STUDIA MARITIMA | XXXVI (2023) | 181–197 | ISSN (print): 0137-3587 | ISSN (online): 2353-303X | DOI: 10.18276/sm.2023.36-04



**Cezary Stępniak**
Department of Information Management Systems
Czestochowa University of Technology
cezary.stepniak@pcz.pl
ORCID: 0000-0003-4833-6411

# Studying the Specificity of Coastal Cities in the Light of the Regional Business Spatial Community Concept

**Keywords:** RBSC, city maps, coastal city management, ICT and IoE tools, SmartCity, Spatial data

## Introduction

Research on the Regional Business Spatial Community (RBSC) has been conducted for 10 years, the starting point of which is the use of common maps to manage smart and sustainable cities.[1] During this time, among others, organisational conditions were analysed, it was theoretically verified that from a technical point of view the construction of appropriate systems is possible, potential barriers were examined.[2] Among the conclusions resulting from the research conducted so far, two, unfortunately, opposing tendencies towards the presented concept can be noticed. On the one hand, there is a growing interest in the problems of spatial management, including infrastructural investments. Most investments, regardless of their field and type, require appropriate adjustment in their environment. This is not only about the investment itself, but also how it will affect its surroundings. On the other hand, there is the issue of the lack of full

1 Dorota Jelonek, Cezary Stępniak and Tomasz Turek, "The Concept of Building Regional Business Spatial Community," *Proceedings of the 4th International Conference on Data Communication Networking* (2013): 83–90, *10th International Joint Conference on e-Business and Telecommunications*, 29–31 July 2013, accessed 7 June 2023, DOI: 10.5220/0004531700830090.

2 Dorota Jelonek, Cezary Stępniak and Tomasz Turek, "Barriers in Creating Regional Business Spatial Community," *Annals of Computer Science and Information Systems* 2 (2014), *Proceedings of the 2014 Federated Conference on Computer Science and Information Systems*, Warsaw, 7–10 September 2014, 1243–1250.

cooperation between the stakeholders involved in the management and development of the city. In addition, the problem of the lack of tools to support such cooperation is often reported. The RBSC concept assumes that the basis for communication between stakeholders interested in managing and functioning within a given city will be shared interactive maps (based on Geographic Information System technology), called city maps, which all interested parties will be able to use within their rights. Online electronic maps will be accompanied by communication tools to facilitate communication between their different users. Data for maps will be provided by authorised users on an ongoing basis, thanks to which city maps will visualise the current state of selected issues taking place in the city (e.g., ongoing investments, public transport, weather, etc.).

The issues of the study fit into the field of sustainable SmartCity management.[3] It is related to the issue of searching for new types of tools that could support city management. The RBSC concept is in a starting point. Its efficient functioning requires the integration of various types of IT systems, ICT tools (Information and Communication Technology) and various types of devices used in SmartCity (e.g., Internet of Things - IoT or Internet of Everything - IoE tools),[4] which include, among others: city monitoring devices, various types of measuring tools, weather and air pollution sensors, and others.[5]

The purpose of this article is to analyse whether coastal cities have their own specificity that should be taken into account when implementing RBSC. Such issues may include, among others: the role of ports,[6] maritime industry, tourism, but also the safety of the city and its inhabitants.

While specifying the subject and scope of the research, the main emphasis was placed on how to take into account the specificity of coastal cities in RBSC. An attempt was also made to analyse whether the aforementioned specificity will affect the formation of regional communities and affect the organisation of the RBSC.

The RBSC concept covers many issues related to the sustainable management and operation of SmartCity. In order to organise the conducted analyses, the RBSC issues were divided into five interrelated planes. On this basis, five more were aspects distinguished of RBSC and these considerations were conducted according to them:

3 Raimundo Díaz-Díaz, Luis Muñoz and Daniel Pérez-González, "The business model evaluation tool for smart cities: application to SmartSantander use cases," *Energies* 10 (2017), 3: 262, accessed 7 June 2023, DOI: 10.3390/en10030262.

4 Dipesh Vaya and Teena Hadpawat, "Internet of Everything (IoE): A New Era of IoT," *Lecture Notes in Electrical Engineering* 570 (2020): 1–6, accessed 7 June 2023, DOI: 10.1007/978-981-13-8715-9_1.

5 Tomasz Turek and Cezary Stepniak, "Areas of integration of GIS technology and smart city tools. Research findings," *Procedia Computer Science* 192 (2021): 4681–4690, accessed 8 June 2023, DOI 10.1016/j.procs.2021.09.246.

6 Brian Hoyle, "The redevelopment of derelict port areas," *The Dock & Harbour Authority* 887 (1998): 46–49.

- Organisational,
- Functional,
- Informational,
- Spatial,
- Technical.

In order to organise the issue of the specificity of coastal cities within the framework of the RBSC, selected factors characteristic of the successively distinguished aspects were indicated. As a result, the aim of the research was to analyse subsequent aspects and, within them, to indicate potential differences in relation to other cities. The aim of the article is to identify the differences mentioned above and to indicate whether they can affect the building of RBSCs in coastal cities.

