left: Group in a constellation analysis workshop. (Photo: Liron Steinmetz)
right top: Workshop group arranging elements. (Photo: Liron Steinmetz)
right below: Flowchart showing assembled constellation analysis. (Photo: Liron Steinmetz)

Constellation Analysis

Brazil, Análise de Constelação

Constellation Analysis is a tool used to clarify perceptions of different stakeholders about critical situations or problems. In workshops, participants visualize interrelationships between actors, as well as the associated natural, technical and regulatory factors.

The Constellation Analysis method (CA) aims at a transparent, mutually accepted visualization of factors ('elements') that are systematically arranged under the method's four categories: actors; rules and concepts; natural elements; technical elements, with the type of their inter-relationships. The process enables consensus to be found between divergent positions, paving the way for better informed decision-making while facilitating a negotiated process of land management with potential changes/techniques.

During brainstorming and/or literature-based approach, different elements are determined and arranged visually on a board. Element categories are actors (e.g. farmers, energy supply company), rules and concepts (e.g. legal framework, plans and programs, regulations), natural factors (e.g. climate, vegetation, water) and technical factors (e.g. fertilizer, wastewater treatment, hydropower plant). Usually this is done by using differently coloured and shaped cards to help articulate ideas within a working group. Then, connections among and between the elements are discussed and the form of these interrelations are visualized as being (a) directed, (b) conflictive, (c) non-existent, (d) contradictory, (e) reluctant or (f) interactive. Through this approach the way towards developing solutions (or follow-up CAs) is guided.

The approach was applied at different scales and with different stakeholders with divergent professional expertise and educational levels, e.g. farmers, fishermen, employees of the government, representatives of indigenous tribes, associations, trade unions, and researchers. People found the methodology promising as it raises awareness and organizes information. Training in the methodology has been carried out amongst interested people at two universities, but not yet local development agents.

The visualization is carried out through an iterative group process. A moderator is needed to initiate the process by inviting the different stakeholders to a conducive location, and to facilitate the process. Exchange among participants is enhanced, and this leads to better understanding of different viewpoints in situations of tension or in the understanding of what has evolved through specific developments in the past. During a second analytical step, the main lessons of the visualization are extracted and documented. Here, missing factors/relationships, and consequently the need for action, are detected. For example, insufficient communication between actors could be uncovered, or it may be detected that planning programs need to be improved.

Location: Pernambuco, Brazil, Itaparica Reservoir, Petrolândia
Approach area: > 10,000 km^2
Type of approach: project/programme based
Focus: mainly on conservation with other activities
WOCAT database reference: A_BRA003en
Related technology: none
Compiled by: Verena Rodorff, Berlin Institute of Technology, Environmental Assessment and Planning Research Group, 10623 Berlin, Germany; verena.rodorff@tu-berlin.de
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Problem, objectives and constraints

Problems:
The main problems addressed by Constellation Analysis were governance challenges and conflicts related to land and water resources. Land: soil fertility, soil erosion, biodiversity, land tenure, access to land and water. Water: scarcity, quality, allocation, fish species.

Aims / Objectives:
The approach can be applied at different levels and for different issues or contexts: all perspectives can be represented and discussed. The application in this case was devised to be an iterative process of consecutive workshops first at the local irrigation project level, and then at the municipal, regional and national levels with the aim of analysing the inhibiting and driving forces behind the current situation in water management, in land management, and around production cycles in agriculture and aquaculture leading to action being taken or decisions made. Farmers and fishermen, employees of government, researchers and experts are considered as the relevant target group to be involved in participatory workshops. In the education sector, the approach can be applied for theses, for field work and for projects as an analytical interdisciplinary approach.

Constraints addressed

	Constraints	Treatments
Technical	Access to the location can be difficult.	It may be possible to organize a pick-up service for participants or to choose an easy-access location.
Workload	Workload can be high. Workshops often take a whole day.	It is important to discuss potential dates in advance. Some people prefer weekends, others don't. The lunch break is useful for more informal interaction. However others use the break to disappear.
Social / cultural / religious	Participants of disadvantaged social groups are sometimes shy in speaking up in a mixed group. Participants of more advantaged groups occasionally show less commitment than others and are more regularly distracted by their mobile phones.	In some cases, segregation of social or gender groups, especially at the beginning of the exercise, can be helpful. No means has yet been found to reduce 'mobile phone distraction' in an acceptable way.
Other	Constraints can occur due to specific group composition during a CA workshop and the participants' individual backgrounds.	The iterative process of the CA promotes a re-assessment of constellations during different group discussions. Views of dominant individuals can be modified in the iterative procedure, especially when participants with different standpoints and positions are involved. The goal is the mutual understanding of divergent positions towards entry points for change or adaptation.
Institutional	Some institutions might not be happy to send their staff to meetings during working hours.	Argumentation promoting the value of the process may help to 'sell' the approach.

