

Supplementary S1: Ecosystem services considered in this study

| Classification according to Haines-Young and Potschin [29] | Ecosystem Service | Definition According to Karrasch et al. [46] |
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| Provisioning services include all nutritional, material and energetic outputs from living systems. | Food production | Plant and animal material which is used as food or for the production of food. |
| | Forage production | Dairy farming and forage production. |
| | Freshwater | Within dry periods the retained fresh water might be used for irrigation measures and drinking water supply. |
| Regulating and maintenance services cover the mediation of flows and maintenance of ecosystem conditions. | Reduction of greenhouse gases | Greenhouse gas reduction at global and local level. |
| | Hazard regulation by water retention | Retention areas for inland floods (extreme precipitation) and saltwater (dike overtopping). |
| | Prevention of saltwater intrusion | Due to a freshwater polder the decrease of groundwater level might be reduced and the hydrostatical pressure increased. |
| Cultural services are non-material outputs of ecosystems related to culture and society. They are primarily regarded as the physical settings, locations or situations that influence people, such as a landscape. The character fundamentally depends on ecosystems. | Recreation and tourism | Attractive landscape and biotopes features strongly linked with the ecosystems and landscape. |
| | Community identification | Regional belonging, the willingness to live there, traditional relations and land use in terms of ecosystems ('natural' landscape features). |

Supplementary S2: Timeline

| Type | Number (Participants) | Core Topics | Year | Comment |
|-----------------------------------|-----------------------|---|------|---|
| Individual interviews | 14 (1) | <p>Knowledge-brokers: asked questions about the personal background of the experts, their general opinion concerning climate change and sustainable land use, introduced the different land management scenarios "trend", "water management" and "carbon sequestration", explained the concept of ecosystem services</p> <p>Experts: Evaluated the extreme scenarios "water management" and "carbon sequestration" and developed first ideas for the "actor-based" scenario</p> | 2011 | <p>The different land management scenarios served as basis to deliver options for sustainable land use management of the case study region. Starting point was the investigation of individual positions, interests and needs concerning spatial planning activities and sustainable land use management and the relationships and interactions between these experts as well. The results and information were crucial for the whole working process. In this first data gathering process, a deeper and structured understanding of the regional conditions, existing conflict fields and general ideas concerning the land management scenarios served as pillar for the following participatory process and the development of an adequate communication strategy, mutual trust building and the formation of a stabile expert group.</p> |
| Regional forum | (12) | <p>Knowledge-brokers: presented an overview of different ideas of the experts</p> <p>Experts: Discussed the different scenarios and collected new ideas for the actor-based scenario</p> | 2011 | |
| Individual interviews | 12 (1) | <p>Knowledge-brokers: proposed a list of land use elements and ecosystem services</p> <p>Experts: Selected and defined land use elements and ecosystem services relevant for the case study area</p> | 2012 | <p>The second phase of data gathering included the stakeholder-based definition of land use elements and ecosystem services. Especially the stakeholder-based definition of ecosystem services was used to translate the former collected data on social preferences and needs in terms of ecosystem services. Furthermore, the experts got a table with the task to evaluate the relationships of land use elements and ecosystem services. Land use elements were defined to gain spatially explicit land use and land cover units covering the case study region and understood by each expert. Simultaneously, these land use elements served as tool to project ecosystem services spatially explicit in the community. After presenting the results of these investigations in the second regional forum, the whole stakeholder group got the task to design the different land management scenarios according to their understanding in a group discussion and consensus-building process by drawing land use management maps.</p> |
| Focus group | 3 (3,2,2) | <p>Knowledge-brokers: proposed a list of land use elements and ecosystem services and explained the next step</p> <p>Experts: Selected and defined land use elements and ecosystem services relevant for the case study area</p> | 2012 | |
| Interviews and written assessment | 12 (1) | <p>Knowledge-brokers: Presented a survey linking land use elements and ecosystem services (Fig. X)</p> <p>Experts: answered the question: How important is one land use element for one ecosystem service?</p> | 2012 | |

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|-----------------------|---------------|--|------|---|
| Regional forum | (11) | Participatory mapping: development of maps representing the different land use elements (one map for every scenario) | 2013 | |
| Individual interviews | 12 (1) | Knowledge-brokers: Asked for expert's individual preferences of land use elements and ecosystem services Presented illustrations of the different scenarios to discuss spatially explicit possible adaptation strategies Experts: Determined individual preferences of land use elements and ecosystem services Gave statements with regards to the climate adaptation strategy | 2013 | The third part of data acquisition incorporated the assessment of the stakeholder preferences concerning each land use element and ecosystem service. This was done in individual interviews. Each expert got a set of cards, each card named by one land use element respectively one ecosystem service. The experts ranked these cards according to their preferences and gave a value between 0 and 100. The following third regional forum was designed to survey the group-preference concerning ecosystem services and land use elements. |
| Focus group | 3 (2,2,2) | Knowledge-brokers: Asked for expert's individual preferences of land use elements and ecosystem services Presented illustrations of the different scenarios to discuss spatially explicit possible adaptation strategies Experts: Determined individual preferences of land use elements and ecosystem services Gave statements with regards to the climate adaptation strategy | 2013 | |
| Regional forum | (7) | Knowledge-brokers: Asked for expert's group preferences of land use elements and ecosystem services Presented illustrations and GIS maps of spatially explicit scenarios Experts: Determined group preferences of land use elements and ecosystem services Discussed illustrations and GIS maps of spatially explicit scenarios | 2013 | |
| Regional forum | (8) | Knowledge-brokers: Presented the actor-based scenario as result of the process Experts: Discussed the actor-based scenario as result of the process | 2014 | Development of a spatially explicit climate adaptation strategy |
| Focus Group | 5 (3,3,2,4,2) | Knowledge-brokers: Presented end results Experts: Discussed end results | 2015 | |

Supplementary S3: Example participatory mapping: Development of spatially explicit land management scenarios

The stakeholder mapped the “actor-based” scenario. This map was converted into an illustration (used for communication) and GIS-map (spatially explicit). The results have been implemented in the official regional spatial plan of the county of Aurich (black cycle).

