SDI for Support of Urban Development
Istanbul - Turkiye

Arif Cagdas AYDINOGLU
Assoc. Prof. Dr., Gebze Technical University, Turkey

www.arifcagdas.com
Overview

- Introduction with Urban Development
- Turkey SDI projects related to INSPIRE
- Case application for TRGIS and INSPIRE
- Projects in Istanbul Metropolitan Municipality
- Discussion and Conclusion
Turkey’s administration is based on central management. Province (İl) is the main administrative units managed by governors. County (İlce) is sub administrative unit of the province. Metropolitan Municipality (Büyükşehir Belediyesi) covers provincial area with the population > 750,000 inside 100km. Municipality (Belediye) is built in the county, and managed by mayor. District (Mahalle) is the lowest level local administrative unit managed by reeve in the municipal areas.

30 Metropolitan Munic. with 519 county Munic.
51 province county + 400 county + 397 town
= 1397 municipalities
31873 districts in the municipal areas of Turkey.
Introduction – Urban Development

- 113 legislations related to Urban GIS were examined (1 anayasa, 64 kanun, 44 yönetmelik, 2 tüzük, 2 KHK) in view of data requirements and working processes of Urban GIS.

According to the law 5216 and 5393;

(Metropolitan) Municipalities must build Urban GIS.

5216 Sayılı BÜYÜKŞEHİR BELEDİYESİ KANUNU
Resmi Gazete: 23.7.2004 - 25531

5393 Sayılı Belediye Kanunu
Maddesi 14- Belediye, Mahalli müşterek nitelikte olmak şartıyla; a: imar, su ve kanalizasyon, ulaşım gibi kentsel altyapı; coğrafi ve kent bilgi sistemleri… Hizmetlerini yapar ve yaptırır.
According to the no.6360 Metropolitan Municipality Law in 2014; 30 Metropol.Munic. cover %65 of Turkey with more tasks for **Urban + Land Management**
Introduction – Urban GIS Applications

• Mapping; application, current map, urban atlas, direction for building survey, servitude, condominium, building license, building inspection, building permits

• Plan and Zoning; zoning applications, split-merge- leaving process of parcel, zoning certificate, development plan and plan changes.

• Support Services; breakdown services, waste water network, road maintenance and repair, transport network, natural gas network, drinking water
Introduction – Urban GIS Applications

• Licence, control, and income; environment tax, property tax, advertising tax, fuel station license, business license, car park management, public inventory management

• Environment, parks, and security; waste management and pollution management, energy efficiency, management of urban furniture, fire services, market place, police services, landscaping

• Social works and health services; social services and welfare, cemetery, veterinary and health
Turkey SDI: TRGIS

- After 1990s, digital map production
  - 1:5000 smaller maps;
    The General Command of Mapping produces STMs
  - 1:5000 and larger maps;
    Municipalities produces Large Scale Topo. Maps

- **TAKBIS- Land Registry & Cadastre Inf. Systems**
  manages 5 million land registry processes

- **UrbanGIS projects**
  declared by %25 of 1397 municipalities

- Other public institutions have produced GIS projects
  serving their needs.

- **CORS-TR**
  Continuously Operating Reference Stations –Turkey
Turkey SDI: TRGIS

Ministry of Environment and Urbanization, General Dir. of GIS was built in 2011;
- coordinating all GIS activities
- determining standards and building TRGIS
- ...

TRGIS and UrbanGIS projects in 2011

- TRGIS project for 86 general directorates
  - defining national geo-data standards
  - geo-portal development
  - determining institutional and policy requirements

- UrbanGIS project for 1397 municipalities + 81 provincial Admin.
  - determining UrbanGIS geo-data standards
  - current situation analysis for UrbanGIS
  - Determining legal and financial requirements
TRGIS (TUCBS)

- TRGIS Legislation, similar to INSPIRE directive, published in March 2015.
- TRGIS administration structure was defined.
- TRGIS vision, strategy, and other regulation needs were determined.
- It addresses for TRGIS geo-data themes’ metadata, and portal.
- However not put into practice yet.
- Legislative conflict for interministrial coordination

In 15 ministries; 86 General Directories,

[Diagram showing the General Directorate of Geographical Information System with Prime Ministry at the center, connected to various ministries and institutions.]
TRGIS Data Specification Methodology

AT NATIONAL level (TRGIS);

In 15 ministries;
• 86 General Directories,
• 88 Head of Departments,
• 118 Branches,
• 366 People (Fieldwork + Workshop)

• 254 Map/Application/Product analysis

AT LOCAL level (UrbanGIS);

• the best UrbanGIS practices-
  16 local Governments analysis
• 210 out of 1395 municipalities

• 71 Map/Application/Product analysis
Annex F
(informative)

Example for an extension to an INSPIRE application schema

F.1 Introduction
The agreement on harmonised data specifications addresses the need of users, in particular pan-European users, to combine multiple spatial data sets without repetitive manual intervention and in such a way that the result is coherent. This requires an effort to transform the existing spatial data to the new harmonised data specifications. In the long-term, it is the hope that less and less effort will be required for such transformations and that data providers start to re-use the harmonised data specifications as the basis for their spatial data sets in case they are restructured. Since national spatial data sets will in almost all cases contain information not covered by the INSPIRE data specifications, national SDIs or community SDIs will typically have to extend the INSPIRE data specification for their own purpose.

