Green clusters for a digital age

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Abstract:

Smart city' is a concept that can be defined in different ways but each definition involves the use of information technology (IT). Its publicly declared goal is to improve the quality of life for its citizens (offering better services, providing a lower environmental footprint, allowing sustainability and last, but not least, improving citizens' power in shaping the life of their city). In 2010, Evika Karamagioli and Lasse Berntzen pictured a 'Russian nested doll'-like expanding list of prerequisites for building Smart Cities: access to technology; accessibility; education and training; freedom to speech/right to privacy/access to information; privacy/identity/anonymity; technological infrastructure; and, the most important one, trust. This paper will contrast, having in mind the digital divide, some of these prerequisites for two countries: Norway and Romania. In addition, given the global challenge of climate change, the smart city concept is coupled with one possible instrument, the development of green industries. Since addressing climate change requires the reduction of fossil resources dependency, transitioning from a fossil-based industrial production to a bio-based (green) industrial structure opens the way for a discussion about green clusters; those might be part of the solution. Some examples of good practices and clusters for green industries from Norway are also provided and some success stories including Romanian firms are presented.

Keywords: *digital economy, digital divide, Romania, Norway.*

1. Introduction

The accelerating and expanding use of information technology for all purposes brings the concept of 'smart' for different activities and products. The 'Smart city' is destined/designed to improve the quality of life for its citizens (through improved services, a lower environmental footprint, sustainable activities and better

governance). In 2010, Evika Karamagioli and Lasse Berntzen pictured a 'Russian nested doll'-like expanding list of prerequisites for building Smart Cities: access to technology; accessibility; education and training; freedom to speech/right to privacy/access to information; privacy/identity/anonymity; technological infrastructure; and, the most important one, trust.

This paper will contrast, having in mind the digital divide, some of these prerequisites (access to technology; accessibility; education and training; freedom to speech/access to information) for two very different countries: Norway and Romania. This comparison was prompted by the noticeable financial effort made by Norway (through grants) to help reduce economic and social disparities and to strengthen the bilateral relations with Romania (among other 14 EU countries in Central and Southern Europe and the Baltics).

The smart city could be conceived as a tool to address the global challenge of climate change, if prompting the development of green industries and their heightened efficiency as green clusters. Some examples of good practices and clusters for green industries from Norway are also provided and some success stories including Romanian firms are presented.

2. Access to technology

The access to technology in the case of this paper is assessed using the statistics for Access to internet for households given their residence area and level of income (by quartiles).

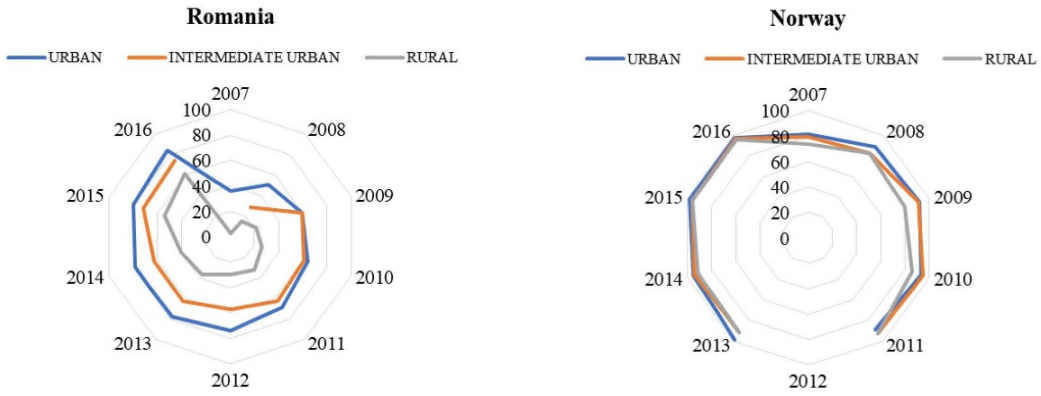

Figure 1. Internet access in households by degree of urbanisation, 2007–2016 (% of all households).
Source: Eurostat (isoc_ci_in_h)

