Smart City initiatives in Timisoara
– plans and actions

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The main goal of this paper is to review the status of the past and current initiatives in order to align the second most important town in Romania with European and world wide smart cities objectives. A lot of effort has been performed, results are available, however there is still a long way to go. The second goal is to reflect the historical context of the region with its particularities in order to prove the background of the decisions. Future actions are also presented.

1. Introduction

The paper is organized as follows. The first chapter covers the geographical position and some commented numbers concerning Timisoara. The second chapter lists the City Hall's goals and objectives in the Smart City initiative. Renewable energy sources are reviewed in the third part, focusing on the current status and legislation issues. The next chapter details the specific actions currently performed in Timisoara, while the last one points out to some future plans.

2. Generalities

Geographical position

Timisoara is situated in western Romania, at the intersection of the parallel 45°47' North latitude with the meridian 21°17" East longitude, and is located, in the Northern hemisphere, at distances almost equal between the North Pole and the Equator, and in the Eastern hemisphere, in the time zone of Central Europe *(Figure 1)*. Timisoara is situated on the course of two corridors of the European transport network TEN-T: Rhine–Danube and Orient/Eastern Mediterranean at a distance of less than 700 km from 13 European capitals. People use to say that Vienna is closer than Bucharest, as one needs 5 hours to reach the Austrian capital compared to 8 hours to Bucharest.

At a national level, Timisoara is the largest city in western Romania, the city's area is 129 km². Timisoara's location in the western part of Romania, near the border with Serbia and Hungary, gave the city a permanent role of intercultural and economic bridge between the three neighboring countries. The prospects of this function were amplified with the establishment in 1994 of the Euro region Danube–Kris–Mures–Tisa (DKMT), a border region which covers 77,456 km² and has a population of about 6 million inhabitants. Timisoara has perspectives of affirmation as a polarizing euro regional center due to its central position in the Euro region, to the fact that it is also the region's biggest economic center, a renowned center of learning, a multicultural center and it is well served in terms of urban and technical infrastructure, communication and movement. Timisoara is also a renowned example of multi-ethnic understanding.

Technical facts

The town population as of July 1st 2014 is 333,531 inhabitants. This is an official number, according to the City hall records. However, a large number of persons live and work in Timisoara (students, specialists and so on) coming from all parts of Romania due to the attraction of available working places. There is a small amount of persons recorded and not living here effectively, so my own estimation is the real population is around 380,000 inhabitants.

The number of cars as of 2012 is 108.029, while the number of goods vehicles is 11.791. Again, the real numbers are much higher, up to 50% higher for cars and even 100% higher for good vehicles (almost all leasing cars are registered in Bucharest).

Figure 1. Locating Timisoara in Central Europe

3. Main goals of the City Hall related to the Smart Cities initiative

Smart City itself is not clearly mentioned as a distinct task. However, a lot of objectives cover the Smart City concept [1]. The claimed goals of the City Hall are (abstract):
- to consolidate Timisoara's profile as a dynamic and innovative economic center,
- to be competitive at the European level,
- to maintain a multicultural and sustainable context,
- to ensure a good quality of life for its population.

The main *objectives* related to these goals are:
- to ensure a sustainable economic development, based on high-tech industry, telecommunications, informatics and high value-added services;
- to improve the technical infrastructure, so that in the near future it will be connected, complex and flexible;
- To achieve an ecological and attractive habitat, for example to achieve and exceed the European Union's target of reducing carbon emissions by 20% by 2020. The revised version of the Sustainable Energy Action Plan was approved by the Local Council in 11.11.2014.

It is worth mentioning here that all political parties agreed upon these objectives [2].

4. Renewable Energy

Green certificates

Green certificates represent a support mechanism for encouraging electricity production from RES (Renewable Energy Sources projected to an ambitious 38% in 2020). They apply to electricity generated from: a) hydro energy used in the power stations (<10 MW); b) wind energy; c) solar energy; d) geothermal energy; e) biomass and bio-liquids; f) waste fermentation gas; and g) gas from the fermentation of sludge from used water cleaning plants. These certificate applied initially to large scale investments and to private owners, but the value of one certificate declined over time (so a lot of projects were dropped and many are on sale) and the bureaucracy makes them unattractive for private owners. There is a lot to improve here.

