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Rediscover of cities as vertical clusters for agricultural needs (objectives) and for specific care in a pandemic condition

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Abstract

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The subject of consideration is the architectural construction and technological features of the specialized clusters, intended for agricultural needs and for specific care, such as education, recreation and sports, medical care. In this way, the significant limitations in the human environment caused by a large-scale pandemic (COVID-19), can be overcome in tall skyscraper buildings located in megacities. The COVID-19 pandemic rearranges human priorities in the big city. The supply of food and basic care occupy a central place in the life of every inhabitant. Author's projects for skyscrapers are presented, which offer various solutions for growing honey plants, bee families (Hong Kong, Mumbai), fruits, vegetables, algae and fish products (Toronto, Mumbai). The storage of cereals in appropriate silos (Hong Kong) is an important point in the supply of wheat, corn, barley, buckwheat and others needed for the planning modules for education and emergency medical care are also offered.

Opportunities for hiking, cycling on a bicycle track (Toronto), cycling trails (Elevator annual 2014), running and others are also considered.

Keywords: new solution; rediscovery; cities; vertical clusters; agricultural needs (objectives); specific care; conditions; pandemic

Introduction

In a pandemic, human behavior changes dramatically. Social contacts are severely limited and vital needs, such as nutrition, medicine, emergency medical care, specialized medical care, care for young children, primary and secondary school students, work for adults, recreation and sports for recovery, transportation of valuable shipments and sick people, as well as others, are particularly important and involve many activities. These activities are performed in spaces with load-bearing structure, walls and floors, filled with appropriate building materials and technologies. In addition to the expanded areas in the skyscraper needed for vital core activities for housing, offices and the hotel part, expanded areas must be provided for clusters and for future cluster initiatives, such as landing and take-off areas for cargo drones of different capacities, for cargo unloading activities also require additional storage areas, including areas for silos, refrigerators and others. The universal volume-planning modules of different sizes are especially suitable for functionally useful activities, entered in the terms of reference for the design of the respective clusters, such as technical areas and volumes of the premises. Collecting rainwater in water vessels located in these modules is their main advantage.

Material and Methods

Theory of clusters

"Clusters", are a specific form of cooperation that has become increasingly important in recent years. Cluster development is observed in all countries, and the stage of

their occurrence is different (Oxford Research, 2008, Barsoumian et al., 2011) right column, row 11 from bottom to top); (Slavova et al., 2018).

"Clusters" are a form of self-organization, that offers competitive advantages, line 18, first round, line 22. (Slavova et al., 2018). As a result of research and implementation of cluster initiatives in a pandemic, clusters provide, within the skyscraper easy access to important agricultural resources, education – preschool, primary and secondary, medical care, sports and recreation, as well as the work of a large number of residents. There is a significant reduction in transportation costs, while at the same time requiring specialized transport, (for example, drones to ensure access to consumers of finished agricultural products, medicines, etc.). Innovation plays a significant role in clusters and cluster initiatives. Innovations with an inventive step mark the highest level in the formation of a specific environment for their development. "Clusters", are defined as drivers of competition, innovation and regional development (Garanti et al.2014); dominant factor in the development of the modern economy (Delgado et al. 2010) and building a competitive business environment (Lin et al. 2006); (Slavova et al. 2018).

The charitable attitude, economic situation and food security of the hosts are essential during a pandemic. (Hendrarini et al., 2018) Agricultural production is closely linked to local traditional species, (Hendrarini et al., 2020); Antoh et al., 2019), for which technological opportunities for growing in high-rise buildings should be sought).

Definitions of clusters

One of the definitions of a cluster is the following – "geographically related concentration of similar, interconnected, or complementary companies with active channels for business relationships, communication and dialogue, which use common specialized infrastructure, labor markets and services and face common development opportunities. and threats." (Ivanov, 2006); https://money.bg/archive/harakteristika-na-klasterite.html)

"Another view is that clusters are something that is based on systematic links between companies and relate to primary or secondary production, technology, natural resources, staff qualifications and distribution channels." (Ivanov, 2006); https://money.bg/archive/harakteristika-na-klasterite.html). If a combination is made between the first part of the first cluster definition and the second part of the second cluster concept, we will obtain a satisfactory definition suitable for the types of clusters, according to the objectives of this article.

