


SMARTIES Project: The Survey of Needs for Municipalities and Trainers for Smart Cities

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Abstract: In an aim to contribute to already existing knowledge upon the subject of smart cities and the public sector's wider knowledge in Europe, this study investigates the perception by the municipalities and the wider public sector, responsible for implementing smart solutions in the environment. The understanding of the concept of smart cities/villages by municipalities is on a low level due to the fact that the problem is too wide, not well described, solutions even wider, accompanied by the lack of experts able to offer comprehensive solutions to municipalities. The study presents factors according to the current municipalities' knowledge (environmental awareness, knowledge and prior experience) and the existing market, of whether these factors can be said that affect the acceptance of smart cities. The public is already aware of the smart cities as a general concept, however, the study sheds light upon the established knowledge that the decision makers have in five countries, Hungary, Slovakia, Italy, Lithuania, and Denmark.

Keywords: smart cities; survey; smart skills development



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1. Introduction

Supporting the educators, the trainers, and the public sector has not been the primary focus in the European research community. While the primary focus has been given throughout the history in the academia, and lately in the business sector, start-ups and entrepreneurs [1], the public sector—regions and municipalities, mainly—have always been finding limited training support or their training needs have only been internally met towards competitiveness and continuous improvement. It is not only the private organisations that should evolve and adapt to external changes, but it is also a need for the public sector to follow. Especially, for countries with oversized public sectors and governmental agencies, this is a must. If they do not invest, there is a risk that the planned growth to take a dramatic deflection and eventually being halted [2]. Furthermore, the trend towards rationalisation of the public sector size—is unavoidably shrinking the sector—something, which requires the remaining staff to bear the continuously increased workload, leaving no room for staff training [3].

Under this rationale, the SMARTIES project is focusing on identifying which are the training and educational needs of the municipalities' personnel, on the concept of smart cities/villages and the understanding of this concept, and all associated concepts,

such big data [4], Internet of Things [5], smart mobility and energy applications [6–9], wide deployment of sensors [10], by the trainers and the responsible decision-makers implementing intelligent solutions in the environment [11]. The understanding of the concept of smart cities/villages by the municipalities is at a low level due to the fact that the problem is wide and undefined and the proposed solutions even wider [12]. Based on this, three main questions did lead this research:

- (a) Is there a need for further training for the public sector officials towards smart cities deployment?
- (b) Are smart city applications/technologies positively accepted?
- (c) Are there any constraints in terms of cybersecurity and personal data treatment/management?

The issue of smart cities/villages is a pressing issue for all European countries. The reason for this is an enormous penetration of IT technologies in all aspects of human life, and the untapped resources of interoperability among various networks and processes aiming to improve the life of citizens, are making municipalities to struggle to cope with this new environment [13].

This goes as wide as from the energy management to traffic organisation to the education system to communication of citizens with the representatives of municipalities and so on. And it is an issue from Portugal to Sweden and from Greece to Estonia. Some countries in Europe have already implemented complex projects to turn their cities to smart cities, such as Copenhagen or Vienna [14], research data show that more than two-thirds of smart city projects remain in the planning or pilot test phases [15]. Therefore, there is vast potential for improvement. It is also true that the EU itself among a number of initiatives is strongly supporting smart cities. There are important EU initiatives that directly support smart cities such as EU Smart Cities Information System [16], Smart Cities and Communities European Innovation Partnership [17], or several initiatives under the Horizon 2020 programme [18]. There is also The European innovation partnership on smart cities and communities (EIP-SCC) which is an initiative supported by the European Commission that brings together cities, industry, small business (SMEs), banks, and research. Yet another programme to mention is the European Initiative on Smart Cities that are part of SETIS—Strategic Energy Technologies Information System. This all clearly demonstrates that the concept is widely supported by the European Commission and its organisations and the need for the project and its transnational partnership.