Participation and decision making

Stakeholders / target groups

planners | land users, individual, groups | SLM specialists / agricultural advisors | teachers / school children / students | politicians / decision makers

Approach costs met by:

– international (German Federal Ministry of Education and Research (BMBF))	100%
Total	**100%**

Annual budget for SLM component: US$ < 2,000. Project money covered all of the relatively low expenses, hypothetically the approach can be undertaken almost free of costs.

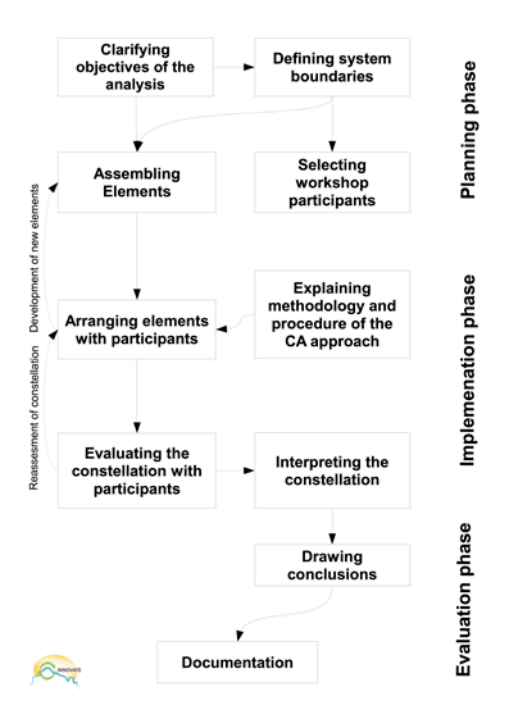
Decisions on choice of the Technology: mainly by land users supported by SLM specialists.
Decisions on method of implementing the Technology: mainly by land users supported by SLM specialists.
Approach designed by: international specialists, national specialists.
Implementing bodies: other (a flexible method to be applied by any group, preferentially mixed stakeholder groups)

Land user involvement

Phase	Involvement	Activities
Initiation/motivation	Passive	Interviews
Planning	None	None
Implementation	Interactive	Workshops
Monitoring/evaluation	Interactive	Workshops
Research	Interactive	Data analysis, lessons learnt, etc.

Differences between participation of men and women: Yes, little. Smallholder workshop consisted predominantly of male farmers and female fishers as fishery in the study area is traditionally controlled by women.

Involvement of disadvantaged groups: Yes, great. Representatives of a smallholder community, of landless people movement and indigenous communities.



Organogram:
Simplified flowchart of the Constellation Analysis Approach
Planning phase:
Clarify the objective or question behind the analysis. Then, have an overview research about first elements (assembling elements), e.g. which actors can give interesting input and how to contact them. Preparing material for the workshop(s): coloured cards, pens, whiteboard, etc.
Implementation phase:
Explain the objective and methodology to participants, the meaning of the elements: actors; rules and concepts; natural elements; technical elements and their different relations. Clarify rules of respecting each other. Arrange the elements. Evaluate the constellation together with participants, e.g. why are elements far or close to each other? Why are relations conflictive and how to overcome? Are elements or relations missing? Is all information available? What are the next steps? Can recommendations be formulated?
Evaluation phase:
Were participants objective enough? How to interpret participant's activity within the workshop? Which actors should be asked as well? Consolidate participants' statements with literature and research and document. Documentation could be a photo or digitalized picture of results with an explanation based on literature.
(Liron Steinmetz)

Technical support

Training / awareness raising: Training provided for land users, field staff/ agricultural advisors. Training was through workshops. Training focused on detecting knowledge gaps and clarifying positions of players, and the role of natural, technical and regulatory factors from multi-angled viewpoints/perspectives as the core of the CA approach.
Advisory service: The extension system is quite adequate to ensure continuation of activities. Given their willingness, the CA approach is reproducible by stakeholders on their own.
Research: Yes, great research. Topics covered include sociology, technology, economics / marketing, ecology
Mostly on station and on-farm research.