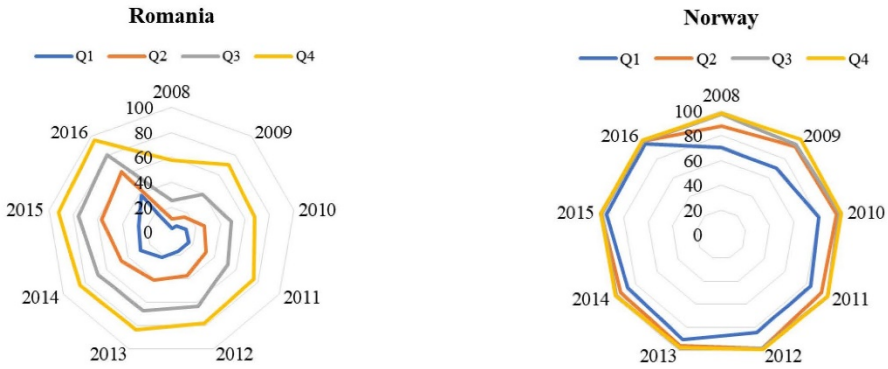

Figure 2. Internet access in households by income level (quartiles), 2008-2016 (% of all households).
Source: Eurostat (isoc_ci_in_h)

3. Accessibility

For Romania, the 'mobile internet era' meant the accessibility gap due to income differences was in a way attenuated (Fig. 3). In 2016, the percentage of people in the first quartile (Q1) who used a portable computer or a handheld device to access the internet away from home or work was only 2.8 times lower than for those in the fourth quartile (Q4) compared to 10 times in 2012. For Norway, due to the advanced digital society, the change was modest, a decrease from 1.5 times in 2012 to 1.3 times in 2016.

Figure 3. Individuals who used a portable computer or a handheld device to access the internet away from home or work by income level (quartiles), 2012-2016 (% of individuals).
Source: Eurostat (isoc_ci_im_i)

The accessibility gap due to residence area was almost closed for both countries (Fig. 4) since mobile internet makes it inocuous.

Figure 4. Individuals who used a portable computer or a handheld device to access the internet away from home or work by residence, 2012-2016 (% of individuals).
Source: Eurostat (isoc_ci_im_i)

When the frequency of internet use is analyzed, for example in the past 3 months (Fig. 5 and 6), the digital divide among the four income categories and the three residence areas is well-defined for Romania and attenuated at the end of the period (2012-2016) for Norway.

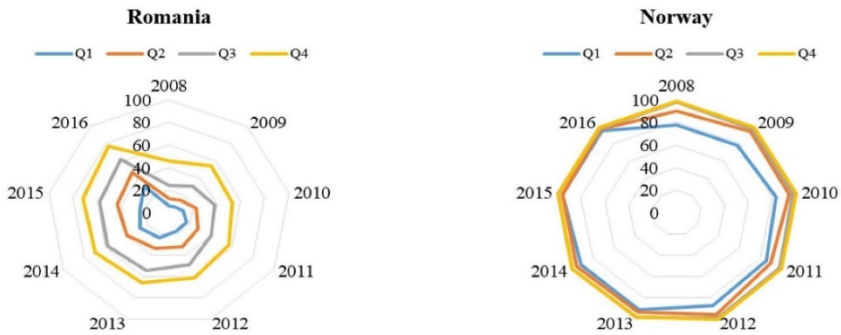

Figure 5. Internet use in the past 3 months by income level (quartiles), 2008-2016 (% of individuals).
Source: Eurostat (isoc_ci_ifp_iu)

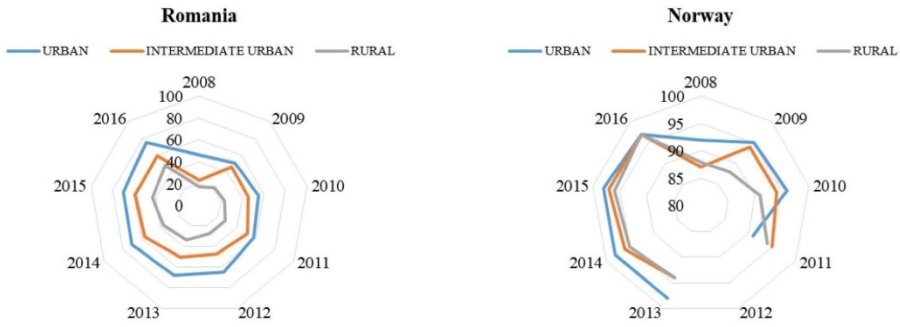

Figure 6. Internet use in the past 3 months by residence, 2008-2016 (% of individuals).
Source: Eurostat (isoc_ci_ifp_iu)

4. Education and training

Education and training statistics hint at peoples ability to adapt to the requirements of a digital world. The educational attainment in a country could be measured simply as the percentage of a population that graduated a certain number of school years. Table 1 illustrates the 2016 situation in Romania and Norway and compares it to the EU-28 average for people of working age and for retirement age.