Cluster initiatives and clusters suitable for use in tall buildings in a pandemic

"The purpose of cluster initiatives is to increase the growth and competitiveness of the cluster …", p.24, ed. 8, left column), (Slavova et al. 2018). In addition to achieving a certain micro-economic framework in a pandemic, a functionally useful combination of cluster initiatives is particularly important, aimed at achieving optimal satisfaction of vital needs of the skyscrapers, without exposing them to additional risk of infection.

Finding the measure between the constraints placed by the pandemic and the respective production of the cluster is of fundamental importance in the development of the strategy of the cluster initiatives ... " The study (Page 24, line 18, left column); (Slavova et al., 2018), identifies, analyzes and determines the state of the initiatives implemented by the clusters in the country, in different aspects: goals of the cluster initiatives and their management, degree and scope of the conducted cluster initiatives, divided into five areas (information and communications; training and qualification; marketing and public relations; cooperation; internationalization), as well as the sources of their funding. " The impact of large-scale pandemics on cluster initiatives is not taken into account in the literature. The re-utilization of cluster activities/productions, aims to ensure the comfort of the residents during a pandemic.

Results and Discussion

Types of clusters. Organization. Location and structure. Possible technical solutions

Organization of agricultural clusters in high-rise buildings

The agricultural cluster is "geographically related concentration of agricultural, interrelated, or complementary ..." (Marin Ivanov, 2006), agricultural activities/productions, such as growing crops, other crops, fruits, vegetables of the needs of the inhabitants for complete nutrition in conditions of epidemic crisis. The processing of the production occupies an important place in the skyscraper, as it provides lasting opportunities for feeding the inhabitants.

Their main purpose is to provide raw materials for food with opportunities for processing and preservation in the structure of the skyscraper. The agricultural clusters are located in the open on the sloping part of the roof of the low body (Evolo 2013, conceptual innovative design, Yanko Aleksandrov and student Zvetko Kirilov); (Figure 1), on the horizontal roof and in separate floors, (Mumbai), (Aleksandrov, 2018b); or are solved, as indoor orchards, (Kun Min); (Aleksandrov, 2020) "Construction of territories for build-