Green house program

This program is another initiative backed by the Government and represents a one-time subsidy, 1300 Euro worth, for one house, if it complies with one or more of the above RES alternatives. According to my own experience, this approach make RES attractive for a standard house in Romania.

For example the Ariston Solar panel installation (2 panels, 1300 liter tank, the subsequent automation and installation are around 2500 Euro and related to the standard natural gas price it makes a 20-25 years period for investment return. The period is reduced to a half with the green house program. Unfortunately, the program was stopped in 2014.

Research Institute for Renewable Energy (Politehnica University, Timisoara)

A big EU funded project, the Research Institute for Renewable Energy in the Politehnica University Timisoara [7] has a dedicated building, state of the art equipment and houses the top specialists in this field.

Hydro energy

Concern to use hydro energy is quite old – for example the old Plant *(Figure 2)* was established 131 years ago, being designed by Emil Szilard, and was one of the first in Europe (and the first in Romania). Today hydro energy is exploited by the Local Heating Company COLTERM. The output power was 1,370 MWh in 2014.

Geothermal energy

This aspect is quite interesting, being not so spread in Europe. Romania has the 3rd highest geothermal potential of European nations with major potential locations on the Western Plain, where Timisoara is situated. In a recent development Liu and Li [3] proved that relatively low temperature geothermal water can drive 1 kW electrical generators based on thermoelectric generators (TEGs). Even more importantly, the total cost of investment after including the capacity factor is lower for TEGs when compared to photovoltaic (PV) and wind. This is an interesting topic to be further investigated, as the current interest in geothermal water is just for leisure.

Figure 2.
The old power plant (located on the Bega River)

Solar energy

Timisoara lays in a medium – good solar region in Romania *(Figure 3)*, making solar energy attractive for investments. However, these initiatives are tightly linked to subsidies, and without central support they prove to be economically inefficient.

As mentioned above, many PV projects were stopped. In our county for example, the Covaci Solar Park [6], was intended to be one of the world's largest thin-film PV power systems, being built on a 60-hectare plot of land to the north of Timisoara. The power plant was projected to be 35 MW (35 GWh yearly generation), the investment amounted to Euro 180 million.
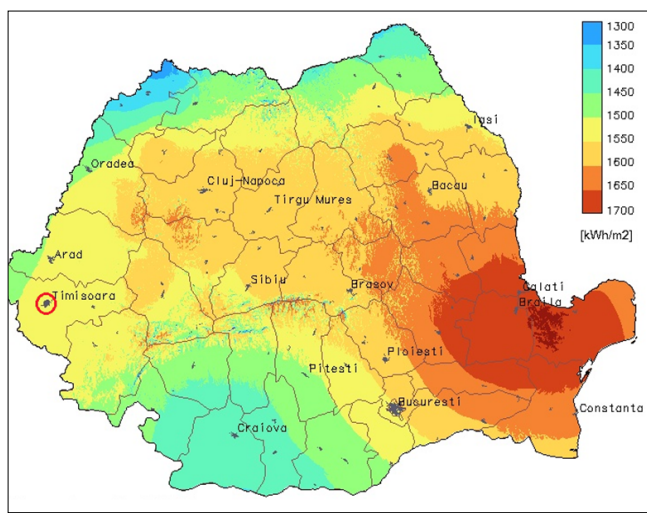

Figure 3.
Sun yearly irradiation is around 1550 kWh/m2
in Timisoara [4]

Compared to the ideal yearly energy, my 3.48 m2 Ariston Kairos fast CD2 solar panels [5] not ideally installed harvested 0.95 MWh from 24.04.2015 to 31.12.2015, providing enough warm water for my 4 people family – no additional heating source was needed until 15th of October. Even in Dec. 2015, an unusual warm month, up to 15% of the necessary heating requirement was provided by the solar panels (arguably a positive fact).

