

Climate Change Adaptation and Interactive Participation of Stakeholders - first Results of the Project "KLIMPASS AKTIV"

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Abstract

During the two foregoing years, a guideline for the development of local climate change adaptation strategies was developed in close cooperation with various stakeholders within a specific district in middle Germany. Based on this guideline, specific adaptation measures have been selected to be realised. This paper gives insight into a new website which is developed in a follow-up project, called KLIMPASS AKTIV. The website serves as information platform for actors involved in the implementation of climate change measures. Textual and map-based information is provided in a convenient way. Apart from the purpose of raising awareness of climate change issues on the local level, the website enables actors to participate actively in planning processes which result from the local adaptation strategy.

1. Introduction

Climate change can have a significant impact on the social, economical and ecological level and the adaptation to these changes is a key to react adequately on climate- and weather-related hazards. However, to successfully adopt measures that could help to cope with climate change impacts, the awareness of these problems needs to be enhanced and coordination on the administrative level to be improved. The aim of the project "KLIMPASS AKTIV" is to support the drivers of successful climate change adaptation. Based on a study by Heilmann and Pundt [1], which proposes a guideline for the development of local adaptation strategies, a web interface has been developed which allows to access climate change related information in a convenient way. It provides a platform for interaction and exchange of knowledge among concerned stakeholders, thus scaling down results and knowledge to the local level, where decisions concerning *concrete* climate adaptation measures have to be made. This platform aims to increase the awareness of potential climate change risks and foster the adaptation of adequate techniques and solutions to cope with these risks.

2. The Role of Local Actors

"Local actors are the key to achieving real impact on the ground. While international donors and agencies and national governments play important roles in establishing effective enabling environments and channelling resources and technical support, ultimately effective adaptation takes place through the dynamics of local governance, civil society engagement, and economic development building from the actions of local authorities, civil society organizations, and private sector businesses" [2].

The local actors must cover the different sectors which have to be taken into account when dealing with climate change adaptation on the local level. First of all, the local administrative units have to be considered, but the private economy, including industry, as well as organizations and citizens should be involved in the discussions as well. Administration and other organizations include, for

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example, sectors such as regional planning, forestry, agriculture, water management, soil protection, but also sectors like traffic infrastructure, industrial production, health, nature protection, and many others.

Within the framework of the development of a local climate change adaptation strategy in close cooperation with a pilot administrative district in Saxony-Anhalt (Landkreis Mansfeld-Südharz), the local stakeholders from the different sectors were invited to explain their specific requirements and make suggestions on the adaptation process. This was done during the project KLIMPASS, which was carried out prior to the KLIMPASS AKTIV project described here [1]. Figure 1 gives an overview of concerned actors which were participating in the project.



Figure 1: Actors and stakeholders within the KLIMPASS AKTIV project

At the end of the KLIMPASS project a guideline was published which represents a general strategy for local administrations to develop climate change adaptation strategies. The goal of such a strategy, however, is to define as concrete as possible which measures should be implemented to prepare for potential climate change-induced events, such as storms, flooding, mudslides, heat, drought, and others.

The next step after publication of the guideline has been the implementation of specific goal-settings defined in the local adaptation strategy of the “Landkreis Mansfeld-Südharz”. To achieve this goal, a follow-up project was established under the name KLIMPASS AKTIV. The project includes the conception and implementation of an interactive website which should provide thematic information and help the stakeholders to coordinate their actions. The next sections explain the technological approach and the current state-of-the-art within KLIMPASS AKTIV.

3. Tools and Techniques for a local website on climate change adaption

The technical implementation of the previously developed conceptual design of the KLIMPASS AKTIV website is accomplished by Joomla3, a well-established content management system (CMS) [3]. The Joomla module “Kunena” is used as an interactive forum extension to the system, and “DokuWiki” is applied as documentation module. Furthermore, the calendar module “JEvents” is integrated in order to provide information on forthcoming dates, such as workshops, presentations or other project related events. Another core component to stimulate the interactive exchange of knowledge is the provision of vulnerability maps and accompanied examples of good-practice measures to deal with climate change risks. The integration of maps was done based on the JavaScript API “OpenLayers” [4], which is an open library for digitally presenting geospatial data. Customized, as well as newly programmed, API components were developed to specifically

address the particular needs of the climate adaptation project and to improve the user-experience on that matter. The usage of KML-files [5] and web map services (WMS) [6] is intended to enable an appropriate implementation and exchange of data. In a next step, a user-controlled interface is currently designed, which allows an integration of vulnerability maps. The RISK information system, which was developed as part of the Nordwest2050 KLIMZUG project (see www.nordwest2050.de), serves as an orientation. However, some features to improve the interactive, web-based communication on maps and measures will be considered more intensively, compared to RISK.