Efforts were made to capture whether certain issues specific to a given type of region will require appropriate organisational solutions, whether the functional scope of the proposed project will be changed, special thematic layers or the use of specific technologies will be needed.

It was initially assumed that maritime issues would most likely expand the issues that should be included in the RBSC. It was assumed that coastal cities fulfil all the functions of other cities, while the coastal location may mean that they will also meet different additional requirements resulting from their location and the adoption of specific functions, e.g., a city–port or city–spa. This will result in the need to include new layers in city maps, new types of stakeholders within the community, and it is also likely that various technological devices specific to the management of coastal regions will have to be used.[7]

The results of previous research on the RBSC concept and on different types of communities have been used in this study. An ongoing analysis of the directions of development of GIS tools was used, including 3D and 4D visualisation technologies and the possibility of building maps based on abstract, i.e., non-geographical spaces, and the possibility of their integration with geographic maps.[8] The third element was the analysis of the specificity of managing coastal cities. In addition to the analysis of the functioning of cities on the basis of available documents and city portals, the results of direct visits to seaside cities in Poland (Świnoujście, Szczecin, Kołobrzeg, Gdynia, Sopot, Gdańsk, Elbląg, Nowe Warpno), were also used, as well as foreign ones, including: London, Copenhagen, Amsterdam, Antwerp, Marseille, Athens or Singapore. Literature analysis was carried out within the framework of these three directions.

7 Sergio Rosendo, Louis Celliers and Micas Mechisso, "Doing more with the same: A reality-check on the ability of local government to implement Integrated Coastal Management for climate change adaptation," *Marine Policy* 87 (January 2018): 29–39, accessed 7 June 2023, DOI: 10.1016/j.marpol.2017.10.001.

8 *A Guide for Smart Communities: Using GIS Technology for Local Government Management*, (Washington: ICMA ESRI, 2018).

## Theoretical foundations and directions of research

The RBSC concept is based on building or making available a common map of the city for all entities interested in housing in a given city, its development having a direct or indirect impact on implemented and planned investments. Initially, the proposed concept was intended to develop a model of a tool that would support investment processes in the city. As it is known, all types of urban investments require not only the development of a project, but often the condition for their implementation in making arrangements with entities for whom the proposed investment will not be indifferent.

The natural initiator of such an undertaking as RBSC seems to be the municipal government. In Poland, such entities are city offices or the Poviat Starosty office. GIS technology is already quite common in these offices, but it is used rather in the industry and is more a supplement to the information technology used than the main tool. Originally, RBSC was to support investment processes in the city. Most urban investments cause changes in their surroundings and can often affect the media infrastructure. Therefore, in the first place, the potential participants of the RBSC included companies supplying various types of utilities. Taking into account the possibility of using the same data in various GIS tools, it was considered that the above-mentioned enterprises could join the RBSC.[9] Assuming that as part of the project, apart from maps, there will also be specially dedicated communicators, in this way a platform for communication between entities interested in specific investments can be created. It should be added that participation in the RBSC was supposed to be voluntary, and each city builds its own tool covering its area of jurisdiction and, of course, its specificity.

With the development of research on RBSC, the number of potential stakeholders of the proposed project grew. These include, among others: non-governmental organisations, residents, investors. In subsequent studies, further groups of entities were included, which included: logistics companies and public transport companies, various types of monitoring entities, industry offices, non-governmental organisations collecting spatial data. It was assumed that the use of the city map should take into account the principles of data security and ownership, as well as the principles of commercial and state secrets.

The rules of operation of the RBSC should encourage various entities to cooperate. The basic principles of cooperation within the RBSC should be voluntary, apart from city offices whose participation is essential for communities to operate effectively. In addition, entities will be needed to verify the correctness of the data collected as part of the project.

9 Cezary Stępniak, "Wybrane aspekty zastosowania geograficznych systemów informatycznych w przedsiębiorstwach dostarczających media," *Zeszyty Naukowe Uniwersytetu Szczecińskiego* 762, *Ekonomiczne Problemy Usług* 104 (2013), 1: 407–415.

The starting point in the RBSC concept is the map. Modern GIS tools use the same spatial data formats. On the other hand, the location of objects on the map is provided by a universal cartographic grid. The GIS tool should be made available by the relevant local government administration office. In an RBSC environment, basically two things are expected of any actor, action and data. The problem is that if key stakeholders dissociate themselves from the proposed concept, other types of actors may be discouraged. Then the RBSC may lose its data sources. Potential RBSC stakeholders include not only potential users but also data providers. The map itself is to be the element that binds the whole project together. When visualising, each user can only use those layers to which they have permission, however, looking from the point of view of the project as a whole, it is necessary to ensure that data on as many layers as possible are available. Considering the role of maps, the following assumptions were made for them within the RBSC:

- RBSC is based on one virtual 3D map (taking into account the time factor - 4D), constructed on the basis of many layers, describing the geographical environment, in this case a given city.
- Under the objects on the maps, additional data can be attached on the basis of hyperlinks, e.g., in the form of documentation, instructions or descriptions.
- Additionally, many abstract maps can be created that will be used by interested entities.
- Layers of maps are created by interested or responsible entities.
- The city map should be enriched with functions belonging to the class of SDSS (Spatial Decision Support System).

