



# CASCADE

Catastrophic shifts in drylands:  
How can we prevent  
ecosystem degradation?

**NEWSLETTER 4**  
March 2017

<http://www.cascade-project.eu/>

## **Final Plenary meeting and Policy Forum in Matera, Italy**



*Photo by Erik van den Elsen*

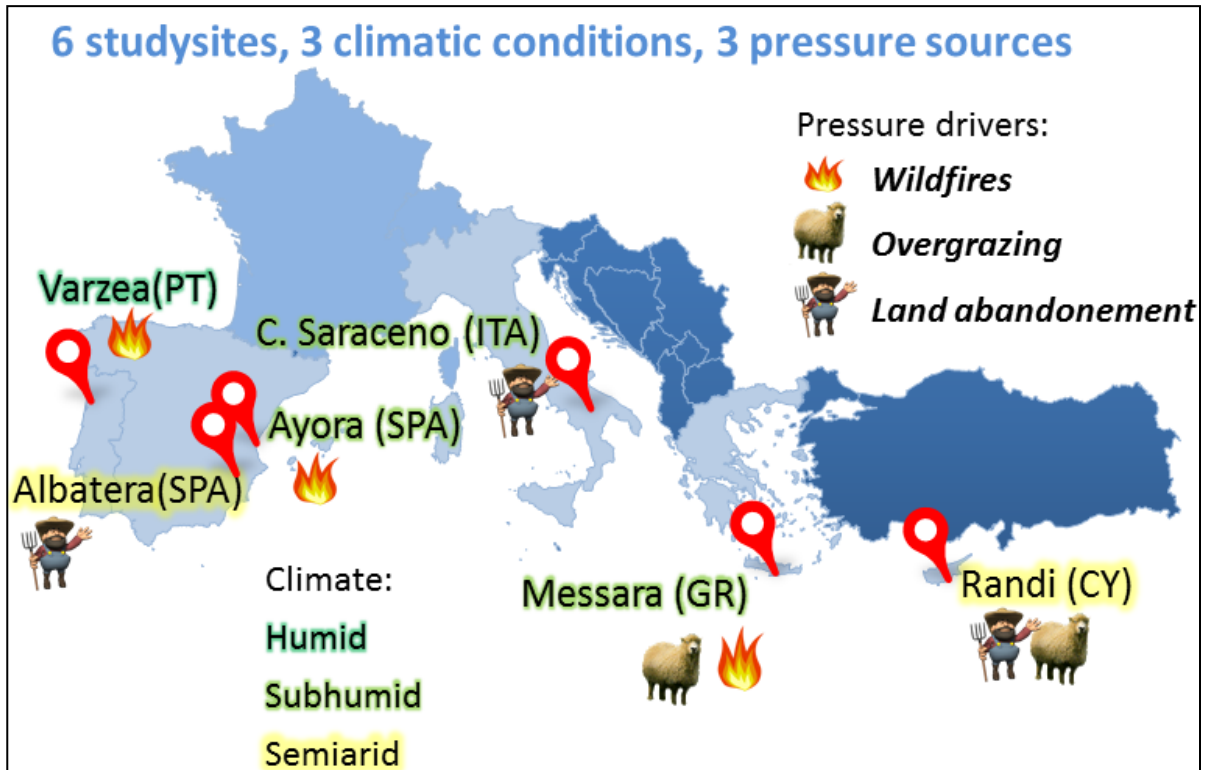
In February 2017 we enjoyed our final plenary meeting in Matera, Italy. This included a field visit to Digilio farm to observe the challenges of farming in an area prone to severe soil erosion (p4), and a Policy Forum to share recommendations with stakeholders and policy makers, at local, EU and UNCCD levels (p5).

Now that experiments and modelling are complete, CASCADE Project partners are better able to answer some key questions about discontinuous shifts or tipping points in dryland ecosystems around the Mediterranean:

- 1. What are sudden ecosystem shifts?**
- 2. What processes happen in the soil and plants during a shift?**
- 3. How can we manage vulnerable ecosystems better?**

The answers to these questions are being compiled and made available on our information system CASCADiS <http://www.cascadis-project.eu/> (p3)

Our study sites in parts of dryland Portugal, Spain, Italy, Crete and Cyprus have been used to establish more precisely the details of changes to the soil and plant ecosystems, particularly due to forest fires, overgrazing and land abandonment.



