

Bartłomiej Oręziak, Karolina Chról\*

# Smart City Concept: Legal Aspects of the Smart Environment in the Light of Renewable Energy Sources\*\*

## 1. INTRODUCTORY REMARKS

The dynamic development process of modern technologies, and thus engineering, technology or civilization, is growing in intensity and becoming more and more noticeable in the 21st century. This is reflected in both the theory and practice of many areas of human life. The said progress will often result in an innovative approach to traditional solutions. It should be postulated that the main goal of innovations to be implemented now or in the future should be to simplify the daily activities of humans, so that they are better, easier or more effective. The thus defined primary goal provides the foundation for research in this specific subject of analysis, including the field named in the title of this paper. It should also be noted that it is not possible to explicitly, permanently and at the same time objectively assess the quality of the novelty of any subject or entity. This is because the reference point will differ depending on the time. Not surprisingly, time as an objective criterion should be the model of conditional and variable control of being innovative. In other words, what can be new today, can be routine tomorrow or the day after. Thus, the classification of a particular entity or object as a novelty depends on the time of the assessment and the result of the assessment may not always be unambiguous. In the research focused on the use of modern technologies for practical use, the actual intention is to implement them in everyday life. Those actions are being taken at this point in time and are becoming an integral part of today's life. For example, at a certain point in time medicine was perceived as a great progress of civilization<sup>1</sup>, while the now modern concept that is currently being implemented is e-Health which, among other things, involves remote medical services provided

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<sup>1</sup> M. Jackson, *The History of Medicine. A Beginner's Guide*, London 2014, pp. 1–197.

via an ICT network to improve patient health<sup>2</sup>. Currently, artificial intelligence is used in various areas of human life, where discussions arise about the potential option of giving it legal capacity<sup>3</sup>, i.e. making it a subject of rights and obligations<sup>4</sup>. Contracts understood in the traditional way in the legal system border upon the possibilities offered by the so-called smart contracts<sup>5</sup>. Legal responsibility is often re-evaluated due to the emergence of a new plane of human activity, i.e. cyberspace<sup>6</sup>. This applies to both criminal<sup>7</sup> and civil<sup>8</sup> liability. It is already visible at first glance that there are many examples of the application of modern technologies for practical use that are relevant to legal sciences.

## 2. THE CONCEPT OF SMART CITY

The energy sector is no exception to the process outlined above. Although in this case it is also about facilitating human life, there are other reasons: reducing

<sup>2</sup> See: P. Terry, *Structural and Legal Implications of E-Health*, "Journal of Health Law" 2000, No. 33/4, pp. 605–614; M. Mars, R. Scott, *Global E-Health Policy: a Work in Progress*, "Health Affairs" 2010, No. 29/2, pp. 237–243; J. Anderson, *Social, Ethical and Legal Barriers to E-Health*, "International Journal of Medical Informatics" 2007, No. 76/5–6, pp. 480–483; A. Vedder, C. Cuijpers, P. Vantsiouri, M. Ferrari, *The Law as a 'Catalyst and Facilitator' for Trust in E-Health: Challenges and Opportunities*, "Law, Innovation and Technology" 2014, No. 6/2, pp. 305–325; M. Bujnowska-Fedak, M. Tomczak, *Innowacyjne aplikacje telemedyczne i usługi e-zdrowia w opiece nad pacjentami w starszym wieku*, "Zdrowie Publiczne i Zarządzanie" 2013, No. 11/4, pp. 302–317; J. Janyszek, K. Frączkowski, *Wirtualna sieć komputerowa e-Zdrowie dla szpitali wrocławskich i regionu dolnośląskiego*, "Acta Bio-Optica et Informatica Medica. Inżynieria Biomedyczna" 2006, No. 12/1, pp. 60–63; K. Frączkowski, *Program e-Zdrowie wspomagający świadczenie usług medycznych-telemedycyna*, "Acta Bio-Optica et Informatica Medica. Inżynieria Biomedyczna" 2005, No. 11/3–4, pp. 54–58.