Using such a technological environment the overall aim of the project KLIMPASS AKTIV should be reached. This involves the provision of most important facts about local, climate change-related issues, including maps, and to establish a forum that serves as a discussion platform, as well as to facilitate the decision-making process which leads to concrete climate change adaptation measures.

4. The KLIMPASS AKTIV Website

The overall aim is to provide textual and map-based, current knowledge about climate change on the one hand, and important local information on the sectors, as well as on concrete climate change adaptation measures, on the other hand.

4.1. Online participation of stakeholders

To enable actors from diverse sectors to participate in the development of the adaptation strategy, a forum or wiki (see figure 2), which can be operated easily and intuitively, assists in cooperating and integrating the knowledge and relevant information. The actors and stakeholders included in the project represent a multitude of interest groups and levels of governance, so that numerous fields of action are covered (figure 1). They orient themselves at the states' adaption strategy of Saxony-Anhalt [7], but acknowledge the need to break down the suggestions made there, on a states' level, to the local level [8]. For each of these fields of action information and brief descriptions of climatological facts are provided, as well as good-practice examples of already implemented measures. These good-practice examples result from partner-projects, and local actors which were and are encouraged to bring in their practical experiences. In order to provide the information via the website, they find a special form there. Using this form, they can explain, in a standardized way, which measures were already implemented or how the implementation will look like in future. Via the forum, other concerned people can react or give further suggestions. In such a way, the discussion can reach more people, including the public, and is carried out on a broader basis.

Additionally, the provision of information about vulnerable areas within the concerned region (e. g. a "Landkreis"), is an important part of the website. Vulnerability maps, for instance, enable stakeholders, to recognize in which areas high pressure for adaptation measures exist.

Specific, exemplary vulnerability maps were designed in the project KLIMPASS. Within KLIMPASS AKTIV, more sophisticated maps will be provided. Here, GIS technology can be used in a convenient way, because a strength of GIS is to integrate data from different sectors, assumed that they are in line with a common spatial reference system. This supports a more holistic approach to the complex area of climate change, thus enabling to integrate, to give only one example, data layers about rivers, soils, digital elevation model, and traffic infrastructure to carry out overlay analyses and identify areas where roads are endangered by potential flooding, or mudslides [9] (see also section 3).

In general, the KLIMPASS AKTIV website should enable administrative employees, stakeholders, and the public to comment on regions which are identified as being vulnerable, and to

acknowledge positively or negatively existing or planned adaptation measures and thereupon provide new proposals (figure 2).

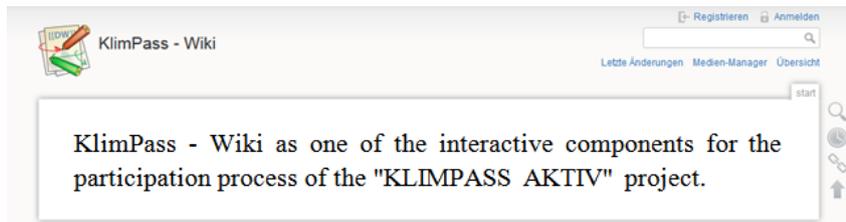


Figure 2: KlimPass - Wiki as an interactive component to enable the participation of stakeholders

4.2. Integration of Vulnerability Maps

As mentioned before or described, for instance, in [12], the identification of vulnerable areas on a local level should result in the provision of vulnerability maps on the new website. The cross-sectoral approach taken in the KLIMPASS project enabled the project team to collect spatial data sets from different sectors. The spatial data sets were provided by local, regional, and states' agencies. The datasets cover different sectoral areas, such as topographic, hydrological, ecological, forest, land cover, and information on soils, as well as climatological and socio-economic data. The climatological data result from a regional simulation model (“RaKliDa”, http://141.30.160.223/RaKliDa_WebServlet) which interpolates climate data such as temperature and precipitation on a 1000m² resolution. This is adequate for local studies and enables stakeholders to integrate the climatological data, and further, sector-specific datasets for GIS-supported overlay analysis.

The maps will be provided using an OpenLayers module which has been integrated into the website (see section 3). Coming from a map which shows, for instance, the complete area under investigation, e. g. the “Landkreis”, users can zoom into smaller regions and investigate if there are local vulnerabilities (in such a case they could click a marker, after which the vulnerability map occurs), or if there are concrete climate change measures planned or already implemented (again, they can click a special marker after which images and textual descriptions of the measure occur as shown in figure 3; here the invasion of neophytes due to changing temperatures is presented).