*Drivers of land degradation in the study sites (Schwilch et al.)*

CASCADE research has demonstrated that increasing green vegetation does not always mean that biodiversity or ecosystem services are improved. There are complex ecological interactions between plant species, for example changing the nature of distributions or gradients of soil moisture, plant nutrients and soil organic matter. These interactions have important roles for the management of land degradation affected by grazing, fire or land abandonment.

See the CASCADE website <http://www.cascade-project.eu/> for details of research results. CASCADE researchers have already published more than 30 papers in peer-reviewed journals.

# CASCADiS information system developments since May 2016 – website content. See: <http://www.cascadis-project.eu/>

### Key messages

What is a tipping point? An animation explaining what a tipping point is, using an example of a semi-arid grazing ecosystem.

Video clips to explain how science is being used to increase our understanding of ecosystem shifts in drylands. [Read more](#)

Posters, factheets and longer booklets written in non-scientific language of interest to a wide range of stakeholder audiences, from policy makers to school children. [Read more](#)

Newsletters highlighting and illustrating the research being done to understand ecosystem shifts at particular CASCADiS study sites. [Read more](#)

### Study sites

Dr Jan Jacob Kieber explains why drylands are important and what particular threats they face [S21]

CASCADiS has investigated six areas (or study sites) in southern Europe in three climatic conditions (humid, subhumid or semiarid) and under three driving pressures (wildfires, overgrazing or land abandonment). In each of these study sites ecosystem shifts have occurred, or are likely to occur, with associated consequences for the vegetation, the animals, and the people living there.

Vrzeva, Portugal

Albaterra, Spain

Ayora, Spain

Castelcarazeno, Italy

Messara, Greece

Randi Forest, Cyprus

### Key Messages

Booklets, factheets and video clips provide information about drylands, ecosystem shifts and the management of vulnerable ecosystems in succinct and easy to read formats.

### Understanding and managing shifts in dryland ecosystems

Dr Violette Gessen explains what the CASCADiS project is about.

### CASCADiS study sites

CASCADiS has investigated six areas (or study sites) in southern Europe where ecosystem shifts have occurred or are likely to occur, with associated consequences for the vegetation, the animals, and the people living there.

### What are sudden ecosystem shifts?

Like other ecosystems, under certain pressures dryland ecosystems can suddenly shift to a new state characterised by a different structure, species composition and/or functioning. Once an ecosystem has shifted, it is not likely to return to its previous state.

### What processes happen in the soil and plants during a shift?

The key to understanding when and how sudden ecosystem shifts occur lies in knowledge of the delayed processes operating between plants, soil and water.

### How can we manage vulnerable ecosystems better?

Sustainable management of drylands involves recognising signs of impending shifts and adapting land use practices to prevent or mitigate them.

### Sudden ecosystem shifts

Dr Ramon Vallejo explains what are sudden ecosystem shifts [4:11]

Drivers of change in the study sites

Structural and functional changes associated with regime shifts

Documented and evaluated natural resource management practices

Adaptation strategies of local land users

### Soil & plant processes

Dr Susana Trnka explains what processes happen in an ecosystem during a sudden shift [2:58]

Critical changes preceding a catastrophic shift (Report D3.1) [Read more](#)

Potential for sudden shifts in ecosystems (Report D4.1) [Read more](#)

What is the role of increasing environmental pressure? (Report D4.2) [Read more](#)

Experiments to trigger thresholds in ecosystem functioning (Report D4.3) [Read more](#)

Simulated pressures and ecosystem responses (Report D6.1) [Read more](#)

### Management

Dr Gudrun Schweich explains how we can manage vulnerable dryland ecosystems better [5:14]

Appropriate indicators for critical thresholds (Report D6.2) [Read more](#)

Restoration potential for preventing and reversing regime shifts (Report D5.2) [Read more](#)

Resilience of natural resource management practices (Report D7.2) [Read more](#)

Comprehensive guidelines for natural resource managers (Report D7.3) [Read more](#)

Costs and benefits of interventions (Report D8.2) [Read more](#)

Multi-scale evaluation with policy makers (Report D8.3) [Read more](#)