The Generic Conceptual Model has been designed to support such extensions. This annex provides an example for a simple extension.

F.2 General rules
The INSPIRE data specifications have been developed through a process involving the European stakeholders. While the future maintenance of the specifications has not yet been fixed, it is reasonable to assume that this will be the case in the future, too. The INSPIRE

Extending an INSPIRE data specification would imply at a minimum that:
- the extension does not change anything in the INSPIRE data specification but normatively references it with all its requirements
- the extension does not add a requirement that breaks any requirement of the INSPIRE data specification

However, the extension may, for example, do any of the following:
- add new application schemas importing INSPIRE or other schemas as needed
- add new types and new constraints in your own application schemas
- extend INSPIRE code lists as long as the INSPIRE data specification does not identify the code list as a centrally managed, non-extensible code list
- add additional portrayal rules

In addition to these general rules that are mainly implied by the rules of UML, further harmonisation will be achieved, if the extensions conform to all requirements of this document and the document “Guidelines for the encoding of spatial data”, too.

F.3 Example
TRGIS is a base geo-data model and includes data sets that users/sectors need to share.
Base data themes were designed and accepted in 2011.

Conceptual Model Components for the development of data standards and interoperability of geo-data sets.
TRGIS Portal + Data Specifications

- **Geoportal**: National Geographic Data portal
- **ATLAS**: presenting of spatial data sets of the ministry on the web
- **Geology data base** *(for INSPIRE Geology)*
- **True OrthoPhoto** and Geospatial Data Product Project *(for INSPIRE Orthoimagery)*
- **E-plan** and plan identification number
- **Forestry GIS, Water GIS, ...**
- **Protected Sites, Land Cover** *(for INSPIRE)*...
TRGIS.BI Building Data Theme

- For INSPIRE Extension, language differences!
- Defining inherited objects is difficult, because of national–sector model interaction

INSPIRE Building theme concept + TRGIS data requirements
TRGIS.TK Land Registry & Cadastre

- TRGIS.TK GML not validated/used!

INSPIRE Cadastre classes + LADM approach + TRGIS requirements
TRGIS.IB Administrative Unit

• Equal to INSPIRE AU without marine side

• Some constraints specific for Turkey were added.
• New inherited feature types and equal code lists.

INSPIRE.AU

TRGIS.IB
TRGIS.AD Address theme

- Similar to INSPIRE
- INSPIRE core attributes was revised !.

- Address components focusing on Turkey, but approach is similar. !
Spatial Address Registration System (MAKS) (for INSPIRE address) in 2011 by Interior Ministry - Gen.Dir. Of Population and Citizenship

National Address Database (UAVT) in 2006, “Numbering and Address Database Regulation” …

2. 3D CITY MODELLING

Nowadays it is possible to create 3D city models at a reasonable cost due to the rapid development of technologies and software. CityGML–IMGeo (DTB), 2009, allows for the creation of 3D city models that can be used for various applications such as urban planning, infrastructure management, and environmental studies.

Figure 2.1: A view from 3D City Model of Berlin [6].

Another interesting use case is the conversion of 2.5D XMI to 2.5D already reference data. This process ensures compatibility with existing tools and systems, while maintaining the necessary level of detail for accurate representation.

Image 6x332 to 745x515
A challenging ETL

A simple ETL

Case Application: TRGIS vs. INSPIRE

TRGIS GML

INSPIRE GML
Case Application: TRGIS.GML
Case Application: TRGIS.GML
Case Application: TRGIS.GML
Case Application: TRGIS.IB >> INSPIRE.AU
Case Application: TRGIS.IB and INSPIRE.AU datasets in QGIS
DISCUSSION

• TRGIS can be compatible with INSPIRE without extra work, but data production do not touch application needs.

• SDI stakeholders are at national, but applications at local level.

• Small municipalities have difficulty for know-how, experience, and sources.

• Well-organized coordination roles should be defined clearly for SDI stakeholders, encouraging their partnership with the private sector.

• No real Urban GIS standard and implementation directive.

• Regulations for all municipalities, but different needs and capacity in the municipalities.

• Data specification guidelines and detailed cookbook are required to develop data specifications.

• Open data interoperability and data transformation need capacity building activities, because people are familiar with traditional GIS software.

• Best practices for INSPIRE should be presented to data providers as an example.

• To develop data policy, More open data More services.

• User needs and value-added are priorities for INSPIRE.
Urban GIS by Cloud Computing
Urban GIS by Cloud Computing

Data Collection

Data Preparation

Software Development

GIS SDK,
Server/desktop software
Urban GIS by Cloud Computing

Numbering Module

Licencing Module

Zoning Module

Infrastructure Module

e-plan
Institutional Geographical Information System

GIS application which has been created by IMM GIS Directorate using own resources. It has started to serve in 2009 and till then it has grown by adding new features and technical updates.

