

# 8 „Development of Smart City Applications Based on Open Data“

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## 8.1 European Union policy regarding Smart Cities

According to the *Digital Agenda for Europe* [1] adopted by the European Commission, “A smart city is a place where the traditional networks and services are made more efficient with the use of digital and telecommunication technologies, for the benefit of its inhabitants and businesses.” With this vision in mind, the European Union is investing in ICT research and innovation and developing policies to improve the quality of life of citizens and make cities more sustainable in view of Europe's 2020 targets.

To speed up the deployment of these solutions, the European Commission has initiated in July 2012 the *European Innovation Partnership (EIP) on Smart Cities and Communities* that intends to bring together European cities, industry leaders, and representatives of civil society to smarten up Europe's urban areas.



Fig. 1. EU Smart Cities and Communities Initiative (Source: <https://eu-smartcities.eu>)

So far, the European Innovation Partnership (EIP) on Smart Cities and Communities has received some 370 commitments to fund and develop smart solutions in the areas of energy, ICT and transport. These commitments involve more than 3,000 partners from across Europe and create a huge potential for making our cities more attractive, and create business opportunities.

The partners have been grouped in *Action Clusters*, based on specific issues related to smart cities, by sharing the knowledge and expertise with their peers, giving

added-value to their national and local experience and identifying gaps that need to be fulfilled at European level.

The 6 Action Clusters which have been set up so far are:

- [Business Models, Finance and Procurement](#)
- [Citizen Focus](#)
- [Integrated Infrastructures & Processes across Energy, ICT and Transport \(including Open Data\)](#)
- [Policy & Regulations / Integrated Planning](#)
- [Sustainable Districts and Built Environment](#)
- [Sustainable Urban Mobility](#)