For older people (55–74 years), the situation is similar for medium education and reversed for low and high education. In Romania, people aged 55 and over (in 2016) belong to those generations that reached working age well before the bloody uprising in December 1989 and got educated and trained in the post-Stalinist era (after 1953). The youngest people considered for this statistics, those who were 25 in 2016 were born a couple of years after the Berlin Wall fell and got educated during the wild 'transition' era.

Table 1. Educational attainment, by selected age groups, 2016 (% of the population)

	25–54 years			55–74 years		
	Low ISCED 0-2	Medium ISCED 3-4	High ISCED 5-8	Low ISCED 0-2	Medium ISCED 3-4	High ISCED 5-8
EU-28	20.5	46.2	33.4	36.3	43.1	20.6
Romania	20.9	59.2	19.8	41.5	50.1	8.5
Norway	16.9	37.0	46.1	20.8	48.6	30.5

Source: Eurostat, Educational attainment statistics: Table 1 (http://ec.europa.eu/eurostat/statistics-explained/index.php/Educational_attainment_statistics)

Figure 7 presents the share of the population aged 30–34 with tertiary education by country.

In 2016, Eurostat was reporting a comparable share of population aged 20–24 having completed at least upper secondary education (ISCED 3) for both countries (79.9% in Romania and 78.1% in Norway). Despite this similarity regarding young peoples' education, the performance of the educational system in the two countries is not alike. For the same year, employment rates of recent graduates (aged 20–34) not in education and training were 90.1% in Norway compared to 69.3% for Romania (Table 2). For the same age group, with upper-secondary and post-secondary non-tertiary general education (ISCED 2011, levels 3-4) their employment rates were 43.5% for Romania and 80.8% for Norway, while for vocational education for the same levels, it was 63.3% for Romania 88.6% for Norway. For people in this age group with tertiary education (ISCED 2011, levels 5-8), their employability is better: 80.7% in Romania, relatively close to 93.6% in Norway.

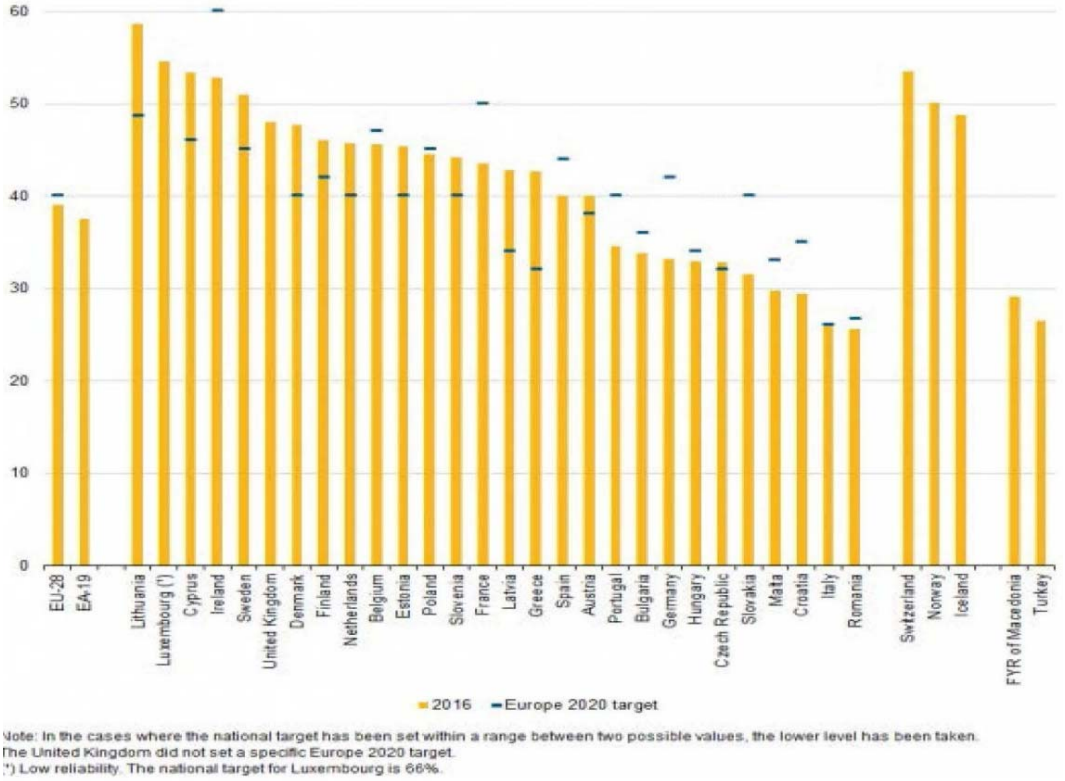

Figure 7. Population aged 30–34 with tertiary educational attainment (ISCED 5–8), by country, 2016 (%).
Source: Eurostat, Educational attainment statistics, Figure 1 (http://ec.europa.eu/eurostat/statistics-explained/index.php/Educational_attainment_statistics)