One of the core features of a city map should be the ability to collect data online. Therefore, the content of maps should be updated on a regular basis. However, this is not always possible and depends on the data refresh policies. In this case, the time horizon of the maps used in RBSC becomes important. It can be assumed that the data visualised on the map can be historical, supplemented offline, online and planning.

Historical data can be understood in various ways. These can be thematic maps from a specific period, but they can also be created by creating links to descriptions of individual objects. The second form is to save selected layers in the form of a map warp, where older objects will be a part of it.

Online data collection is possible if authorised entities share their data based on primary events immediately after their registration. [10] The data itself can be recorded independently as a result of the actions of appropriate tools (e.g., IoE) and made available on city maps in direct mode.

10 Wenwen Li, Michael J. Batty and Michael F. Goodchild, "Real-time GIS for Smart Cities," *International Journal of Geographical Information Science* 34 (2020), 2: 311–324, accessed 7 June 2023, DOI: 10.1080/13658816.2019.1673397.

An important issue, especially for investment and development activities, is the ability to insert planning data. This can be implemented e.g., on the basis of land reservation or investment. In other words, maps may contain data on objects that are being implemented, reported or even just being designed. The aforementioned possibility should be supported with SDSS modules, among others, in order to estimate the expected costs (at least resulting from spatial issues), perform collision analysis or spatial planning[11] using layout of urbanisation zones, administrative borders or plots.[12] Nowadays, there is more and more talk about Digital City Twins, which can also be used within the RBSC.[13] They can also be used for route analysis, where on the basis of corridors of planned investments (e.g. roads, railway or tram tracks, subway lines, but also infrastructure elements, e.g., pipelines), the best routes of their course can be indicated. The same analysis may also indicate other infrastructure elements or other types of objects that would require intervention in some way (e.g., relocation, modernisation or security).

In addition to maps, the issue of internal communication between stakeholders is also important in the RBSC concept. The medium of communication may be a social tool of choice for the exchange of messages or documentation if it cannot be represented by maps. For cooperation within the proposed communities, selected types of messengers can be used.

From the point of view of individual stakeholder groups, selected layers can be associated with messengers dedicated to them. In addition, selected planning events can create new circles and make appropriate changes to the maps of individual stakeholder groups. In practice, this can work on the principle of rapid alert systems.

In this paper, the five aspects of RBSC mentioned earlier will be used as a basis for comparing solutions that can be applied in ordinary and coastal cities. In this way, a comparative analysis of RBSC requirements for coastal and other cities was carried out.

11 Yan Ma and Zhenjiang Shen, *Strategic Spatial Planning Support System for Sustainable Development: Agent-Based Modelling and Simulation* (Cham, Switzerland: Springer Cham, 2022).

12 Suleyman Sisman and Arif Çağdaş Aydinoglu, "Using GIS-based multi-criteria decision analysis techniques in the smart cities," *International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences - ISPRS Archives* 44 (2020), 4/W3: 383–389, accessed 7 June 2023, DOI: 10.5194/isprs-archives-XLIV-4-W3-2020-383-2020.

13 Cheng Qian et.al., "Digital Twin—Cyber Replica of Physical Things: Architecture, Applications and Future Research Directions," *Future Internet* 14 (2022), 64: 1–25, accessed 7 June 2023, DOI: 10.3390/fi14020064; Martin Enders and Nadja Hoßbach, "Dimensions of digital twin applications-a literature review," *AMCIS 2019 Proceedings* 4 (2019): 2575–2584.

## Specificity of coastal cities

In the history of Poland, the issue of access to the sea played an important role. Anyway, a similar policy on the Baltic Sea was pursued by: Sweden, Russia, Denmark and German countries. Similarly, in other regions of the world, such as the Persian Gulf region, access to key inter-oceanic channels (Suez and Panama Canals), were places where various countries have tried to take control of transport routes. Political-military and economic-social problems overlap in such regions. Own access to the sea was treated as an opportunity to conduct free trade. Hence, trade and specific industrial issues, such as shipbuilding, were related to the sea. Coastal cities are related to the construction of ports and transport infrastructure, enabling the delivery and export of goods. In addition, there are issues of political security (threat of potential armed conflicts – for example – Odessa) and natural security (issues of floods, tsunamis or typhoons (e.g., Florida, the Philippines, the Caribbean).

From the organisational point of view (the first aspect), in coastal cities, state administration bodies usually play a greater role. It is talking about the administration of ports and security systems. In addition, for the needs of the functioning of ports, it is necessary to prepare an appropriate transport infrastructure. The aforementioned infrastructure includes roads with appropriate parameters, railway lines, and, if possible, also inland navigation ports with the necessary arrangement of water facilities.