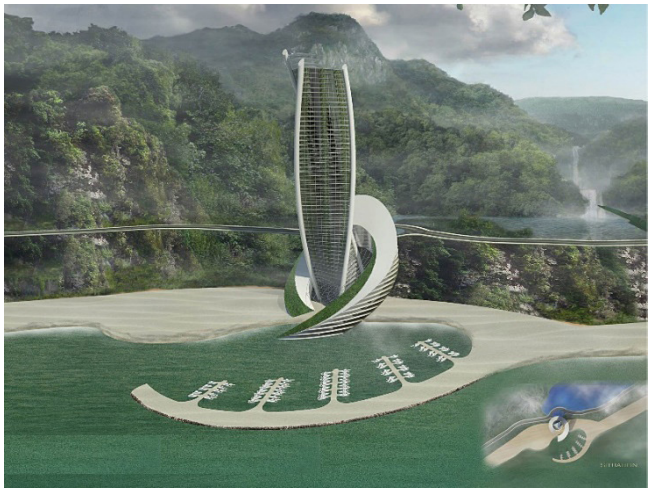

Fig. 1. Evolo 2013

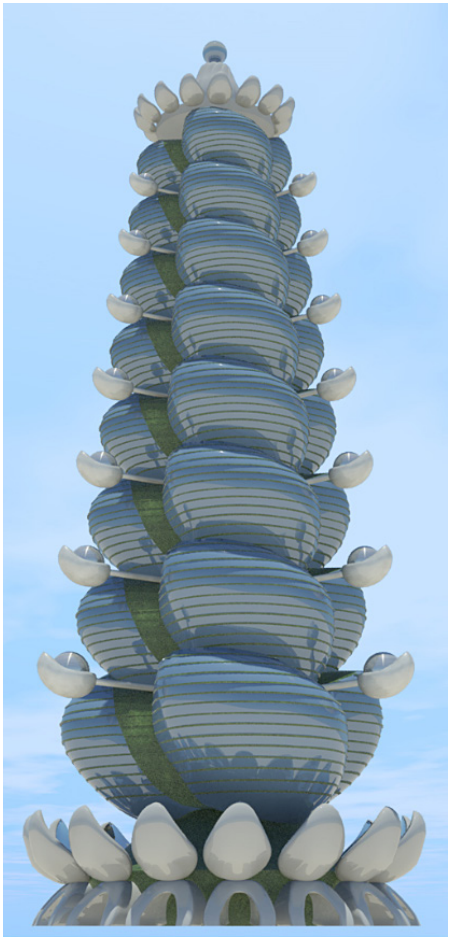

Fig. 2. Arcology Skyscraper, Hong Kong. Articulation of eight similar elements equipped with water spheres, step on spoons to dampen vibrations in an earthquake

ings and complexes for storage and production of plant and animal products"; (Vlasarev, (2014) and the height of the skyscraper are of particular importance in the development of cluster initiatives.

Silos, common storeys and individual storeys to the dwellings in the skyscraper

Silos. Their spaces are an integral part of the service of the skyscraper. Cereals are stored in silos located at the base of the skyscraper. (Arcology Skyscraper, 2014, Hong Kong; Conceptual Innovative Design, Yanko Aleksandrov and student Valeri Kantardzhiev, 2014); (Figures 2, 3)

Irrigation of plants is guaranteed by rainwater stored in water vessels, located on the top floor. Roof steam generator for electricity generation, roof water vessels for rainwater collection, water spheres for extinguishing earthquake fluctuations, fruit and vegetable growing gardens, circular arrangement of silos in the lower part, intended for grain storage crops. (Conceptual innovative design, Yanko Aleksandrov and student Valeri Kantardzhiev, 2014); (Figures 2, 3).

The different number of divisions with volumetric façade elements affects the capacity of the non-scraper in terms of living areas, work offices and hotel areas, as well as cluster areas. (Archology Skyscraper, Hong Kong, Conceptual Innovative Design, Yanko Alexandrov and student Valeri Kantardzhiev, 2014); (Figures 2, 3). All these areas, ensuring the development of agricultural clusters, must be entered in advance in the design assignment. This avoids the need to adjust areas during a pandemic. Agricultural production is serviced by agriculturally qualified specialists, and clusters are managed by companies "… with active channels for business relations, communication and dialogue." (Ivanov, 2006) Overproduction reaches the markets with the help of drones, adapted to properly transport the products throughout the year, if there are resources for that. Containers. Agri-

Fig. 3. Arcology Skyscraper, Hong Kong. Articulation of five similar facade elements, equipped with water spheres, located in carrying spoons vibration damping in an earthquake

cultural products are grown and stored in container-type fruit stores, (Mumbai), (Aleksandrov, 2018b). They are located next to each dwelling, which is also filled with containers. Innovative solutions with an inventive step of the author for the implementation of walls and ceilings of refrigeration chambers of fruit stores are given in a specialized chapter by the author, published by Nova Science Publishers, Inc.; (Aleksandrov, 2018c).

Organization of educational clusters (for preschool, primary and secondary education); (Figures 4-7)

The educational cluster is «…geographically related concentration of related, interrelated, or complementary ...» (Ivanov, 2006), educational activities such as pre-school, primary and secondary education and other resources for computer equipment and facilities to meet the needs of children living in full education in an epidemic crisis.

