Concept of the Monitoring System for Commune Land Management According to the ISO Series 19100 Standards

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Key words: GI, land management, SDI, standards

SUMMARY

Monitoring the changes in the rural and urban areas is necessary for the land management, allowing better decisions for the spatial plans and the optimal use of the space. In Poland systems for that purpose at the local level are in progress and there is still insufficient use of IT tools in the land management at the lowest level of administrative division.

The goal of the created system is to integrate monitoring of the rural and urban areas. There are two subsystems, one of them realizes tasks for rural areas and the second one is for the whole administrative unit – commune. Interoperability between these subsystems and data interchange are provided.

Some aspects of the subsystems are modeled in accordance with the EN–ISO geographic information series of standards. System is created according to the model – driven approach, to provide consistency with the frame of Spatial Data Infrastructure (SDI). The feature catalogue is specified in accordance with EN–ISO 19110, Geographic information – Methodology for feature cataloguing. It documents features types in a set of geographic data, definitions and descriptions of feature types. Data structure and semantics is in accordance with EN–ISO 19109, Geographic information – Rules for application schema. There are also specified metadata according to EN–ISO 19115, Geographic information – Metadata.

Concept of this monitoring system is innovative and addressed to the spatial administrators at the commune level responsible for monitoring the state and the changes in land. Special emphasis is put on the rural areas and on system's specification in accordance with the geographic information series of standards.

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1. INTRODUCTION

In Poland systems that would help to monitor changes in land are in progress. There is still insufficient use of IT tools in the land management at the lowest level of administrative division. The goal of the author's system is to integrate monitoring of the rural and urban areas. There are two subsystems, one of them realizes tasks for rural areas and the second one is for the whole administrative unit – commune.

There is interoperability between these two subsystems. Interoperability means (PN-EN-ISO 19101:2005) the ability of the subsystems to provide information sharing and inter-application co-operative process control. Functional unists can communicate, execute programs and transfer data. But to built interoperable data infrastructure there must be semantic interoperability. Features types must be defined and the relationships between them. To provide interoperable data infrastructure the monitoring system should be in accordance with the ISO series 19100 standards.

2. CONCEPTUAL MODELING OF THE MONITORING SYSTEM'S DATASETS

Conceptual modeling can be defined as the complete, precise, unique and independent upon software platforms formulation of a system model in a form of application schemas. It guarantees uniformity, agreement and consistency of applications on different platforms and in different environments.

2.1 Feature cataloguing

The feature catalogue should present the abstraction of the reality in some sets of the geographic data as a defined classification of phenomena. Feature catalogues define the types of features, their operations, attributes and relationships. They provide better understanding of the content and meaning of the data. Feature catalogue can reduce costs of data acquisition and simplify the process of product specification for geographic datasets. In Poland classifications of features in datasets in spatial planning (Fig. 1a, b) and especially for rural planning differ and are partly, because there are still not catalogued domains and harmonization is needed.

Standard (ISO/DIS 19110, 2001) allows to built some framework and harmonize existing feature catalogues.

Fig. 2 presents the excerpt of the feature catalogue of the subsystem for rural area.

2.2 Standardized method of creating application schemas

The feature catalogue can be the base for application schemas. Application schemas facilitate the acquiring, processing, analyzing, accessing and transferring of geographic data between different users, systems and locations. In this paper application schemas provide the description of the data structure required by two subsystems, one for the rural areas and the second one for the whole administrative unit – commune.

Tablica 1 – Oznaczenia graficzne obiektów budowlanych

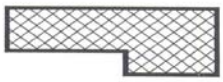
Lp.	Przedmiot oznaczenia	Przedstawienie graficzne	Grubość linii mm	Uwagi
1	2	3	4	5
1.1	Linie obrysu i przekrój projektowanego obiektu budowlanego		1.4	Przekrój poziomy należy wykonać 1,0 m powyżej poziomu terenu usytuowania obiektu budowlanego. Zewnętrzna krawędź obrysu ścian powinna pokrywać się z rzeczywistym zewnętrznym obrysem ścian projektowanego obiektu budowlanego.
1.2	Budynek adaptowany bez zmiany obrysu zewnętrznego		1,0 dla obrysu zewnętrz-nego 0,25 dla linii kreskowania ukośnego	Linie kreskowania ukośnego kreślić w odstępach 2 mm pod kątem 45°.

Fig. 1a The example of the feature classification (PN-B-01027, 2002)

2	TERENY ZABUDOWY USŁUGOWEJ			
2.1	Tereny zabudowy usługowej	U		– kolor czerwony
2.2	Tereny sportu i rekreacji	US		– kreskowanie zielono- -czerwone
2.3	Tereny rozmieszczenia obiektów handlowych o powierzchni sprzedaży powyżej 2 000 m^2	UC		– kreskowanie czerwono- -ciemnoszare

Fig. 1b The example of the feature classification (Rozporządzenie…, 2002)

Each application schema can be integrated with different schemas, which are described in ISO series 19100 standards. Fig. 3 shows the land cover application schema which is integrated with the spatial schema (PN – EN – ISO 19107, 2005). For feature class "land cover" geometric type GM_surface is chosen.