<sup>3</sup> See: A. Silverman, *Mind, Machine, and Metaphor. An Essay on Artificial Intelligence and Legal Reasoning*. Boulder, Colorado 1993, p. 1 et seq.; J. Searle, *Is the Brain's Mind a Computer Program?*, "Scientific American" 1990, p. 26 et seq.

<sup>4</sup> See: A. Wolter, J. Ignatowicz, K. Stefaniuk, *Prawo cywilne. Zarys części ogólnej*, Warszawa 2000, p. 157; S. Grzybowski, *System prawa cywilnego*, Warszawa 1985, p. 284; M. Pazdan, *Podmioty stosunków cywilnoprawnych — zagadnienia ogólne* [in:] *Prawo cywilne — część ogólna. System Prawa Prywatnego*, M. Safjan (ed.), Warszawa 2007, pp. 914–916.

<sup>5</sup> See: I. Bashir, *Mastering Blockchain. Distributed Ledgers, Decentralization and Smart Contracts Explained*, Birmingham 2017, pp. 21–23, 43–44; J. Garcia-Alfaro, G. Navarro-Arribas, H. Hartentein, J. Herrera-Joancomarti, *Data Privacy Management, Cryptocurrencies and Blockchain Technology*, Oslo 2017, pp. 297–411; B. Kelly, *The Bitcoin Big Bang. How Alternative Currencies are About to Change the World*, New Jersey 2015, pp. 149–163; P. Venegas, *Guide to Smart Contracts. Blockchain Examples*, Cambridge 2017, pp. 5–7.

<sup>6</sup> The Republic of Poland is one of the very few countries to have adopted a legal definition of cyberspace. The said definition is laid down in the Act of 29 August 2002 on Martial Law and the Powers of the Commander-in-Chief of the Armed Forces and the Principles of Subordination to the Constitutional Bodies of the Republic of Poland (...): "The cyberspace referred to in paragraph 1 shall be understood to mean the space for the processing and exchange of information created by ICT systems, as defined in Article 3 point 3 of the Act of 17 February 2005 on Computerisation of Activities of Entities Carrying Out Public Tasks (Polish title: Ustawa z 17.02.2005 r. o informatyzacji działalności podmiotów realizujących zadania publiczne, Dz.U. z 2017 r. poz. 570), including the links between them and relations with users (wraz z powiązaniem pomiędzy nimi oraz relacjami z użytkownikami [tekst jedn.: Dz.U. z 2017 r. poz. 1932])".

<sup>7</sup> See: E. Simon, *Cyberporn and Censorship: Constitutional Barriers to Preventing Access to Internet Pornography by Minors*, *The Journal of Criminal Law and Criminology* 1998, No. 88/3, pp. 1015–1048; B. Wible, *A Site Where Hackers are Welcome: Using Hack-In Contests to Shape Preferences and Deter Computer Crime*, "The Yale Law Journal" 2003, No. 112/6, pp. 1577–1623; B. Hancock, *US and Europe Cybercrime Agreement Problems*, "Computers and Security" 2000, No. 19/4, pp. 306–307; C. Coleman, *Security Cyberspace—New Laws and Developing Strategies*, "Computer Law and Security Report" 2003, No. 19/2, pp. 131–136; A. Stolz, *Congress and Capital Punishment: An Exercise in Symbolic Politics*, "Law and Policy Quarterly" 1983, No. 5/2, pp. 157–180.