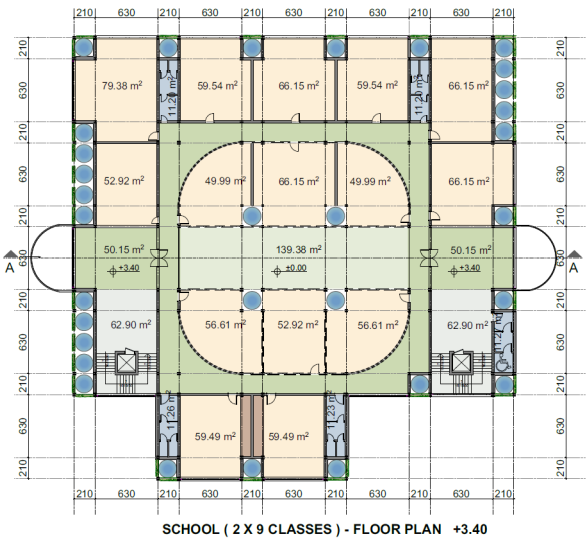

Fig. 4. A two-storey school located on the roof of a skyscraper

Educational clusters cover pre-school, primary and secondary education. The educational process occupies an important place in the life of the skyscraper, as it provides a full education for the children of the inhabitants. It is advisable to link theoretical training with practices developed in the relevant essential clusters. Volume-planning modules are especially suitable for the development of educational clusters. The size of the modules also allows for the organization of interactive classes specialized in the interests of the educational process.

It is advisable to integrate children of all ages in the work processes: planting, fertilizing, watering, weeding, picking and other activities. The youngest children should be cared for in pandas – minimized nurseries and kindergartens for 8-10 children.

Fig. 5. East façade. School 2 x 9 classes. East elevation

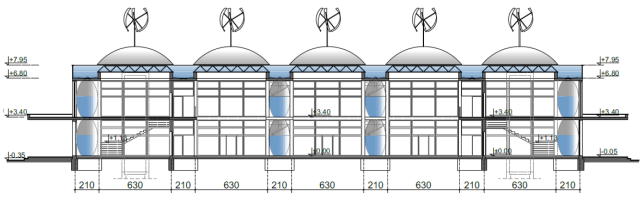

Fig. 6. Section through the staircase. School 2 x 9 classes

Fig. 7. Interactive classes in primary education

Organization of medical care clusters; (supply of medicines, emergency medical care, specialized medical care); (Figure 8)

Medical care clusters. These are "…geographically related concentration of related, interrelated, or complementary ..." (Ivanov, 2006) medical activities/care, such as drug supply, emergency medical care, specialized medical care and medical equipment. the medical needs of the residents in case of need The provision of medical care occupies an important place in the skyscraper as it ensures the health of the occupants. Medical care clusters include: drug supply, emergency medical care, and specialized medical care for

a limited number of patients, including pandemic isolation. Particularly suitable are medical volume-planning modules, the dimensions of which are in accordance with the functional-planning decisions of the medical premises. (Aleskandrova, 2009); (Aleksandrova, 2016).

The necessary medical areas are located in the space between the water vessels. Photovoltaic coatings and wind turbines provide electricity for domestic and medical purposes. Rainwater is stored in water vessels and after dry treatment is used for the needs of the cluster for medical purposes.

Organization of sports and leisure clusters; (Figures 9-11)

Clusters for sports and recreation. These are "…geographically related concentration of related, interdependent, or complementary ..." (Ivanov, 2006) sports activities, such as cycling, running, technical resources and others, designed to meet the needs of the sport. Sport plays an important role in the daily lives of people living in the skyscraper, as it maintains their healthy lifestyle.

View of the skyscraper with three bicycle wheels with spokes suspended on three vertical cores, on which the panoramic transparent elevators move. design of skyscrapers surrounded by jogging paths and bicycle lanes; (Figure 9); (conceptual innovative design, Aleksandrova, Aleskandrov, student Jurijs Eisaks – Construction College – Riga, Latvia, "Elevator annual" 2014). A fragment of the bicycle wheel, spokes and wind turbines. The spokes are trails for horizontal running, and the bicycle wheel is used for climbing on a slope (hiking). (Figures.10, 11); (conceptual innovative design, Aleksandrova, Aleskandrov, student Jurijs Eisaks – Construction College – Riga, Latvia, "Elevator annual" 2014).