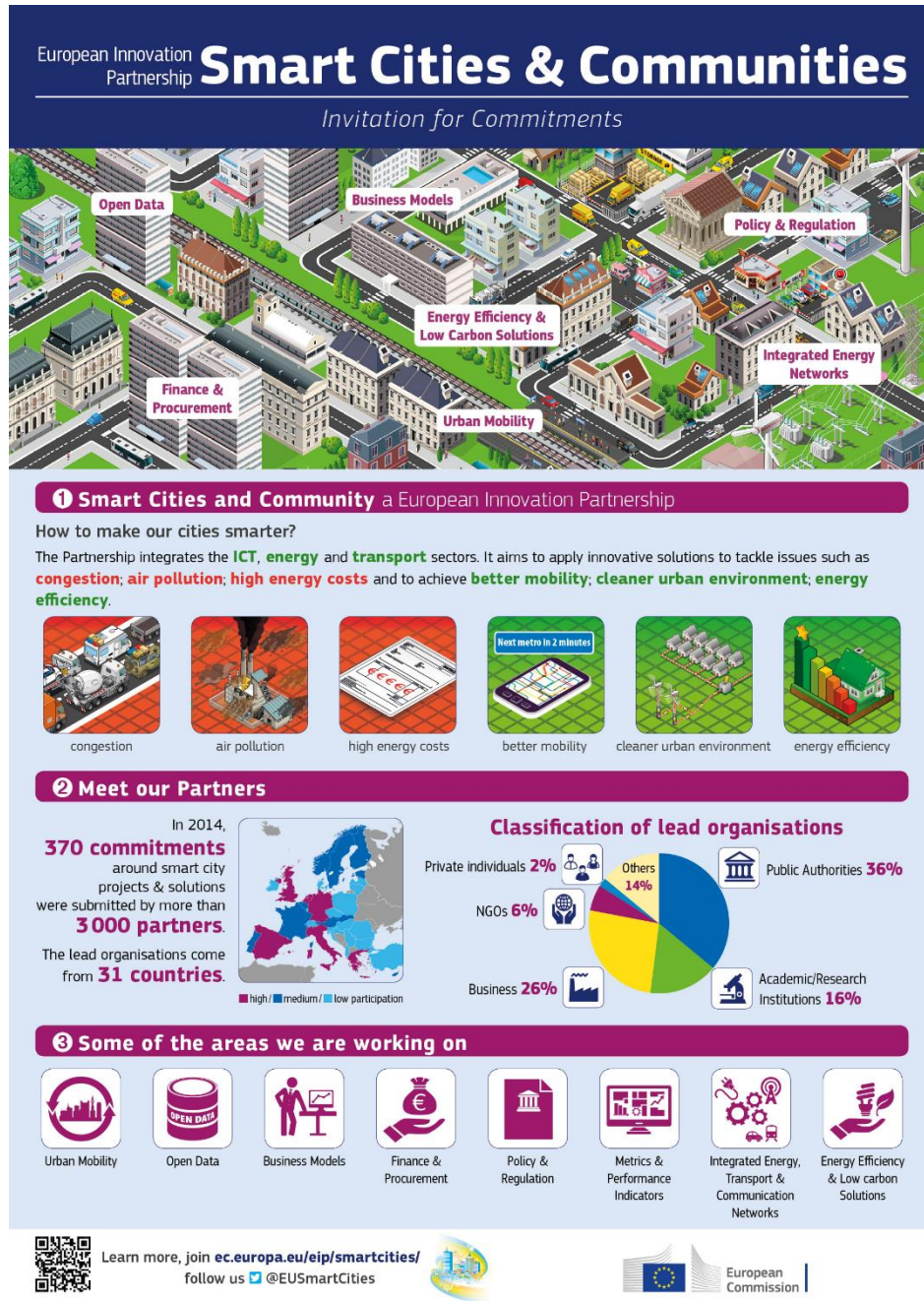


Fig. 2. Smart Cities and Communities Initiative. Invitation for Commitments

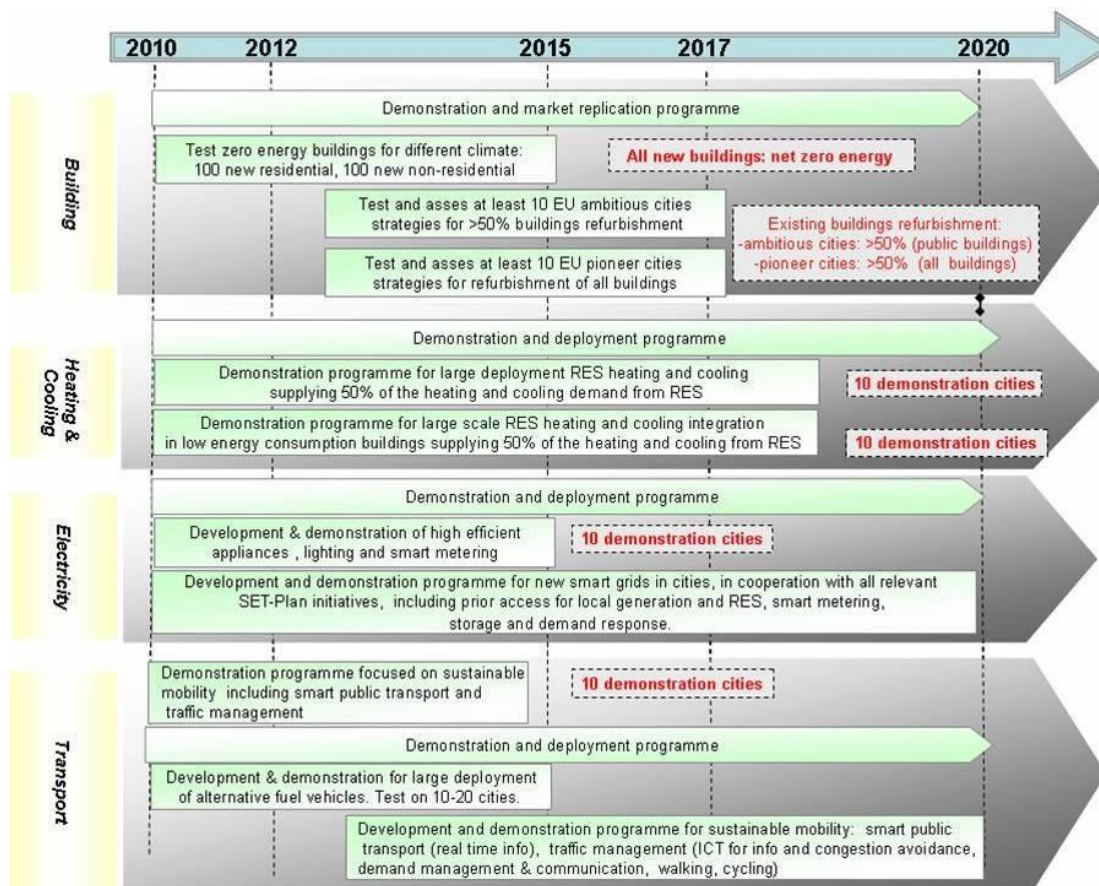


Fig. 3. Smart Cities Initiative Roadmap. EC SET Plan (Source: SETIS, 2011)

The *Action Clusters Kick-Off Conference* took place in Brussels, on October 9th, 2014. There were over 300 guests participating. The conference has been honoured by the presence of the key politicians pushing this initiative:

- EC Vice President for Energy Günther H. Oettinger
- EC Vice President for Digital Agenda, Neelie Kroes
- EC Vice President for Transport, Siim Kallas

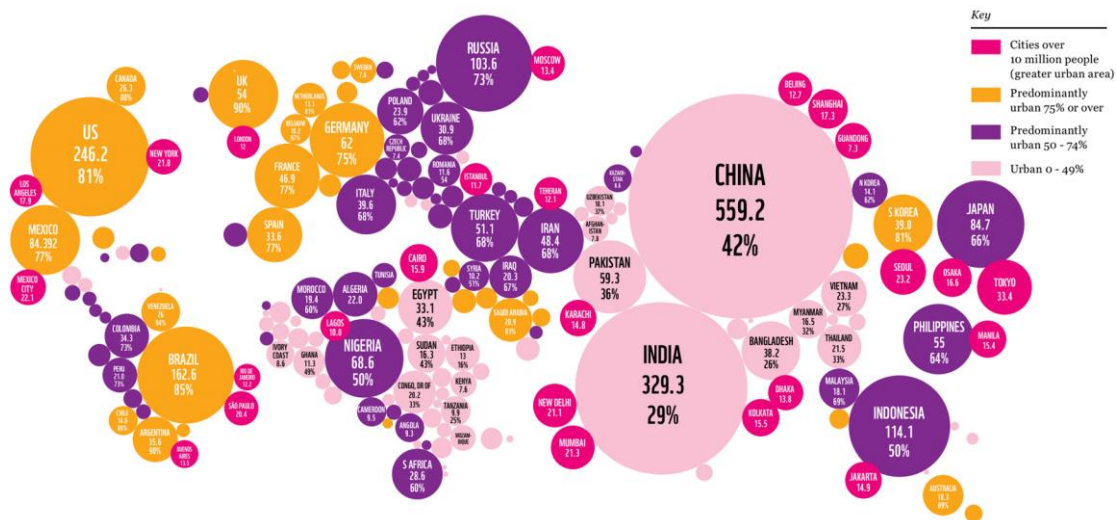
## 8.2 Visions of Smart City in the ICT Era