<sup>8</sup> See: G. Colangelo, M. Maggiolino, *ISPs' Copyright Liability in the EU Digital Single Market Strategy*, "International Journal of Law and Information Technology" 2018, No. 26/2, pp. 142–159; J. Koo, *Away we Ziggo: the Latest Chapter in the EU Communication to the Public Story*, "Journal of Intellectual Property Law & Practice" 2018, No. 13/7, pp. 542–551; J. Nordemann, *Recent CJEU Case Law on Communication to the Public and its Application in Germany: A New EU Concept of Liability*, "Journal of Intellectual Property Law & Practice" 2018, No. 13/9, pp. 744–756.

costs, increasing energy availability, emission reduction, increase in the share of distributed energy production, opening energy markets to competition, and seeking savings in terms of investment, energy, emissions and labour costs<sup>9</sup>. The Smart City concept can be considered a flagship example of innovation in the energy sector. It means using the latest developments in information and communication technologies, including mobile technologies and the Internet, to modernize cities and make them more friendly<sup>10</sup>. It is noted that a city is smart when “the use of information and communication technologies makes the key elements of the city’s infrastructure and services, including city administration, education, healthcare, public security, real estate, transport and communal services, more intelligent, connected and efficient”<sup>11</sup>. Referring to the European Parliament document, it can be seen that a smart city has six foundations: Intelligent Management, Intelligent Economy, Intelligent Mobility, Intelligent Environment, Intelligent People, and Intelligent Life<sup>12</sup>:

#### Smart Governance

Joined up within-city and across-city governance, including services and interactions which link and, where relevant, integrate public, private, civil and European Community organizations so the city can function efficiently and effectively as one organism. The main enabling tool to achieve this is ICT (infrastructures, hardware and software), enabled by smart processes and interoperability and fueled by data. International, national and hinterland links are also important (beyond the city), given that a Smart City could be described as quintessentially a globally networked hub. This entails public, private and civil partnerships and collaboration with different stakeholders working together in pursuing smart objectives at city level. Smart objectives include transparency and open data by using ICT and e-government in participatory decision-making and co-created e-services, for example apps. Smart Governance, as a transversal factor, can also orchestrate and integrate some or all of the other smart characteristics.

<sup>9</sup> Definition of Smart Metering and Applications and Identification of Benefits, [https://www.vtt.fi/inf/julkaisut/muut/2008/Definition\\_of\\_smart\\_metering\\_and\\_applications\\_and\\_identification\\_of\\_benefits.pdf](https://www.vtt.fi/inf/julkaisut/muut/2008/Definition_of_smart_metering_and_applications_and_identification_of_benefits.pdf) (accessed on: 24 October 2018).

<sup>10</sup> T. Campbell, *Foreword* [in:] *Smart Cities as Democratic Ecologies*, D. Araya (ed.), New York 2015, p. 14–15; V. Albino, U. Berardi, R. Dangelico, *Smart Cities: Definitions, Dimensions, Performance, and Initiatives*, ”Journal of Urban Technology” 2015, No. 22/1, p. 4.

<sup>11</sup> M. Trombin, R. Pinna, M. Musso, E. Magnaghi, M. de Marco, *Mobility Management: From Traditional to People-Centric Approach in the Smart City* [in:] *Emerging Technologies for Connected Internet of Vehicles and Intelligent Transportation System Networks: Emerging Technologies for Connected and Smart Vehicles*, M. Elhoseny, A. Hassanien (eds.), Cham 2020, p. 166.

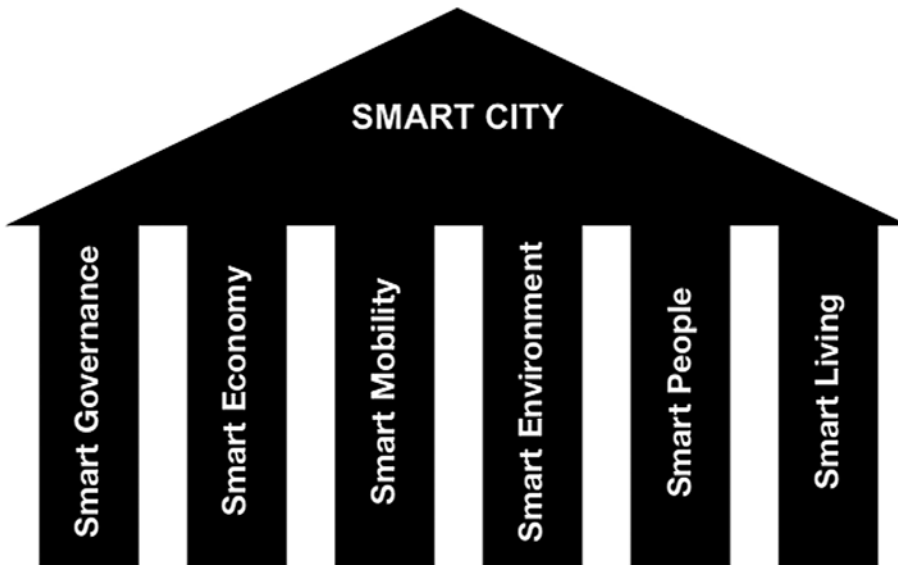
<sup>12</sup> Mapping Smart Cities in the EU. Study, [http://www.europarl.europa.eu/RegData/etudes/etudes/join/2014/507480/IPOL-ITRE\\_ET\(2014\)507480\\_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/etudes/join/2014/507480/IPOL-ITRE_ET(2014)507480_EN.pdf) (accessed on: 24 October 2018).