It is not though only the fact that European Commission supports the idea, that makes the needs for smart cities applications by municipalities and the wider public sector. It is the variety of applications and the opportunities offered to disrupt the existing model [19]. The opportunities for improving the public sector's efficient operation are endless. However, all these opportunities were introduced and offered to public employees and the municipalities without any concrete plan and prior preparation. In Russia, the readiness of the municipalities' digital transformation was studied, and only three municipalities were found that meet all of the study's criteria, indicating a high degree of readiness [20]. Business models are reformulated and offered from businesses to public employees focusing not only on innovation and new technologies, but also on the long-term plan of the city to implement a smart city [21]. The approach each time for the training and the opportunities offered were different. There are cases where the development was based on open-mindedness and the political, such as in the case of Trikala city in Greece [22], and other cases that a more structured approach was pursued, not following exactly the same path, though. In Belgium in the city of Ghent, it was decided to bring together under collaborative projects, various actors such as businesses, civil servants, entrepreneurs etc, while in the case of Germany for Cologne, they had tailor-made solutions for the public employees [23].

There are surveys aim to public officials that focus on specific solutions, e.g., intelligent waste management [24], cybersecurity [25], IoT applications [26], blockchain technology [27], smart transportation [28], but the survey was usually focusing only on

one smart solution and most of the times on one country. This work managed to collect the point of view of several officials around a number of smart applications in five European countries (geographically distributed from Southern to Northern Europe), with the participation of which the SMARTIES project run, Hungary, Slovakia, Italy, Lithuania, and Denmark.

2. Methodology

The role of the educators that will contribute to developing the competences of the public employees in the field of smart cities is crucial. Those will support adult learners by delivering new types of training and consultation activities [29]. This will embrace the public sector's needs and lead to open-minded approaches that eventually make the decision makers evolve and become proactive in terms of the cities' future needs. How is this going to be achieved? The SMARTIES project follows another way. It addresses questions to the public employees on aiming at identifying what is for them a smart city and its characteristics in order to strengthen the educational outputs of the project. Project members did survey the needs of the recipients (municipalities and regions) and the target group of the project (adult educators, trainers) aiming at illustrating their understanding of the problem(s) and learning needs [30]. Based on the outcomes of this survey they will propose a curriculum, adapt it for the best needs of the municipalities and educators and afterwards work on preparing course materials. Within the scope of the project these educators will be trained (by participating on the project events such as webinars and conferences, and by using online resources) and, thereafter, be able to deliver their knowledge to municipalities in all the partner countries [31,32].

For the empirical part study that guided the work, there has been a data collection part from the five countries, Hungary, Slovakia, Italy, Lithuania, and Denmark. A survey has been prepared which has been distributed to decision makers of the public sector (mainly regions and municipalities) and is based on 61 respondents from the five countries. The survey because of its distribution setup, had a number of representatives from a number of regions of each country participating. The respondents have been randomly selected, among the municipalities and the wider public sector, in order to get a rough representation of the relevant population. The questionnaire included 17 questions in total and the results were collected and were set up in tables, to give an overview of the answers received. Each question was summarized and presented as a percentage or as a net number (of total votes) of the choices given. For those interested to participate (or at least stay informed) at the events organised under the SMARTIES project, there was a section that the participants could write down their names and contact details.

The surveys were distributed either by personal emails to the recipients or by visiting the municipality having arranged a meeting in advance for this specific reason. The respondents were given sufficient time to respond (almost a month) and they either filled in the survey electronically (google forms) or the printed copy.

3. Results and Discussion

The questionnaire did not take more than 15–20 min of time for the participants. Some of the most important questions of the survey are shown in Figures 1–6, and the graphs are presenting some of the most important results.

