Development of a Database Supporting the Management of Nature Conservation Measures in Schleswig-Holstein

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Abstract

A database application is introduced which supports the state authorities in Schleswig-Holstein in managing nature conservation measures. The data warehouse platform disy Cadenza includes disy GISterm and offers all needed evaluation and reporting functions as well as Geographic Information System (GIS) options. The system is completed by a measure acquisition component which is integrated seamlessly within the Cadenza platform, thus presenting a consistent information system making available all nature conservation measure related data and functions.

1. Introduction

1.1 Demands for a modern, consistent data management for nature conservation

In order to fulfil the complex tasks in the field of nature conservation the responsible authorities in the state of Schleswig-Holstein need a modern and consistent data management. Especially in order to comply with national and international reporting obligations an information system is required which documents all measures to be planned and implemented for nature conservation.

In 2009 the Ministry of Energy Transition, Agriculture, Environment and Rural Areas of Schleswig-Holstein (MELUR) mandated the companies DigSyLand and disy to create a data management concept as a prerequisite for the nature conservation measure database (NCDB). This database should be the first step in optimizing the data management strategy in the field of environment and nature conservation. So it was decided to base on the widely proven evaluation platform disy Cadenza (Lukács et al. 2008).

1.2 Tasks nature conservation measure database

The planned nature conservation measure database should provide the following functions:
- Manage the different types of nature conservation measures.

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- Offer comprehensive evaluation options in order to meet the various evaluation requirements of the responsible experts.
- A sophisticated access rights management should reflect the different responsibilities of the concerned experts belonging to different authorities (ministry and state agency).
- The system should be user-friendly and easy to use and should be taken into operation without much installation efforts on the client side.
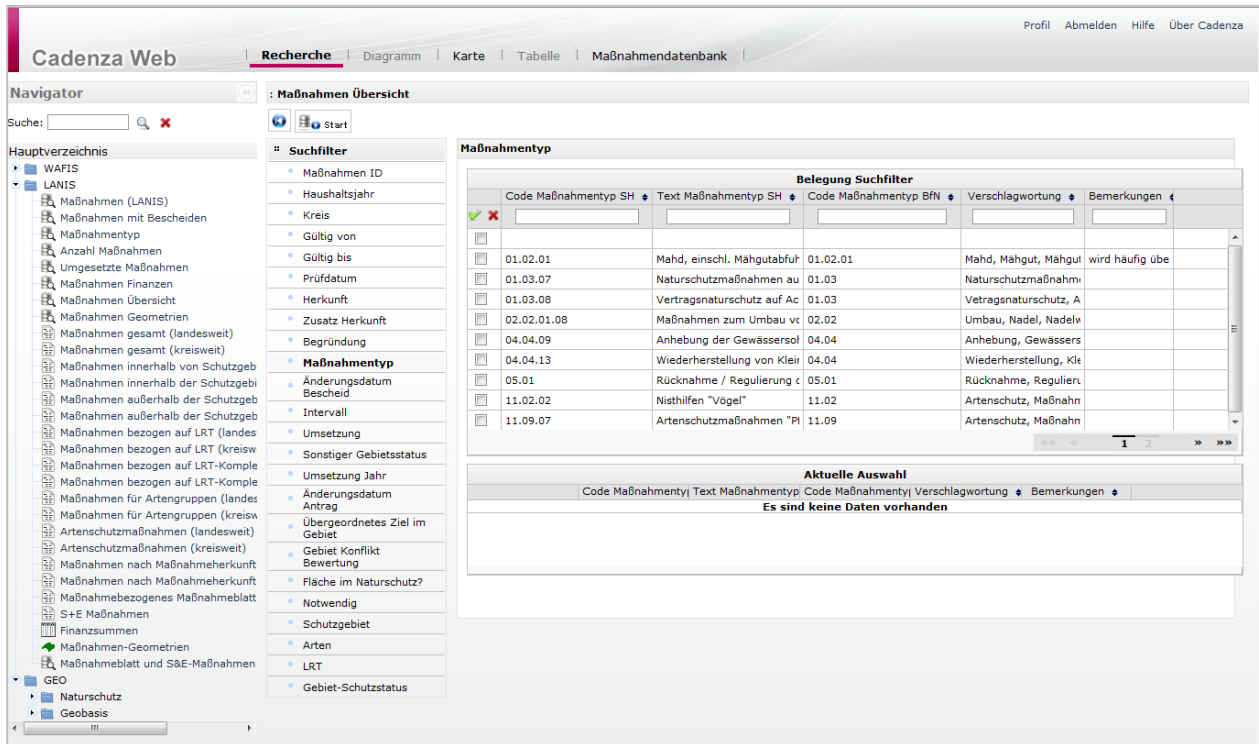- The system should by extendible and adaptable to changed requirements.

