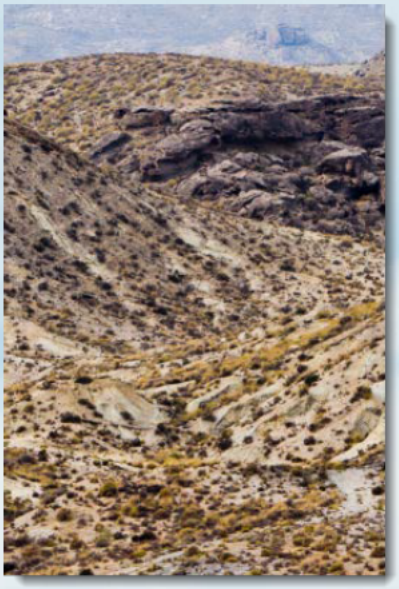
CASCADE
Catastrophic shifts in drylands:
How can we prevent ecosystem degradation?

CASCADE REPORT series



Final CASCADiS website

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www.cascade-project.eu

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CASCADE

Catastropic shifts in drylands

Deliverable 9.2

Final CASCADiS website

July 2017

Project: CASCADE CAtastrophic Shifts in drylands: how CAn we prevent ecosystem DEgradation?

Coordinator: Prof. Dr. Coen J Ritsema.

ALTERRA, the Netherlands

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Table of content

Executive summary

The CASCADiS website http://www.cascadis-project.eu/ is the CASCADE project's major dissemination product.

Comprised of over 200 articles, grouped into five main sections, CASCADiS presents answers to the questions:

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

Almost all the content of CASCADE's 16 scientific deliverables has been made publically accessible[1] and presented in an integrated way would not possible if documents were simply available for separate download. A number of strategies have been used to help prevent overwhelming the visitor with large amounts of text-based information.

In addition, CASCADiS contains a number of videos and video clips in which partners present and explain their research. To help reach the wide-ranging target audience, there is also additional material written in lay terms and in the local languages of the study sites.

Despite the 6 year gap between writing the initial specifications for the CASCADiS website and its completion, most of the specifications have been met, while others have been modified to reflect the evolution of the project or of website design more generally.

In the long term CASCADiS will be hosted by the JRC and its use will continue to be monitored.

1. Introduction

CASCADiS – the CASCADE Information System is the project's major dissemination product. In contrast to the CASCADE project website (which is used for internal organisation and management of the project), CASCADiS presents the key project messages, results and recommendations in different formats, making them available and accessible to the target audiences.

This document presents an overview of CASCADiS, but the main part of the deliverable is the website itself (Figure 1)

http://www.cascadis-project.eu/

[1] Because project partners are currently preparing scientific publications based on CASCADE data and results, there will be restricted access to some sections of CASCADiS until the end of 2017.

Figure 1 Home page of the CASCADiS website showing the five main sections of the site.

2. CASCADiS content

The CASCADiS website contains some 200 articles, organised into five main sections.

The first two are

- **Key messages** (http://www.cascadis-project.eu/key-messages)
- **Study sites** (http://www.cascadis-project.eu/study-sites-new)

The **Key messages** section includes material explicitly developed to enhance dissemination (such as factsheets, booklets, newsletters, video clips and an animation). **Study sites** contains the site descriptions and comparisons derived from Deliverable 2.1 as well as study site-specific results and recommendations from other parts of the project.

The other three sections contain the information providing answers to CASCADE's three principal research questions.

- **What are sudden ecosystem shifts?** (http://www.cascadis-project.eu/sudden-ecosystem-shifts)
- **What processes happen in the soil and plants during a shift?** (http://www.cascadis-project.eu/processes)
- **How can we manage vulnerable ecosystems better?** (http://www.cascadis-project.eu/better-management)

Each section is divided into four to six subsections, the content for each being provided by one of the project deliverables (see Table 1 for details).

Table 1: Description of each of the five CASCADiS sections and the source of their contents.