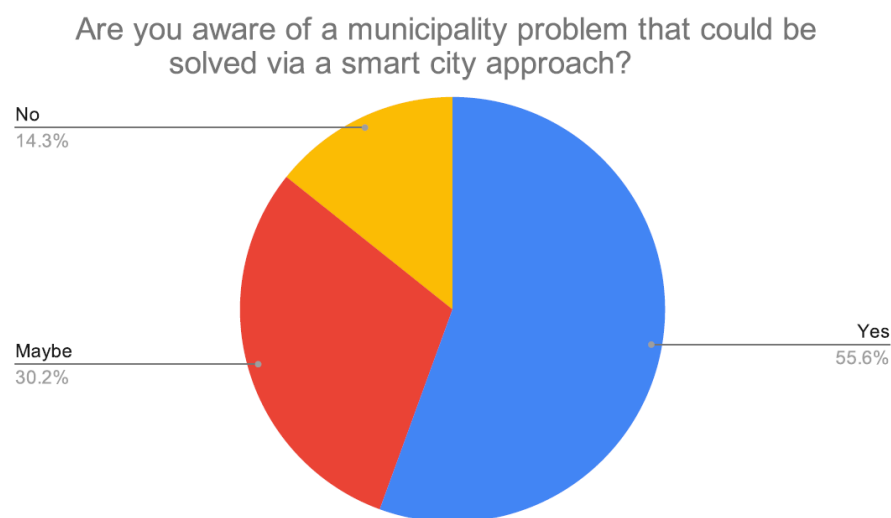


Figure 1. Question: “Are you aware of a municipality problem that could be solved via a smart city approach?”

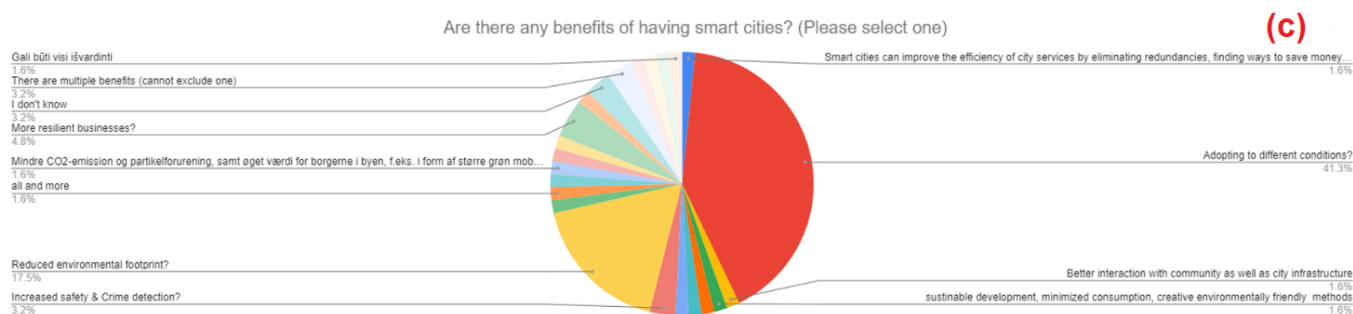
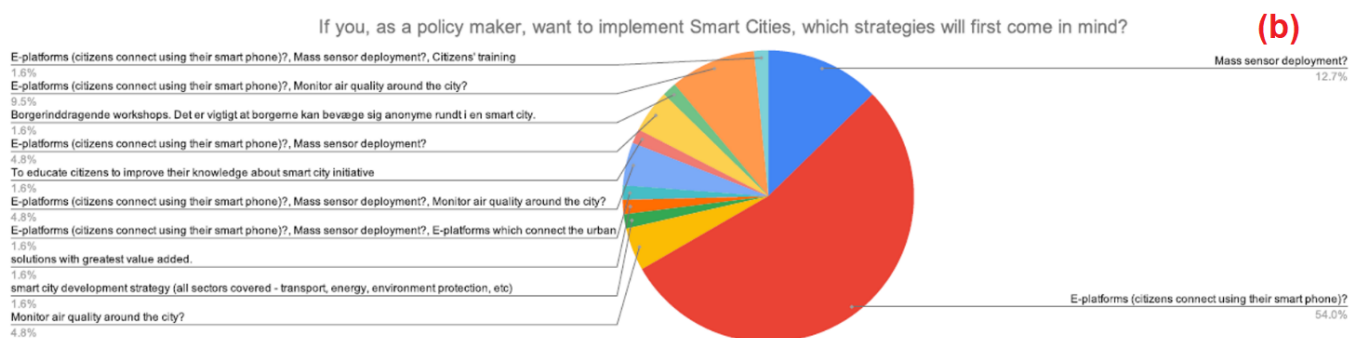
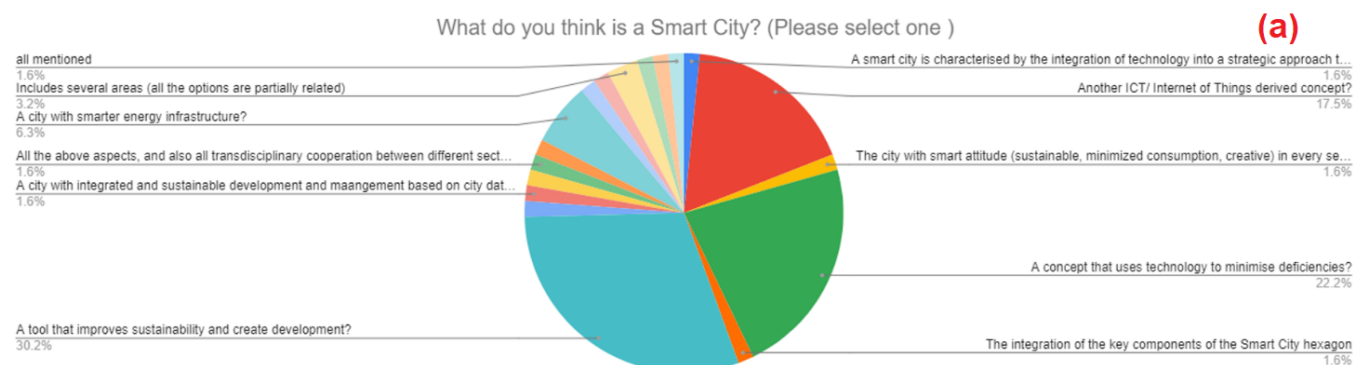


