



## REJUVENATE

### Crop Based Systems for Sustainable Risk Based Land Management for Economically Marginal Degraded Land.

Project duration: (12 +) 36  
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Agricultural Sciences and Spatial Planning*



DECHEMA e.V.

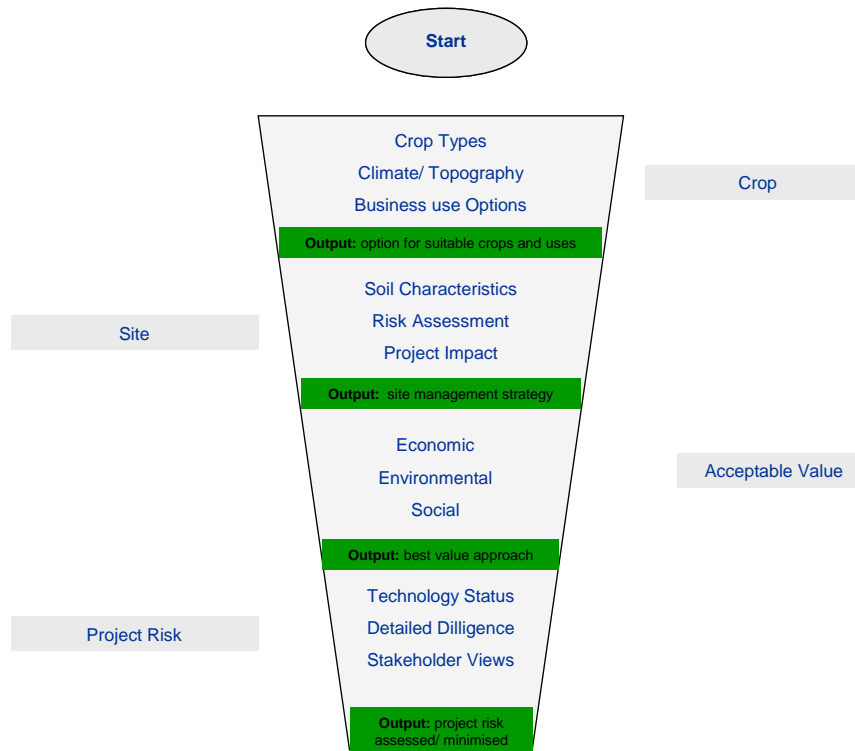


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# Rejuvenate decision support tool, DST (developed 1<sup>st</sup> phase)



# Aims Rejuvenate phase 2

1. Establish three full scale case studies in the participating countries (Sweden, Romania and additional desk study Belgium).
2. Validate the decision support approach based on Strength, Weakness, Opportunity and Threat (SWOT) analysis, with regard to i) crop and site management and ii) biomass use and delivery of value to stakeholders.
3. Perform ecological, environmental, legal and economical assessment of the crop based systems for sustainable risk based land management (RBLM), including the full chain of choice from fields to biomass use.
4. Identify ongoing research, developments and experience of implementation agendas for the re-use of contaminated land for biofuels.
5. Provide a mechanism for other countries and third party funders to add further case studies to the project over its three year life span.

## Case study sites

Swedish demonstration sites

Vivsta varv

Hägga torp landfill, Kallinge



Romanian sites

Copsa Mica, Micasasa



Other ongoing sites:

Lommel, Be

Phytopop, Fr

Phytosed Ec1, Fr

# Case study sites tasks

- Measure the uptake in vegetation - potential intake by grazers
- Triad analysis (the Häggatorp landfill) – ecological risk assessment
- Assess potential costs and revenues
- Test the DST
  - SWOT analysis

## Results – Häggatorp landfill and Vivsta, Sweden

### SOIL:

No risk initially and no increased risk through the course of project (TRIAD/Chemical analyses).

### Vegetation:

Low concentrations in stem and leaves –  
no risk for grazing animals.

Higher growth Häggatorp than Vivsta





# Cost and revenues, Vivsta and Kallinge

1. The biomass can be sold as biofuel

Net income:

50 - 160 € /a/ha (Vivsta)

270 - 370 € /a/ha (Kallinge)

2. The biomass classified as hazardous waste

Net loss: 160 – 260 € /a/ha

3. The biomass left at site

Cost: 100 € /a/ha

Costs and revenues  
Former maize field in Lommel in the Campine region in Flanders,  
Belgium  
(Hasselt University)

- Estimated net income
  - rapeseed grown in rotation with energy maize: € 1023 - 1354/a·ha.
  - Willow: € 111/a·ha.
- All studied crops offer the potential to reduce CO<sub>2</sub> emission .