Sections	Subsections and content sources
Key messages Booklets, factsheets and video clips provide information about drylands, ecosystem shifts and the management of vulnerable ecosystems in succinct and easy to read formats.	**Animation**. What is a tipping point? An animation explaining what a tipping points 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. **Posters, factsheets and longer booklets** written in non-scientific language of interest to a wide range of stakeholder audiences, from policy makers to school children. **Newsletters** highlighting and illustrating the research being done to understand ecosystem shifts at particular CASCADE study sites.
Study sites CASCADE 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.	D2.1 Study site descriptions D2.2 Drivers of change in the study sites D5.1 Structural and functional changes D8.1 Adaptation strategies for changing conditions D3.1 Critical changes preceding a catastrophic shift D5.2 Restoration potential for preventing and reversing regime shifts D8.3 Stakeholder workshop to evaluate SLM guidelines
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.	**D2.2 Drivers of change in the study sites:** Natural and human induced drivers of change are analyzed in each of the CASCADE study sites. The impact of such changes on potential sudden ecosystem shifts are described in terms of a common unifying framework into which instability observed can be fitted. Climate is a governing driver for all Study Sites and land use, land cover, production, consumption and disposal drive the relationship between social and ecological systems. **D5.1 Structural and functional changes associated with regime shifts:** Structural and functional changes in ecosystems affect the services that can be provided. This report details how those changes can be measured and gives results from the CASCADE study sites under pressures from grazing, fire and multiple, diffuse causes.

	D7.1 Documented and evaluated natural resource management practices: Descriptions of the 20 sustainable land management technologies and 3 approaches already in use in the study sites at the start of CASCADE. **D8.1 Adaptation strategies of local land users:** In participatory workshops, stakeholders identified changes in environmental conditions that they have experienced over the last 20 years and discussed how they have adapted to them. They also described the kind of changes they expect to witness in the future and how they might to cope with them too.
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 detailed processes operating between plants, soil and water.	**D3.1 Critical changes preceding catastrophic shifts:** Observational and manipulative field experiments to investigate changes in the plant-soil system in response to external stress, focussing on stress caused by increasing wild fire recurrence, grazing intensity and severe drought. **D4.1 Potential for sudden shifts in ecosystems:** In order to disentangle the various components of the ecohydrological feedbacks that relate plant pattern, resource availability and productivity in drylands, as well as the independent role of critical factors that control these feedbacks, CASCADE performed manipulative experiments combined with field observations. **D4.2 The role of increasing environmental pressure in triggering sudden shifts:** Report on manipulative field experiments to assess the occurrence of non-linear, threshold dynamics and tipping points towards a degraded state in response to decreasing plant cover and to gain insights about the mechanisms underlying such dynamics. **D4.3 Dryland restoration dynamics and thresholds as a function of plant pattern and diversity:** Report on the use of manipulative field experiments and modelling to examine the role of patch, size, diversity, spatial pattern and ecohydrological feedbacks in dryland restoration and degradation reversal. **D6.1 Simulated pressures and ecosystem responses:** Models developed in CASCADE focused on two axes of improvement of current dryland models relevant to studying dryland resilience. Firstly on the way external pressures are incorporated in dryland models (in particular on grazing, fire and drought) and secondly on the way vegetation is modelled (incorporating species, functional groups and species-species interactions).
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.	**D6.2 Indicators of critical thresholds:** A tool box of generic early warning indicators to improve degradation monitoring in drylands and thereby help set up effective strategies to prevent desertification before its onset. **D5.2 Restoration potential for preventing and reversing regime shifts:** Different restoration approaches are needed according to the degree of degradation of a site, but little is known about the relationship between the restoration potential and the

	accumulated loss of ecosystem services. This report focuses on the assessment of some important ecosystem services in CASCADE's degraded and and restored study sites in order to determine their restoration potential. **D7.2 A method for resilience assessment:** The resilience assessment tool is designed to be applicable on a variety of socio-ecological systems, from mainly natural ones to those heavily modified by human activities. The assessment summarises and organises information to understand the resilience of the socio-ecological system at the scale at which management is implemented, highlighting strengths and weaknesses of the land management in coping with the disturbances that occur in the area. The tool's results give important descriptive information on the processes that could modify the socio-ecological system's resilience and the role of land management in it. **D7.3 Comprehensive guidelines for natural resource managers:** Practical guidelines for use by land managers in situations of land abandonment, forest fire and overgrazing. **D8.2 Socio-ecological effectiveness of land management:** The conceptualisation of the socio-ecological effectiveness of land management and a five-step approach to modelling it. **D8.3 Multi-scale evaluation with policy makers:** Feedback from stakeholders and policy makers about the sustainable land management guidelines, scenario analysis and key findings of the CASCADE project.