## Field visit to an organic farm, Municipality of Basilicata

Wednesday February 22<sup>nd</sup>, 2017

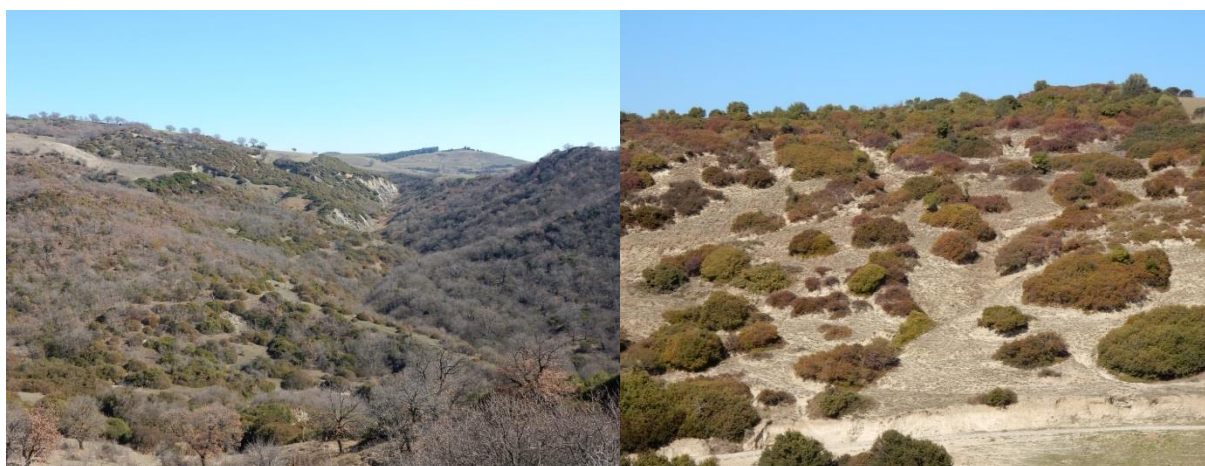
By Rudi Hessel

On the way to the farm we could observe different stages of land degradation, especially through erosion by water on the soils and soft geology. These stages ranged from rills in cropland to extensive badland complexes.

At the farm we received explanation about cropping (especially durum wheat) and livestock (goats and sheep). It was demonstrated that a cease in grazing due to abandonment resulted in an increase in bushes and trees (left photo), which increases fire risk. Once such abandoned areas are covered by vegetation, a return to agricultural use becomes difficult. In addition, owners do not earn any income from these areas anymore. Hence, from a socio-economic point of view, abandonment results in degradation.

In the grazed areas clear vegetation patterns could be observed (right photo), and it was evident that plants growing in the middle of the patches were protected from grazing by the plants at the edge of the patch.

Experiments conducted as part of the CASCADE Project have demonstrated how the ecology of plant communities in such landscapes respond to pressures (such as from grazing or climate) in a non-linear manner, and that there may be sudden shifts that may or may not be reversible.



*Left: Area abandoned around 25 years ago. Right: Vegetation patterns in grazed area (Photos by Rudi Hessel)*

# CASCADE POLICY FORUM

Friday 24<sup>th</sup> February 2017

The CASCADE Policy Forum was planned to provide discussions between researchers, stakeholders and policy makers at local, municipal, national, EU and UNCCD levels. What do stakeholders find most interesting about CASCADE? How far can CASCADE results contribute to policy making? The results will feed into our Deliverable 8.3 Report on multi-scale evaluation with policy makers.



*The CASCADE Policy Forum (left) with two of the invited contributors (right), Sergio Zelaya (FAO) and Victor Castillo (UNCCD). Photos by Erik van den Elsen*