The need for smarter cities is defined by the main challenges cities are facing today [3], [4] :

1. Growing population

In Europe alone, about 80% of the population lives in cities and urbanization is accelerating, while in China about 300-400 million people will move to cities in the next 15 years [5]. By 2030 it is estimated that the urban population will be around 5 billions people. In the 21<sup>st</sup> century, cities will account for 90% of population growth, 80% of global CO<sub>2</sub> emissions and 75% of energy use.





The Smart City concept is therefore based on a six pillars model [6], with the corresponding indicators:

1. Smart Economy,
2. Smart Mobility,
3. Smart Environment,
4. Smart Governance,
5. Smart People,
6. Smart Living

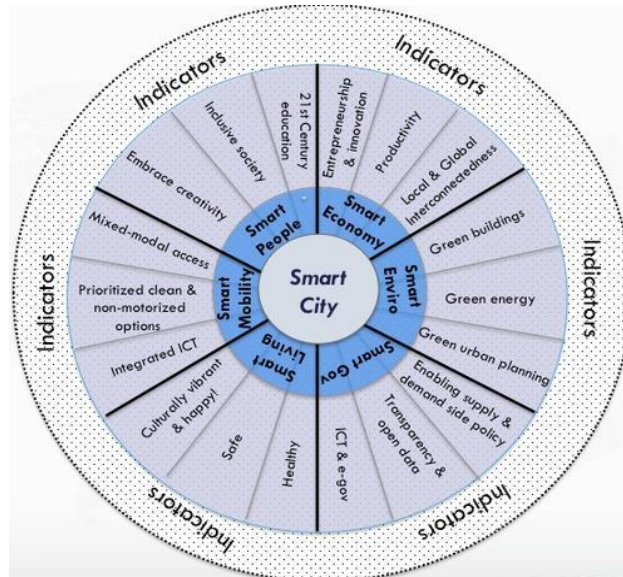


Fig. 5. The Smart Cities Wheel developed by Cohen

#### *Smart Economy:*

- Innovative spirit
- Entrepreneurship
- Economic image & trademarks
- Productivity
- Flexibility of labour market
- International embeddedness
- Ability to transform

#### *Smart Mobility:*

- Local accessibility
- (Inter-)national accessibility
- Availability of infrastructure
- Sustainable, innovative and safe transport systems

#### *Smart Environment:*

- Attractivity of natural condition
- Less pollution
- Environmental protection
- Sustainable resource management

#### *Governance:*

- Participation in decision-making
- Public and social services
- Transparent governance
- Political strategies & perspectives

#### *People:*

- Level of qualification
- Affinity to life long learning
- Social and ethnic plurality
- Flexibility
- Creativity
- Cosmopolitanism/open mindedness
- Participation in public life

#### *Living:*

- Cultural facilities
- Health conditions
- Individual safety
- Housing quality
- Education facilities
- Touristic attractiveness
- Social cohesion

### **8.3 Open Data**

*Open data* is data that can be freely used, re-used and redistributed by anyone - subject only, at most, to the requirement to attribute and share alike [7].

The most important principles of Open Data are:

- *Availability and Access*: the data must be available as a whole and at no more than a reasonable reproduction cost, preferably by downloading over the internet. The data must also be available in a convenient and modifiable form.
- *Re-use and Redistribution*: the data must be provided under terms that permit re-use and redistribution including the intermixing with other datasets.
- *Universal Participation*: everyone must be able to use, re-use and redistribute - there should be no discrimination against fields of endeavour or against persons or groups. For example, 'non-commercial' restrictions that would prevent 'commercial' use, or restrictions of use for certain purposes (e.g. only in education), are not allowed.

The most important feature of Open Data is *interoperability*. Interoperability denotes the ability of diverse systems and organizations to work together (inter-operate). In this case, it is the ability to interoperate - or intermix - different datasets. Interoperability is important because it allows for different components to work together. This ability is essential to building large, complex systems.