In addition to a commercial port, such cities may have war ports, which means that part of the city area may be excluded from public access, however, infrastructure and transport networks should also be built there and integrated with the city infrastructure. In practice, this means that when creating a community of the RBSC type, it is necessary to take into account the need to include additional entities, such as: representatives of state and military administration.

The necessity of cooperation between state and local government administration bodies may cause conflicts of a competence nature. It is about who is to govern the community. A kind of example of potential conflicts is present today around the port of Elbląg. In principle, the above-mentioned problem can be avoided by focusing on technical and functional solutions. However, the specificity in this case will be the issue of security, so additional security measures must be imposed on RBSC solutions.

In addition to safety issues, it can be assumed that in coastal cities, representatives of the tourism industries may play a greater role in their management. Specific water investments may appear, such as a pier or municipal water transport, e.g., water trams (as in Venice or Copenhagen) or an aerial railway (as in Singapore to Sentosa Island). The distribution of urban zones will also result from the location of ports, shipyards, military zones and the topography of the city.

Functionality (the second aspect) depends on RBSC participants. Building a city map tool associated with the available messengers will not automatically create a community. It can be built by information needs, willingness to cooperate and trust. Based on the results of previous research on RBSC, it can be assumed that maps are still underestimated as a management support tool. The ability to build integrated maps requires not only data exchange between stakeholders, but also issues of trust and willingness to cooperate.

The functional scope of the RBSC is shaped primarily by data providers. According to the concept, city councils are the most predisposed to the role of the entity managing the community. Within the city councils there are many departments that deal with different areas of city functioning and use different maps. Therefore, RBSC, as a basic added value to support city management, enables the integration of maps within the office. This is followed by municipal services, agencies, and municipal enterprises. As a result, maps can be weather maps, noise or pollution maps, traffic data or the location of the fleet included in public transport. The digitisation of urban life allows the use of ICT and IoE tools in ever new areas, and thus the recording of subsequent types of spatial data, which will take the form of successive layers on city maps. Some of the layers will be characteristic of the marine theme.

Within the community, it is possible to create inner circles. In coastal cities, these can be specific circles for selected stakeholders. They may concern e.g., security, coastal protection, contamination and threat monitoring (especially in water issues, e.g., natural threat to the waters of the Baltic due to algae and bacteria). The possibility of direct communication between interested entities combined with current spatial visualisation of specific areas according to selected criteria can facilitate solving crisis situations or planning new projects (e.g., using SDSS).

With the addition of new types of entities, the functional scope of the RBSC may grow. The scope of spatial thematic analyses may also increase. In this way, it will be possible to use, among others, planning maps (enabling the placement of planned facilities and investments, using the augmented reality technology at the same time), 4D visualisations and the specific use of 3D technology related to maritime or, more broadly, water, if a river flows through the city, constituting a shipping route or important as a public transport artery. It can be assumed that sooner or later such cities will monitor the state of water in their area, taking into account various factors (e.g., safety, water transport, tourism or ecology – the example survey in Stockholm).[14]

For this to be possible within the RBSC, individual entities that conduct appropriate research and collect spatial data must be willing to share their data in a format acceptable by the city map (the third aspect). The problem is, if the measuring devices used by them

14 Ing-Marie Gren and Henrik Scharin, "Efficient management of eutrophic coastal zones in theory and ractice: An application on nitrogen reduction to the Stockholm archipelago," *Regional Environmental Change* 7 (March 2007), 1: 27–35, accessed 7 June 2023, DOI: 10.1007/s10113-007-0023-7.

can save data collected in the appropriate format and, preferably, in online mode, send them to servers directly connected to the city map.

Another issue is the validity of the data. There are layers that need a current update, e.g., weather data, ecological data, traffic volume, location of public transport units or safety.[15] This data collected from various types of sensors must be continuously transferred to the relevant institutions. At least some of it may be transferred to the RBSC. Some of the above-mentioned data is important for maritime issues. For example, weather and hydrological data for shipping in the city area are of great importance. They may also be important for some types of tourism. Another thing is that some of the measuring devices may be on board vessels.

Analysing the specificity of coastal cities in terms of information and communication, one can pay attention to certain issues that will be important from the point of view of RBSC and may constitute a maritime extension of the discussed communities. The use of information resources within the RBSC is twofold: reproductive and analytical. Reproductive means that city maps recreate the state of the city based on the collected data. The analytical nature consists in the fact that spatial data can be processed using maps, thanks to which the city map can provide new information values (usually using SDSS functionality).

As mentioned, apart from a common city map, the use of communication tools is an important convenience. At least some of the RBSC circles may be closed and available only to selected users. Some of the created circles within electronic communities may be characteristic only for coastal cities and entities interested in this subject. This concerns both entities involved in the functioning of the port and the appropriate logistic infrastructure, as well as entities involved in the development of tourism. Specialised circles could be created for security and even naval issues. Of course, these circles should be properly secured. Within social circles, types of primary events or processes may be designated on the basis of which spatial data will be recorded. This means that relevant, authorised entities can transfer data of a maritime nature, enabling the creation of specialised layers.