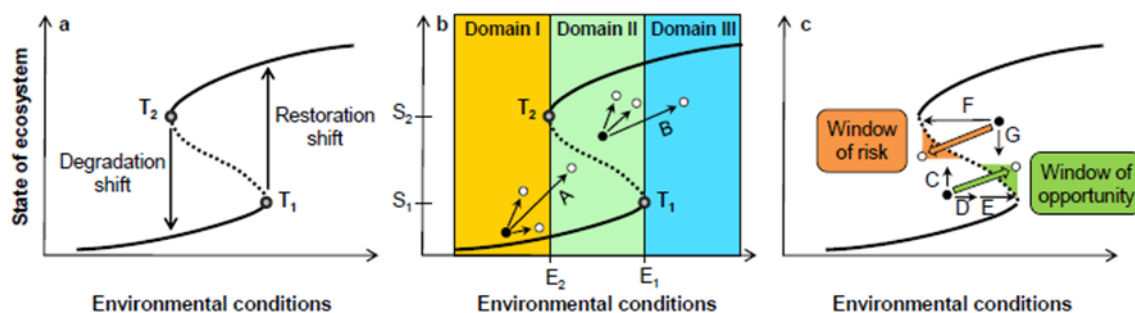
**Luca Braia** (Councillor representing Agriculture and Forestry in the Basilicata Region) described a major goal for the Basilicata Region to increase agricultural production while also conserving energy. Good communication between actors is essential, with public and private stakeholders coming together to design projects to raise the level of awareness and knowledge of the agricultural sector. In the Basilicata region a Smart Specialization Strategy will guide research, innovation and business support for agricultural policies and stimulate quality products based on sustainable management of natural resources.

*«Our ecosystems are damaged by a combination of environmental and human factors, and we need appropriate and efficient land management decisions both inside the EU framework and implemented at national, regional and local levels, to prevent direct and indirect impacts on our lives.»*

**Victor Castillo** (representing the UNCCD secretariat) explained the concept and advancement of Land Degradation Neutrality, one of the targets (target 15.3.1) included in the UN Sustainable Development Goals. It may not be realistic to stop land degradation, but we can plan measures to maintain and improve the amount and quality of land resources within the same land type.

The fundamental idea of LDN is to achieve no net loss of land-based natural capital; through measures to avoid and reduce land degradation combined with measures to reverse past land degradation. Values of losses and gains may be estimated and monitored using indicators related to a base-line. The three global impact indicators are: Land Cover Change, Land Productivity (net primary productivity) and Carbon stocks (soil organic carbon).

CASCADE contributes to the aims of LDN by providing insights into the ecology and dynamics of drylands, and also refinement of land management recommendations that support sustainable land use. Cost-effectiveness and efficiency can be enhanced by considering the non-linear fluctuations of ecosystem regimes, and identifying risks and opportunities for adaptation, especially with regard to climate-change.

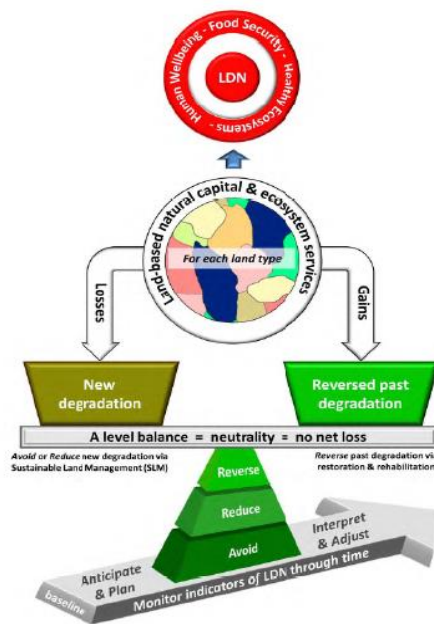


CASCADE researchers are providing some answers. From: Sietz et al., 2017 Learning from non-linear ecosystem dynamics is vital for achieving land degradation neutrality. Land Degradation and Development (in press) DOI: 10.1002/ldr.2732

**Sergio Zelaya** (from the Land and Water Division of FAO) focussed on the targets of the UN Sustainable Development Goals. Land Degradation Neutrality is target 15.3, along with sustainable agriculture (2.4) and sustainable forest management (15.2). Climate-smart agriculture (CSA) is a useful approach used by FAO, “that helps to guide actions needed to transform and reorient agricultural systems to effectively support development and ensure food security in a changing climate. CSA aims to tackle three main objectives: sustainably increasing agricultural productivity and incomes; adapting and building resilience to climate change; and reducing and/or removing greenhouse gas emissions, where possible.”

<http://www.fao.org/climate-smart-agriculture/en/>

There are various mechanisms to achieve more integrated Incentives for Ecosystem Services, using a better combination of policy instruments, including co-financing, training, and promotion of sustainable land management, assisted by FAO's decision support system. The CASCADE Project supports all these aims.



*From UNCCD Scientific Conceptual Framework for Land Degradation Neutrality*

**Panos Panagos** (on behalf of Peter Wehrheim, DG-CLIMA) provided input from the EU. Of particular importance is promotion of transition to a low emissions economy. According to the Paris Agreement EU countries are required to limit their emissions to help keep global warming below 2°C, with regular reviews to ensure these commitments can be increased in line with scientific advice.