Each subsection is further divided into an

- introductory summary followed by,
- usually, 4-6 articles (see Figure 2).

The introductory summary provides an overview of this part of CASCADiS and shows how the articles relate to each other.

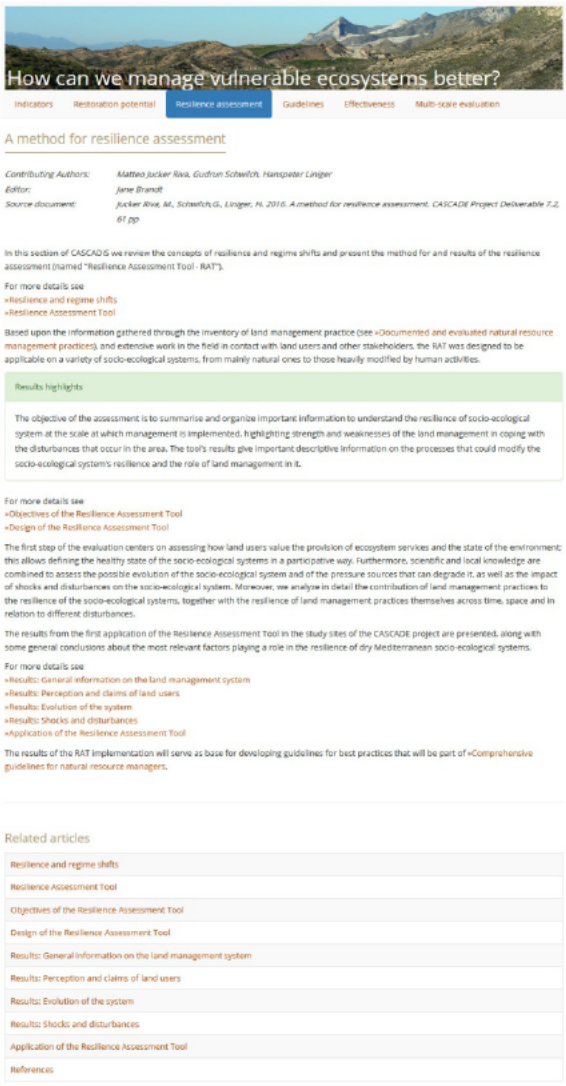

Figure 2 Screenshot of an executive summary introduction to a subsection and the related articles (http://www.cascadis-project.eu/structure-function-changes)

3. Design and appearance

By design and intention CASCADiS is a content-heavy website. The advantage of this is that the entire project output can be publically accessible and presented in an integrated way that is not possible if deliverable documents are simply available for separate download.

A number of strategies have been used to help mitigate the possibility of overwhelming the visitor with indigestible amounts of text-based information.

1. Although articles can be searched for and read as stand-alone pages, they do make more sense if considered within the context of the rest of the articles from that subsection. Consequently the menu structure is clearly displayed at the top of each page, and each section is visually reinforced by the use of different banner images.
2. Menus are placed top and bottom of the screen allowing the full width of the page to be used with plenty of white space.

3. The font colour is dark grey reducing the contrast between the letters and the white background. Formatting has been kept as simple as possible, just enough to highlight sub-headings within an article.
4. Long documents have been broken into a series of discrete shorter articles, where possible not longer than 1,000 words each or a couple of mouse scrolls.
5. Bullet points and numbered lists are used to break up longer paragraphs.
6. All images are a standard 150 px high but, on mouseover, a larger 600 px wide version is displayed with a full caption.
7. Coloured boxes make it easy to find any results highlights in an article.

4. Variety of media

In addition to the text-based content, CASCADiS contains a number of videos and video clips what were made by the partners to explain their work and results (See also Deliverable 9.3).