Wind Energy

The Politehnica University Timisoara has an almost 50 year old tradition for wind energy research, with good results and applications. A detailed study [8] reviews the past and current initiatives and the overall conditions for wind harvesting in Romania.

5. Smart City Actions

Many of the Smart city directions are on development, and will be highlighted next. Due to cumbersome legislation, some of the actions are unnecessary delayed due to bid reclaims, making difficult to respect the projected milestones. In the Local Council, all political players reached a conclusion to support infrastructure, pollution reduction, and public transportation in an effort to

bring the town to a respected European level. Vision 2030 Timisoara is a sustainable concept for development of the infrastructure in Timisoara, approved by the Local Council in 2007. The City of Timisoara has been committed to the European Covenant of Mayors in 2010 and is nominated for European Capital in 2021.

Building refurbishment

Most block of flats were built during the socialism years and need rehabilitation. This is a major concern for the local authorities and citizens. For example, in 2015, as many as 51 blocks of flats were under reconstruction, an estimated 10 million Euro investment (60% being EU funded). Besides sparing the energy and overall life conditions improvement, this objective modified the street view, adding nice colors to the old gray preferred by the communists.

Smart lighting

Started in 2014, in Children's Park, reduces up to 35% the energy consumption and allows smartphone control, remote monitoring. It is a state of the art achievement, well received by the inhabitants. Gradually the technology evolved in other several districts over the town. My own proposal to further improve the system is to add infrared movement sensor, to reduce the light to a minimum during the night during quiet periods. This can be even more improved with a prediction algorithm in order to estimate the direction of movement.

Excellence in internet speed

According to OOKLA Net Index, 9 cities in Romania are among the top 15 cities in the world, with the highest download speed of fixed broadband internet connections. Timisoara is ranked #9 with 86.55 Mbps average download speed. There are several available offers rated at 1 Gbps, and the prices are affordable (4G+ networks offer 300 Mbps download speeds in main Romanian towns, including Timisoara).

CO_2 Emissions

In 2008 – the Baseline Emission Inventory year, the total energy consumption was 3,711,006 MWh, the corresponding CO_2 emission being 1,179,453 tons (3.8 tons/capita – population 311,481 in 2008. The Monitoring Emission Inventories compiled till 2013, is presented in *Figure 4*.
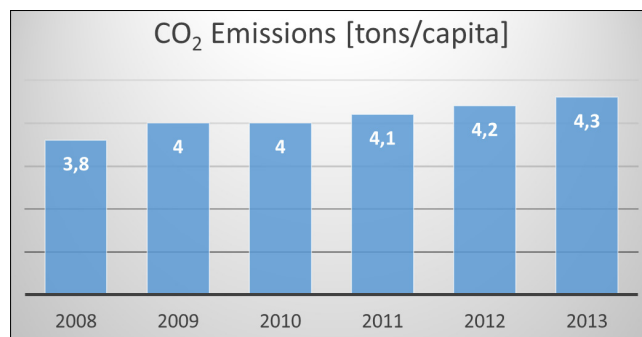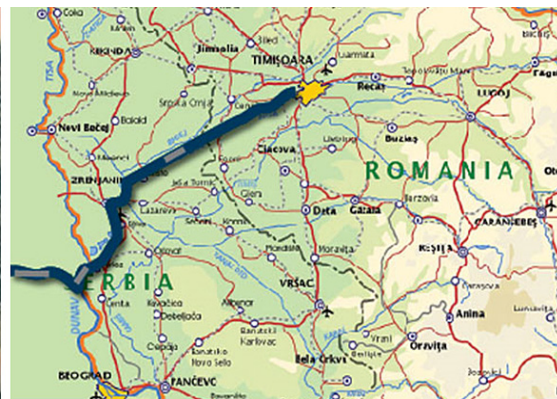
Figure 4. CO_2 Emissions

Figure 5.
Transportation
on the Bega
River in the
19th Century
(left),
and the map of
the water road
(right)

(Almost) free bicycles

Included in a very nice initiative, 300 new bicycles are offered free of charge in 1 hour time slots, from one station to the other. The offer is restricted to public transportation card owners and is particularly used in sunny periods (March-November). Due to the size of the city, a 1 hour time ride is more than enough to reach the destination point.