Figure 2. Questions: (a) “What is a smart city?” (b) “Which smart city strategies will first come in mind if the respondent is a city policy maker?” (c) “If there are any benefits of having smart cities?”

Do you think that the services to the citizen will get better, worse, or stay the same if artificial intelligence and machine learning are widely implemented?

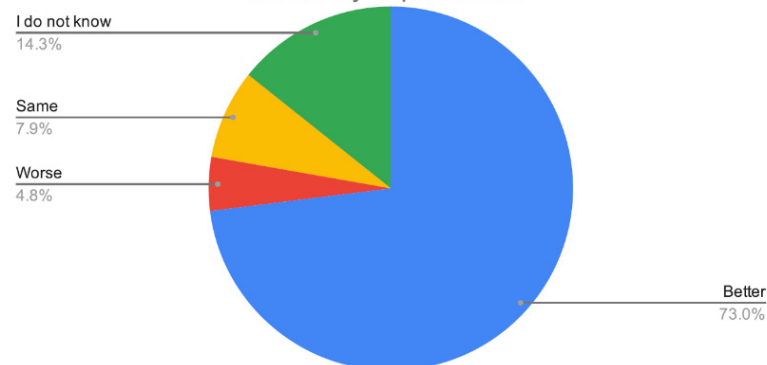
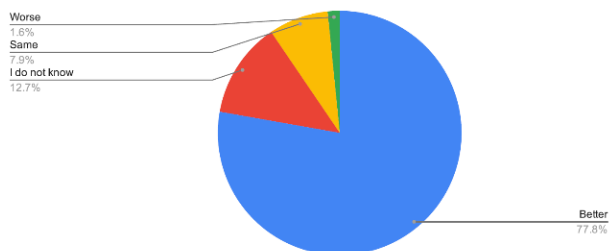
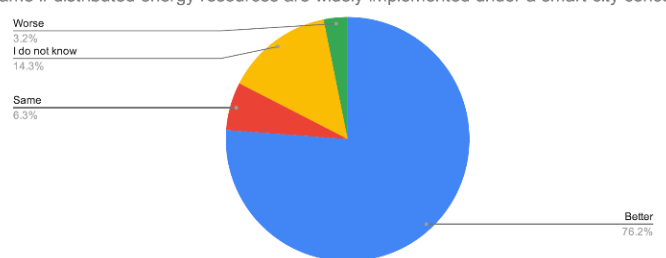


Figure 3. Question: “Do you think that the services to the citizen will get better, worse, or stay the same if artificial intelligence and machine learning are widely implemented under a smart city concept”?