Figure 1
The nature conservation measure database offers a variety of evaluations and reports based on the data warehouse platform disy Cadenza

2. Development of measure database

2.1 Basic conditions

The evaluation platform disy Cadenza with its GIS module disy GISterm should establish the basis of the measure database and should provide the needed evaluation and geospatial functionalities (Figures 1 and 3).

Cadenza offers a desktop user interface (Cadenza Professional) as well as a web-based user interface (Cadenza Web). It was decided to use mainly the web interface because no installation effort is needed on

the client side and access will be possible from all authorities within the state intranet including the outposts.

One main task of the measure database involves the acquisition of measure related data. While data acquisition is not the main focus of Cadenza, the development of a *special acquisition application* was planned. This application should also be web-based and closely be integrated with the Cadenza platform using its application interface (Nagypal et al. 2008).
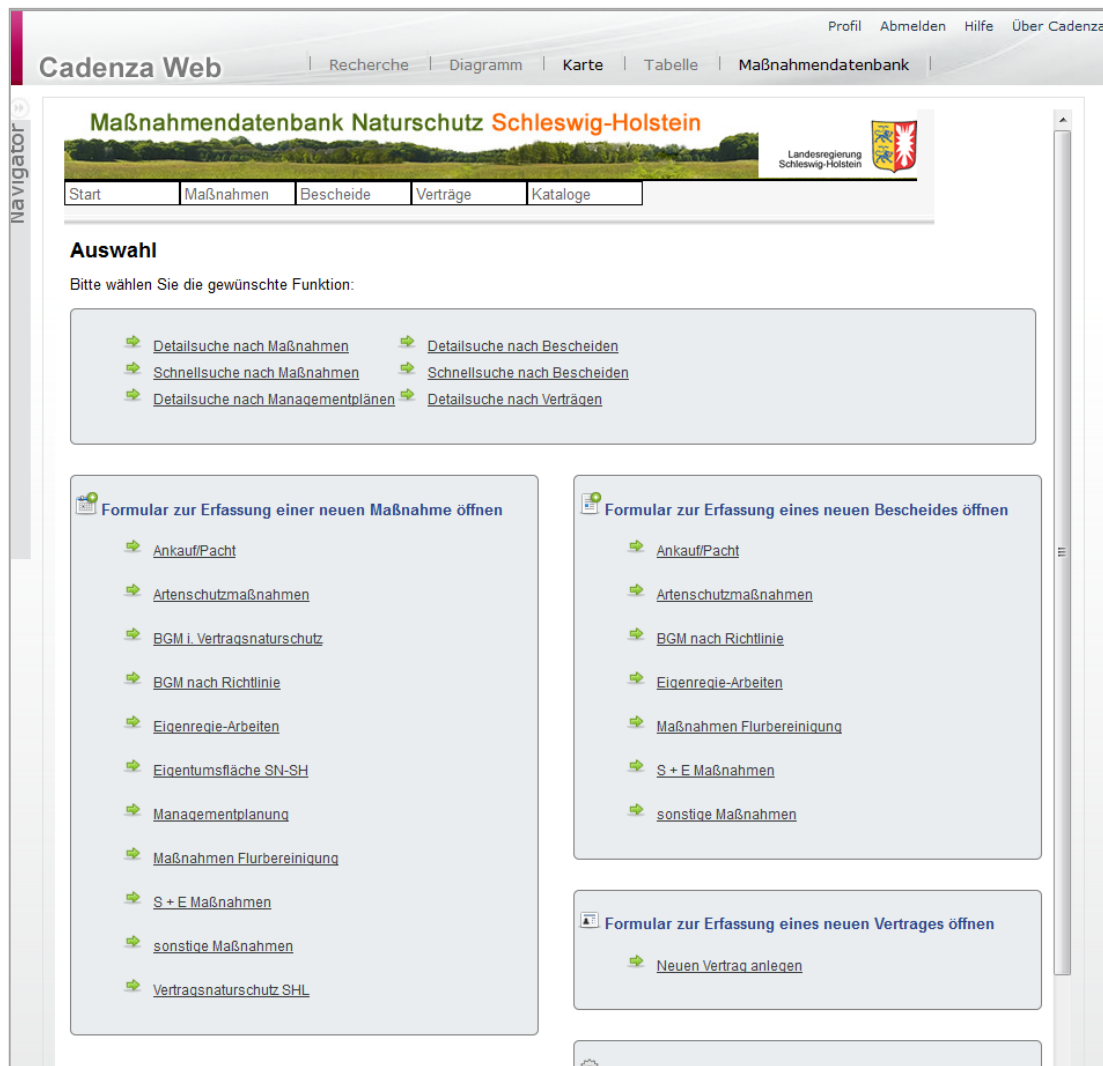

Figure 2
The Measure acquisition application presents functions according to the user's access rights

2.2 Measure acquisition application

Because several web based data acquisition applications successfully employed by the state agency were implemented using a PHP framework (Hosenfeld et al. 2008) a similar solution was intended in realizing

the desired measure application. The application was developed in PHP 5 and uses an Apache Webserver. The user interface was designed according to the users' requirements achieving improved usability. For example, data acquisition is supported by AJAX (Asynchronous JavaScript and XML) techniques in order to generate selection lists for protected areas, species and similar data.