FEATURE CATALOGUE

Name: Feature catalogue of subsystem RA
Scope: Monitoring system of urban and rural areas
Version no.: 1.2
Version date: 2008-02-25
Definition source:
Feature catalogue producer: Agnieszka Zwirowicz
University of Warmia and Mazury
Olsztyn

FEATURE TYPE

Name: *Stagnant water*
Definition:
Code: PT_W1
Aliases:
Feature attribiute names: kind of reservior, name
Feature association names: is on

FEATURE ATTRIBUTE

Name: kind of reservior
Code: PT_W100
Value data type: character
Value measurement unit:
Value domain type: 1 ('' enumerated'')
Feature attribute values:

Label	*Code*	*Definition*
lake	1	
pond	2	

Fig. 2 The excerpt of the feature catalogue of the subsystem for rural area

2.3 Concept of the metadata

Considering that datasets of the two subsystems could be used by many users, a structure for describing data is needed. This structure provides the proper characteristic of the data of the subsystems: the identification, the extent, the quality, the spatial reference, the distribution of digital geographic data. Fig. 4 shows metadata packages of the monitoring system of the rural areas. For each package is UML diagram (Jacobson, 2005) and data dictionary (Table 1.) which describe the characteristics of the metadata.

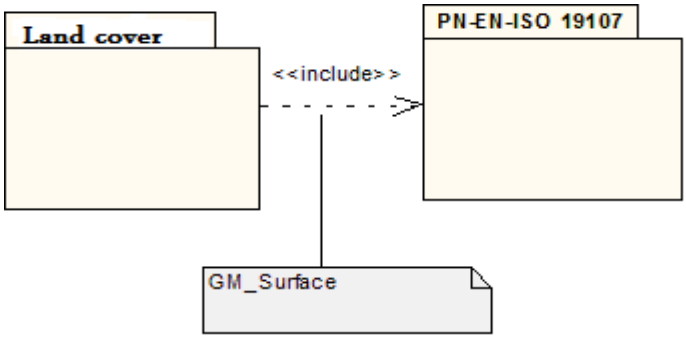


Fig.3 Application schemas' integration

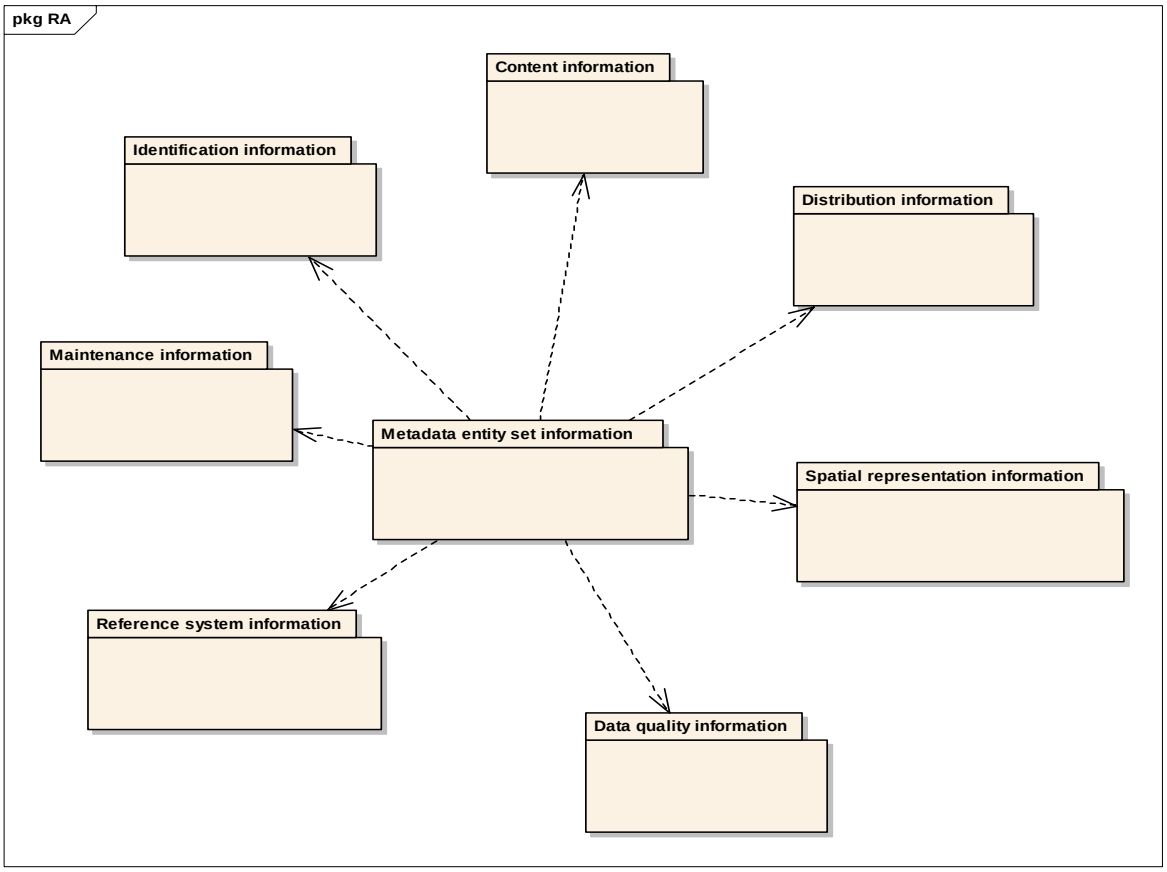


Fig. 4 Metadata packages of the monitoring system of the rural areas

Table 1. Dictionary for Metadata entity set information in accordance with (PN – EN – ISO 19115, 2005)

No.	Name	Definition	Data type
1.	MD_Metadata	Root entity, which defines metadata about resources	Class
2.	contact	Party responsible for the metadata information	Class
3.	DateStamp	Date that the metadata was created	Class
4.	Role name: SpatialRepresentationInfo	Digital representation of spatial information in the dataset	Association
5.	Role name: ReferenceSytemInfo	Description of the spatial and temporal reference systems used in the dataset	Association
6.	Role name: identificationInfo	basic information abort the resources to which the metadata applies	Association