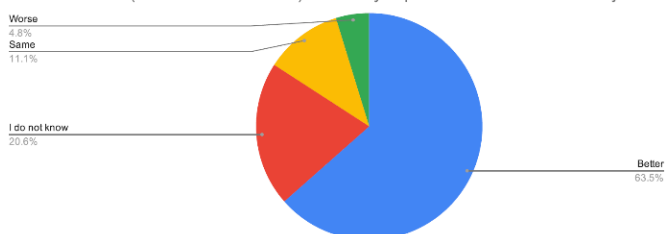
Do you think that the services to the citizen will get better, worse, or stay the same if data analytics are widely implemented under a smart city concept?



Do you think that the services to the citizen will get better, worse, or stay the same if distributed energy resources are widely implemented under a smart city concept?



Do you think that the services to the citizen will get better, worse, or stay the same if the electronic cards (known as smart cards) are widely implemented under a smart city concept?



Do you think that the services to the citizen will get better, worse, or stay the same if the use of smart phones are widely implemented under a smart city concept?

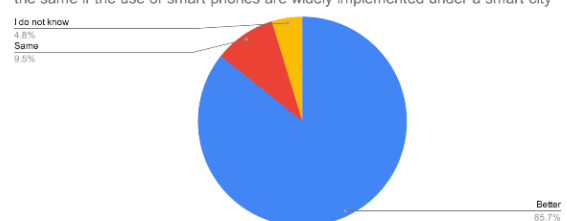


Figure 4. Question: “Do you think that the services to the citizen will get better, worse, or stay the same if data analytics, distributed energy resources, electronic cards, and smart phones are widely implemented under a smart city concept”?

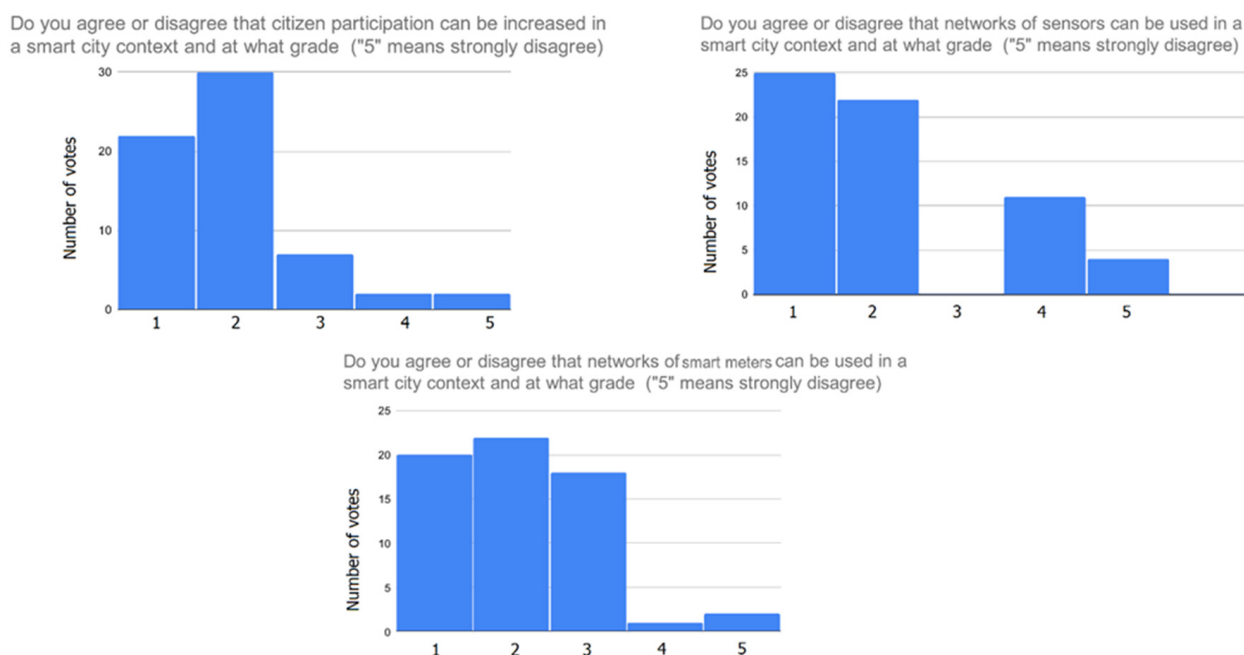


Figure 5. Question: “Do you agree or disagree that (**top left**) citizen participation can be increased in a smart city context, (**top right**) networks of sensors can be used, (**bottom**) wide adoption of smart meters can be used, and at what grade”?