The application could be seamlessly integrated within the Cadenza environment, so that the user will have to deal only with one platform (Figure 2). The acquisition application shares user access and session information with Cadenza. User and access rights management can be done within Cadenza.

2.3 Spatial acquisition component GISterm Web

In order to manage the nature conservation measures spatial information is essential. Cadenza's WebGIS component disy GISterm Web was extended with an API option to acquire and edit geospatial data, so that Cadenza for this purpose is not only used for evaluations but also to edit geodata. This API can be used by any web development framework and is based on an HTML-interface. The developer is not required to have any experience in storing persistent geometry data in order to work with spatial data, because the geodata management is done by the API.

While all non-spatial measure details are edited by the measure acquisition application, GISterm Web enables the user to acquire geospatial measure details (Figure 3).
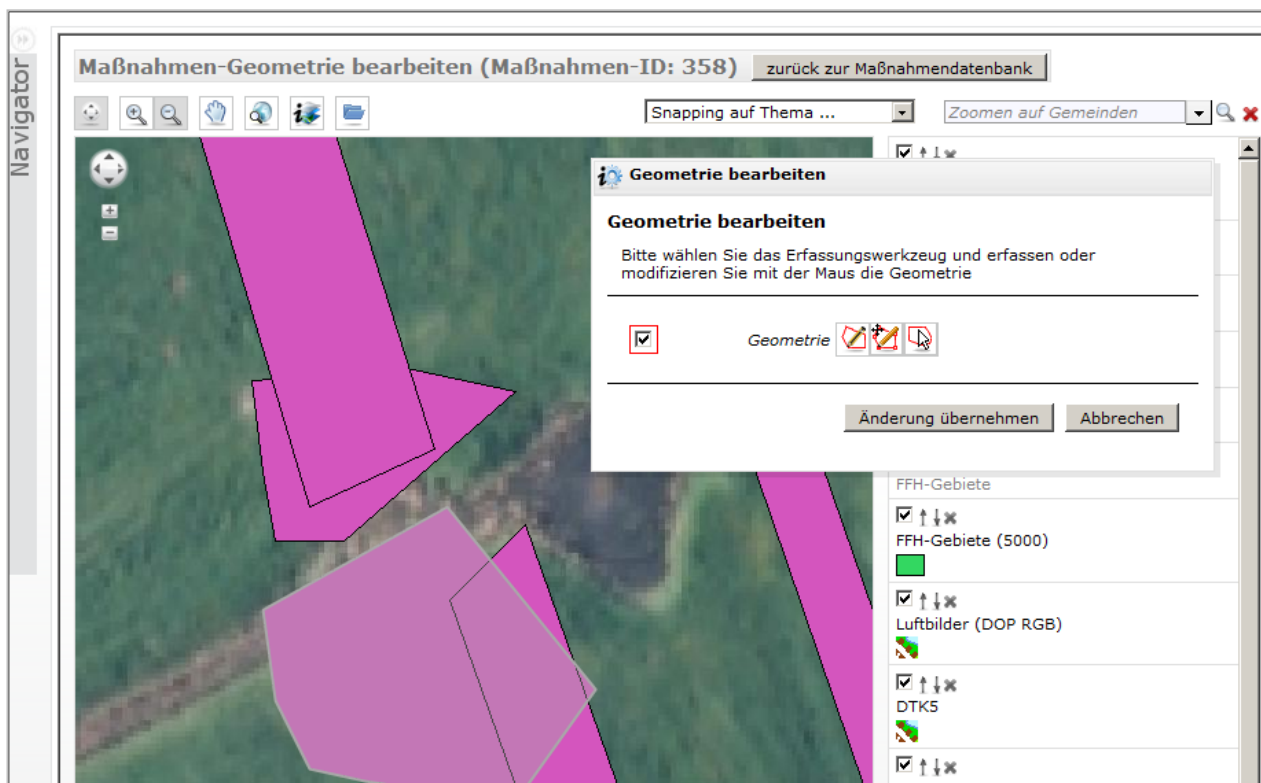

Figure 3
disy GISterm Web is used to acquire and edit geospatial data which is combined with topical data

3. Data management and access

3.1 Data management

All non-spatial measure related data can be entered and edited within the acquisition application. Data is stored in the central Oracle database. This includes geospatial data acquired with GISterm Web using the Oracle Locator option in order to manage spatial as well as non-spatial data in a combined way within Oracle. The Ministry of Energy Transition, Agriculture, Environment and Rural Areas Schleswig-Holstein follows this strategy to establish open and tool independent access to the data.