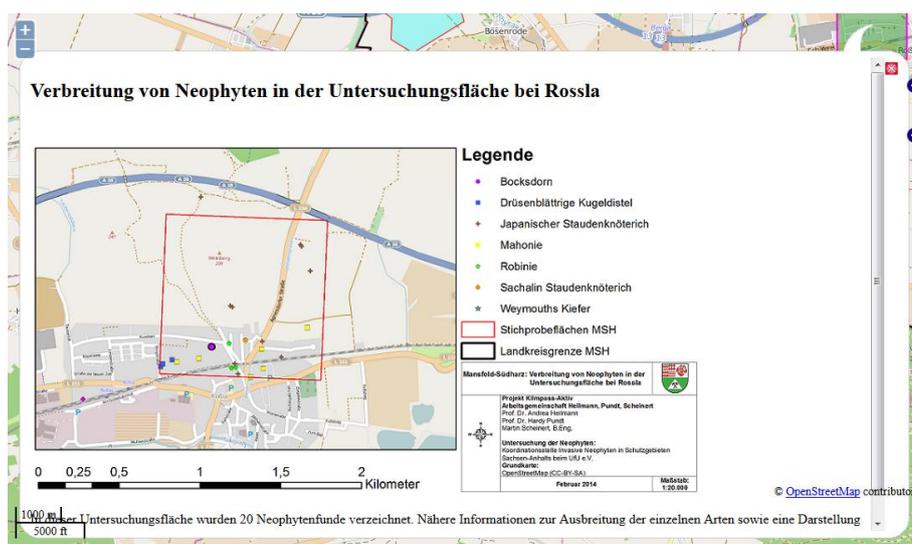


Figure 3: Detailed pop-up information about some project related measures

The OpenLayers API has been extended to some visualization and grouping capabilities. In addition, a grouping and scale dependent display function within the LayerSwitcher component has

been integrated. The LayerSwitcher control displays a table of contents for the map. This causes a clear presentation and arrangement of the various BaseLayers and Overlays within the map visualization. It is complemented by an adaptation option to allow user-defined symbolization of feature and coverage data based on the Styled Layer Descriptor (SLD) implementation Specification [13] for the representation of Web Map Services (WMS).

The map application represents one of the interactive components to display the project results. According Gullotta & Schulz [14] they provide a convenient means to sensitization. Figure 4 shows an example from the current KLIMPASS AKTIV website, showing the Landkreis Mansfeld-Südharz, thus presenting the geographical area, concrete climate adaptation measures within this area (“Klimaanpassungsmaßnahmen”), and more specifically, measures that were implemented in the water management sector (“Gewässerentwicklung”). In such a way, users can easily access the relevant information on all climate change-related measures within the area. Using the forum, and wiki, they can react, make suggestions, criticize, etc.