During discussions a number of recommendations emerged, for example:

1. **Small non-linear changes in ecosystem responses can translate into large changes in the provision of ecosystem services**
2. **Policies and management guidelines need to incorporate flexibility to respond to sudden shifts**
3. **Increased resilience must incorporate consideration of the varying timescales of processes, technologies and policies**
4. **Soil properties, especially soil organic carbon, must be better integrated into policies in order to make a stronger impact**
5. **Knowledge sharing continues to be a challenge. It is important to use the common language of policy makers to communicate scientific research findings to them**

In the afternoon a Round Table discussion involved Susana Bautista (UA), Diana Sietz (WU), Gianni Quaranta (UNIBAS) from CASCADE; with Victor Castillo (UNCCD), Sergio Zelaya (FAO), Panos Panagos (EU-JRC), Riu Pombo (stakeholder from Portugal; fires), George Papadavid (stakeholder from Cyprus; grazing), Donato di Stefano (stakeholder from Italy; land abandonment), Angelica Saggese (Italian Senate), plus a video message from Gianni Pitella (former Vice-president of the European Parliament).

Lindsay Stringer (moderating the Round Table) asked participants to respond to a set of questions:

1. **What were the most surprising findings from CASCADE?**
2. **How do CASCADE results inform your work?**
3. **What enablers do you need, or what is currently missing, which could help you use our CASCADE project results?**
4. **What knowledge gaps remain?**

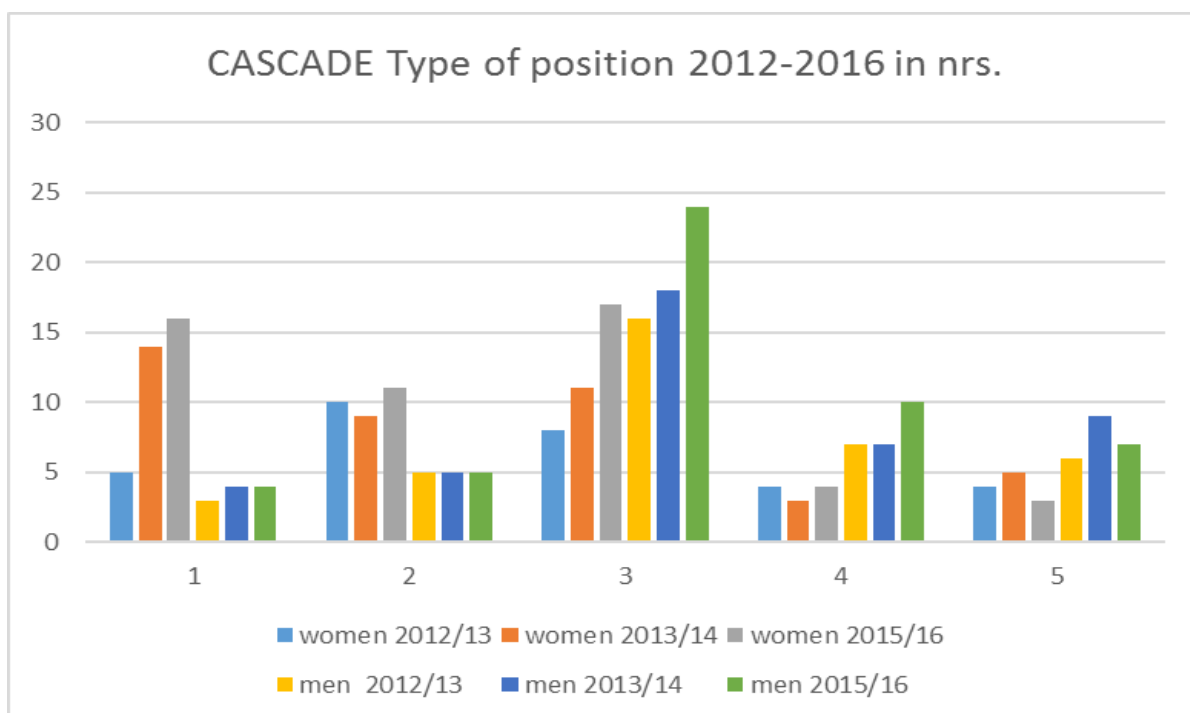
Some important points that emerged included:

- **Although ecosystems can change rapidly, associated socio-economic responses may be slow**
- **The more stakeholders are involved, the better the guidelines for policy can be**
- **Policy makers rely on scientists to provide information they can use in their decision-making. Clear roles and responsibilities are required so that scientists provide information in appropriate ways and at the appropriate times.**
- **There are opportunities for knowledge sharing, e.g. the UNCCD's knowledge hub, that must be used to make research results more accessible to national governments**
- **Policies must be clear about their aims, for example whether they target people or the environment, or both**
- **Carefully chosen incentives may help people take notice and act**
- **It is cheaper to prevent land degradation than to restore land degraded already**



## Gender balance in the CASCADE Project

It is recommended that all EU research projects should take active measures to achieve the best balance of gender as possible, both among researchers and among the stakeholders who are involved with the project. With regard to researchers, an analysis of the numbers of men and women employed in different roles between 2012 and 2016 does show a good balance.



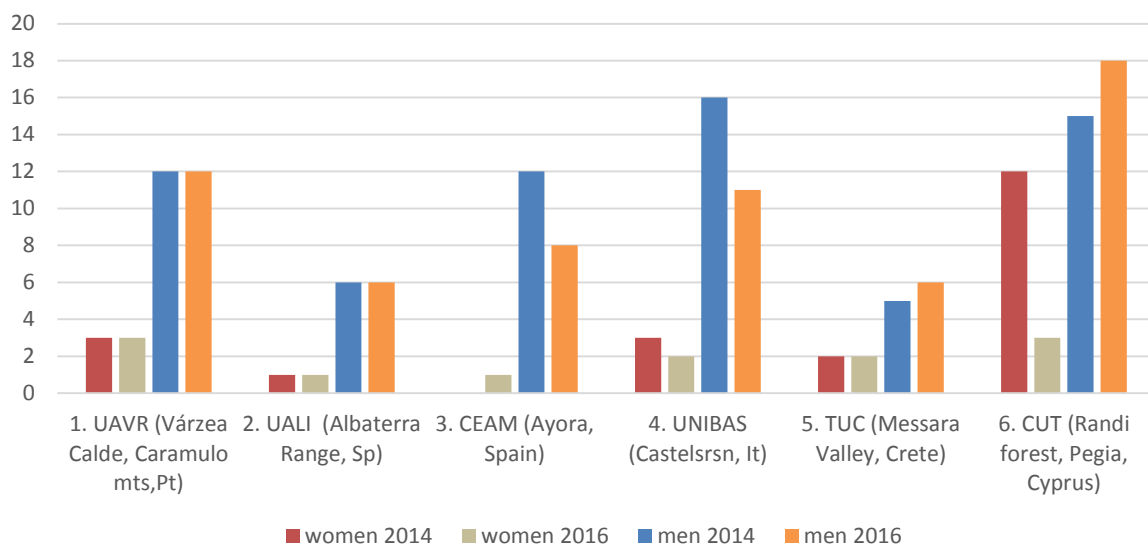
1=other staff; 2=early researcher; 3=experienced researcher; 4=science team leader; 5=scientific manager

CASCADE research	2012	2014	2016	Av
women	31	42	51	41
men	37	43	50	43
total	68	85	101	85

Throughout the project there have been similar numbers of female and male researchers involved, and in 2016 there were 51 women and 50 men.

Achieving a gender balance among stakeholders is much more difficult, and this proved to be impossible in this project. A graph of gender balance for each of the six study sites shows that women were involved, but

## Number of stakeholders (m/w) in CASCADE study sites 2014 and 2016



always in lower numbers than the men. In Cyprus women who were included in 2014 gave up their places to men by 2016. These results indicate that more should be done to interest and include female stakeholders in research projects, because at present their views, ideas and perspectives are not always being represented adequately.

As CASCADE Deliverables are completed, they will be made available for download on the CASCADE website <http://www.cascade-project.eu/index.php/downloads/project-deliverables> and be described in the information system CASCADiS <http://www.cascadis-project.eu/sudden-ecosystem-shifts>

*Compiled and edited by Nichola Geeson, March 2017 with contributions from Rudi Hessel, Lindsay Stringer, Victor Castillo, Heleen Claringbould and Erik van den Elsen*

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