Not all publicly made available data are open data. In order to be open, the data should be:

- published in an open format (such as CSV, JSON, XML, RDF etc.), that allows their automated processing
- described as rich metadata and classified according to standard vocabularies (DCAT, Eurovoc, ADMS etc.) in order to facilitate search and interoperability
- accessible as data transfer (massive data fluxes), as well as through API – Application Programming Interfaces, in order to facilitate their automatic processing
- accompanied by explicatory documents regarding used metadata and vocabulary, in order to facilitate data bases interoperability
- periodically updated by re-users, in order to maintain data quality

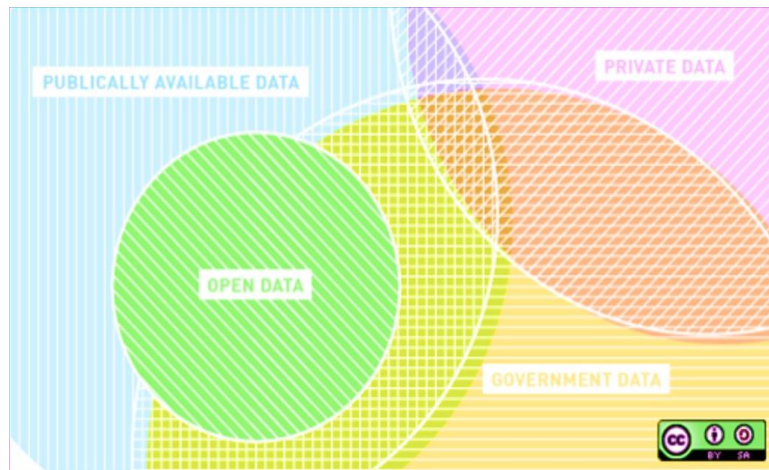


Fig. 6. Open Data vs. Publically Available Data (Source: opensource.com)

## 8.4 Open Data Applications

Open Data are used by a large variety of IT experts in order to develop application of interest for the public. Generally, those applications are online application and most of them are accessible from a mobile device (smartphone, tablet etc.).

Some of the most known and used applications based on open data (that probably everybody used) are:

- *weather applications*, based on data provided by the meteorologists
- *exchange rate applications*, based on data provided by central banks
- *transport planning applications*, based on data provided by municipalities, underground – bus – train transport companies

Many of those applications, more and more sophisticated, are able to provide a better access to information for population, better governance services or better social services for different groups of people. This is the reason why they are at the core of developing Smart Cities applications on all pillars defining a Smart City.

### 5. Study Case: Smart City and Open Data in Romania

In Smart Cities, digital technologies translate into better public services for citizens, better use of resources and less impact on the environment.

Efforts in the realization of Smart Cities projects are just at the beginning in some areas of Romania. However, the IT industry is quite developed and some enthusiast IT experts have started working in the field, more or less on a voluntary base. This is how a number of associations have been established:

- Open Data Coalition (<http://datedeschise.fundatia.ro/>)
- Smart City Association (<http://mysmartcity.ro>)
- Association for Technology and Internet ([www.apiti.ro](http://www.apiti.ro))
- Open Knowledge Romania (<https://okfn.org/network/romania/> and <http://ro.okfn.org/>)

After signing the Open Government Partnership international agreement [8], in December 2012 the Romanian Government established a Department for Online Services and Design. One of its main tasks was to establish a governmental portal for central access to open data sets made available by public authorities, on the aim to help people to find, to save and to use all information generated and owned by administrative structures. The portal can be found at <http://data.gov.ro/>.

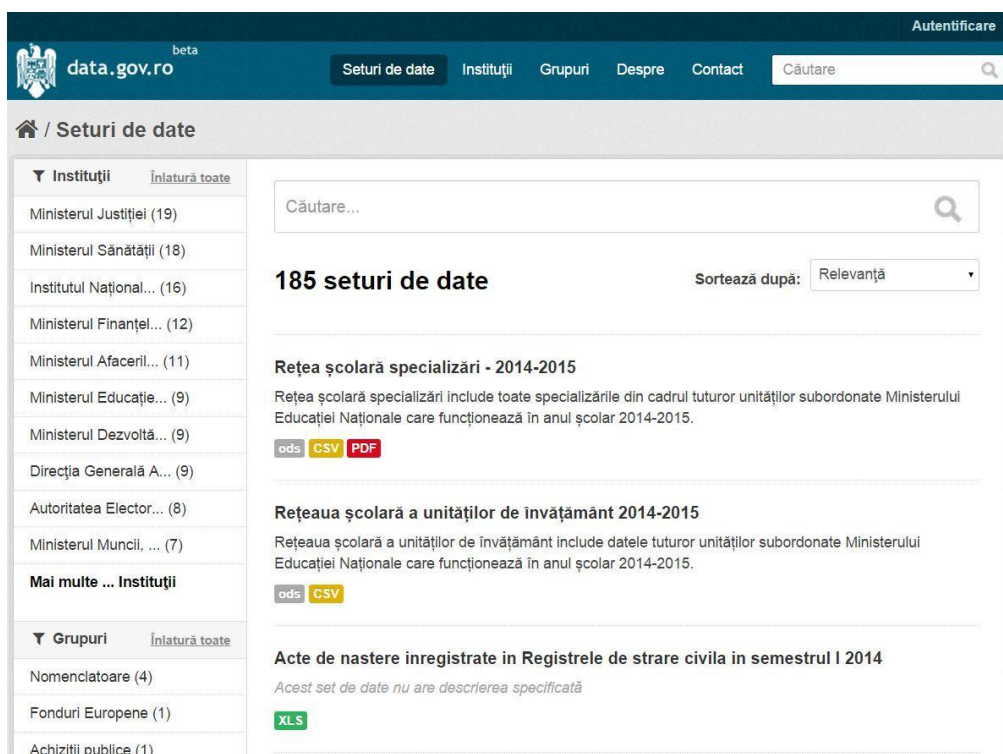


Fig. 7. Sample from the Romanian Governmental Portal of Open Data

In reply to the call for expressions of interest launched as part of the European Innovation Partnership on Smart Cities and Communities initiative (<https://eu-smartcities.eu/>), a partnership formed by Politehnica University of Timisoara, Timisoara City Hall and the Smart City Association submitted the Commitment 7711, related to the use of Open Data Sets for creating smart applications to the benefit of citizens.