- Smart Economy E-business and e-commerce, increased productivity, ICT-enabled and advanced manufacturing and delivery of services, ICT-enabled innovation, as well as new products, new services and business models. It also establishes smart clusters and eco-systems (e.g. digital business and entrepreneurship). Smart Economy also entails local and global inter-connectedness and international embeddedness with physical and virtual flows of goods, services and knowledge.
- Smart Mobility ICT supported and integrated transport and logistics systems. For example, sustainable, safe and interconnected transportation systems can encompass trams, buses, trains, metros, cars, cycles and pedestrians in situations using one or more modes of transport. Smart Mobility prioritizes clean and often non-motorized options. Relevant and real-time information can be accessed by the public in order to save time and improve commuting efficiency, save costs and reduce CO<sub>2</sub> emissions, as well as to network transport managers to improve services and provide feedback to citizens. Mobility system users might also provide their own real-time data or contribute to long-term planning.
- Smart Environment Smart energy including renewables, ICT-enabled energy grids, metering, pollution control and monitoring, renovation of buildings and amenities, green buildings, green urban planning, as well as resource use efficiency, re-use and resource substitution which serves the above goals. Urban services such as street lighting, waste management, drainage systems, and water resource systems that are monitored to evaluate the system, reduce pollution and improve water quality are also good examples.
- Smart People E-skills, working in ICT-enabled working, having access to education and training, human resources and capacity management, within an inclusive society that improves creativity and fosters innovation. As a characteristic, it can also enable people and communities to themselves input, use, manipulate and personalize data, for example through appropriate data analytic tools and dashboards, to make decisions and create products and services.
- Smart Living ICT-enabled life styles, behavior and consumption. Smart Living is also healthy and safe living in a culturally vibrant city with diverse cultural facilities and incorporates good quality housing and accommodation. Smart Living is also linked to high levels of social cohesion and social capital.

The Smart City concept requires implementation of all its components, which are essentially independent from one another, which means that there is no specific internal hierarchy. Therefore, it cannot be said that one Smart City foundation is more important than the other, so there is no pyramid with a top and a base. However, there is a connection between them, namely the Intelligent Management, Intelligent Economy, Intelligent Mobility, Intelligent Environment, Intelligent People, and Intelligent Life are the pillars, and the smart city is the roof. This article will discuss the legal aspects of a smart environment in the light of renewable energy sources. The simplified structure of the smart city concept is illustrated in Figure below.

**Figure**

Simplified structure of smart city concept (own elaboration)



Simplified structure of smart city concept.