It can, therefore, be assumed that the inclusion of maritime issues may result in the need to increase the number of available or required layers. Layering itself is not a problem. It appears when users will be interested in analytical aspects related to the city map. Then there is a need to create a matrix of relationships between different layers. Thanks to this, it is possible to show the existing dependencies as well as contradictions on the maps (collision analysis for objects from different layers).

15 Booma Sowkarthiga Balasubramani et.al., "Smart Data Management of Urban Infrastructure Using Geographic Information Systems," *Journal of Infrastructure Systems* 26 (2020), 4: 06020002, accessed 8 June 2023, DOI: 10.1061/(ASCE)IS.1943-555X.0000582.

Another possibility is the analysis of corridors, e.g., for the course of water communication routes within a given city.

The spatial (the fourth) aspect in the RBSC refers to the geographic extent captured by the city map. Maps of coastal cities differ in that part of them is a body of water. The issue of cities entering the sea may have a different meaning. Just like China does in the South China Sea, annexing more islands and thus trying to expand the scope of its territorial waters. Then, collecting as much data as possible about this body of water is of political importance and may shift the importance of city management from land to sea issues.

In practice, taking into account spatial aspects in the strict sense of the sea may result in e.g., the need to take into account new thematic layers of a maritime nature. These include, among others: the condition of the bottom, sea tides, water pollution, location of navigational signs or hydrological devices, traffic control on water communication routes (an example is the problem of traffic control in the Strait of Singapore, where an additional problem is the state borders of Singapore, Indonesia and Malaysia). The data collected in this way not only describe the current state, but also make it possible to carry out various types of multi-criteria analyses and to undertake planning works in the field of water management in the city.

The fifth aspect is the technical aspect. Sustainable SmartCity concepts require multi-pronged actions.[16] Contemporary city management is very often divided into internal departments of municipal offices, where individual issues are perceived from the level of a given management area. The situation becomes more complicated when it is necessary to prepare solutions that require action in many areas of the city's functioning. Therefore, the RBSC with its map of the city can be a tool that will allow to look at the city as an environment that is a conglomerate of many different types of phenomena, processes or activities. It should be assumed that a common map will be much more readable than many reports from different entities.

Looking for the specificity of coastal cities, it is possible to indicate all types of tools, recorders, sensors that in SmartCity operate on the IoT or IoE principle. Devices of this type, using Internet connections, are data sources for city maps. The specificity of coastal cities manifests itself mainly in the types of devices that are focused on recording data relating to maritime issues. They can therefore be placed on water infrastructure devices, on vessels, as well as on devices operating above or below the water surface.

Technical solutions can facilitate the presentation of the state of the city in a more or less detailed way. But they can also present the dynamics of the city, presenting the investments in progress, allowing for the reservation of areas for future investments, facilitating the simulation of the impact of a given investment on its surroundings.

16 Sorin-George Toma and Andreea Saseanu, "The world's smartest cities in the metropolitan century," *Ovidius University Annals, Economic Sciences Series* 18 (2018), 1: 111–116.

They also allow for planning and performing of various types of analyses using specialised IT systems equipped with appropriate different types of models.[17] Automating the use of the aforementioned models can facilitate the introduction of smart functions to city management, as well as to facilitate the implementation of tasks related to the pursuit of sustainable city development.

## Potential benefits of using RBSC in coastal cities

Talks with representatives of the management boards of various cities in Poland usually led to the fact that RBSC would probably bring the implementation of the SmartCity idea in a given city closer, but in practice its implementation is difficult to implement due to organisational conditions.[18]

Nevertheless, it is worth analysing the potential benefits that the implementation of RBSC could bring. In these considerations, an attempt was made to present the potential benefits that RBSC could bring to the management of coastal cities. Potential benefits are presented adequately to the previously mentioned five aspects.

In the organisational aspect, attention was mainly paid to the fact that new types of users and stakeholders may appear within the RBSC. The use of a common map armed with circles of private and public communicators will allow the creation of a tool where many online data will be available simultaneously and it will be possible to communicate on an ongoing basis about the situation in the city. RBSC can be a standard medium of communication between the city government, institutions related to maritime issues (e.g., port authorities, shipowners, state administration offices, navy and military units or sea rescue). The planned project may be conducive to capturing emergency situations in maritime matters, facilitate cooperation between various services and stakeholders. It may also allow for an integrated view of sea and land issues (e.g., building an integrated transport system of the city including the port,[19] water transport units and public transport).[20] Thanks to RBSC, it is possible not only to monitor the condition of cities, react in crisis situations, but also to plan the development of the city,

17 T.M. Vinod Kumar, ed., *Smart Master Planning for Cities. Case Studies on Digital Innovations* (Singapore: Springer Verlag, 22 July 2022).

18 Tomasz Turek and Cezary Stępniak, "Barriers to the Application of Spatial Information Systems in the SmartCity Dynamic Management," *Procedia Computer Science* 207 (2022): 4217–4226, accessed 8 June 2023, DOI: 10.1016/j.procs.2022.09.485.

