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2. ONTOLOGY OF (SMART) CITY AND ITS PRACTICAL RELEVANT INTRODUCTORY REMARKS

As the title of this text suggests (ontology is an important part of philosophy), it is philosophical in nature. It should be stressed that the word "philosophical" should be, in the present context, regarded as closely related to such phrases as "transdisciplinary approach" or "holistic perspective". – This declaration I would like to supplement with two general remarks that should help to characterize its type and goals. The first remark concerns globalization. This word is not only defined in many ways but also (what is much more important) referred to phenomena and processes of various sorts: civilizational, cultural, economic, political, social… Due to character of this text and its limited size, it is impossible to discuss, even very briefly, this conceptual and theoretical variety: I have to limit myself to presenting this interpretation of globalization[2] that is, as I believe, most useful at this place. It should be convenient to begin this presentation with mentioning two events that happened fifty years ago: In Stockholm, from June 5–16, 1972, the United Nations Conference on the Human Environment was held. This same year, the Club of Rome (established in 1968) issued the "Limits to Growth" report. Regardless of many debates and (scientific, ideological, political – often intermingled) controversies aroused by these two events, one thing seems beyond discussion: they contributed significantly to the development of global consciousness. Considerably (though still inadequately) has increased the number of those who are aware that whole humanity faces big problems (among them those related to climate changes seem to be most widely known) that can be solved only by our common, global actions. We are also more than decades ago (though also inadequately…) aware that our species together with all the artifacts we have produced is but a part of one global (encompassing the whole Earth, and particularly – the whole life-world) system.

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[2] One of the best concise discussions of this concept contains Osterhammel: Osterhammel J.: Globalization. [In:] Bentley J.H. (ed.): The Oxford Handbook of World History. Oxford University Press, Oxford 2011, pp. 89–104.

Two simple but important (and strongly interrelated) facts should account for the relevance of the perspective I have just outlined for the issues that will be addressed in this essay: Firstly, the absolute and relative number of people living in the cities is still increasing and – in the coming decades – will be (even if slower than the previous one). Secondly, cities – though have fundamentally contributed to the progress which we have experienced in various domain of our life – have no less fundamentally contributed to the generating the big problems we have to cope with. The conclusion to these observations is simple: the successful solving of the global problems depends very much on the development of cities – smart, intelligent, wise.[3]

And now my second remark. Among popular (even: fashionable) labels used for characterizing "our times" (say, the last few decades) is the term "knowledge society". Its popularity certainly reflects important civilization (social etc.) changes that have occurred over the last decades. They might be briefly and concisely characterized as "great growth of knowledge production"; growth measured by numbers – of scientists, of academic institutions, of books and journals, of congresses and symposia… Even if not all "products" of science contribute significantly to the growth of our knowledge the overall development of our knowledge should be expected – due to "gaussian" statistical regularities. If we would produce knowledge "for its own sake" only, we could be very pleased. But if we take into account the simple fact that growth of "knowledge production" is strongly connected with more prosaic interests and motivations (manifested i.a. by an increase in states expenditures on science) than with the intellectual ethos of Plato or Aristotle, we will note some paradoxical aspects of this growth. This *problematique* would deserve separate, comprehensive analysis. Here, but few short notes will be made: First, the sheer number of "scientific products" results in difficulties for those who are exclusively (or mainly) interested in applications of (scientific) knowledge ("information noise"). Second, the various factors of the growth of "knowledge production" result in progressive diversification ("balkanization") of science[4]. Various attempts to counteract this process have been undertaken – with rather limited success. Let us look at the idea of interdisciplinarity (a catchword – more or less popular since 1970s). If it is something more than a slogan, it increases rather than decreases the number of disciplines (e.g. the rise of biochemistry did not result in disappearance of more "centrally" located biological or chemical/sub/disciplines; in humanities the same might be said about historical sociology or social psychology). But

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[3] To develop this remark one should discuss the Barber's ideas on the increasing significant of the role played by mayors. Barber B.: If Mayors Ruled The World: Dysfunctional Nations, Rising Cities. Yale University Press, New Haven 2013.

[4] Interesting comments on these problems and some practical proposals how to solve tincreasing hem are presented in the philosophical book of great physicist Murray Gell-Mann: Gell-Mann M.: The Quark and The Jaguar: Adventures in The Simple and The Complex. Abacus, London 1995.

is the increasing diversification of sciences and specialization of scientists a serious practical problem? I do share the opinion that the answer to this question is definitely positive. Especially – in the time of globalization: in the epoch in which humanity, eco--sphere and techno-sphere are getting elements (sub-systems) of one socio-eco-techno--system[5] we need – more and more, and for very practical reasons – knowledge about the whole system and not only about its various sub-, sub-sub- etc., systems. It is obvious that the specialist knowledge is of fundamental importance. To avoid any misunderstanding, let me avail of analogy with geography/cartography: In most practical situations we need – if any – city plans; probably less often – regional and national maps, still less – those of continents. But even the map of the whole globe is useful not only for geographical education. It might be also noted that the practical importance of world maps has been increasing in correlation to the increase of the scope of various activities (political, military, trade etc.).

Now, I would like to draw some conclusions from these two remarks: Firstly, there is no doubt that – due to a large number of factors (from the number of city-dwellers to political and cultural role of cities) – the development of cities is a key element of the development of the global civilization. Therefore, the quality of the cities development (particularly: its smartness, its intelligent character) determines significantly the ways in which are and will be solved the global problems humanity faces today and will face in the coming future. Secondly, there is also no doubt that smart/intelligent development of cities must be knowledge-based (science-supported). Thirdly, if the development of cities is to be smart/intelligent, it must be (at least in the longer perspective) holistic/sustainable[6]. Fourthly, science-supported holistic/sustainable development presupposes holistic (comprehensive, complex, systematic…) knowledge about city. And here is the point: city has – for the last century or so – become an object of studies of various scientific – social, natural, engineering – disciplines. In virtually all cases specialized sub-disciplines have developed: sociology of cities[7] and urban anthropology, geography of cities and social ecology[8], urban (regional etc.) planning and urban

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[5] One of the first who introduced the concept of techno-sphere, and of anthropo-technical and socio-technical system was J. Dietrych (1907-2001) – professor of Silesian University of Technology: Dietrych J. System i konstrukcja. Wyd. Naukowo-Techniczne, Warszawa 1983.

[6] The notion of sustainability (sustainable development etc.) has been a subject of many debates and controversies. A useful overview can be found in: Tainter J.A.: Understanding sustainability through history; resources and complexity. [In:] Caradonna J.L. (ed.): Routledge Handbook of the History of Sustainability. Routledge, London 2018, pp. 40–56). A discussion of the relations between sustainability and city development is presented in Zavestoski S.: Sustainability and the reframing of the world city. [In:] Caradonna J.L. (ed.): Routledge Handbook of the History of Sustainability. Routledge, London 2018, pp. 219–232.