External material support / subsidies

Contribution per area (state/private sector): No
Labour: Voluntary
Input: None
Credit: Credit was not available
Support to local institutions: No

Monitoring and evaluation

Monitored aspects	Methods and indicators
area treated	Ad hoc observations by project staff, government: joint agreement on the scale of constellation analysis in accordance with stakeholders.
socio-cultural	Regular observations by project staff: attitude, gender, status of workshop participants / stakeholders
management of approach	Regular observations by project staff: feedback on approach by stakeholders: self-evaluation
economic / production	Indicators of profitability, revenue from each stage per person, economic valuation of soil improvement
no. of land users involved	Regular measurements by land users: number of participants in workshops.

Changes as result of monitoring and evaluation: There were few changes in the approach. The moderator needs an assistant; the group size was reduced.

Impacts of the Approach

Improved sustainable land management: Yes, little. No immediate impact, however the CA approach could potentially contribute to improved sustainable land management and in particular governance.
Adoption by other land users / projects: Yes, few. Interest from cooperating universities (UFPE-Universidade Federal de Pernambuco, IFPE-Instituto Federal de Pernambuco).
Improved livelihoods / human well-being: Yes, little. No immediate impact, however the CA approach could potentially contribute to improved well-being.
Improved situation of disadvantaged groups: Yes, little. No immediate impact, however the CA approach could potentially contribute to an improved situation for socially and economically disadvantaged groups.
Poverty alleviation: No. No measurement possible.
Training, advisory service and research:

- Training effectiveness:

Teachers, planners, land users, school children / students, politicians / decision-makers, agricultural advisor / trainers : good
SLM specialists: excellent

- Advisory service effectiveness:

Technicians / conservation specialists, school children / students, politicians / decision-makers, planners, teachers, land users: good
Land/water use rights: None of the above in the implementation of the approach. Land use/water rights could be the topic of a CA. However, these are not of direct relevance for the application of the approach.
Long-term impact of subsidies: Irrelevant

Conclusions and lessons learnt

Main motivation of land users to implement SLM: Affiliation to movement / project / group / networks; production; environmental consciousness, morale, health; Well-being and livelihoods improvement; prestige / social pressure.
Sustainability of activities: Yes the land users can sustain the approach activities without support. Knowledge acquired about a complex, perhaps previously non-transparent system and newly established contacts support future decision-making. In general CA is a flexible method that can be applied by any group, but preferentially mixed stakeholder groups.

Strengths and → how to sustain/improve	Weaknesses and → how to overcome
Results can be used for the planning of regional development → Continued discussion of results are required.	One workshop cannot manage to convey the dynamics of a situation → Formulate recommendations for action and distribute a report to stakeholders
Space for interchange of ideas and establishing contacts → Maintain a list of actors and participants.	CA only visualizes the current situation. Different future scenarios over a given timespan can be presented only in a series of single CA visualizations → CA could lay the groundwork for scenario modelling approaches (e.g. Bayesian Networks).
Integrates different views of problems → Formulate recommendations.	
Facilitates participation possibilities for stakeholders → Establish identical or similar workshops/events and facilitate participation processes.	Insufficient space for all to participate, topics covered in too little time. As more than one workshop is needed, the approach does not necessarily provide solutions in the end → Prepare goal-orientated workshops and finish a workshop by identifying potential solutions and formulating recommendations. I is important to well document and report on the workshops and distribute the reports to stakeholders.
Allows expression and discussion of different views, knowledge integration, both inter- and transdisciplinary, characterised by an iterative and participative nature, able to detect complex situations and questions → better facilitate and encourage discussions among stakeholder during new and upcoming workshops	

Key reference(s): Rodorff V.et al. (2013a) Driving forces and barriers for a sustainable management of the Itaparica reservoir region - basic milestones towards a constellation analysis. In: Gunkel G. et al. (Eds.) (2013) Sustainable Management of Water and Land in Semiarid Areas. Editora Universitária UFPE, Recife, pp 2 • Rodorff, V., Siegmund-Schultze, M., Köppel, J., Gomes, E.T.A. (2015) Governança da bacia hidrográfica do rio São Francisco: Desafios de escala sob olhares inter e transdisciplinares. Revista Brasileira de Ciências Ambientais 36, 30-56.
Contact person: Verena Rodorff, Berlin Institute of Technology (Technische Universität Berlin), Environmental Assessment and Planning Research Group, Secr. EB 5, Straße des 17. Juni 145, 10623 Berlin, Germany; verena.rodorff@tu-berlin.de