19 Cezary Stępniak et.al., "Integration of the Infrastructure of Systems Used in Smart Cities for the Planning of Transport and Communication Systems in Cities," *Energies* 14 (2021), 11: 3069, accessed 8 June 2023, DOI: 10.3390/en14113069.

20 Sam McLeod, Jan Scheurer and Carey Curtis, "Urban public transport: planning principles and emerging practice," *Journal of Planning Literature* 32 (2017): 223–239, accessed 8 June 2023, DOI: 10.1177/0885412217693570.

taking into account its maritime functions. These plans may be preceded by various types of spatial analyses.

Electronic maps allow you to visualise any number of layers. This means that if it is necessary, it is possible to add new layers or assign new functionalities to them as your needs arise. For coastal cities, this means that all sea-related functionality can also be included (the second aspect). In practice, the functional benefits include:

– The possibility of establishing additional thematic circles specific to the maritime theme,
– New layers on the city map provided by RBSC,
– Analytical and planning capabilities covering maritime issues,
– New types of processes that can be included in semantic layers visualised on abstract maps that translate into city maps.

By specifying new functional areas in coastal cities, potential RBSC extensions may concern, among others:

– The location of the port, the water and transport routes serving it, and the creation of appropriate zones in its surroundings.
– Support for IoE devices monitoring the condition of the port and fairways (this strengthens the requirement to use 3D technology), it should be assumed that some of these devices will be located on vessels.
– The use of city maps will allow taking into account the shape of the coastline and possibly the system of watercourses (rivers, canals and other water reservoirs) in various types of spatial analyses and city development plans.
– Maps will be able to include data, analyses and plans in the field of tourism, recreation and spa functions related to the maritime specificity.
– The issue of security of the city and its inhabitants, including hydrological issues, should be much more emphasised.

Information issues in RBSC are related to the circulation of information resources of a spatial nature (the third aspect). In this case, the philosophy of collecting, especially visualising and sharing data changes. Data becomes available through circles and permissions, and some of it may become publicly available to any RBSC user through the city map. More specifically, the potential information benefits resulting from the construction of the RBSC include, among others:

– Facilitating communication between entities that should cooperate in managing and planning the development of coastal cities.
– Creating a public forum enabling the promotion of various types of initiatives that may affect the development of the city, of course, taking into account the specificity of coastal cities.
– Enabling the exchange of data on current and planned urban investments, including maritime investments.

- Allows for approximate estimation of the costs of projects (including maritime projects) and indicates potential conflicts, both existing and likely to occur between potential projects planned in the city or its maritime surroundings.
- Creation of a tool facilitating the identification and estimation of needs in the field of urban and maritime infrastructure.
- Supporting the planning of land and water communication routes, the course of public transport and the planning of municipal car parks and marinas in order to limit the entry of vehicles to cities and settlements with touristic and health resort values.

The use of a city map as part of the RBSC will, by definition, facilitate the planning and implementation of tasks in the field of spatial and maritime economy, especially that the collected data can be of a current, historical or planning nature. The use of 3D and 4D maps as well as simulation technologies, augmented reality or digital city twins may, on the one hand, facilitate the planning of investments and various types of urban projects (including maritime projects), and be a tool for potential mediation between various stakeholder groups.

RBSC partly changes the way users can view data. Although it is focused on collecting data, its primary purpose is to visualise it (the fourth aspect). Visualisation in this project refers to both quantitative and qualitative data. At the same time, both types of data must have some spatial attributes in order to be applied to the map. Quantitative data will be converted into objects within the appropriate layers, while qualitative data will be transformed into documents, which in turn will be linked to the corresponding features visible on the maps. Therefore, it can be assumed that the city map can become a kind of spatially arranged Big Data repository.

The technical infrastructure of the RBSC is divided into two parts (the fifth aspect). One part is data recording tools, i.e., the aforementioned IoE tools, smart recorders, control sensors, measuring devices, etc. For coastal cities, this means that a platform is proposed that allows you to collect and visualise data for the needs of the maritime economy of a given city, concerning, among others, weather, sea tides, ecology, water safety or functioning of water infrastructure.

The second part is ICT tools and IT systems. ICT tools and IoE tools are basic tools that record data and send it to specialised IT systems. These, in turn, are connected to GIS (Geographic Information Systems) for geographic spaces and SIS (Spatial Information Systems) for abstract spaces. As part of the aforementioned tools, it is possible to develop various types of analyses, insert simulation models for marine or hydrological phenomena, and then visualise them on city maps.

## Conclusion

The RBSC concept is consistently promoted by the research team as part of research on SmartCity and sustainable urban development. It still remains largely at the level of theoretical considerations. Although, especially during the COVID-19 pandemic, there was a need to create electronic communities in order to prepare joint arrangements, especially in the field of planned investments, which requires the cooperation of administration offices, investors and media providers.[21] The same applies to redefining urbanisation zones and planning new transport and logistics systems. Then there is also the need to create a community, if only to facilitate public consultations.