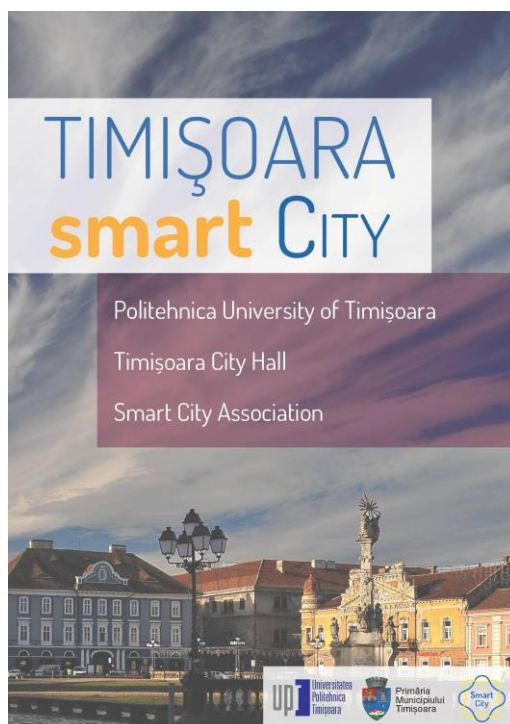


Fig. 8. Timisoara Commitment for the EIP on Smart Cities



One of the first results was the increased number of data sets made available by Timisoara City Hall on the governmental portal, that located it on the first place in Romania.

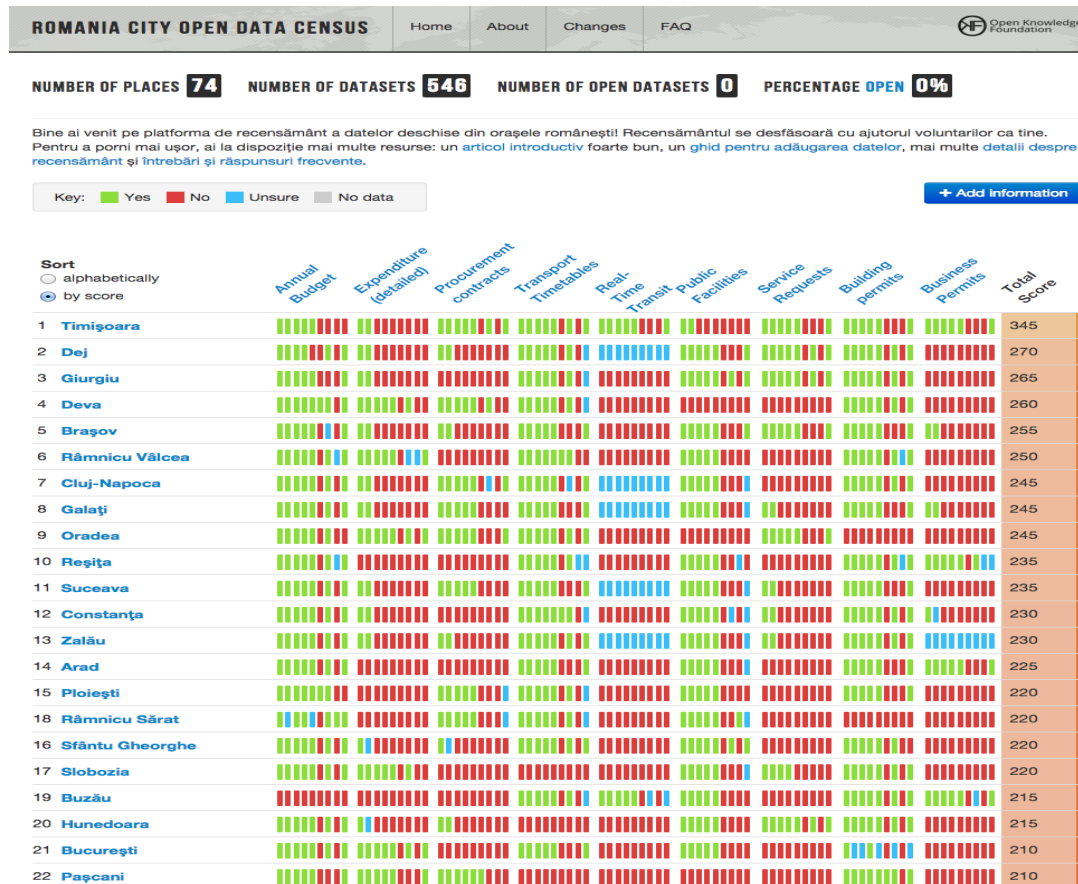


Fig. 9. Open Data Sets uploaded by Timisoara City Hall



Fig. 10. Timisoara – first place in Romania in Open Data

## 8.5 Smart City Applications based on Open Data developed in Timisoara

Once a significant number of data-sets being made available by the Timisoara City Hall, the local IT community, centered on the group of initiative from the Politehnica University, started developing various applications.