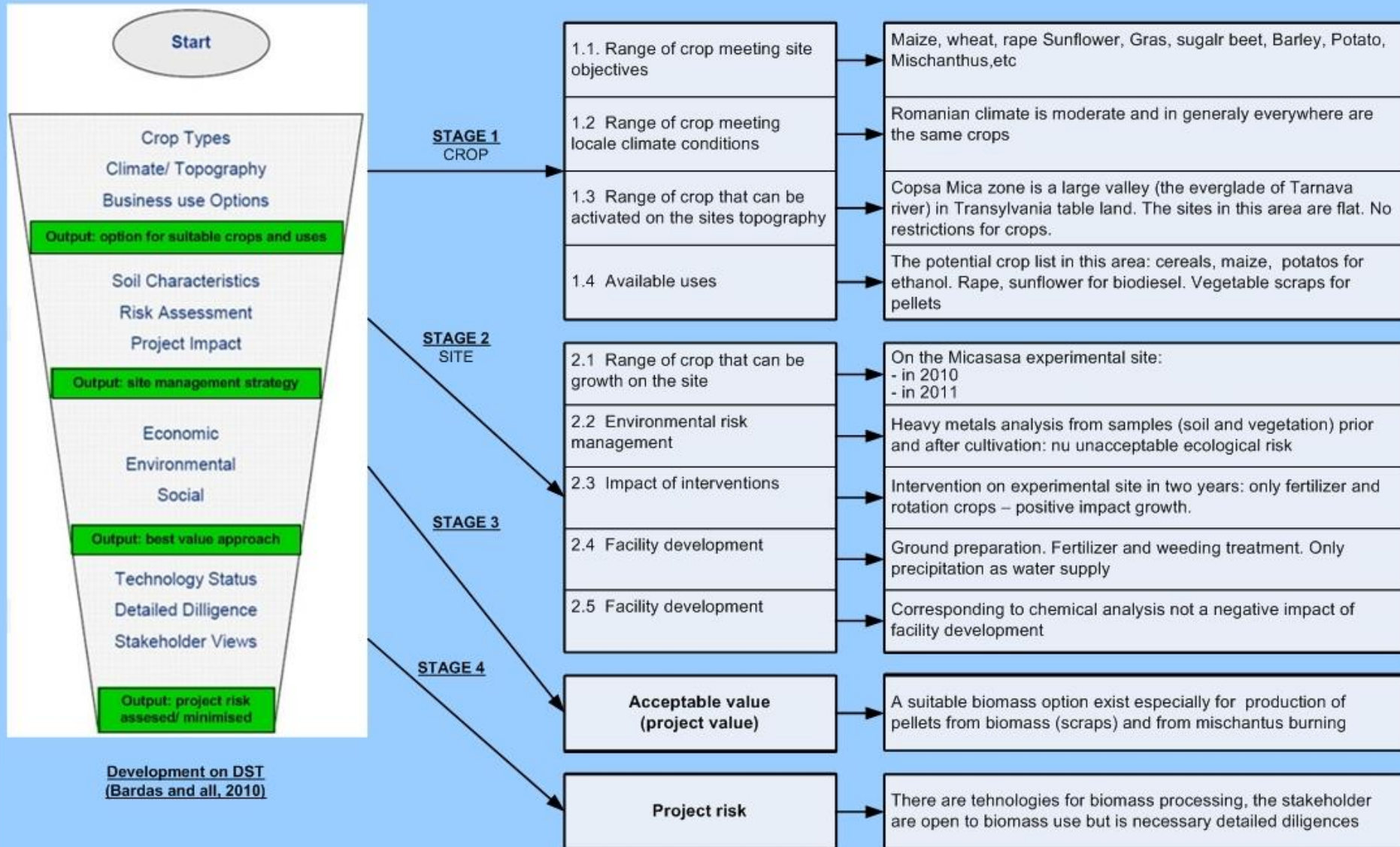


# DST application showed

- Phyto-remediation is a sustainable option in most of the cases
- Costs and revenues = f(praxis, perception, classification, ...)
- Need of short guide -> development of short guide
  - Short information about the DST and the aspects to be considered at each stage of the framework process
  - Examples from applying the DST
    - The Häggatort landfill, Kallinge
    - Copsa Mica, Micasasa, Romania
    - Vivsta varv
    - Phytopop case study
    - Phytosed Ec1 case study
    - Workshop activity on uranium mining sites, Romania