Floor lifts, bicycle wheels with escalators and spokes with wind turbines mounted on them are the main technical features of the architectural structure; (Figures 9-11); (conceptual innovative design, Aleksandrova, Aleksandrov,

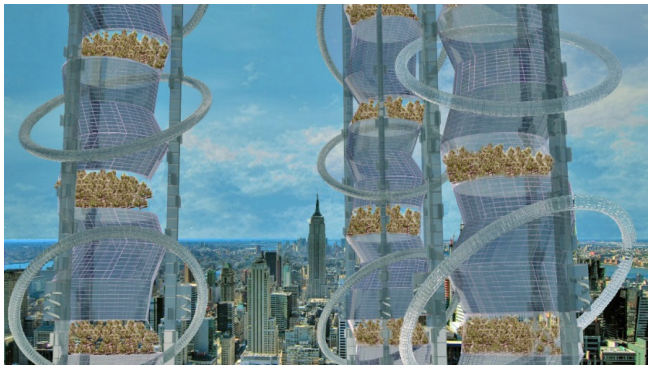

Fig. 9. Floor recreation parks and hiking trails located in bicycle wheels surrounding the skyscrapers. "Elevator annual" 2014. Competitive project № 1000001360

Fig. 10. For bike paths and for running. "Elevator annual" 2014. Competitive project № 1000001360

student Jurijs Eisaks – Construction College – Riga, Latvia, "Elevator annual" 2014).

To restore the body, residents can use sports facilities built into the structure of the skyscraper (on the roof is a bike path – Toronto); (Figure12); (conceptual innovative design,

Fig. 8. Modules without a basement. Cross section through three water vessels

1 – foundation; 2 – columns; 3 – capital; 4 – open; 5 – roof panels; 6 – board beams; 7 – inclined trapezoidal farms; 8 – roof slab; 9 – photovoltaic elements; 10 – dome; 11 wind turbine; 12 – foot foundation; 13 – water vessel; 14 – water receiver; 15 – hole for a water turbine; 16 – inclined surface; 17 – wall of the water vessel with integrated floating hose for irrigation of plants; 18 – first circulator; 19 – second circulation pump; 20 – overflow; 21 – discharge of circulator pumps; 22 – pipe

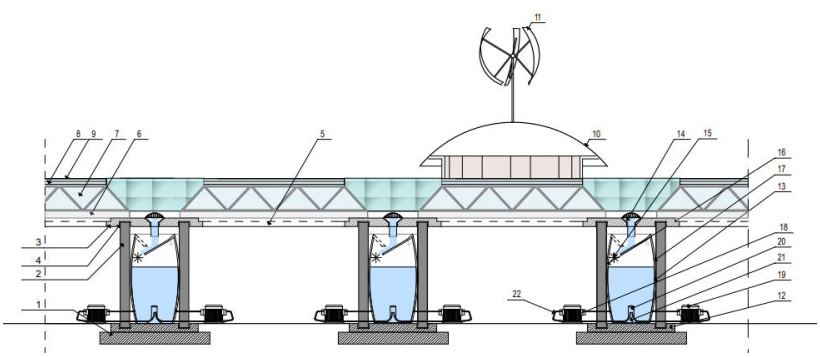

Fig. 11. "Elevator annual" 2014.
Competitive project № 1000001360. Fragment.
Vertical gondola lift

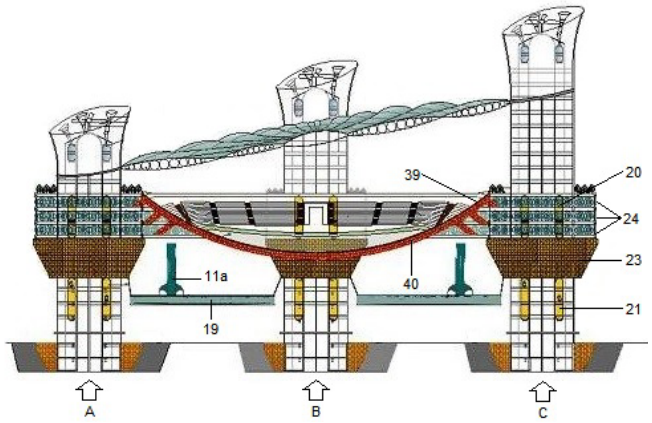

Fig. 12. Skyscraper with bike path, Toronto, Canada.
A, B, C – cores of the skyscraper; 11a – falling waterfall located in a transparent soft tube; 19 – swinging transparent aquarium, hung on ropes to the floor slabs; 20 – pulling elevator; 21 – pushing elevator; 23 – spatial formwork; 24 – three-storey structure mounted on the formwork at ground level; 39 – cycle track; 40 – the inverted shell of the cycle track 39, mounted on the ground and raised by means of the elevators 20 and 21, located in the cores A, B, C.