[7] Jałowiecki B., Szczepański M.: Miasto i przestrzeń w perspektywie socjologicznej. Wyd. Naukowe Scholar, Warszawa 2006.

[8] Pióro Z.; Główne nurty ekologii społecznej. [In:] Pióro Z. (ed.) Przestrzeń i społeczeństwo. Z badań ekologii społecznej. KiW, Warszawa 1982, pp. 7–51.

economics. City has also been one of the main objects of the study of some wider disciplines such as energy or transport engineering. There is little doubt that this specialization has had many positive consequences. But, as I have tried to argument, we do need also (and not! – instead) holistic image of city.

Having accepted this thesis, one should consider the question: how to accomplish this task – how to construct such an image? Should we commence from systematic overview of the research results achieved by all the relevant disciplines? – Such a strategy seems to be impractical: it would take too much time. And the results may be doubtful: many ideas expressed in various theoretical languages, using different terminologies… For this reason, I have decided to look for a different strategy.

The strategy I have adopted might be called "top-down" approach and contrasted with the "down-top" one. This strategy might be succinctly characterized by analogy/comparison with mathematics: in contemporary (the 20th–21st century) mathematics one starts (most often though not always) from a most abstract theory (set theory), then passes to less abstract ones (algebra, topology) to come to mathematical analysis, probability etc. To apply this strategy to a domain oriented at studying cities – real-world objects, and not mathematic objects belonging to, let us say, an ideal world – it is risky. But risk is, I am profoundly convinced, unavoidable in any sphere of human activity. And science is not an exception to this rule.

And still a note: Any science – be natural, be social – is based on some elements of general, pre-scientific knowledge. One of the tasks of a scientific discipline beginning exploration of a domain of the world is to order and precise this pre-scientific knowledge. It should be stressed that that the relevance of this knowledge depends – to a considerable extent – on some ontological peculiarities of the given domain, and in particular – on its relative stability or instability: the physical order has been stable for millenia at least; basic elements of biological order have also remained unchanged. Contrarily, the social order: for the last ten thousand years or so, it has been changing – faster and faster, and more and more profoundly. And so it has been with the cities. Analyses – much wider than possible here – would be necessary if the evolution of the cities (since their beginning some seven/eight thousand years ago were to be studied. Thus, speaking about cities I think mainly about those which have existed for the last two centuries (or a few decades more) – since the beginning of the (first) industrial revolution.

As a name for the most abstract and general part of the trans- and multi-disciplinary theory of city, I have chosen the word "ontology"[9]. This choice is by no means incidental. On the contrary, it has rather profound motivation: First, this term designates

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[9] This decision has been inspired by the ideas of the prominent Polish philosopher Roman Ingarden who stressed the ontological character of his studies on art: Ingarden R. Studia z estetyki. Vol. II. PWN, Warszawa 1966.

a very important part of philosophy. And, from the point of view I accept, philosophy has in the contemporary world an important role to play. Its task is to construct sciences--based world-view(s), and – in particular – to develop language enabling "synthesizing" the main ideas/results of physics and psychology, of biology and sociology etc. into one world-view. (The two initial remarks should make clear why I regard this task of philosophy as important.) Second, various parts of ontology (sometime called "regional ontologies") try to answer two fundamental questions: (1) What is the "essence" of, say, man (or living organism, architectural work of art, society…)? (2) What is the (fundamental) structure of the given type of objects?

Having made the above remarks, I have outlined the main ideas which motivated and directed my work on this text. Now, at the very end of this section, I would like to present the structure of this text.

The next (second) section will be devoted to the ontology of cities – in the possibly broad sense of the last word. This decision assumes that something both interesting and general can be said about, say, ancient Athens, medieval Baghdad, early modern Cracow, 19th century Tokyo, 20th century New York, 21st century Shanghai, also about contemporary Zakopane or Gliwice, and about thousands other places on the Earth which existed and disappear or still exist. The third chapter will be more future--oriented, thus more "speculative": I think that the term "smart city" only to a limited degree can be referred to the cities as they exist to-day, and much more to the cities as they will probably/hopefully exist in the future. In both these sections I will regard city as "stable" object (i.e. consciously abstracting from its dynamics). In the subsequent (fourth) section the concept of development – applied to city – will be discussed. The concept of smart/intelligent development will be introduced and its relations with that of smart city will be discussed. The last (fifth) section will contain final remarks: I will summarize the results of the discussions in this text and present vistas on future researches.

2.1. Ontology of city

2.1.1. Some remarks on the notion of city

Some readers might expect at this place a definition of city. Unfortunately, I am not going either to quote one or to offer my own. This decision is a consequence of my very general methodological conviction: I believe that definition – in the precise, strict sense of this word – can be formulated only in the context of a theoretical (in particular:

conceptual) system. Avoiding rather long methodological/logical considerations – completely unnecessary here, let me suggest you considering a standard geometric definition (e.g of circle or cube) or a physical one (e.g. acceleration) – model instances of definitions.

To my knowledge, no such system exists. What are we to do then? I think that two complementary ways can be taken. First, we can use a method which is sometime called "ostensive" ("deictic") definition. The word "definition" – if used as a part of the phrase "ostensive definition" – refers to a complex (both nonverbal and verbal) behavior. Such definition we use while teaching a child some simple words: we show him/her an object and say "This is a fork (spoon, pen etc.)". We can "define" city by saying: London is a city but also, say, Zamość, Mexico City etc. (I assume as obvious that one knows a certain number of cities.) And second, we can indicate a certain number of other notions which are related to that of city. I think that the list of such notions should contain at least the following items: (social) space, territory, building, people, inhabiting… So much for now.

Being convinced that even without a formal ("scientific") definition, we know quite well what city is, and we know enough different cities, I am going to pass now to the analysis of the structural analysis of city. It will be divided into two steps. In the first – I will analyze city "from inside"; as a complex object, composed of various "strata", elements etc. In the second – I will look at city "from outside": as an element of larger systems, networks etc.

2.1.2. City as a complex system

So, let us look at city as a complex object. What kind of object is city? Figuratively speaking (and suggesting an analogy with some medieval ideas[10]), one might say that city is object of the same sort as the global system but "in miniature": it is a socio-eco--techno-system but – much smaller (compare Tokyo – the biggest city /ca.40 / with the planet population /ca. 8bln/). Having noted this structural analogy, one could ask the question about existence of systems of this kind – other than global system and cities. It seems to me that the answer is negative but the issue requires further analysis. Regardless of how large (and internally differentiated) is the class of systems of this type, one issue is beyond all discussion: the very essence of such systems demands close and strong cooperation between social, biological and engineering sciences in order to develop a comprehensive theory of such systems.

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[10] The whole world was interpreter as macro-cosmos, and man – as micro-cosmos.