### 8.5.1 Timisoara Street History

Timisoara Street History is a map-based web application that displays the current and past street names in Timisoara using an intuitive, usable map that displays well on desktops and smartphones.

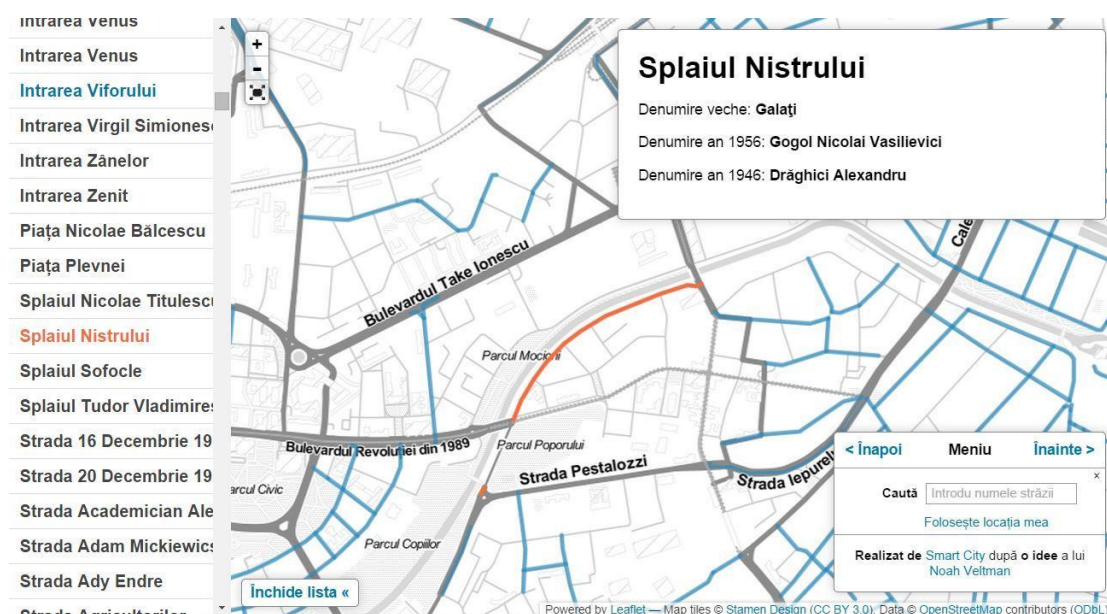


Fig. 11. Screenshot from Timișoara Street History: [apps.mysmartcity.ro/Street-History](http://apps.mysmartcity.ro/Street-History)

The project aimed to prove the usefulness of a dataset published on the Government's Open Data Portal by the Timisoara City Hall. The dataset is a comprehensive list of the current and past street names in the city. As such, citizens are now able to browse through the streets in Timisoara and learn how they were called and how the name changed during the previous century. The application can be found online at <http://apps.mysmartcity.ro/Street-History/>.

### 8.5.2 City Alerts

The application has been developed by a team of students from the Politehnica University of Timisoara, with the aim to gather open government data related to incidents and planned changes that happen in the city.