Table 2. Employment rates of recent graduates (aged 20–34) not in education and training, 2016 (%)

	Total	Upper-secondary and post-secondary non-tertiary **general** education (ISCED 2011, levels 3-4)	Upper-secondary and post-secondary non-tertiary **vocational** education (ISCED 2011, levels 3-4)	Tertiary education (ISCED 2011, levels 5-8)
EU-28	78.2	62.9	75.0	82.8
Romania	69.3	43.5	63.3	80.7
Norway	90.1	80.8	88.6	93.6

Source: Eurostat, Employment rates of recent graduates Table 1 (http://ec.europa.eu/eurostat/statistics-explained/index.php/Employment_rates_of_recent_graduates)

Employability relates not only to the education system but also to vocational training offered by firms.

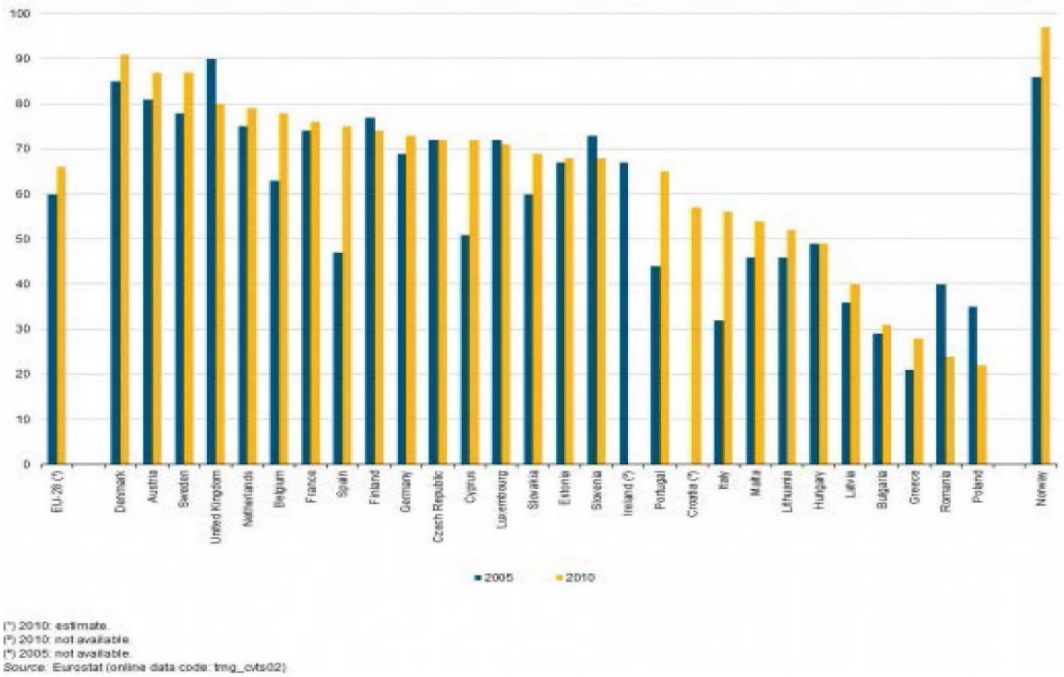

Figure 8. Share of enterprises providing continuing vocational training, 2005 and 2010 (%).
Source: EUROSTAT Vocational education and training statistics Figure 4,
http://ec.europa.eu/eurostat/statistics-explained/index.php/Vocational_education_and_training_statistics

Figure 8 illustrates the change in the share of enterprises providing continuing vocational training between 2005 and 2010 in European Union states compared to Norway. Unfortunatelly, joining the EU did not have a positive outcome for Romania's vocational training system, since in 2010 it declined to almost half the share in 2005.

5. Freedom to speech/access to information

"Freedom to speech" and "Access to information" scores are relatively close for both Romania and Norway. These prerequisites for a Smart City are in place for both countries, and it seems that additional financial effort in this direction might not be very effective.

