climate change adaptation & sustainable development

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6°C
11°F

>30 days over 95°F each year!

change in avg T (°C)

2081-2100

IPCC 5th Report
900,000 species
What do we do?
STOP!

3700 Gt

Global Carbon Project
economic revolution
Mitigation
Adaptation
...holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C above pre-industrial levels...
Mitigation
50
Adaptation 85
... strongly urges developed country Parties to scale up their level of financial support, with a concrete roadmap to achieve the goal of **jointly providing USD 100 billion annually by 2020** for mitigation and adaptation ...
Adaptation
1. Paris set mitigation and adaptation goals.
2. Adaptation needs investment.
3. Need to bend curve in adaptation.
4. Migration is an adaptation strategy.
5. Nature is an adaptation strategy.
1 Paris set mitigation and adaptation goals
2 Adaptation needs investment
$500B per year
Financing gap

Fund: $483 million
Goal: $100 billion/2020
1. Paris set mitigation and adaptation goals
2. Adaptation needs investment
3. Need to bend curve in adaptation
Country index

- 45 indicators
- 180 countries
- 1995-2017
- open & authoritative data

Rigorous and Evolving

The ND-GAIN Country Index has been designed by experts and is improved under a continuous open review process. See our methodology.

ND-GAIN Index Country Rankings

<table>
<thead>
<tr>
<th>Top 5 Countries</th>
<th>Score</th>
<th>Bottom 5 Countries</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Zealand</td>
<td>81.8</td>
<td>Dem. Rep. of the Congo</td>
<td>31.5</td>
</tr>
<tr>
<td>Norway</td>
<td>81.4</td>
<td>Sudan</td>
<td>30.2</td>
</tr>
<tr>
<td>Denmark</td>
<td>80.4</td>
<td>Central African Rep.</td>
<td>28.9</td>
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<tr>
<td>United Kingdom</td>
<td>79.0</td>
<td>Chad</td>
<td>28.9</td>
</tr>
<tr>
<td>Germany</td>
<td>78.9</td>
<td>Eritrea</td>
<td>24.8</td>
</tr>
</tbody>
</table>
Years to reach average adaptive capacity of OECD

- BRIC
- HIC
- Global Avg
- LIC

www.gain.org
1. Paris set mitigation and adaptation goals
2. Adaptation needs investment
3. Need to bend curve in resiliency
4. Migration is an adaptation strategy
2010-2015
until migration

Vulnerability
- Water
- Food
- Ecosystems
- Health
- Human Habitats
- Infrastructure

Exposure
Sensitivity
Adaptive capacity
Managed relocation

Intervention to reduce negative effects of climate change

Intentional movement of species from current range to where predicted to live in the future.

Richardson et al. 2009 | Cartoon by Boston Globe 2008
A Hunt for Seeds to Save Species, Perhaps by Helping Them Move

By ANNE SAVER

CHICAGO — Pitcher’s thistle, whose fuzzy leaves and creamy pink petals once thrived in the sand dunes along several of the Great Lakes, was driven by development, drought and weeds into virtual extinction from the shores of Lake Michigan decades ago.

But in the 1990s, seeds collected from different parts of the thistle’s range were grown at the Chicago Botanic Garden and planted with the help of the Morton Arboretum along the lake, in Illinois State Beach Park, north of Chicago near the Wisconsin state line. The plants from Indiana’s dunes to the south are doing well; the plants that had come from the north are failing.

With those mixed results in mind, scientists from the botanic garden are sending teams out across the Midwest and West to the Rocky Mountains and Great Basin to collect seeds from different populations of 1,500 prairie species by 2016, and from 3,900 species by 2030. The goal is to preserve the species and, depending on changes in climate, perhaps even help species that generally grow near one another to migrate to a new range.

Is it wise or foolish to assist with the migration of plants?

“Perhaps in 50 to 100 years, because habitats or climates are so altered, we might end up trying to move species in a restoration context, to assemble them in new ways,” Dr. Vit said.

Paul Voss, a conservation scientist and curator of the Dixon National Tallgrass Prairie Seed Bank at the botanic garden, is seeking permits to test the concept with wet plants, by pushing it into new, colder territory along the shores of Lake Ontario. "It may be that we could grow an individual species in a few years," Dr. Vit said.

But assisted migration, as it is called, is actually a debated issue. One side are those like the botanic garden scientists, who argue that the risks are better than doing nothing.

“Those who believe that climate change is likely to be very rapid and that seeds only disperse a few hundred yards, had it ‘naturally’,” said Kaye Havens, the botanic garden’s director of plant science and conservation.

While the debate continues, scientists at the botanic garden are building the needed collections and assessing the adaptation of different populations of species.

In September, they moved collections of 800 Midwest species — made up of 300,000 seeds — from their old home in four large freezers, hardly different from the kind a large family might use to store homemade produce and a side of beef.

"The first time I walked in here, I started to cry," Dr. Vit said. "I know what a disaster is in the world.

Is it wise or foolish to assist with the migration of plants?

Seeds of Success, started in 2005 in response to a Congressional mandate to plant native seed in restoring public lands destroyed by wildlife, began its first major restoration initiative in June 2006. A consortium of botanic gardens and other institutions has sent 65 teams across the country, which so far have collected more than 30,000 species.

"We hope to connect 20 populations across the species’ ranges so we can get 95 percent of the genetic diversity of the species," said Peggy Orwell, the plant conservation program manager at the arboretum. "Because frankly, we don’t know what it is if we’re going to need when we’re talking restoration in light of climate change. It’s going to be one big experiment."
Planning for migration

- Identify regions with fastest change
- Identify climate refugia
- Plan parks & reserves to receive migrants
- Build corridors
- Facilitate migration

Middle Eastern migrants to Europe

Hellmann & Ackerly. 2015
1. Paris set mitigation and adaptation goals
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habitat conservation
restoration
25% = 2°
100% = 5°

Sharma et al. 2017
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~hopeful future~
prosperity
prosperity
freedom
prosperity
freedom
stewardship
Thank you!