This study analyses the problem of whether RBSC created for coastal cities would have its own specificity. Based on the five aspects distinguished for the purposes of these considerations, it can be assumed that there will be a certain specificity of coastal cities. From the organisational point of view, there may be a conflict of competences between state and local government institutions over who is to organise and manage such systems. However, it seems logical that RBSC also in coastal cities should be managed by the competent local government office. From the functional point of view, the functional scope of entities (stakeholders) and processes taking place in coastal cities will change slightly. As part of the information aspect, it should be stated that there will be a certain group of data characteristic only for coastal cities. For coastal cities, it will be necessary to develop specific data processing procedures that take into account data of a maritime nature. We are talking about SDSS class systems. Within the spatial aspects, 3D maps relating to water areas will be a specific issue. Firstly, there will be a problem of how to define the third dimension in sea areas and, secondly, the water area is assumed to be less stable than the land area when defining the location of objects. Also, the technical aspect will be different. First of all, it is about devices that will be used only for water areas.

When it comes to coastal cities, RBSC seems to be even more useful in their case. This is due to the fact that in the aforementioned towns there are more issues that require consultation and then multi-organisational cooperation during the implementation of various types of investments and projects, as well as during the normal functioning of the maritime sphere in the current life of the city. To sum up, however, it should be said that the biggest problem is still how to convince individual cities to implement the RBSC concept.

21 Srikanta Patnaik et al., eds., *Smart Cities and Smart Communities. Empowering Citizens through Intelligent Technologies* (Singapore: Springer Verlag, 29 May 2022).

## BIBLIOGRAPHY:

*A Guide for Smart Communities: Using GIS Technology for Local Government Management*. ICMA ESRI Washington 2018. Accessed 5 June 2023. https://icma.org/sites/default/files/18-137%20GIS%20e-Primer%20Report_final.pdf.

Balasubramani, Booma Sowkarthiga, Mohamed Badhrudeen, Sybil Derrible, and Isabel F Cruz. "Smart Data Management of Urban Infrastructure Using Geographic Information Systems." *Journal of Infrastructure Systems* 26 (2020), 4: 06020002. Accessed 5 June 2023. DOI: 10.1061/(ASCE)IS.1943-555X.0000582.

Díaz-Díaz, Raimundo, Luis Muñoz, and Daniel Pérez-González. "The business model evaluation tool for smart cities: application to SmartSantander use cases." *Energies* 10 (2017), 3: 262. Accessed 5 June 2023. DOI: 10.3390/en10030262.

Enders, Martin, and Nadja Hoßbach. "Dimensions of digital twin applications-a literature review." *Proceedings of the 25th Americas Conference on Information Systems*, AMCIS 4 (2019): 2575–2584.

Gren, Ing-Marie, and Henrik Scharin. "Efficient management of eutrophic coastal zones in theory and practice: An application on nitrogen reduction to the Stockholm archipelago." *Regional Environmental Change* 7 (March 2007), 1: 27–35. Accessed 7 June 2023. DOI:10.1007/s10113-007-0023-7.

Hoyle, Brian. "The redevelopment of derelict port areas." *The Dock & Harbour Authority* 887 (1998): 46–49.

Jelonek, Dorota, Cezary Stępniak, and Tomasz Turek. "The Concept of Building Regional Business Spatial Community." *Proceedings of 4th International Conference on Data Communication Networking* (2013): 83–90. 10th International Joint Conference on e-Business and Telecommunications, 29–31 July 2013. Accessed 7 June 2023. DOI: 10.5220/0004531700830090.

Jelonek Dorota, Cezary Stępniak, and Tomasz Turek. "Barriers in Creating Regional Business Spatial Community." *Annals of Computer Science and Information Systems* 2 (2014): 1243–1250. *Proceedings of the 2014 Federated Conference on Computer Science and Information Systems*. September 7–10, 2014, Warsaw, Poland. Accessed 5 June 2023. DOI: 10.15439/978-83-60810-58-3.

Li, Wenwen, Michael J. Batty, Michael F. Goodchild. "Real-time GIS for Smart Cities." *International Journal of Geographical Information Science* 34 (2020), 2: 311–324. Accessed 7 June 2023. DOI: 10.1080/13658816.2019.1673397.

Ma, Yan, and Zhenjiang Shen. *Strategic Spatial Planning Support System for Sustainable Development*: *Agent-Based Modelling and Simulation*. Cham, Switzerland: Springer Cham, 2022.

McLeod, Sam, Jan Scheurer, and Carey Curtis. "Urban public transport: planning principles and emerging practice." *Journal of Planning Literature* 32 (2017): 223–239. Accessed 8 June 2023. DOI: 10.1177/0885412217693570.

Patnaik, Srikanta, Siddhartha Sen, and Sudeshna Ghosh, eds. *Smart Cities and Smart Communities. Empowering Citizens through Intelligent Technologies*. Singapore: Springer Verlag, 29 May 2022.