### 3. IDENTIFICATION OF THE MOST IMPORTANT LEGAL ASPECTS OF THE SMART CITY

One of the many goals of the Smart City is to regulate the city's power system with as large contribution of renewable energy sources (hereinafter: RES) as possible, all while maintaining an appropriate level of energy security. This raises the need to introduce a sustainable energy flow within the city and its territory<sup>13</sup>. A comprehensive legal regulation of the flow of electricity at national and then local level is necessary

<sup>13</sup> H. Haarstad, Marikken W. Wathne, *Are Smart City Projects Catalyzing Urban Energy Sustainability?*, "Energy Policy" 2019, Vol. 129, pp. 924–925.

to achieve this assumption. First of all, it is appropriate to start by indicating the five basic areas of electric energy legislation: production, storage, infrastructure, equipment and transport<sup>14</sup>. These areas are usually regulated generally at the national level, however, in the case of the introduction of renewable energy sources and greater automation, as assumed by the Smart City concept, the regulation of energy supply itself will require many legal actions to be taken at the level of the particular city authorities. Due to the framework of this publication, it was necessary to limit ourselves to analysing the three main issues in connection with the diagram presented above, i.e. intelligent management, intelligent people and intelligent mobility as the key aspects. Intelligent economy and intelligent environment will be combined with intelligent management in this analysis, and administration activities at the local level for the city will be presented under this segment. The second segment includes intelligent people whose activities can be considered the foundation for the existence of the Smart City; here the emphasis will be laid on acts activating participation in creating distributed energy. The third and last segment is intelligent mobility, which should be combined with intelligent life that correlates the above-mentioned features of the standards with a large share of market mechanisms.

The first group of regulations with an authorization to take appropriate actions, related to the pillars of intelligent management, intelligent economy and intelligent environment, will be addressed to local authorities at the city level. Most provisions regarding renewable energy sources are laid down in universally binding legislative acts at a national or international level. However, a smart city must not only be able to choose a model for planning and operating the network, but also to assess the potential availability of space for renewable energy and municipal power plants to determine the best locations and types of generations to install under specific geographical constraints<sup>15</sup>. Therefore, there must be provisions authorizing city authorities to regulate the above issues and introduce renewable energy sources in the city, which will enable the integration of hybrid distributed generation systems with the intelligent energy system<sup>16</sup>. The main task of city authorities in this group of regulations is therefore to create micro-networks that respond in real time, optimizing energy flow to avoid peak overloads and reward users' pro-energy attitudes<sup>17</sup>.

The second group of regulations applies to the basic pillar of the Smart City, i.e. intelligent people. As already mentioned, the Smart City will be based on dispersed renewable energy sources. This means that the physical units will be able to operate as prosumers in the power generation sector. As the Smart City develops, this will generate problems of greater complexity such as intelligent systems, intelligent energy trading markets, and regulation of prosumer clustering, e.g. in city districts<sup>18</sup>.

<sup>14</sup> C.F. Calvillo, A. Sánchez-Miralles, J. Villar, *Energy Management and Planning in Smart Cities*, "Renewable and Sustainable Energy Reviews" 2016, Vol. 55, pp. 273–287.

<sup>15</sup> C.F. Calvillo, A. Sánchez-Miralles, J. Villar, *Energy Management...*, p. 283.

<sup>16</sup> F. D'ascenzo, A. Tantau, M. Savastano, A. Şanta, *New Energy Policies for Smart Cities – a Comparison among Smart Cities in the European Union*, "Proceedings of the International Conference on Business Excellence" 2019, No. 13(1), p. 1147.

<sup>17</sup> C. Lazaroiu, M. Roscia, D. Zaninelli, *Fuzzy Logic to Improve Prosumer Experience into a Smart City*, 2018 International Conference on Smart Grid, p. 56.

<sup>18</sup> S. Karnouskos, *Demand Side Management via Prosumer Interactions in a Smart City Energy Marketplace*, 2nd IEEE PES International Conference and Exhibition on Innovative Smart Grid Technologies, Manchester 2011, pp. 2–3.