"Freedom to speech" is assessed based on Freedom House's 2016 report score:

Section	Max Score	Romania	Norway
Freedom of Expression and Belief	16	14	16

Source: Romania https://freedomhouse.org/report/freedom-world/2016/romania and Norway https://freedomhouse.org/report/freedom-world/2016/norway

"Access to information" is assessed using the Global Right to Information Rating (RTI):

Section	Max Score	Romania	Norway
Right of Access	6	5	5
Scope	30	29	16
Requesting procedures	30	17	15
Exceptions	30	13	16
Appeals	30	4	22
Sanctions	8	6	2
Promotional measures	16	9	2
TOTAL	150	83	78

Source: **Romania** http://www.rti-rating.org/country-data/scoring/?country_name=Romania#right Law on Free Access to Public Information, first adopted in 2001; **Norway** http://www.rti-rating.org/country-data/scoring/?country_name=Norway#right Act of 19 May 2006 No. 16 relating to the right of access to documents held by public authorities and public undertakings (Freedom of Information Act), first adopted in 1970

6. Examples of good practices and green clusters: Norway and Romania

Under the pressure of the global challenge of climate change, the smart city concept could be coupled with one fast emerging tool: the development of green clusters. Even there is great diversity between the different Norwegian clusters (Brekke, 2017) there are special government actions to support and develop the participating clusters through international-level best practice. An example (based on the triple helix model) is the cluster Electronic Coast comprised of electronic- and ICT-based companies in the county of Vestfold, with the University College of Southeast Norway (abbreviated HSN) as the anchor institution providing high quality teaching, research and innovation development capacities, and MicroTech Innovation (MTI) is the independent company coordinating micro- and nanotechnology cluster development efforts. Some Norwegian success stories including Romanian firms (Gusland, 2017) were reported as a result of European (EEA/EC) projects such as MEDICARE MEMSCAP-EUROMEDICA IASI; GREENCARE TRILOBITE-MICROELECTRONICA Bucharest (green industry and water care); HASTAC EC FP 6 (MEMSCAP, aerospace, Jet engine emissions-environment); HISVESTA EC FP7 (MEMSCAP, altimetry improvements-safety).

The list of Romanian cluster initiatives for bio-based industries and their respective development stage includes: PROWOOD (primary biomass sector)/ Maturity stage; Green Energy (renewable energies)/Maturity stage; IndAgro Pol (food & feed)/Maturity stage; ETREC (automotive)/Take off stage; ASTRICO NE (textile)/Maturity stage; ELINCLUS (automotive)/Maturity stage; ROSENC (Renewable energies)/Maturity stage; Traditions Manufacture Future (textile)/Take off stage; REGIOFA (primary biomass sector)/Take off stage; Romanian Textile Concept (textile)/Maturity stage; Transylvanian Furniture Cluster (primary biomass

sector)/Maturity stage; AgrooFood Regional Cluster (food & feed)/Take off stage; Agro Transylvania (food & feed)/Maturity stage; MECHATREC (automotive)/Take off stage; Transylvanian Textile and Fashion (textile)/Take off stage; Builders Guild Iasi (eco construction)/Initial stage; Construct Cluster Oltenia (eco construction)/ Take off stage; Advertise Printing Packaging (pulp & paper)/Take off stage; BIOGAS INNO (renewable energies)/Initial stage; Green Solutions Lower Danube (renewable energies)/Take off stage; TREC (renewable energies)/Take off stage; ACAROM (automotive)/Take off stage; START Innovation (renewable energies)/Initial stage; BIODANUBIUS (renewable energies)/Initial stage; ECOIND (renewable energies)/ Initial stage; INOMAR (renewable energies)/Initial stage; and last but not least Transylvanian Mechanical Engineering (automotive)/Initial stage.

More than a third of those clusters could be considered as key drivers or pioneers in the bio-economy in Romania. Romania's green industries strengths are Primary biomass, Food & Feed and Renewable Energy, while opportunities are in Phyto-pharmaceuticals, Textile & Clothing, Eco-Construction and Human resource.

7. Conclusions

Four of the ten prerequisites of a Smart City were presented for Norway and Romania (access to technology; accessibility; education and training; freedom to speech/access to information). The purpose of this overview was to illustrate the similarities/disparities existing in those areas for these two, very different, countries given that Norway could be a model-country and it makes a consistent financial effort to help reduce economic and social disparities and to strengthen the bilateral relations with Romania.

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