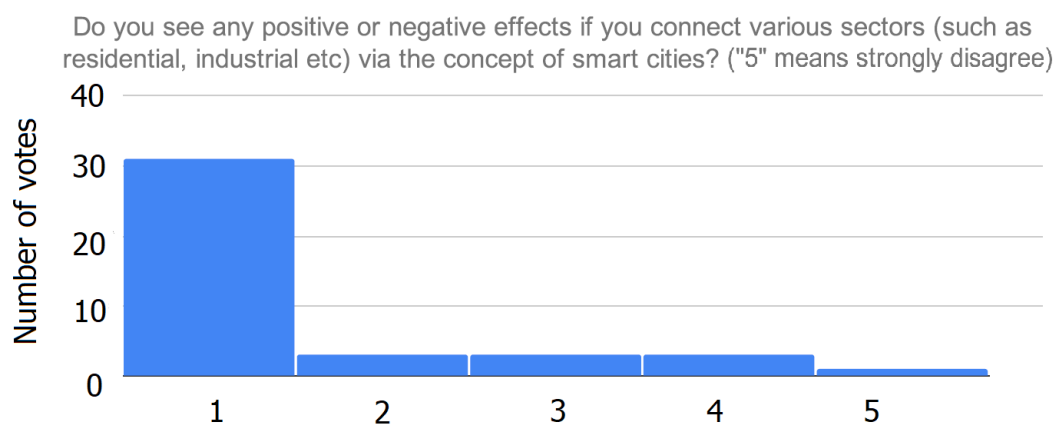


Figure 6. Question: “Do you see any positive or negative effects if you connect various sectors (such as residential, industrial etc) via the concept of smart cities?”

One of the first questions in the survey was: “Are you aware of a municipality problem that could be solved via a smart city approach?” The respondents were sure or almost certain at about 85% that there is a municipality problem that a smart city approach could solve (Figure 1). Only 15% said replied emphatically that it is not such. This (together with the 30% that replied “maybe”) could be interpreted as a clear need for training of the municipalities’ personnel towards that direction.

Open-ended questions followed in the survey asking the participants to describe (a) what is a smart city for them, (b) which smart city strategies will first come in mind if the respondent is a city policymaker and (c) if there are any benefits of having smart cities. Figure 2 presents the answers. On the question “what do you think is a smart city?”, one respondent out of three replied that is a tool that improves sustainability and creates development. One out of five replied that it is another ICT/Internet of Things concept and another one1 out of five that it is a concept that uses technology to minimise deficiencies.

In Figure 2b, it is seen that more than half replied, if the respondent acted as a city decision maker, that E-platforms (citizens connecting using their smart phones) is the preferred smart city strategy that first comes in mind. In the question if there are any

benefits of having smart cities (Figure 2c), more than 40% replied that the obvious benefit is that it gives the opportunity to be able to adapt under different conditions. A percentage of 17% replied that smart cities mean reduced environmental footprint. Therefore, as a result, what was ranked high in the respondents' opinions (in total almost 60%) was adaptability and environmental benefit.

It was believed by the authors that in the wide smart city deployment in the near future, artificial intelligence (AI) and machine learning (ML) will play a crucial role. Therefore, one of the questions asked in the survey was to answer if they think that the services to the citizen will get better, worse, or stay the same if artificial intelligence and machine learning will be widely implemented under a smart city concept (Figure 3).