Nevertheless, the basis for regulation in this segment is to enable prosumers to exist by regulating the definition and conditions of participation in the network and creating systems that encourage individuals to transform into “clean” electricity users and consumers, i.e. to start producing renewable energy with a certain capacity<sup>19</sup>. This requires, first of all, a rational and coherent administration activities, and thus maintaining legal stability, which is crucial for entrepreneurs and investors to make investment decisions<sup>20</sup>. Secondly, regulation must encourage action, e.g. through tax breaks or a favourable energy trading system in the network, allowing it to be collected at a time of greater demand. Thirdly, city authorities must take steps that will raise public awareness of the possibility of taking action and such information must be communicated in an accessible manner, i.e. “translated into knowledge in context” to influence consumers, organizations and policy makers<sup>21</sup>. Thus, the objective of regulation in this group addressed to Intelligent People is to outline the rules of operation and encourage entities to join the energy market. This basic regulation is closely connected with the above segment, because inasmuch it is more practical, yet without favourable conditions and regulations allowing for balancing energy, prosumers are pointless.

The third and final group of regulations are provisions on intelligent mobility. It is equally appropriate to assign this element to Smart Living because the choice of electric or autonomous vehicles involves responsible and far-reaching decisions that affect the day-to-day functioning of the society. There are many legal regulations on mobility in the city, but to stay close to the topic of the article, the central point of focus should be electromobility. It is closely related to deployment of green energy, because it increases electricity consumption by generating the need to increase the share of renewable energy. Many tools come to the rescue, such as the frequently set up European emissions trading scheme (ETS)<sup>22</sup>. The decision to buy an electric car is made after analysing the legal benefits and the infrastructure of charging stations in the city and the vicinity<sup>23</sup>. Companies that build stations decide to develop infrastructure under the influence of exploring development opportunities in a given Smart City. Legal regulations should, first of all, create a good legal framework for the development of electromobility, and secondly, regulate aspects such as the principles of installing stations on the road with due regard for their adaptation to many vehicles and appropriate distribution, rules of movement and road signs and the relevant technical parameters<sup>24</sup>. This leads to the conclusion that the standards are to be targeted at a wider audience than in

<sup>19</sup> P. Ekman, J. Röndell, Y. Yang, *Exploring Smart Cities and Market Transformations from a Service-Dominant Logic Perspective*, “Sustainable Cities and Society” 2019, Vol. 51, p. 4.

<sup>20</sup> M.L.D. Cedeno, M.G.D. Arteaga, A.V. Perez, M.L.D. Arteaga, *Regulatory Framework for Renewable Energy Sources in Ecuador Case Study Province of Manabi*, “International Journal of Social Sciences and Humanities” 2017, No. 1(2), pp. 38–39.

<sup>21</sup> P. Ekman, J. Röndell, Y. Yang, *Exploring Smart Cities...*, p. 10.

<sup>22</sup> G. Sierpiński, M. Staniek, *Platform to Support the Implementation of Electromobility in Smart Cities Based on ICT Applications – Concept for an Electric Travelling Project*, „Zeszyty Naukowe. Transport/Politechnika Śląska” 2018, Vol. 100, p. 187.

<sup>23</sup> R. Wolbertus, M. Kroesen, R. van den Hoed, C.G. Chorus, *Policy Effects on Charging Behaviour of Electric Vehicle Owners and on Purchase Intentions of Prospective Owners: Natural and Stated Choice Experiments*, “Transportation Research. Part D: Transport & Environment” 2018, Vol. 62, pp. 286–287.

<sup>24</sup> M. Sechilariu et al., *Smart Microgrid and Urban Planning for Better Electromobility*, IEEE Vehicle Power and Propulsion Conference (VPPC), Belfort 2017, p. 3.

the previous segment, that is, citizens, and thus enterprises. In this segment, legal regulations are the starting point, but as soon as they lead to the emergence of consumers and entrepreneurs, their importance should fade in favour of the rules prevailing on the market.

#### 4. POTENTIAL PROBLEMS AND POSSIBLE SOLUTIONS

Due to the fact that this research focuses on the legal aspects of renewable energy development in the Smart City, we should identify three main threats related to legal regulations and indicate possible actions to counteract the occurrence of or solve the existing problems. The main problems are related to the scope of regulation and its strength. For the purposes of identifying problems, the following types of regulations should be distinguished:

- a. general and weak,
- b. detailed and rigid,
- c. focused on the national level.