Water road

This is a very interesting topic, as our region had the first water road in Romania (built 1728–1760), with a considerable length of 114 km *(Figure 5)*, from Timisoara to Titel (Serbia). It used to linked Timisoara to Vienna and consequently up to Rotterdam. The rehabilitation of Bega River Banks is completed, but full 114 km navigation is prohibited for the moment. However the City Hall organized a bid to buy as many as 7 electrical boats, capable to transport 40-60 persons each, to be used both for public transportations and tourism. The boats, called Vaporetto, are expected to arrive in Timisoara starting February 2016 (at the time of writing this paper, the first is 95% completed).

Traffic Management

A dedicated control center is on the final stage of development. This corresponds to a 4 million Euro investment and will provide 134 linked crossings and 230 real-time video cameras. The system is expected to be fully operational in 2016.

6. Future Plans and Development

Openville

This is a private 220 million Euro Investment, started in 2015, to be finished in 2018. It is a 594.000 m² area (including a 55.000 m² green park), owning the highest building in Romania (155 m, 27 floors), thought as an office, leisure and commercial neighborhood *(Figure 6)*. Most of the works can be seen on site, some of them being in advance.

City Hall's further plans

The public transportation is a main concern. Various projects are envisaged, such as the Underground subway, intermodal public transport stations and a Smart-City Control Center to control the parking are just some topics to improve traffic management. Healthcare monitoring for aged people and proper waste management are among other objectives. The City Hall intends to have its own power and data network in the main districts, to overcome issues due to a third party ownership.

The Future

Merging two important western cities of Romania, thus uniting Arad and Timisoara (the towns are 50 km away) is not a new idea. This will pop-up a 1 million+ inhabitants metropolis *(Figure 7)*. Talks started in 2008, in October the two mayors (Gheorghe Falca and Nicolae Robu) agreed on principles. It is to be seen if the project will be finally implemented.

Figure 6.
OpenVille,
a private
investment to
create a high
tech and
leisure area –
a town within
a town

7. Conclusions

This paper performed a review of the Smart City actions, initiatives and plans in Timisoara, Romania. Due to space constraints, only a limited number of topics were covered. Personal opinions and comments were inserted. As a final word, I will highlight some strengths in this area: a good commitment from local authorities and good results in fighting against corruption at the national level. On the local site, many on-going EU-funded projects changed the shape of the town. On the negative edge, the main weaknesses are linked to the political instability (mainly legislation and bureaucracy), the lack of a national holistic approach. On the site, a lot of investments are still needed and the City Hall has to fight in some areas with citizens' reluctance when promoting new actions.

Acknowledgement

Author

AUREL GONTEAN graduated the Electronics and Telecommunications Faculty, "Politehnica" University of Timisoara, Romania in 1986. He received the PhD degree in 1998, from the same university. He became a full professor in 2005. He is a PhD Advisor since 2008 (field: Electronics and Telecommunications); 5 PhD thesis were delivered meanwhile. Starting 2009, he is visiting professor at Baden-Wuerttemberg Cooperative State University Loerrach, Germany. From 2004 till 2012 he was vice dean of the Electronics and Telecommunications Faculty, Timisoara, Romania. He has been appointed as EU expert for evaluating project proposals for the Scientific Research Fund, Sofia, Bulgaria, from 2008 to 2009. He published over 150 papers, 8 books, 3 chapters in international books, has over 25 contracts and grants and holds 2 patents. His current research interests are Energy Harvesting, Memristors and Smart Cities.

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