The results showed that three out of four from the personnel in the regions and in municipalities believed that the services to the citizens would become better and only 5% was convinced that the services would be worse. The same question was included in the survey about data analytics, distributed energy resources, electronic cards (smart cards), and smart phones (Figure 4). Under the same rationale, the authors wanted to compare the reaction of the personnel in less established and clearly defined concepts, such as about data analytics or more tangible options, such as smart phones, which are already used widely worldwide. What should be stressed is that while, in all the other options, an answer "worse" was selected—even by few—in the case of smart phones, it was not. For the data analytics or the AI and ML they had to guess and imagine how things were going to be; in the case of smart phones they all already knew that the services to the citizen have already been improved in various ways. For both data analytics and distributed energy resources, the addition of "same" and "I don't know" was approximately 20%. This can be interpreted as the respondents were reluctant, since the description of "data analytics" and "distributed energy resources" was limited in the questions. On the other hand, when it comes to the question of electronic cards, the addition of "same" and "I don't know" reached more than 30%. This 10% difference it is obviously proof of scepticism and correlation to the fact that so many have heard about e-cards and privacy issues and personal data protection, especially since this questionnaire was shared after the European legislation passed in 2016, setting new rules on how SMEs and large enterprises manage and distribute personal data.

Another batch of questions in the survey were those focused on the grade of agreement with some statements of the personnel of the regions and municipalities. The questions were focused on how much they agree or disagree that (a) citizen participation [33] can be increased in a smart city context, (b) networks of sensors can be used, (c) wide adoption of smart meters can be used (Figure 5). The results revealed that although everyone strongly agreed that citizen participation will be increased, that was not exactly the case in the other two questions regarding sensors and smart meters adoption. Especially for the networks of sensors, there were clearly some disagreements in comparison with the other two questions. A rough interpretation could be linked to the fact that a large deployment of sensors could again violate in some degree the personal data freedom levels. The same could be assumed for the smart meters, since a high share of moderate acceptance votes ("3") are noted.

A similar question—requiring though synthetic thinking and a critical approach was asked to the respondents, asking if connecting various industrial sectors via smart cities, would have a positive or a negative effect overall (Figure 6).

What should be stressed here is that most respondents believed that it would have positive effects and very few negatives, but what should be pointed out is that a significant number of personnel of the regions and the municipalities decided not to answer in this question. The limited skillset of the personnel on correlating complex meanings could be another reason and could decisively prove that there is a clear need for specific training on smart cities with material developed to create complex thinking synthesizing ideas and goals.

A well-known smart city framework for Vienna was followed in order to ask the participants in the survey questions relevant to the overall quality of life improvement.

The Smart City Wien Framework Strategy (SCWR) was developed to set the priorities and pave the way for the city Vienna to focus on the wider European climate targets for the next decades, specifically focused on energy, mobility, buildings and infrastructure [14]. The questions to be answered were trying to link the different SCWR categories with the quality of life of the citizens (Figure 7).