Yanko Aleksandrov and students Magdalena Mihailova, Kirchev), either in indoor spaces are located floor gyms serving office offices, or in external horseshoe-shaped elements (Hong Kong), covering the skyscraper or in rings like a bicycle wheel with spokes, (Elevator annual "2014), surrounding the skyscraper, too.

Employment of residents in specialized activities of clusters

Twisted skyscraper, surrounded by horseshoe-shaped elements with three and four-channel channels-floors, intended for tourism and mountaineering, and for growing fruits and vegetables; (conceptual innovative design; Aleksandrov, Aleksandrova and student Kirilov, 2014). (Aleksandrov, 2018a); (Figure13) The channels of the horseshoe-shaped elements are selectively fixed to the vertices of the triangular prism plan. Access to these channels is provided by the floors in which the elements are fixed).

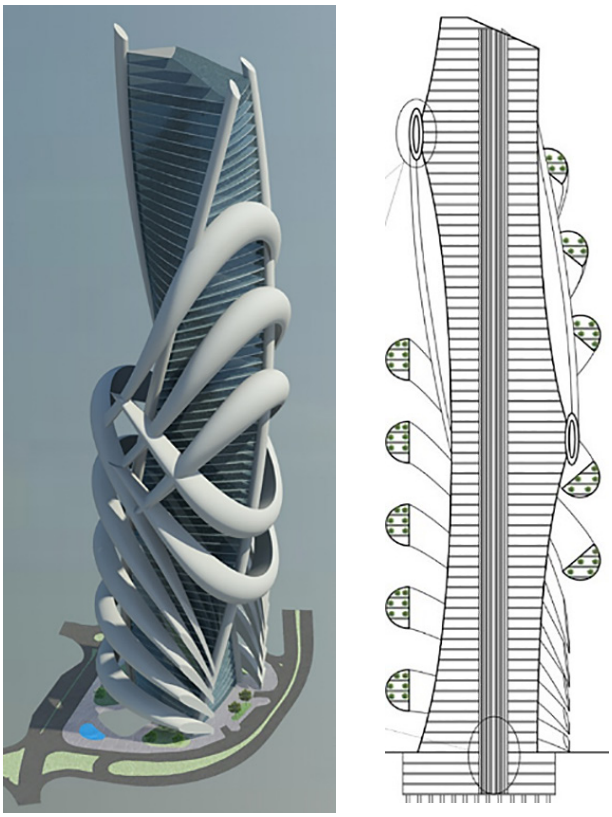

Fig. 13. Arcology Skyscraper, Hong Kong.
View (*left*) and section (*right*)

During a pandemic, it is important to ensure that residents work in compliance with sanitary and epidemiological protection measures. Suitable, according to the type of their education are: participation in cluster management; execution of online orders; participation in the cultivation of fruits and vegetables; participation in algae cultivation; fish and marine species; maintenance of the vertical infrastructure of the skyscraper; participation in medical care; participation in the educational process; participation in medical care, provided in clinics with a minimum capacity to serve residents.

Conclusions

In a pandemic, vertical clusters are a promising form for the development of agricultural production and care for the inhabitants of skyscrapers in megacities. Clusters are cru-

cial to establishing a successful business environment, where the use of innovation is a top priority. Agricultural clusters, educational clusters, medical care clusters, sports and leisure clusters, located in the skyscrapers reveal to us a new specific architectural structure.

Their joint presence in this structure guarantees independence in the survival of cities in a pandemic (COVID-19). Innovations with an inventive step, as combinations between known and new technical features, are especially important in the development of a strategy for the construction implementation and for the technical equipment of the clusters. They open up unlimited opportunities in implementing new cluster initiatives.

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