Figure 3. Video clip included in CASCADiS

These video clips are used to introduce the project in the Key Messages (http://www.cascadis-project.eu/video-clips) and at the start of each of the five main sections.

An animation gives an example of how a catastrophic tipping point can be reached by a combination of overgrazing and drought (http://www.cascadis-project.eu/video-clips).

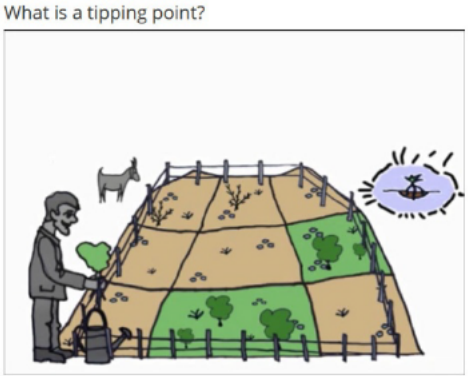

Figure 4. Animation included in CASCADiS

Posters, newsletters and guidelines for sustainable land management, used in work with the different groups of stakeholders are embedded in CASCADiS for online reading or download (for example http://www.cascadis-project.eu/guidelines/142-the-forest-fire-context).


Guidelines for Land Managers
The FOREST FIRE context

Principle 2: Diversity of species reduces flammability, as well as outbreaks of pests, and thus leads to reduced fire hazards. In particular, promoting resprouters facilitates recovery after fire.

- ✓ Avoid afforestation with single or flammable species
- ✓ Sustain and increase diversity of endemic plants
- ✓ Avoid removing resprouters
- ✓ Plant resprouters in favourable places (northern slopes, humid spots)

Mediterranean forests in fire prone areas are at present dominated by seeder species (those regrowing from seeds after fire), especially where afforestation with Pines was implemented*. These are very flammable.

Resprouters (those regrowing from the roots after fire) are less resistant to drought and germinate with more difficulties than seeders. But they increase the capacity of the forest to recover after fire, especially if conditions in the first year are not favourable for seed germination.

CASCADE *Typical seeder (left) and resprouter (right) species of the Mediterranean

Also available in EN | ES | GR | IT | PT |

Figure 5. A document designed and produced for working with stakeholders

5. Adaptation of content to suit target audiences

The target audiences, not only for CASCADiS but for all CASCADE's dissemination activities, are as follows:

1. International bodies such as the UNCBD, UNFCCC, UNCCD
2. European Commission (EC) level, (DG-Environment, DG-Agriculture, and DG-Research)
3. End users at regional and national administration level
4. Local land users and other local stakeholders
5. Various disciplines of the scientific community
6. The media
7. General public, including students and schoolchildren

Because the deliverables are written in English, most of the content of CASCADiS is also in English. Although it is difficult to say for certain, it is probable that much of detail of the conceptual frameworks, experimental methodology and results will be mainly of interest to the scientific community, so this limitation to English may not be too significant. However, where it was clear that CASCADE needed to reach audiences with other specific interests (such as the local land users or regional and national administrations) either as part of the work programme (e.g. stakeholder workshops in WP 7 and 8, or the policy forum in WP 8) or as part of the regular dissemination activities, new material was written using lay terms and in the study site's local languages (Spanish, Portuguese, Italian and Greek). All this material is available on CASCADiS.

- Project video (http://www.cascadis-project.eu/key-messages)
- Animation (http://www.cascadis-project.eu/key-messages)

- Project leaflet (http://www.cascadis-project.eu/posters-factsheets/25-project-brochure-en)
- Guidelines for land management (http://www.cascadis-project.eu/guidelines)

6. Long term hosting

The website will continue to be edited and updated until all the outstanding papers have been written (including the integrated paper address the three main research questions). After that it will be transferred to the JRC for long term hosting. The JRC already host the CASCADE Database as well as the results of other EU-funded projects. Use of CASCADiS will continue to be monitored.

7. Conclusions

The CASCADiS website (CASCADE Information System) is the project's major dissemination product. It is the principal repository of the project's scientific deliverables and dissemination material, designed to give public access to the research results, conclusions and recommendations. In the long term, the website will be hosted by the JRC.