In the next step I would like to offer a somewhat modified and more subtle/detailed model of city. While constructing it, I will be using some ideas developed by the great French historian Fernand Braudel (1902–1985) and by the world-wide known Polish philosopher Roman Ingarden (1893–1970). At the first sight their areas of interest appear very different: Braudel is speaking about natural environment, civilizations, everyday life[11]…, Ingarden is analyzing the structure of literary, musical, architectural…works of arts. But if to look at these ideas from a still broader perspective, best – from that of the prominent German ontologist Nicolai Hartmann (1882-1950), we should note, rather easily, their formal/structural similarity. This similarity can be characterized by a single (adopted from geology) term: stratum (layer).

Now, let us briefly present the ideas grouped under the umbrella of this term. First, in some objects, say – in a painting, we can distinguish (analytically!, in a standard esthetical situation we perceive the painting as a unite whole) a certain number of strata (say – in the case of a realistic painting, e.g. – to focus our attention – in Matejko's "Battle of Grunwald" – the "purely material" stratum /i.e. the cloth and paint lumps/, the visual stratum /i.e. color spots, lines etc./, the stratum of objects /i.e. people, horses, weapons, elements of landscape etc./, the narrative structure /i.e. a pedestrian soldier is attacking a Teutonic knight/, the interpretive stratum /i.e. the Teutonic knight interpreted as Ulrich von Jungingen/, the symbolic stratum – say a vision of the history of Poland, its relations with Lithuania and Germany etc./). Second, the order in which the strata have been presented is not incidental; on the contrary, it reflects important ontological relations between the strata: the subsequent stratum can exist based on the previous one (note that this relation is transitive). Third, each of those strata is of different ontological character (physical, perceptual,…, "historiosophical") ; thus, each of them has to be analyzed with the help of different kinds of knowledge/science. Fourth, the character of the object depends not on the "lower" strata but on the "upper" ones; in the case of the painting: it is a work of art due to its "content" and artist "form", and not – due to its material foundation (though – without it – it could not exist).

As the Reader might have guessed, the above discussion was intended as a conceptual introduction to the following thesis: city is a multi-strata object. My next task is to describe the strata structure of city.

Any city is a part of the surface of the Earth, in other words – a territory[12]. The various traits of the territory are of importance[13]: First, the shape of the territory: flat or

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[11] Braudel demonstrated his ideas in his own historical practice rather than presents them in an abstract form. His great work devoted to the history of the "Mediterranean world" in the 16th century – a work which starts from the geology and ecology of the region and ends with military and diplomatic events – is the best presentation of his ontology. Cf. Braudel (7) Reader interested in a short summary of his view should consult Braudel (6).

[12] The concept territory should be discussed in the context of the much more general notion of space. On its significance for architecture and urban planning cf. Szmidt (49).

mountainous (or various combinations of these two "extremal" types). Second – its "geometrical shape": circular, linear, irregular…Third, the location of the given territory on the planet: its distance from the Equator (or, to put it alternatively, from the poles), also from the oceans and seas; somewhat differently put – its location in a climatic zone.

The next stratum could be described as material/artefactual[14] one. In most cities (even in some Ancient ones, not to say about contemporary Tokyo or New York or other metropolises), this stratum is very complex. Its systematic and possibly complete description might be a subject of a separate paper. Here, I can propose but a tentative and simplified attempt at such a description. Starting from two – complementary – perspectives (on one hand: historical – based on the evolution of cities, on the other: phenomenological – based on everyday experience) we could say that various buildings (considered here just as "purely" material objects) are the main part of the material/artefactual stratum. "Empty" space – a complementation of built-up space – should be regarded as a special part of this stratum. If we assume that the word "empty" is used here not in an absolute (quasi-Democritean) sense, but as a short equivalent for "not build-up" , then we can say that roads, sidewalks, parks and gardens are elements of – so understood – "empty" space. (It should be stressed that trees, flowers, grass etc. – are its elements.) Last but – by no means – least, infrastructure. First: water. Second: energy. Third: sewage system. Fourth: transport. And fifth (most recent, but particularly important in the context of the idea of smart cities): control and information system.

Ending (or stopping) at this very moment we could speak about "dead cities" only. But genuine cities are living cities. And living cities are cities in which live people. Saying this, we pass to social ontology (a border area between philosophy and sociology). Perhaps it is an area no more complex than that encompassing two previously discussed strata but surely – much more controversial. Trying to avoid too far-reaching philosophical/sociological debates, I suggest using (at least temporarily) a model which will allow us about only three social strata of city. The first one is composed of human individuals (of women and men, of children and adults etc.). The second – of human actions (of all types: from resting – in this or that form – to working). And the third – of relations between humans and between their actions[15] (in other words: of networks connecting both humans and their actions). The notion of the third stratum demands a few commenting words: One might suppose that limiting myself only to relations between humans and their actions and giving up speaking about families, parishes, schools, offices, etc., I have omitted a very important part of social reality. But it is

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[13] On territory in a historical perspective cf. Lewis (31).
[14] On artefacts in a philosophical perspective cf. Thomasson (51).
[15] Janik's book (22) on Vienna contains very interesting and instructive concrete analyses of such relations.

not so. This (rather apparent than real) omission is a consequence of the fact that I have accepted the idea that social groups, organizations and institutions can be regarded simply as special (relatively durable and relatively well defined) relations between humans/actions. It seems necessary, while speaking about this stratum, to stress the existence of a special type of human actions and special type of organizations/institutions oriented at city – at its re-construction/transformation. (More on this issue will be said in the chapter 4.).

Having introduced the strata encompassing humans (their actions, and their relations) we should return to the sphere of material objects. City can be viewed also as a great "container" of countlessly many things used by humans in course of all their actions. The spectrum of these objects extends from food and tools to its preservation and consumption, through clothes and furniture, work and play instruments, to learning and worshiping devices. – It might be discussed whether this sphere should be regarded as a part of the material/artefactual stratum or as a separate stratum. At this moment of my work I want to remain this question open.

And now I would like to discuss the issues related to the viewing city as – to use a philosophical jargon – an intentional object. Without delving into some philosophical problems – too distant from the issues tackled in this text, I will characterize the meaning of this concept by referring to an example – to the concept of painting work of art (see above the remarks on the "Battle of Grunwald"). On one hand, it is a physical object (cloth, paints etc.) On the other, it contains some content. And this content has be grasped, understood, interpreted… And understanding/interpretation of any meaningful object is impossible without someone who performs these mental actions. Formulating it in somewhat different way, we could say that a painted cloth, if kept in a museum warehouse, is a work of art only potentially, and is getting an actual work if viewed by visitors.

