend to be heading for a rise in temperature of up to 4°C", says Sommer. In this case, the projected losses of capacity for plant species richness would considerably exceed possible gains in other regions.

"Politicians throughout the world should be paying greater attention to the impact of climate change on biodiversity as this is the basis of our human existence", demands Professor Dr. Wilhelm Barthlott, Director of the Nees Institute and co-author of the study. He and his study group have been investigating global plant diversity for 15 years. Barthlott welcomes the fact that the United Nations has declared 2010 to be the year of biodiversity. "This was an important signal!".

Provided by University of Bonn

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