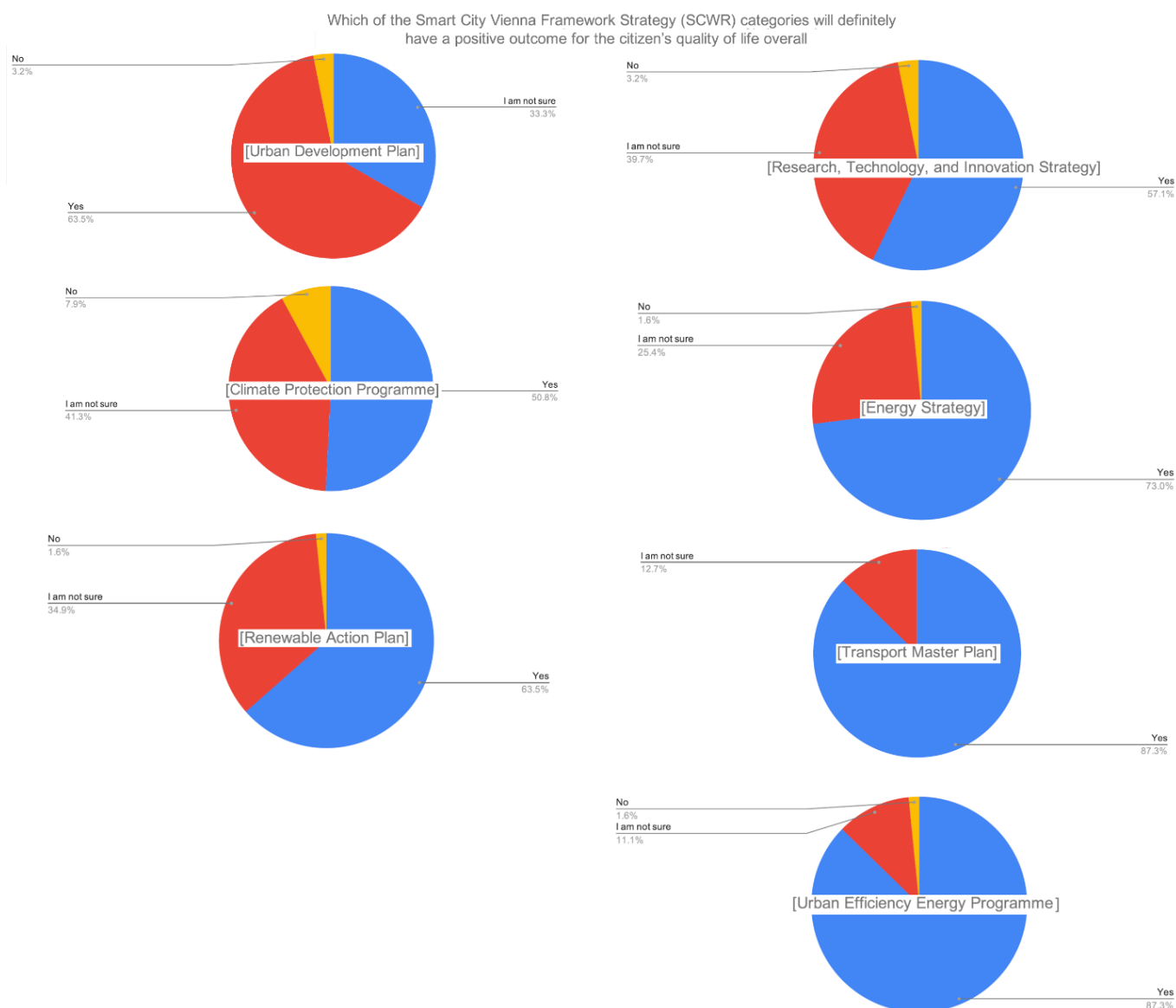


Figure 7. Question: “Which of the Smart City Vienna Framework Strategy (SCWR) categories will definitely have a positive outcome for the citizen’s quality of life overall?”

It was revealed that in all cases (and different SCWR categories) the respondents believe that they will have overall a positive outcome for the citizen’s quality of life. This was more profound in the cases of “Transport Master Plan” and “Urban Efficiency Energy Programme” where the positive answer was more than 87%. The lowest positive percentages—still high enough and clearly higher than 50%—were observed in the “Climate Protection Programme” and “Research, Technology, and Innovation Strategy”. However, it can be seen for example that the participants answered that the Urban Efficiency Energy Programme will have a positive outcome for the citizen’s quality of life by 87.3%, while for the Urban Development Plan, it was 63.5%. The difference can be interpreted that the participants believe stronger that the energy efficiency plan in an urban

environment is much more needed and it will be much more beneficial compared to the urban development plan [34]. Both the energy strategy and the renewable action plan gather higher percentages of approval by the participants.

4. Conclusions

This study was focused on registering the ideas and viewpoints of personnel working on municipalities, regions, and the wider public sector relevant to smart cities deployment. The study took place in five countries and answers were collected by respondents from Lithuania, Denmark, Slovakia, Italy, and Hungary on the matter. In general, it was revealed that there is a need for further training for the public sector in order to deal with the increasing challenges that the transition to more intelligent communities will bring along. It was found based on the respondents' answers that AI and ML will play a crucial role in the future, and that services to the citizen will get better if data analytics, distributed energy resources, electronic cards and smart phones are widely implemented. In most of the cases, various smart city technologies/policies were positively accepted. However, participants were not equally positive and enthusiastic for the smart cards or the network of smart sensors and in some grade smart meters. This could be partially interpreted as objections in terms of security and privacy issues. The complexity of tasks towards this direction needs further support. It was also interpreted that smartness and evolvement should not violate privacy and careful data sharing and management—the one should not preclude the other and scepticism should not backfire and destroy the vast potential of future intelligent and integrated communities.

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