Let us commence with buildings. Obviously, they are – as already stressed – material objects which can be characterized by various physical parameters, of which many are of great significance from human/practical point of view (say, fire – or other – safety). But some buildings are – also – architectural works of arts[16]. Let us think about various monuments – some of them are masterpieces of sculpture; also – about "purely" artistic sculptures, including – recently – quite fashionable "artistic benches". All these objects, however differentiated, have one trait in common: they can be regarded as individual objects. It might be claimed that all such objects constitute a stratum of the city in which they are located.

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[16] Some Ingarden's considerations (according to many specialists: of classic significance) are devoted just to architectural works of art. Cf. Ingarden (20) and also – Illes, Ray (19).

And now, let us shift our attention to – among others – gardens and parks. Some of them are counted – and, I believe, rightly so – as works of art. But – works of art of a special kind. They can be regarded – at least at some cases – as "second order" (i.e. composed of "first order" works – e.g. of individual sculptures; some exhibitions consisting of paintings, sculptures etc. – e.g. "Poles' Self-portrait"[17]) works. – The issues that arise here would deserve a separate and extensive discussion (based upon analyses of numerous and variegated instances). Such a discussion is not possible here. I have to limit myself to making a few short comments. Firstly: The important role played by the "empty" spaces of the city is to be noted (an interesting analogy with the role of silence in music). Secondly: the role of various panoramas – both "internal" (of particularly interesting/valuable parts of the given city) and "external" (of the natural surrounding of the city). Thirdly: the spatial (geometrical etc.) structure of the city – perhaps the most important element allowing us to regard the whole city as a single "high order" work of art.[18]

Still another stratum should be, as I suppose, distinguished. A stratum which also – like that just discussed above - consists of some intentional objects. What is the reason to distinguish it? – Should not we speak about one intentional stratum? My answer is: We should not. Why? – I suggest to start with analysis of an instance: Think about a part of the Berlin Wall. Nobody would call it "work of art". Also, almost for sure, nobody would ascribe to it a (positive) esthetical value. But, the block of concrete – especially if located in its "historically proper" place – has a historical (emotional, cognitive…) value. To make this object – or any similar – more "nice" would result in depriving it its historical value. Even some "empty" places can posses a value of this type and, according to the opinion I share, should remain undeveloped.[19]

I would like to end this sketchy discussion of the strata-structure of city with a few notes on two strata that can be regarded as composed of intentional objects – if this concept is used in a very broad (and weak) sense. One of them might be defined as "audio-space", the other as "odor-space". The objects of these two spaces might be regarded as intentional if this term is to direct our attention toward their double – objective/subjective – character.

So much as for city viewed "from inside" – as a complex multi-strata object. Now, let us pass to city seen "from outside" – as a "point" (node, vertex) of some networks.

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[17] A great exhibition in the National Museum in Cracow (1979).

[18] Remarks on the so-called Royal Track in Varsow might add some concretness to these considerations. Cf. Szmidt (49) More on these issues in Eco (10) and Porębski (43), These theoretical considerations can be supplemented by a very interesting book on Gdańsk (and is cultural/symbolic strata) – Cf. Bossak-Herbst (5).

[19] Still another type of, let's call it, symbolic stratum, discusses Kowalski (26) He also analyses this issue in the legal context of intellectual property rights.

2.1.3. City a node of networks

The most basic idea of this part of the ontology of city which analyses city as a node of networks is expressed in the plural form of the last noun: City is not a node of a single network – contrarily: it is node of number (rather large than small) of networks. Introducing the notion of centrality (and – correspondingly – of peripherality) we can say that one and the same city can be a central node in a network (say, transport one) and a peripheral one in another (say, administrative one). This plain and rather obvious remark confirms a simple but important methodological observation: ontology of city must draw from ontology of social space (of which is a part).

Let us try to characterize a certain number of networks of which cities are nodes. Cities (like villages) are territories. No (small) territory is self-sufficient[20]. Thus, any city (and today even any village) has to be connected with other territories: matter, energy and information must flow into and out of it. Therefore, city must be a node in a road and/or rail and/or air-line network. Also – of power grid and of radio/TV/internet networks.

The transport/communication networks form the material basis for social networks of exchange. Numerous factors determine the directions, scale, and forms of exchange (in a very broad sense of the word: voluntary or involuntary, equal or inequal, barter or money-mediated).

The transport/communication networks deliver also the material fundamentals for political/administrative networks. Networks of this type provide well-known and very clear (at least in comparison with some other types of network) examples of hierarchies ordering the nodes: a city is the capital – of a state, of a region (Land, voivodship etc.), of a sub-region (Kreis, county) etc. The fundamental role is also these that two types of networks (transport and communication) play also for culture – broadly understood: as patterns and styles of human behavior (from eating and sex, through recreational activities to morality, attitudes toward death etc.) To a considerable degree, one can speak about the process of cultural diffusion (from more central to more peripheral nodes) but more complex mechanisms can be also observed, for instance increase of traditionalism as reaction to abrupt and too far-reaching cultural changes.[21] At the end of this point, let us formulate a question being a variant of a much more general one –

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[20] I formulate this thesis in a simplistic way. The concept of self-sufficiency is both difficult and important; particularly today: in the time of globalization. But a systematic analysis of this problem is a subject for another text.

[21] On the territory/geographical aspect of innovations (their diffusion): Asheim B., Gertler M.S.: The Geography of Innovation; Regional Innovation Systems. [In:] Fagerberg J., Mowery D.C., Nelson R.R. (eds.): The Oxford Handbook of Innovation, 2005, pp. 291–311.

a question about autonomy: of individual, of nation/state, and – of city. Is it possible (to what degree) that cities would autonomously determine their futures? A partial and tentative answer will be given at the end of the next section.

2.2. Ontology of smart city

2.2.1. City as a "living" system

At the beginning of this section I will formulate some remarks – of a relevance .to both the present and the next ones. In the previous section, I have stressed that genuine city is "living" one. It is a metaphor. But this metaphor is to suggest some analogies between city – viewed as a complex system – and living (organic) systems[22]. Let us list them and characterize them briefly.

First, both cities and living systems are dynamical systems: various movements of their parts (changes of their internal and external relations) are not incidental but are of fundamental importance for them – their "essence" depends on these movements/ changes. Second, these movements/changes (the word "processes" can be conveniently used for sequences of them) can be grouped into two classes: periodical (e.g. circulation of blood in organism, circulation of electric energy in city) and directional (e.g. spatial growth of the organism/city)[23]. The processes of types are interlinked in various ways but studying these links presupposes their analytical distinction. Third: virtually all living (both in the literally and metaphorical sense of this word) systems contain sub-systems that regulate processes – ongoing both inside the systems and between them and their environments.