Renewable energy regulation in the Smart City, which is too general and weak, generates inaction and legal uncertainty. In such a professional and detailed field as energy, there is a need to articulate a specific regulatory framework for renewable energy and to determine a set of mechanisms and support measures aimed at fostering the diversified introduction of technologies using them<sup>25</sup>. In the absence of optimal legal regulation, local authorities and entrepreneurs will not get involved in the development of green energy, because the conventional source is simpler to obtain and its availability is more certain. Therefore, the Smart City must be managed on the basis of well-defined principles and guidelines, they are the basis for efficient work between the administration and local public authorities<sup>26</sup>. Underregulation of these aspects can cause stagnation, thus eliminating intelligent energy according to the definition of Smart City from the picture.

A mirror image of the above-mentioned threat is yet another peril. A rigid legal framework regulating the mechanisms related to renewable energy in a too detailed and strict way in Smart City leads to a lack of social approval for standards and blocking decisions on the use of renewable energy. The remedy to this problem is to opt for an extensive deployment of renewable energy sources by developing a viable and coherent incentive economy, comprehensive energy plans at national and state level, and a strong regulatory environment<sup>27</sup>. In both the cases referred to above, legal regulation must be optimal and supported by expert research and social consultations.

The third of these factors will be discussed most widely, as it directly relates to renewable energy in the Smart City. The above cases are an example of incorrect regulation at the national level and would affect the power system of the

<sup>25</sup> M.L.D. Cedeno, M.G.D. Arteaga, A.V. Perez, M.L.D. Arteaga, *Regulatory framework...*, p. 39.

<sup>26</sup> S. Joshi, S. Saxena, T. Godbole, Shreya, *Developing Smart Cities: An Integrated Framework*, "Procedia Computer Science" 2016, Vol. 93, p. 905.

<sup>27</sup> S. Carley, *Tangled in the Wires: An Assessment of the Existing U.S. Renewable Energy Legal Framework*, "Natural Resources Journal" 2006, No. 3, Vol. 46, p. 790.



whole country, while the largest threat to the Smart City is regulation which too focused at the national level, without competence standards for shaping energy plans at the local level. Local governments are responsible for planning initiatives that must include policies that protect, legitimize and accelerate the development of renewable energy sources. It is their responsibility to adapt incentives to the needs of residents in a given area in order to stimulate the growth of the market for renewable energy products. Local governments are also responsible for the technical part of tasks such as issuing building and land use permits, spatial development plans or creating infrastructure that allows energy to be fed into the grid<sup>28</sup>. In broad terms, all levels of administration must be involved to achieve an effective and coherent development, including the lowest bodies at city level<sup>29</sup>. The postulated action preventing blocking of renewable energy location processes in the case of small-scale systems will be, firstly, providing local administration with legislative possibilities and, secondly, educating local authorities so that they can fully use the potential vested in them.

## 5. CONCLUSION

Instead of a traditional conclusion, a catalogue of postulates will be presented, constituting the final insights on the issue which is the subject of this paper:

- The main goal of innovations to be implemented should be to simplify everyday human activities in order to make them better, easier and more effective;
- It is not possible to explicitly and continuously and also objectively assess the quality of the novelty of any subject or entity. Time as an objective criterion should be the model of conditioned and variable control of the feature of innovation;
- The flagship example of innovation in the energy sector is currently the Smart City concept, which means using the achievements of information and communication technologies to modernize cities and make them more friendly;
- The Smart City concept requires implementation of all its components: Intelligent Management, Intelligent Economy, Intelligent Mobility, Intelligent Environment, Intelligent People, and Intelligent Life;
- All components are pillars, and a smart city is a roof in this concept;
- The main task of city authorities in the set of regulations on intelligent management, intelligent economy and intelligent environment is to create micro-networks that respond in real time, optimizing energy flow to avoid peak overloads and reward users' pro-energy attitudes;
- The regulation addressed to Intelligent People is to outline the rules of operation and encourage entities to join the energy market;

<sup>28</sup> P. Salkin, *Key to Unlocking the Power of Small Scale Renewable Energy: Local Land Use Regulation*, 27 "Univ. Fla. J. Land Use & Env't'l Law" 339, "Touro Law Center Legal Studies Research Paper Series" 2012, No. 14–28, pp. 354, 367.