No.	Name	Definition	Data type
7.	Role name: ContentInfo	Provides information abort the feature catalogue and describes the coverage and image data characteristics	Association
8.	Role name: DistributionInfo	Provides information abort the distributor and options for obtaining the resources	Association
9.	Role name: DataQualityInfo	Provides overall assessment of quality of a resources	Association
10.	Role name: metadaMaintenance	Provides information about the frequency of metadata updates and the scope of the updates	Association

3. THE MONITORING SYSTEM AND SDI

The monitoring system, which is in accordance with the ISO series 19100 standards, can deal with web services (prCEN/TR 15449, 2006) and be both the data producer (Fig. 5a) and the data user (Fig 5b).

Metadata of the subsystems are placed in the catalogue servers, the application schemas provide reaching the consensus about data structure and are base for the transport and storage of geographic information in XML/GML.

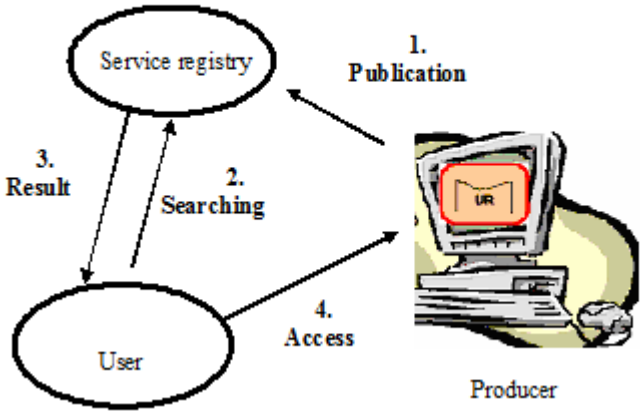


Fig. 5a The subsystem of the monitoring system for the rural areas as the data producer

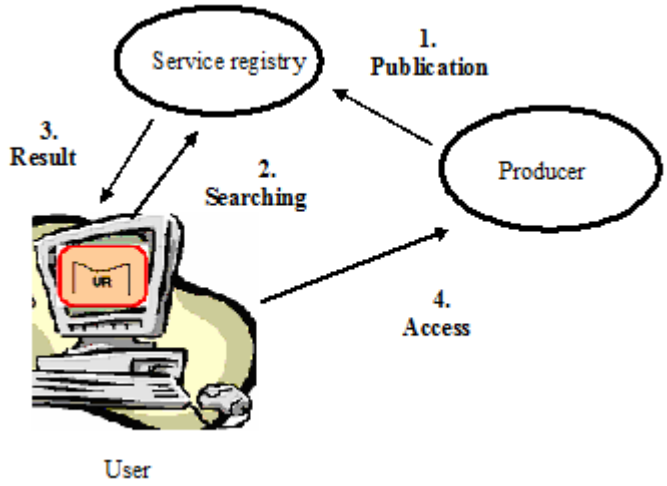


Fig. 5b The subsystem of the monitoring system for the rural areas as the user of data

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BIOGRAPHICAL NOTES

Agnieszka Zwirowicz – 28 years old, lecturer at the University of Warmia and Mazury in Olsztyn, Poland; MSc in 2004 at UWM in Olsztyn, MSc thesis "Proposal of the mathematical model of the land development"; the reward of the district surveying company in Olsztyn for the best students; PhD in 2007 at UWM in Olsztyn, PhD thesis "Concept of the information system supporting land management at the commune level"; the award of the faculty council for PhD thesis; the author and co – author of more than 10 papers and 11 oral presentations at national and international conferences and 3 posters; co-author and webmaster of e-dictionary for ISO series 19100 standards (http://www.e-przewodnik.gugik.gov.pl).

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