These analogies suggest two complementary theses. According to the first one, all cities are – in a sense – smart cities: all cities (also villages) have regulative sub-systems of this or that sort. But, and this the second thesis, it is neither incidental nor unimportant that the concept of "smart city" has recently been gaining popularity. Following Herbert Spencer (1820-1903) and many his continuators, we can use the term "evolution" in a very general sense and apply it to very different processes – in particular: to the development of cities. Use of this term – and some analogies it suggests – should help us to understand some elements of the development of cities. Think about biological

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[22] I use here some ideas of Rosnay J.: Le macroscope. Vers une vision globale. Ed. Du Seuil, Paris 1982. He speaks for instance about "metabolism of city".

[23] These formulations are – as in many other places of this text – of schematic character. In a more elaborate text we should (and could) speak about, say, degrees of periodicity/directionality.

regulative sub-systems. Even the simplest organisms (e.g. bacteria) have them. But the birth of vertebrates, then – of special sort of them: mammals, and – of special kind of mammals: humans – and all these important transformations in the history of life have been strictly connected with the development of nervous systems. Being aware of the importance of the all previous "turning points" in the evolution of biological regulative systems, we have no reason to underestimate the profoundness of this transformation that resulted in the development of human brain/mind and in result – in the development of human culture (technology, art, religion, science, law…). Using this analogy, we could say that the we live in a period of a very profound transformation in the millenia-long history of cities – perhaps the most profound, to be compared only with the very rise of cities. And just this transformation has found its manifestation in the phrase "smart city".

And the last introductory comment. In this section, I am going to analyze in some detail the (actual and possible) traits of smart cities as "stable" units (in which all processes are of periodic character); I regard the issue of city (smart) development as particularly important, and for this reason, I have decided to devote to it a separate chapter.

2.2.2. City as (self-)regulated system

Let us start sketching ontology of smart city from presentation of the simplest abstract model of regulation. According to it, we have to distinguish two elements: object of regulation (briefly: object) and subject of regulation (briefly: regulator). These elements are connected by at least one relation (or, to be more precise, a set of relations of a type); this relation can be denoted with the word "power". Such a relation exists if regulator is able to influence some states (parameters) of the object. However, assuming additionally (rejecting some "pathological" – in the human world – situations) that the regulation is an intentional/rational activity, we must add some elements to our model. First, a cognitive relation. Regulator has to have some general knowledge about the object[24] – about some its parameters; it also has to have some detailed knowledge – about the values[25] these parameters assume at the given period/moment of time. It has to have also some self--knowledge: about its possibilities to exert some influence on the object (about the scope of its power over it). Regulator must be also equipped with some criteria of choice

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[24] On the problem of relations between power and knowledge Fricker M.: Rational Authority and Social Power. [In:] Goldman A.I., Whitcomb D. (eds.): Social Epistemology: Essential Readings. Oxford University Press, Oxford 2011, pp. 54–70; Goldman A.I.: A Guide to Social Epistemology. [In:] Goldman A.I., Whitcomb D. (eds.) Social Epistemology: Essential Readings. Oxford University Press, Oxford 2011, pp. 11–37.
[25] The word "value" is used here as in mathematics (a number is the value of a function at a given point) and not as in humanities (the esthetic value of a painting).

(relations of preference) between alternative possible values of manipulable/steerable parameters. This model presents what might be regarded as the "essence" of regulation. But for its applications to most practically interesting situations, it must be supplemented by two elements: a set of cognitive instruments and a set of instruments of power; without these instruments establishing the respective relations would be (very) difficult or even impossible. So much about the abstract model. Let us try to apply it to city.

City will be regarded here as object of regulation. The considerations presented in the previous chapters demonstrate that city is complex multi-strata system. Each of its sub-systems is characterized by a large number of parameters. It can be assumed that the respective numbers tend to increase. However, taking into account the very fast progress of computer and other electronic systems, we can assume that regulation of the material stratum – however difficult today – will be, slower or faster, progressing. Much more difficult seem to be the problems connected with the human/social strata. To some extent, they are connected with the processes of globalization: with massive translocation of many industries (think for instance about the situation Detroit faced in 2013 when it had to declare bankruptcy) or with migrations (think about Marseille or Paris, recently – Stockholm). Individual cities have little influence on these processes.

Now, let us pass to the concept of regulator. Who is the regulator of a city? This question should not be decided just by adopting one definition or another. Also reference to the legal/constitutional system should not be accepted[26]. The answers should be formulated as scientific hypotheses supported (as always only in a measure) by empirical research (in some cases: very difficult since certain members of the regulator can be very interested in concealing their membership in this group). It is obvious that the answers concerning Mexico City or Gliwice, Kopenhagen or Damascus… will be very different – not only personally (what is obvious) but also, so to say, structurally. It might be worth noting that the spectrum of possible answers extends between "dictatorship" (one person) and "perfect democracy" (all dwellers); it obvious that real situations can be located somewhere in-between these two rather purely logical possibilities. At this moment, I have indicated a field that deserves repeated sociological studies (social reality is constantly changing thus the similar problems have to be re-examined over and over again) – a large book might be written. Thus, I have to limit myself to a few general remarks. First, let us note that regulator is just a group of people (let us call them individual regulators). Second, this group can be divided in various ways (e.g. on the basis of material or nonmaterial resources, or – of spheres of interests etc.) into sub--groups. Third, the criteria of regulation can be more or less contradictory. Four, contradictory interests of groups of approximately equal force may result in a "paralysis" of some city sub-systems.

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[26] We should avoid confusing description (of what is) with prescription (of what should be).

The effective city-regulation presupposes many factors. In the present context of two should be mentioned. First: transparency. Second: the culture of negotiations and compromise[27]. Both very difficult to be achieved. But both so important that even a small step bringing the achievements of these goals closer should be appreciated.

In the next step, let us assume that (all or some) individual regulators are a coherent (common interests and moral and other values) group. Even such a situation does not guarantee that their regulative activity will be coherent. The cognitive factors have to be taken into account. First, the general knowledge. At this moment we should return for a while to issues mentioned in the first section. There, I have emphasized the practical relevance of the ontological perspective outlined in this text. And now that claim can be additionally supported: our perception of the world (any part of it, e.g. of a city) depends on many factors, among them – on professional education. Therefore, even if we share moral values and political opinions, our perception not only of the whole Universe (national history etc.) but even of the city, in which we live cannot be identical. A holistic view on city – delivered by ontology – should facilitate (be the modesty of this word stressed) looking for a common integrated view on this very city in which we live and whose problems we are trying to solve.