<sup>29</sup> S. Carley, *Tangled in the Wires: An Assessment of the Existing U.S. Renewable Energy Legal Framework*, *Natural Resources Journal* 2006, No. 3, Vol. 46, p. 781.

- Legal regulation within the framework of intelligent mobility should create the right legal framework for the development of electromobility, and such aspects as the principles of installing stations along roads, including their adaptation to the number vehicles and appropriate distribution, rules of movement and road signs and relevant technical parameters;
- Renewable energy regulation in the Smart City, which is too general and weak, generates inaction and legal uncertainty;
- The rigid law regulating the mechanisms related to renewable energy in a too detailed and strict way in Smart City leads to a lack of social approval for standards and blocking decisions on the use of renewable energy;
- Local governments are responsible for planning initiatives that must take into account policies that protect, legitimize and accelerate RES development.

Finally, it should be emphasized that the Smart City requires the creation of intelligent and well-thought-out law, sensitive to the specificity of renewable energy sources, which should be perceived as vital for each pillar of the concept. Thus, without a proper, effective and efficient implementation of renewable energy sources, in particular at the local regulatory level, one cannot speak of a full implementation of the Smart City concept.

### Abstract

#### **Bartłomiej Oręziak, Karolina Chról, *Smart City Concept: Legal Aspects of the Smart Environment in the Light of Renewable Energy Sources***

*This research paper analyses legal aspects of the application of modern technologies for practical use in the energy sector in the form of a Smart City. The issue of Smart Environment in the light of renewable energy sources was classified as the main research axis. The main goal of the paper, from the methodological point of view, involves decoding the impact and importance of renewable energy sources for the full implementation of the Smart City concept. First, the article presents introductory remarks regarding the general outline of technical, technological and civilization progress. Then, the essence of the Smart City concept and its pillars have been presented. This permitted the authors to move on to identify the most important legal aspects of the issue discussed in this paper and to search for potential problems and suggest possible solutions. The paper ends with a concise summary containing the authors' observations on the subject and de lege ferenda postulates.*

**Keywords:** Smart City, Smart Environment, Renewable Energy, Law, New Technologies

### Streszczenie

#### **Bartłomiej Oręziak, Karolina Chról, *Koncepcja Smart City. Prawne aspekty Inteligentnego Środowiska w świetle odnawialnych źródeł energii***

*Artykuł naukowy dokonuje analizy prawnych aspektów zastosowania nowoczesnych technologii do użytku praktycznego w energetyce w postaci Smart City. Za główną oś badawczą zakwalifikowano zagadnienie Inteligentnego Środowiska w świetle odnawialnych*

źródeł energii, zaś za główny cel przyjęto właściwe z metodologicznego punktu widzenia zdekodowanie wpływu oraz znaczenia odnawialnych źródeł energii na pełną implementację koncepcji Smart City. W pierwszej kolejności zostały przedstawione uwagi wprowadzające dotyczące ogólnego zarysu postępu technicznego, technologicznego oraz cywilizacyjnego. Następnie zaprezentowano istotę koncepcji Smart City, gdzie przedstawiono jej filary. Powyższe umożliwiło przejście do identyfikacji najważniejszych aspektów prawnych tytułowego zagadnienia oraz poszukiwania potencjalnych problemów i propozycji możliwych rozwiązań. Artykuł kończy się zwięzłym podsumowaniem, zawierającym autorskie spostrzeżenia w relewantnej materii oraz postulaty *de lege ferenda*.

**Słowa kluczowe:** inteligentne miasto, inteligentne środowisko, energia odnawialna, prawo, nowe technologie

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