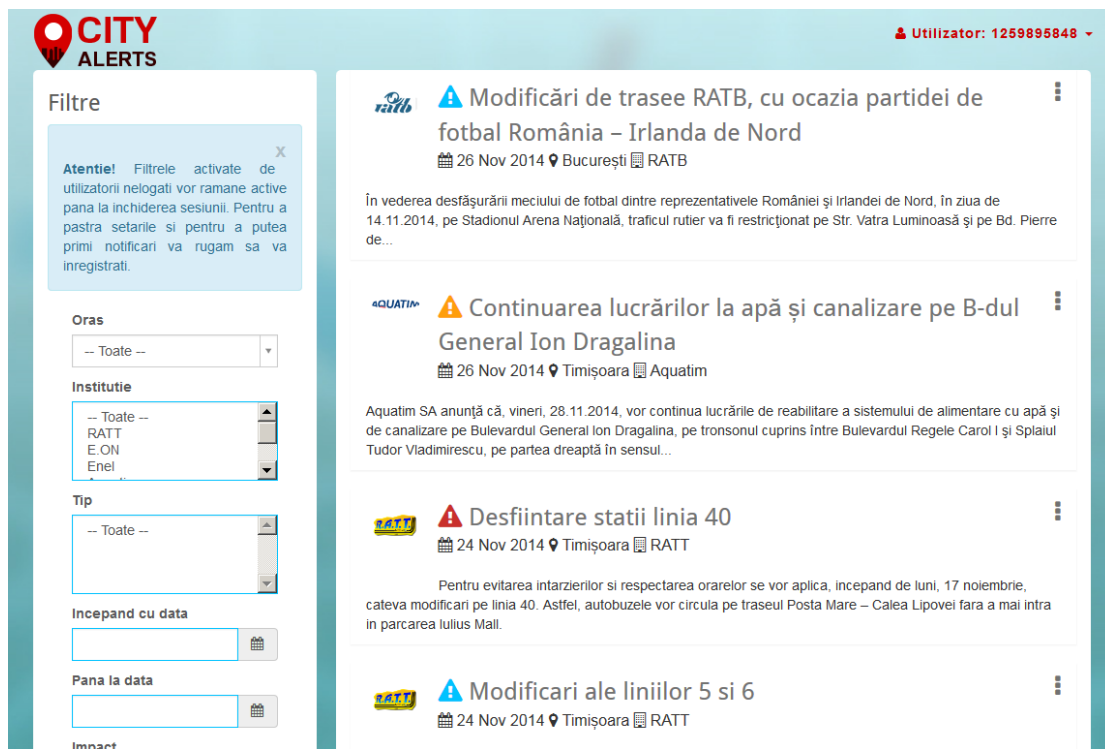


Fig. 12. Screenshot from City Alerts: [www.cityalerts.info](http://www.cityalerts.info)

Citizens can register themselves on the platform, stating the area of the city in which they are interested in, and they will receive notifications about electricity or gas shut-offs on their street, changes in the route of the buses, improvements on certain streets and so on.

For that, all open data provided by the agencies and local companies belonging to the public administration, that might provide works in the city are interrogated in real time, in order to provide the alerts for the population. The sets of open data are provided in different formats that are transformed by the application.

The application is accesible online from a smartphone or from the computer. The user can also select to receive notifications via email or SMS.

### 8.5.3 Augmented Reality Tourism Application

This mobile augmented reality application helps tourists to get a sense of the unfamiliar surroundings based on popular linked open data content sources that are integrated for this purpose. The current version is available online.

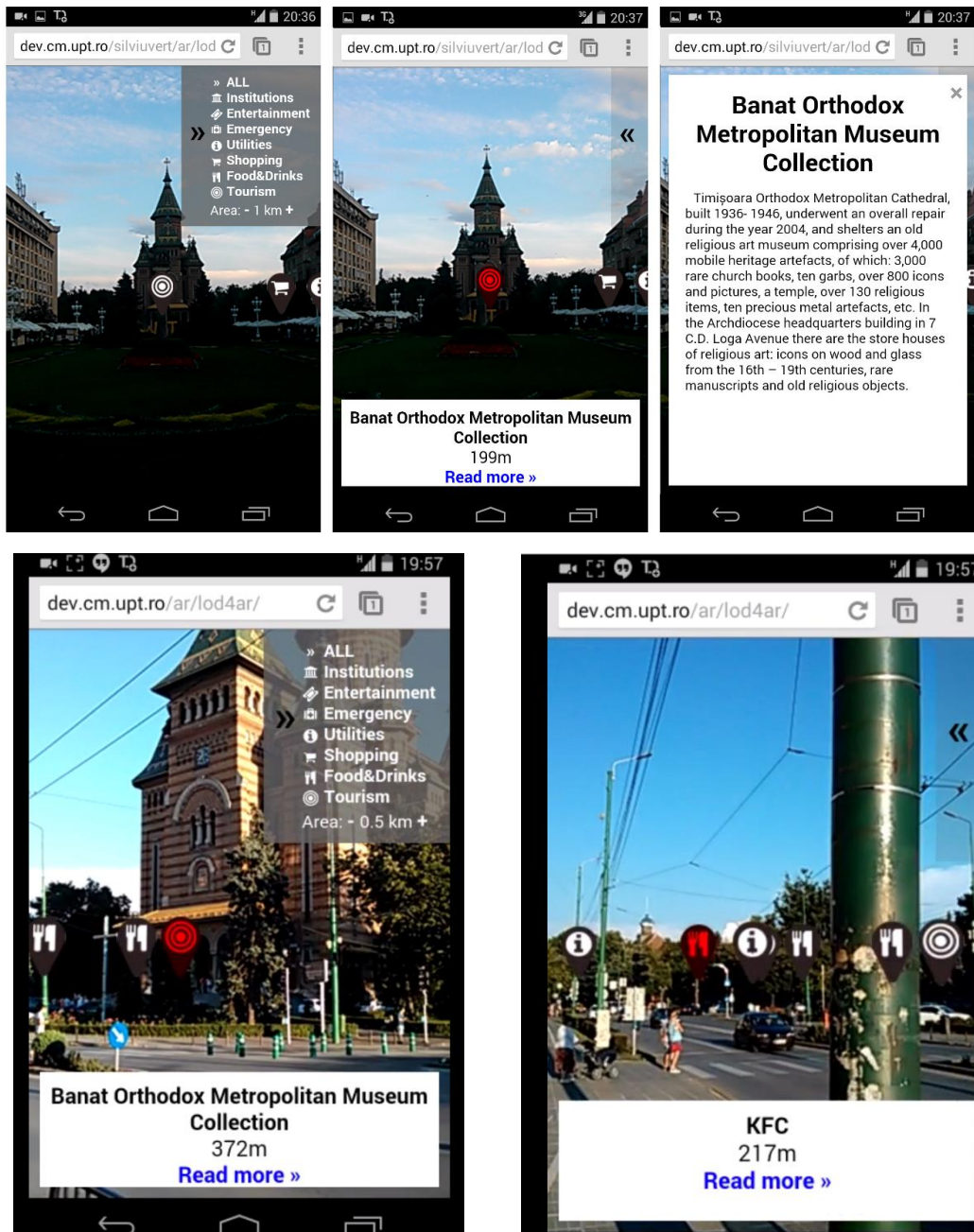


Fig. 13.