Last but not least: we could say that ontology is important from the point of view of the role played by the general knowledge about cities (saying alternatively: from the point of view of questions "addressed" to a city). As regards the detailed knowledge – that concerning the given city (saying alternatively: from the point of view of answers "obtained" from the city), this depends, on one hand, on the computer/Internet based system of information about city, but – on the other – on the reliability of data. Data on material strata can be (assume optimistically) introduced to the information system automatically. But data on human/social strata must be introduced by humans. One of the fundamental concepts (and problems) of sociology appears here: trust.[28]

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[27] At this moment I would like at least to mention the concept of deliberative democracy – democracy not limited to (otherwise very important institution of) free election democracy in which debate and negotiations play important role. For such a democracy important role may play social epistemology. Goldman A.I.: A Guide to Social Epistemology. [In:] Goldman A.I., Whitcomb D. (eds.) Social Epistemology: Essential Readings. Oxford University Press, Oxford 2011, pp. 11–37. The importance of democratic procedures and culture manifests itself better if the phenomenon of conflict is taken into account. On its application in the context of urban planning: Goldman A.I.: A Guide to Social Epistemology. [In:] Goldman A.I., Whitcomb D. (eds.) Social Epistemology: Essential Readings. Oxford University Press, Oxford 2011, pp. 11–37. On the possible roles IT can play in development of democracy: Noveck B.S.: Wiki Government. How Technology Can Make Government Better, Democracy Stronger, And Citizens More Powerful. Brooking Institution Press, Washington D.C 2009.

[28] Lackey J.: Testimony: Acquiring Knowledge from Others. [In:] Goldman A.I., Whitcomb D. (eds.): Social Epistemology: Essential Readings. Oxford University Press, Oxford 2011, pp. 71–91.

2.3. Development of (smart) city

2.3.1. Cities as dynamical/evolving systems

Cities are dynamical systems. Though real processes ongoing in the cities are complex and differentiated, it is convenient – as suggested in the previous chapter – to divide them into two groups. The first one contains periodic (or *quasi*-periodic) processes, the second = directional processes. Periodical processes were discussed in the previous section. In the present section my focus will be on directional processes.

For brevity but – first of all – to suggest some intuitions, the word "development" will be used as a synonym for "directional process".

Before starting discussion of (smart) city development I will make a few remarks on the general notion of development. Firstly, it is used in many domains: in economy and psychology, in biology and sociology… Secondly, growth of an object (of GDP per capita, of individual organism, of number of members of an organization, etc. etc.) could be regarded as the simplest instance of development. Thirdly, as "genuine" development are regarded processes of qualitative (and not only quantitative) changes[29]. This formulation would deserve a longer debate – impossible here. I limit myself to indicating the relevance of the category of innovation[30] and to invoking some close/related adjectives (used to characterize some changes) such as "profound", "essential", "important", "structural"… Taken together with the opposition "qualitative – quantitative" they should create intuitions allowing to grasp the meaning of the term "development' – without using a formal definition.

Let us continue for a while the discussion of the general (ontological) notion of development. In a schematic way, we can distinguish two types of development: spontaneous (not regulated, not planned) and planned (not spontaneous, regulated). You can easily see that economic both economic development and improvement of an individual's language competence can be spontaneous or planned, both the growth of an organization and solving of some scientific problems…

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[29] At this point a reference to the (at the first sight: academic, but in fact – ideological and political) debates on the difference between economic growth and economic development. These concepts, most often applied to states, can be undoubtedly used in the case of cities: Bornstein D.: How To Change The World: Social Entrepreneurs and The Power of New Ideas. Oxford University Press, Oxford 2007; Edquist Ch.: Systems of Innovations: Perspectives and Challenges. [In:] Fagerberg J., Mowery D.C., Nelson R.R. (eds.): The Oxford Handbook of Innovation, pp. 181–208.

[30] Among various types of innovations one should direct one's attention to the notion of organizational innovation. Lam A.: Organizational Innovation. [In:] Fagerberg J., Mowery D.C., Nelson R.R. (eds.): The Oxford Handbook of Innovation, pp. 115–147; Osborne D., Gaebler T.: Reinventing Government. How The Entrepreneurial Spirit Is Transforming The Private Sector. Penguin, London 1992.

In the present point I am going to concentrate on the spontaneous development of cities[31]. The planned development will be discussed in the next section.

The development of cities has undoubtedly been associated with the demographic processes and especially with the growth of population. In this context two interrelated facts should be mentioned: First: the growth of population was for a long time very slow (the size of world population is estimated for 16th century at 0.5 billion and the threshold of 1 billion was trespassed about 1820). Second: until the first industrial revolution (ca. 1760–1840) virtually all societies were agricultural with 80–90% of population living in villages. Since this revolution both the absolute and relative size of urban population has been increasing. This demographical process started the territorial expansion of the cities. Among other factors, it was supported by the gradual liquidation of city walls (resulting from some military and political developments).

Fundamental role has also been played by the accelerated development of technology. Two domains should be mentioned at least here: that of – both public and private – transportation (note the important role played by bicycle – a relatively simple invention), and that of energy – the great and differentiated role.

So much about the development of the material stratum of cities. Now, let us say some words about their human/social stratum. Before the industrial revolution cities were inhabited mainly by merchants and artisans. In the 19th century, cities started to become places in which were concentrated two new great and important social groups: working class (or, more broadly, proletariat – comprising those working in services) and "white collars" (from intellectuals to petty clerks). Cities (especially great ones) have become territories on which develop various more or less formal organizations co-creating civil society.

And the third group of strata, let us call it shortly – cultural. Artistic aesthetic values of buildings and their complexes were appreciated even in ancient times, thus little is to be added here. But there are social/cultural phenomena – not identical but very close to the artistic ones. I think here about cultural property or monuments but also about cemeteries (Arlington, Pere Lachaise…) or even ruins (Hiroshima Peace Memorial)… These strata has been developing since the end of 18th century. This development has been to a large degree determined by a complex of processes that might be summarily called "discovery of History/Past" – processes connected, among others, with the development of nationalisms of which historical memory was/is an important part.

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[31] One of the best discussions of the interactions between development of cities (in Europe) and other macro-processes – in the long perspective (990–1992): Tilly Ch.: Coercion, Capital, and European States. Blackwell, Cambridge (Mass.) 1992.

Summarily, the development of cities has mainly been an effect of various pressures and emerging possibilities to react to them. But approximately at the same time (in 19th century) ideas of planned development of cities begun to come into existence. This process become intensified in the 20th century, and precisely to this issue, I will now turn.

2.3.2. The idea of "Smart City" in a historical perspective

As we remember, the industrial revolution that profoundly influenced the development of cities began in the second half of 18th century. It was also a period in which the Enlightenment ideas were gaining wide popularity in almost all of Europe. Of course, the Enlightenment was a very complex (even contradictory) phenomenon. However, if we want to indicate its most central and important idea, we should – I believe – invoke the concept of progress. This concept groups a number of more specific ideas; among them – the idea of conscious, intentional construction of social reality. This idea concretized in many ways and inspired various practical city/urban activities[32] (such as those of R. Owen). It also inspired different concepts for urban development. Let us mention some of those that have been implemented. We can start from Ebenezer Howard's idea of garden city (Wetwyn, UK; Nowa Huta, Poland…) through those of Le Corbusier ("Cite radieuse", Marseille), Karl Ehn (Vienna's municipal housing), Oscar Niemeyer's Brasilia, to Auroville – inspired by Mirra Alfassa and designed by Roger Anger.