## STAGES

## Ex. Romania



# Results SWOT analyses

1. The DST method offers structure
2. The process needs to be iterative
3. The goal and aim of the site needs to be decided prior stage 1 of the DST process
4. The method is useful at early stages in the planning and decision process
5. The method is time consuming when only applied late in a process  
(and the order of considerations is not always relevant at this stage of a planning process)
6. The method worked well for the sites where it was applied especially early in the process
7. The method can be part of wider decision support frameworks

# Dissemination

- Scientific publications**

Suer, P., Andersson-Sköld, Y., 2011, Biofuel or excavation? ? Life cycle assessment (LCA) of soil remediation options. Biomass and Bioenergy, Volume 35, Issue 2, 969-981

Bardos, P., Bone, B., Andersson-Sköld, Y., Suer, P., Track, T., Wagelmans, M., 2011, Crop-based systems for sustainable risk-based land management for economically marginal damaged land. Remediation Journal, Volume 21, Issue 4, pages 117-33

Andersson-Sköld, Y., Bardos, P., Chalot, M., Bert, V., Deplanque, M., Track, T., Crutu, G., Cundy, A.. The Rejuvenate DST for biomass selection on marginal land ? results from case study applications. Submitted ES&T 2013

Enell, A., Vestin, J., Wagelmans, M., Lithner, D., Andersson-Sköld, Y. Cultivation of bioenergy crops on contaminated land ? Risks and potentials based on field experiments in Sweden. Manuscript in prep. 2013
- Conferences**

Bardos et al., 2009, Green Remediation 2009, Copenhagen, Denmark

Suer et al., ConSoil 2010, 11, Salzburg, Austria, 2010

Andersson-Sköld et al., Nätverket Renare Mark, Värmöte, Sundsvall, 2011

Witters, OVAM, Mechelen, 2011

Andersson-Sköld, et al., Keszthely, Hungary, 2011

Andersson-Sköld et al., International conference on the biogeochemistry of trace elements, ICOBTE 2011, Florence, 2011

Wagelmans et al, 2012, 6th SETAC World Congress / SETAC 22nd Europe Annual Meeting, Berlin, 2012

Andersson-Sköld et al., 9th International Phytotechnology Society (IPS) conference, Hasselt, Belgium, 2012

Andersson-Sköld et al., The 2nd International Conference on Sustainable Remediation Vienna, Austria, 2012

Enell et al., Nätverket Renare Mark, Värmöte, Malmö, 2013

Andersson-Sköld et al., Aqua Consoil, Barcelona, Spain, 2013

**Poster presentations**

ConSoil 2010

Nordrocs 2010.

EGU, Vienna, 2010.

BMPC (Balkan Mineral Processing Congress), 2011

International Exergy, Life Cycle Assessment and Sustainability Symposium, 2011

Romanian International Conference on Chemistry and Chemical Engineering, 2011

Nätverket Renare Mark, 2013

XV Anniversary BMPC, 2013
- Reports**

Final Report Rejuvenate 2

Midterm report of Rejuvenate2

DST Guide
- Popular publications**

Reviewing Rejuvenate, International Innovation. Disseminating Science, Research and Technology, Eurofocus, issue 4, 2011

Naturvårdsverket Forskningsdagar för journalister, Sweden, 19th January, 2011, Rejuvenate - Solrosor och Salix på förorenad mark (in Swedish).

Energiskog renar industrimark, SVT.se, 11-01-26.

Energiskog ska sanera fabriksmark, Lantbrukets affärstidning, 11-01-25.

Energiskog till sanering, E-magasin 5 STT, 5/2011.

Salixodling kan sanera Utansjöfabriken, Allehanda, Härmösand. 24 januari, 2011.

Solrosor renar giftig mark, Ren Landsbygd 2011.

# Thank you!

Downloads: [HTTP://PROJECTS.SWEDGEO.SE/R2/](http://PROJECTS.SWEDGEO.SE/R2/)

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# SNOWMAN NETWORK

Knowledge for sustainable soils



*The Swedish Research Council for Environment,  
Agricultural Sciences and Spatial Planning*



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