An Open Source Application

We are giving support to world accepted open source systems. Programmers may modify and customize the applications due to requests of IMM’s departments.

Public Transportation Vehicles

Getting information about metro, tram, bus, sea bus, mini bus, taxi routes and stops.

Convenient for multi-level user profiles

Staff can easily use the application via user friendly interface.

Estate Management

Updating the information and tracking the situation of estates owned by IMM in map environment can be done. In addition, information about expropriated parcels can be reached.

1/5000 Plan and Modification Information

IMM staff can use up-to-date 1/1000 and 1/5000 plans and modifications via this platform.

Aerial Image

Changes of the city can be seen via aerial photos from 1946 to today.

360° Panoramic View

Panoramic pictures which are taken citywide help IMM staff to do relevant works without going to field.

IMM Owned Building Information

Building Pictures
Building Documents
Land Registry Information

3D Terrain Model

Information can be gathered from 3D terrain model which is created by laser scanners.

City Infrastructure Data

All relevant institutions can access city infrastructure information, by doing this duplication of excavations and hammering each other lines can be prevented.

Spatial Inquiries

Borders, coastal lines, protected zones etc. can be reached online.

Stream Information System

Stream basin information and flood risk factors can be seen on map. Aimed to predict flood and take action against.

IMM Departments Data

Spatial information provided by IMM departments can be seen on map in real-time.

Online Land Register Inquiry

Authorized staff can inquire up to date deeds. All inquiries have been reported monthly.
Istanbul's New City Map

City map app is developed and enriched to fulfill needs of Istanbul. Please click http://sehirharitasi.ibb.gov.tr/ for address search, street view, public transport and more.

Street View
By clicking on the 360 panorama option, you can see the panoramas of streets which you can visit. Shooting time and coordinates are available.

Istanbul Stories
Istanbul stories module designed for telling and showing historical richness of Istanbul by map.

Public Transport
You can easily reach detailed information of public transport (subway, bus, sea bus, tram, minibus and taxi) from starting point to destination on map.

API Support for Developers
You can use city map API library which is developed for developers for free.

Language Support
The application can be used in English and Turkish.

Aerial Photographs
Timeline of Istanbul aerial photographs (since 1946) for seeing the differences by years.

Field And Distance Measurements
You can easily measure and find out current measurement of any field or distance.

Social Media
Sharing location on Istanbul’s new city map via social media links is very easy.

Mobile Application
Mobile application will soon be available.

http://sehirharitasi.ibb.gov.tr
IMM PUBLIC TRANSPORTATION INFORMATION SYSTEM

GTFS (General Transit Feed Specification)
By this project, standardization on public transit has been achieved. Relevant departments can use GTFS formatted data.

TUBS
It is aimed to produce the public transit data of IMM for planning transportation and to use this data in master plan works. In this project, GTFS data standard has been used. In this method, produced up to date data has been transferred to the GIS Directorate’s central database and served to relevant departments in interoperability principles. By supporting citizens with accurate and up to date public transit information will contribute of disseminating the usage of public transit.

Data Production
All data produced in this project are integrated by the city information system and a web application has been created for the institutions to produce data in GTFS format.

Travel Plan
Providing point to point multi model travel planning is aimed. By doing this, it is planned to help citizens and tourist to use public transit more efficiently and to reduce CO2 emission.

Public Transit Data Sets
It is important to have up-to-date and standardized data to achieve integrated public transit system. By this project relevant planning departments can get proper data sets to feed their analyses.

Benefits of the system
Public Transit Institutions and City Information System Integration. Reaching up to date information. Efficient planning by detailed public transit analyses. Providing information to policy decision systems. Optimized travel planning.

Goals
Managing Public Transit Information System by City Information System using international standards. Achieving more accurate analyses by up to date data. Supporting citizens by accurate and up to date data.
IMM Vector and Pest Control Automation
CONCLUSION

POLICY
- Coordination and defining stakeholder roles clearly
- Open data and easy sharing/pricing policies
- Interaction with national policies
- Information Society reforms

TECHNOLOGY
- Adaptation to technical standards
- Developing data specs. for the applications
- CLOUD platform services
- Quality and mew trends for data collection

ECONOMIC
- Coordination: Public-Private-University-Citizens
- Value-added applications
- Developing methodology for data/service production
- Economic contribution with data sharing
- Sharing applications and best practices
- Providing public participation

SOCIAL
- Coordination: Providing public participation
- Education and capacity building activities
- Increasing awareness
- Sharing applications and best practices
- Value-added applications
- Economic contribution with data sharing
- Planning investment collaboratively

CONCLUSION
Thanks...

Assoc. Prof. Dr. Arif Cagdas AYDINOGLU
Gebze Technical University
TURKEY

web: www.arifcagdas.com
e-mail: arifcagdas@gmail.com