The rise of the idea (ideas) of Smart City is, I think, to be viewed best in the perspective briefly sketched above.

The name "Smart City" has its predecessors: "Wired Cities" and "Intelligent Cities". The first term seems to have lost its popularity. The second is still in use; for instance, this year (2022) in November, intelligent Cities Exhibition and Conference will be held in Cairo.

Individual decisions of some city authorities (Los Angeles, Singapore) are regarded as first steps towards smart city, but dynamic development of the idea and practice of smart city started at the beginning of the 21st century. A large paper might be devoted to a systematic description of this development. Therefore, but a few sample information will be provided here. A few completely new cities – designed as smart cities – have been built. Perhaps most famous is Masdar (Abu Dabi, United Arab Emirates) – built in

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[32] A very interesting analysis of the relations between social, cultural etc. processes and the development of urban ideologies and practices contains Wujek: Wujek J.: Mity i utopie architektury XX wieku. Wyd. Arkady, Warszawa 1986.

the years 2006–2010 Interestingly, the project has been supported by both the US government and Greenpeace. Some already existing cities have applied for official recognition as smart city. It is possible due to the establishing the international norm ISO 37120[33] (first edition 2014, second – 2018). It is also very interesting that almost from the very outset of the process of development of smart cities, this process has been accompanied by various organizational initiatives of international character. To mention initiative Smart Cities Council (established in 2012). The ten years or so that have passed since the beginning of their activities is perhaps too short period to formulate overbearing opinions. On the other hand, today, having observed the rapid development during the post-war decades, we have become aware of various pathologies characterizing international organizations (from UN to sport federations). Is it possible that organizations supporting smart development of cities will be smart too.

A few words should also be said about the role of sciences and academia in the development of smart cities. In this moment, a few institutions active on this field exist. Among them, the MIT Smart Cities Lab seems to be most concentrated on these issues.

In 2018, Institution of Engineering and Technology (UK) launched the "Smart City" Journal.

Ending this part of these considerations, I would like to say some words about an interesting fact: Analyzing the relatively short period of the development of smart cities, some experts have distinguished three types of smart cities (or three phases of their development). According to contemporary habits, one says about City 1.0, City 2.0, and City 3.0:

The City 1.0 is one in which information technologies are used to regulate material infrastructure of the city (transportation, energy etc.).

The term "City 2.0" is applied to those cities which widely use IT to collect various types information about cities and to use them to city governance.

The notion of City 3.0. refers to those cities which enlarge using IT to various forms of social (including political) life.

Using the ontological analyses presented in the previous sections, one could say that one can note a trend toward interpreting the second part of the phrase "smart city" (i.e. the word "city") in more and more comprehensive way (i.e. encompassing all strata and sub-systems of city): as a human community availing for its development sophisticated technologies.

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[33] Midor K., Płaza G.: Norma ISO 37120 – nowe narzędzie do oceny i porównania inteligentnych miast. [In:] Jonek-Kowalska I., Kaźmierczak J.(eds.): Inteligentny rozwój inteligentnych miast. CeDeWu, Warszawa 2020, pp. 189–202. According to this paper, three Polish cities (Gdynia, Warszawa, Kielce) have received certificates.

2.4. Final remarks

Let me commence these final remarks with re-invoking a widely accepted thesis: The process of urbanization will be continued – for a few decades at least. More and more people will live in cities. More and more cities will become megacities. – If so, solving the global problems, facing the global challenges, achieving the global goals (grouped under the one-word slogan "sustainability") – all this depends to a great and ever greater extent on the development of the cities.

And cities are becoming more and more complex[34]. Thus, steering their development is getting more and more difficult. And possibly effective steering should be knowledge-based (it is a necessary condition, by no means – a sufficient one). Based – on what knowledge? The shortest answer: both on practical (drawing from personal experience) and theoretical/academic (drawing from books, seminars, lectures etc.) knowledge; their complementarity should be emphasized. [35]

A note on the role of IT in the distribution of practical knowledge[36]. First: its role in building world-wide network(s) of mayors (deputy mayors etc.), activists of city movements etc. – network(s) enabling exchange of the practical knowledge. Second: its role in "objectivization" of the practical knowledge in the form of permanently accessible (and supplemented) knowledge bases. Incidentally, quite a dose of academic knowledge is necessary to design such bases.

And now, a few words on academic knowledge[37]. The great part of such knowledge exists in the verbal form ("great part" – since we are today aware of the role of so-called "tacit knowledge"[38]) – in the form of (sets of) theorems, hypotheses etc. These linguistic

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[34] On the relations between theory of complexity and that of smart city: Kowalska-Styczeń, A.: Badanie złożonych zjawisk społecznych w kontekście inteligentnego miasta. [In:] Jonek-Kowalska I., Kaźmierczak J. (eds.): Inteligentny rozwój inteligentnych miast. CeDeWu, Warszawa 2020, pp. 137–147. More generally and complexity Mainzer K. Thinking in Complexity. The Computational Dynamics of Matter, Mind, and Mankind. Springer, Berlin 2004; Gell-Mann M.: The Quark and The Jaguar: Adventures in The Simple and The Complex. Abacus, London 1995.

[35] This distinction is also of schematic/instrumental character. Systematization of practical knowledge is one of the tasks of academic knowledge. As am interesting instance of such studies can serve the book of Kurowski: Kurowski S.: Warszawa na tle stolic Europy. Wyd. KUL, Lublin 1987. More generally on these relations: Kuzior A.: Zastosowanie Modelu Quintuple Helix w projektowaniu Smart Sustainable City. [In:] Jonek-Kowalska I., Kaźmierczak J.(eds): Inteligentny rozwój inteligentnych miast. CeDeWu, Warszawa 2020, pp. 15–26.

[36] Brey Ph., Hartz Soraker J.: Philosophy of Computing and Information Technology. [In:] Meijers A. (ed.): Philosophy of Technology and Engineering Sciences. Elsevier, Amsterdam 2009, pp. 1341–1409.

[37] Polish experiences in the development of cities-academia relations analyze: Jonek-Kowalska I., Kaźmierczak J.: Ocena potencjału relacji miasto -uczelnia w zakresie kreowania inteligentnych miast w Polsce. [In:] Jonek--Kowalska I., Kaźmierczak J. (eds.): Inteligentny rozwój inteligentnych miast. CeDeWu, Warszawa 2020, pp. 27–38.