Qian, Cheng, Xing Liu, Colin Ripley, Mian Qian, Fan Liang, and Wei Yu. "Digital Twin—Cyber Replica of Physical Things: Architecture, Applications and Future Research Directions." *Future Internet* 14 (2022), 64: 1–25. Accessed 7 June 2023. DOI: 10.1080/13658816.2019.1673397.

Rosendo, Sergio, Louis Celliers, and Micas Mechisso. "Doing more with the same: A reality-check on the ability of local government to implement Integrated Coastal Management for climate change adaptation." *Marine Policy* 87 (January 2018): 29–39. Accessed 7 June 2023. DOI: 10.1016/j.marpol.2017.10.001.

Sisman, Suleyman, and Arif Çağdaş Aydinoglu. "Using GIS-based multi-criteria decision analysis techniques in the smart cities." *International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences – ISPRS Archives* 44 (2020), 4/W3: 383–389. Accessed 7 June 2023. DOI: 10.5194/isprsarchives-XLIV-4-W3-2020-383-2020.

Stepniak, Cezary. "Wybrane aspekty zastosowania geograficznych systemów informatycznych w przedsiębiorstwach dostarczających media." *Zeszyty Naukowe Uniwersytetu Szczecińskiego* 762*, Ekonomiczne Problemy Usług,* 104 (2013), 1: 407–415.

Stępniak, Cezary, Dorota Jelonek, Magdalena Wyrwicka, and Iwona Chomiak-Orsa, "Integration of the Infrastructure of Systems Used in Smart Cities for the Planning of Transport and Communication Systems in Cites." *Energies* 14 (2021), 11: 3069. Accessed 8 June 2023. DOI: 10.3390/en14113069.

Toma, Sorin-George, Andreea Saseanu. "The world's smartest cities in the metropolitan century." *Ovidius University Annals, Economic Sciences Series* 18 (2018), 1: 111–116.

Turek, Tomasz, and Cezary Stępniak. "Areas of integration of GIS technology and smart city tools. Research findings." *Procedia Computer Science* 192 (2021): 4681–4690. Accessed 8 June 2023. DOI: 10.1016/j.procs.2021.09.246.

Turek, Tomasz, and Cezary Stepniak. "Barriers to the Application of Spatial Information Systems in the SmartCity Dynamic Management." *Procedia Computer Science* 207 (2022): 4217–4226. Accessed 8 June 2023. DOI:10.1016/j.procs.2022.09.485.

Vaya, Dipesh, and Teena Hadpawat. "Internet of Everything (IoE): A New Era of IoT." *Lecture Notes in Electrical Engineering* 570 (2020): 1–6. Accessed 7 June 2023. DOI: 10.1007/978-981-13-8715-9_1.

Vinod Kumar, T.M., ed. *Smart Master Planning for Cities. Case Studies on Digital Innovations*. Singapore: Springer Verlag, 22 July 2022.

English version: Mark Atkinson

**SUMMARY**

This study refers to the concept of Regional Business Spatial Community (RBSC) supporting the idea of sustainable development of SmartCity. The idea of RBSC is based on the possibility of using a map of the city through the application of GIS (Geographic Information Systems) technology combined with social communication tools thanks to which communities can be built. The article is based on the research material from the work on RBSC and the specificity of coastal cities was analysed through electronic observation (websites of cities) and direct observation based on visits to coastal cities. The analysis was carried out according to five aspects: organisational, functional, informational, spatial and technical. The study presents what specifics should be taken into account in the RBSC of coastal cities.

## Badanie specyfiki miast nadmorskich w świetle koncepcji regionalnych społeczności biznesowych

**Słowa kluczowe:** RBSC, mapy miast, zarządzanie miastami nadmorskimi, narzędzia ICT i Internetu wszystkiego, SmartCity, dane przestrzenne

**STRESZCZENIE**

Niniejsze opracowanie odnosi się do koncepcji Regionalnych Społeczności Biznesowych (RBSC – Regional Business Spatial Community) wspierającej ideę zrównoważonego rozwoju SmartCity. Idea RBSC bazuje na możliwości zastosowania mapy miasta wykorzystującej technologię GIS (Geographic Information Systems) powiązanej z narzędziami komunikacji społecznej dzięki którym można budować społeczności. W rozważaniach podjęto problem czy RBSC zastosowany w miastach nadmorskich będzie miał swoją specyfikę. W rozważaniach wykorzystano materiał badawczy z prac nad RBSC oraz przeanalizowano specyfikę miast nadmorskich poprzez obserwację elektroniczną (strony internetowe miast) I bezpośrednią na podstawie wizyt w miastach nadmorskich. Analizy dokonano według pięciu aspektów: organizacyjnego, funkcjonalnego, informacyjnego, przestrzennego oraz technicznego. Opracowanie przedstawia, jaką specyfikę należałoby uwzględnić w RBSC miast nadmorskich.

**Citation**

Stępniak, Cezary. "Studying the specificity of coastal cities in the light of the Regional Business Spatial Community concept." *Studia Maritima* 36 (2023): 181–197. DOI: 10.18276/sm.2023.36-04.