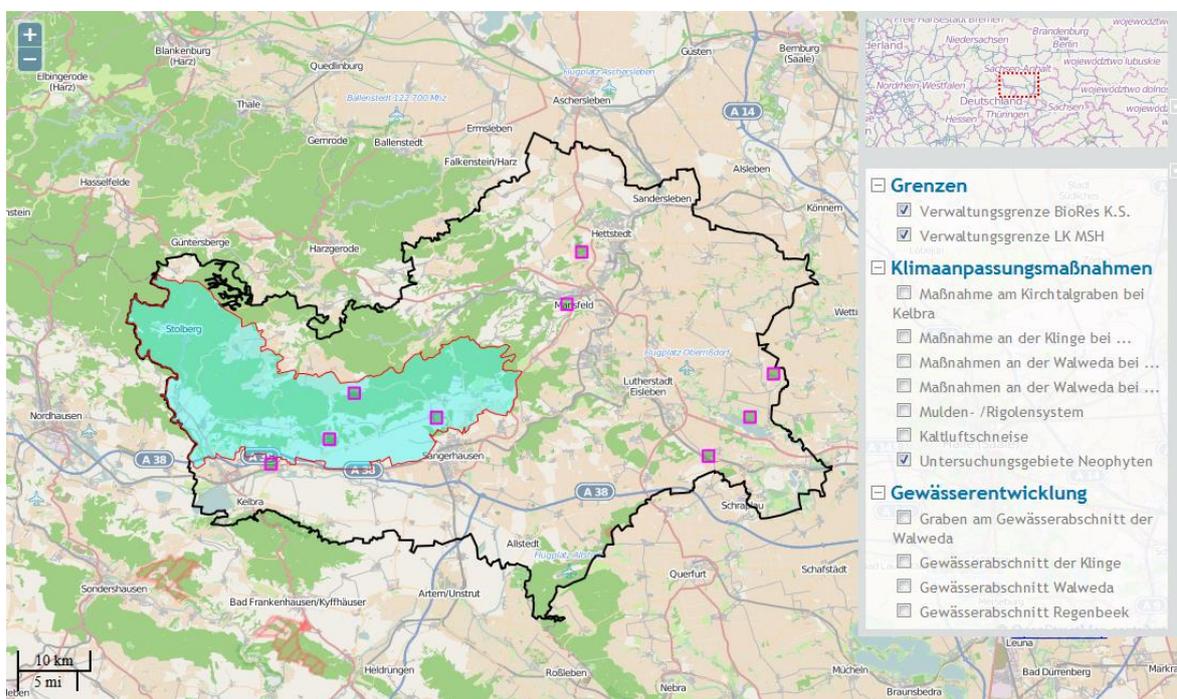


Figure 4: Integrated interactive Map to visualise the climate change adaption measures

5. Analysis of acceptance and usage

The evaluation of the project is accompanied by a two way website analysis function of Google Analytics [10] and Stylytics2 [11]. The main reason for this double analysis, is the fact that Stylytics2 can't be blocked easily by users. 5.177 page views were registered since the evaluation starts in the End of January 2014. Overall 168 users from 10 different nations have used the web portal. 447 Sessions and thus about 96% of the accesses occurred from locale stakeholders around the region of Mansfeld-Südharz in Germany. A filtering of the IP-address space of the Harz University ensure an eligible evaluation process. Most peaks which are listed in the typical page view analysis, as shown in figure 5, correlate with the achievement of various milestones and project activities. The highest increase, for example, reflects the call for submissions of good-practice examples and interesting thematic news in a KLIMPASS AKTIV-related newsletter between 20th and 22th May 2014.

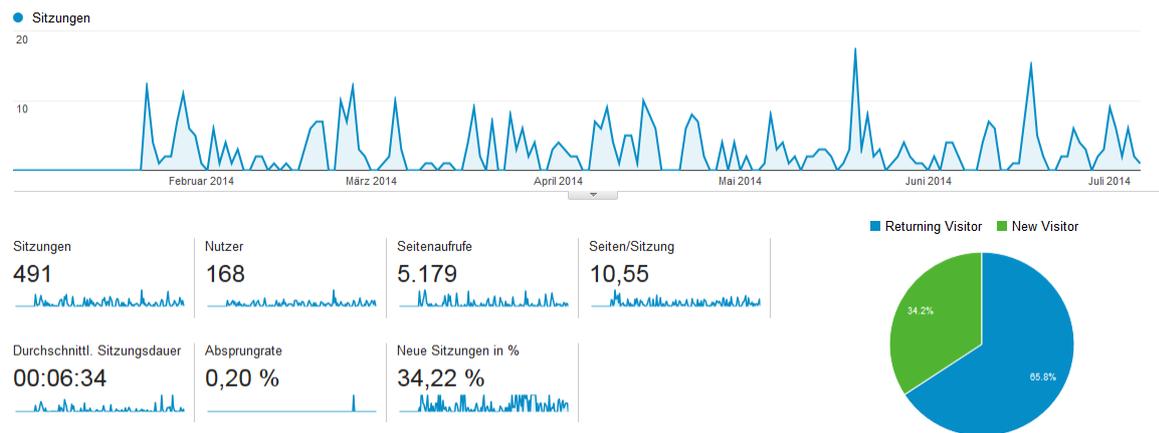


Figure 5: Analysis of the acceptance and usage of the KLIMPASS AKTIV website with Google Analytics

The continuous adaption of the web portal is supported by different workshops and presentations. Thus, all actors and stakeholders are involved in the development process and comments will be taken into account seriously.

6. Conclusion and Outlook

The KLIMPASS-AKTIV website is aimed at supporting user interaction concerning the challenges of *local* climate change adaptation. On the local level, decisions about concrete adaptation measures have to be made. Therefore, large-scale knowledge and experience is quite important. Examples of already implemented adaptation measures, as well as vulnerability maps, can help stakeholders to understand the situation and participate in the development of a local adaptation strategy. However, stakeholders in other regions can possibly profit from such a website to develop their “own” concepts. Users should have the opportunity to comment and criticise current developments, which is enabled through the website. The website, however, will also be opened, at least partly, for the public. Local citizens may have both, substantial knowledge on local conditions which should be considered during decision-making, and the capability to make concrete proposals on how to proceed with climate adaptation in a sustainable manner in future.

On the basis of the regular usage of the KLIMPASS-AKTIV website, data processing by Google Analytics and other services, the evaluation of the project will be continued. Based on this evaluation and feedback from administrative, and other, stakeholders, a constant adjustment process is established and will be optimized. Furthermore, the website should help to raise the overall, public awareness for climate change and the necessity for everyone to prepare for the changes that might happen in the future.

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