[38] On tacit knowledge (and its applications in engineering sciences): Nightingale P.: Tacit Knowledge and Engineering Design.[In:] Meijers A. (ed.): Philosophy of Technology and Engineering Sciences. Elsevier, Amsterdam 2009, pp. 351–374.

items are composed (as all sentences) of words. Some of them play an auxiliary role, some – central, fundamental. These words receive special names – such as theoretical concepts/notions or categories. Their role can hardly be overestimated (can you imagine contemporary science without such concepts like "atom", "electro-magnetic field", "gen", "ecosystem", "intelligence", "market"…?). Therefore, an important part of theoretical work in sciences is about developing theoretical/scientific languages: about making the concepts more precise, and about analyzing the relations between concepts. The second activity might be conveniently characterized as investigating a (part of a) conceptual network. The first step in such investigations is to describe "conceptual surrounding" of a concept; in other words: enlisting the concepts that seem to be related (in a significant way) to a concept of particular interest to us.

Here, of such particular interest is obviously the concept of smart city. And, as suggest the analyses in this text, its "conceptual surrounding" comprises a few groups of concepts. First, general ontological concepts (such as system, stratum, process, development etc.). Second, concepts belonging to "regional" ontologies: to the ontology of technology (such as techno-sphere, technological system, internet of things, technology assessment[39] etc.) and to the social ontology (such as community, collective action etc.). Third, epistemological concepts (information, knowledge – explicit and "tacit" etc.). Fourth – such, very important, sociological concepts as social capital[40] and intellectual capital[41]. And, last but not least, fifth group – of "ideological" concepts. It contains such notions as sustainability[42], society 5.0, industry 4.0. – A systematic study of this conceptual network is a task to be undertaken in another text.

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[39] A very good succinct (and based on author's practical experience as the director of the German TA office) presentation of the main ideas of TA: Grunwald A.: Technology Assessment: Concepts and Methods. [In:] Meijers A. (ed.): Philosophy of Technology and Engineering Sciences. Elsevier, Amsterdam 2009, pp. 1103–1146.

[40] On creating social capital in smart cities: Osika G.: Connexity jako element koncepcji Smart City – analiza wybranych aspektów na przykładzie polskich miast [In]: Jonek-Kowalska I., Kaźmierczak J. (eds.): Inteligentny rozwój inteligentnych miast. CeDeWu, Warszawa 2020, pp. 123–136.

[41] On creating intellectual capital via organizational learning: Mazur S., Olejniczak K.: Rola organizacyjnego uczenia się we współczesnym zarządzaniu publicznym. [In:] Olejniczak K.(ed.): Organizacje uczące się. Wyd. Naukowe „Scholar", Warszawa 2012, pp. 25–60; Olejniczak K.: Model organizacyjnego uczenia się dla administracji publicznej [In:] Olejniczak K.(ed.): Organizacje uczące się. Wyd. Naukowe „Scholar", Warszawa 2012, pp. 166–201.

[42] On this notion in historical perspective: Tainter J.A.: Understanding sustainability through history; resources and complexity. [In:] Caradonna J.L. (ed.): Routledge Handbook of the History of Sustainability. Routledge, London 2018, pp. 40–56. On the idea of sustainable development and the social (political etc.) changes necessary to actualize it: Robinson J.A., Maggs D.: At the crossroads: sustainability and the twilight of the modern world. [In:] Caradonna J.L. (ed.): Routledge Handbook of the History of Sustainability. Routledge, London 2018, pp. 387–40. As an interesting instance of various conceptual links can serve the notion of sustainable architecture: Baweja V.: Sustainable architecture: a short history. [In:] Caradonna J.L. (ed.): Routledge Handbook of the History of Sustainability. Routledge, London 2018, pp. 273–295. Conections between sustainability and city development analyzes Zavestoski: Zavestoski S.: Sustainability and the reframing

Let me add that – from the point of view I do share – any debates on priority of more theoretically or more empirically oriented studied are but waste of time. Both philosophical (epistemological) analyses and historical studies have demonstrated – beyond any reasonable doubt – that development of all scientific disciplines is a very complex process in which theoretical speculation, construction of instruments, logical analysis, experiments etc. interact. There is not reason to suppose that in the case of city studies should by otherwise.

But ontology of (smart) city is significant not only for the development of academic knowledge about (smart) cities. It is important also (or even: first of all) from the practical point of view: Smart development of a city presupposes existence of strategies and plans. As it is in the case of any complex system, also cities should have strategies and plans of different generality/specificity; among them – most general and perspective. And just for such strategy knowledge provided by ontology (I speak here about a type of knowledge – in any discipline one can find theories, conceptions etc. of different value, philosophy/ontology is no exception to this rule.) seems to be most significant. But even in the case of less general strategies, ontology has at least two roles to be played. First, preparation of general and perspective strategy may take a rather long time, therefore some partial strategies/plans must be prepared. But to make a possibly optimal decision as to what strategy is to be prepared most urgently one must have knowledge of the city as a whole. – Ontology of city may serve as an instrument to assess/evaluate this knowledge (its completeness/incompleteness etc.). Secondly, ontology can also serve as a kind of "map of knowledge" – indicating which part of academic knowledge is most relevant for the diagnosis and solving this or that practical problem. And third, not only choosing a solution to the given problem but even the selection/definition of the "most urgent" ("most important" etc.) problem can be a matter of controversies and manipulations.[43] The perspective offered by ontology may help to make such debates more factual and rational.

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of the world city. [In:] Caradonna J.L. (ed.): Routledge Handbook of the History of Sustainability. Routledge, London 2018, pp. 219–232.

[43] The idea of smart city is – from the point of view I share – closely connected with the idea of deliberative democracy. Gutmann A., Thompson D.: Why Deliberative Democracy? Princeton University Press, Princeton 2004; Healey P.: Collaborative Planning. Shaping Places in Fragmented Societies. Bloomsbury Publishing, London 2005. Very close to the notion of deliberative democracy is that of participative democracy. On this notion and its applications Rożałowska B.; W stronę Human Smart City – praktyka partycypacji obywatelskiej w polskich miastach. [In]: Jonek-Kowalska I., Kaźmierczak J.(eds.), Inteligentny rozwój inteligentnych miast. CeDeWu, Warszawa 2020, pp.147-158; Sadik-Khan J., Solomonow S.: Streetfight: Handbook for an Urban Revolution. Penguin London 2016. On epistemological foundations of deliberative democracy: Zollman K.J.S.: The Communication Structure of Epistemic Community. [In:] Goldman A.I., Whitcomb D. (eds.) Social Epistemology: Essential Readings. Oxford University Press, Oxford 2011, pp. 338–350.

Let me end these final remarks, and thus – the whole text, with a comment on the slogan of environmentalists, anti and alter globalists, and many others concerned with the future of the humanity: "Think globally, act locally". I hope that this text implements this postulate in a double way. First, it is about such development of cities which takes into account the global problems and contributes to their solution. Second, it tries to consider how science could help cities to make their development more sustainable.