It was an important aim of the intended data management system to provide a central instance where all types of measures are maintained in order to avoid local files, maintained in different locations by different personnel.

Thus, the measure database covers all types of measures like management plans, contract-based nature protection schemes, protection and development measures and some more. In order to facilitate comprehensive evaluations a unified common data model was designed mapping all relevant properties of all types of measures.

3.2 Evaluations

The platform disy Cadenza is used to perform queries and evaluations. This includes topical and spatial queries as well as spatial presentations of query results. Query results can be displayed in tabular form and can then also be exported into common file formats (like CSV and Microsoft Excel).

Results can also be displayed on the map and can be combined with various geographic layers using disy GISterm which is completely integrated in disy Cadenza. These layers can be stored within the Oracle database, but might also be provided by services like WMS and WFS or file-based data like ESRI shape files.

In addition to these evaluations, reports can be generated based on various criteria, resulting in PDF files in a layout according to the required design specifications.

3.3 Access rights and configuration

While access to the acquisition component is limited to certain experts, especially concerning the modification of data, all members of the related authorities can use disy Cadenza to perform evaluations.

Write access rights can be defined separately for each input field and dependent on the type of measure. So experts of the different institutions and with different topical areas are assigned with different write access rights reflecting their actual responsibilities.

Configuration of all input forms concerning layout, access rights, labeling and other properties could be flexibly adapted to up-to-date needs without modifying the program code. These specifications are maintained in configuration files. Configurable options include the assignment of access rights for each input field to user groups.

3.4 Data harmonization with catalogue tables

It was intended to harmonize all acquired measure data as much as possible in order to facilitate consistent evaluations covering all types of measures. One method supporting this aim is the usage of catalogue tables which generate lists of valid input options for the majority of input fields.

Figure 4
Important measure properties are configured using catalogue tables (excerpt).

On the one hand this makes data acquisition easier to use and on the other hand it ensures more consistent data.

The catalogue tables can be edited and extended by certain experts who are assigned special access rights, so only few persons can modify the catalogue tables, thus guaranteeing the catalogue consistency (Figure 4).

3.5 Integration with other nature conservation data

The measure database is closely related with other nature conservation data managed in different databases concerning for instance protected areas, species lists as well as habitat and biotope types.

4.   Conclusion and Outlook

The aim to provide a comprehensive IT solution which offers the needed functions to acquire and manage all details concerning the different types of nature conservation measures in Schleswig-Holstein was achieved by the presented nature conservation measure database. The universal evaluation platform disy Cadenza with disy GISterm was combined with a tailored measure acquisition application.

After a test period beginning in summer 2011 productive operations started in February 2012. During the test period yet several improvements could be performed. The current user experiences will be analyzed and will be taken into account for further developments.

The nature conservation measure database can serve as an example for similar fields of application in nature conservation and other environmental topics.

The nature conservation measure database was a first step in building a data warehouse making nature conservation related data available for all experts in the state agency and in the ministry. The next step will include the integration of the database of protected areas ("Schutzgebietskataster").

Bibliography

Hosenfeld, F.; Behrens, D.; Lempert, M.; Rinker, A.; Trepel, M. & Steingräber, A. (2008): Database of measures supporting creation of management plan and programme of measures for implementing Water Framework Directive. In: Möller, A.; Page, B. & Schreiber, M. (eds): Environmental Informatics and Industrial Ecology. 22th International Conference on Informatics for Environmental Protection, pp. 541 – 548.

Lukács, G.; Kazakos, W.; & Kumer, D. (2008): Integrierte Umweltdatenbanken: Geodatenhaltung, Architekturalternativen, Inhaltliche und technische Aspekte der Modellierung. In: Knetsch, G.; Jessen, K. & Beckmann, I. (eds.): Umweltinformationssysteme, Suchmaschinen und Wissensmanagement - Methoden und Instrumente, Umweltbundesamt, Workshop des Arbeitskreises „Umweltdatenbanken / Umweltinformationssysteme" der Fachgruppe „Informatik im Umweltschutz", Dessau, pp. 43 – 48.

Nagypal, G.; Lukacs, G.; Vogt, G.; Kazakos, W. & Weber, D. (2008): Die Landesweite Datenbank für die Wasserwirtschaft und das Wasserbuch in Niedersachsen: Ein Data Warehouse mit integrierter Fachanwendung auf der Basis von disy Cadenza. In: Möller, A.; Page, B. & Schreiber, M. (eds): Environmental Informatics and Industrial Ecology. 22th International Conference on Informatics for Environmental Protection, pp. 293 – 300.