Screenshots of the mobile browser application: dev.cm.upt.ro/ar

#### 8.5.4 CityArtTM

Timisoara City Art is a project developed during the Timisoara Open Culture Hackathon that was organized in Timisoara in 2015. The hackathon was the first event in Romania to facilitate the reuse of open cultural data. Hackers, graphic designers, artists and representatives of national cultural institutions were invited to develop applications and design platforms that can reinvent the relationship between the public and the cultural works. Cultural data refers to collections, art works, books and other types of publications, audio visual materials, photographs, archived documents, monuments (content), as well as to descriptive information about these (metadata), such as title, creator, year, dimension, technology used etc.



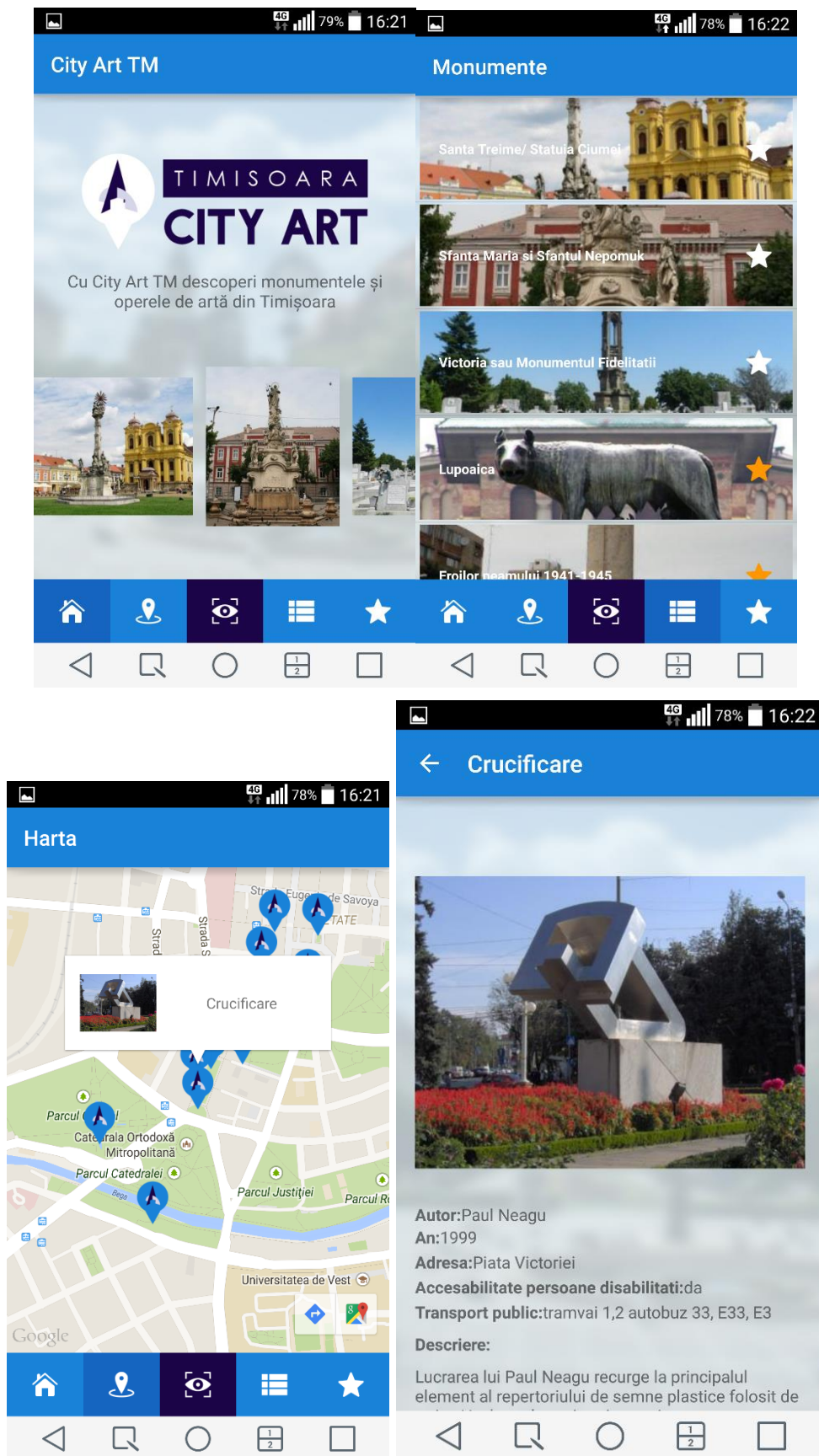


Fig. 14. Screenshots of the City Art application

### 8.5.5 How to develop Open Data Applications

As stated for the Timisoara City Art application, many of the open data based created applications are developed by groups of students guided by a mentor, that is usually a university professor or an IT expert from a company.

Usually, those events are organized by the afore mentioned associations working with open data, such as: Romanian Coalition for Open Data, Multimedia Center of the Politehnica University Timisoara, West University Timisoara, Smart City Association, Kosson Community, Open Knowledge Romania and authorities representatives such as the Department for Online Services and Design of the Romanian Government and Timisoara City Hall.



## 8.6 Bibliography

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