

URBAN LOGISTICS: SPREADING OF THE CITY INCREASES FOOD COSTS

Krzysztof Lewandowski

Wrocław University of Technology and Science, Wyb. Wyspainskiego 27, Wrocław, Poland, EU,
krzysztof.lewandowski@pwr.edu.pl

Keywords: urban sprawl, food, price, spatial planning

Abstract: If you want to live in city. You want to have, a house, garden and no less than two cars. Of course, you want to life in city centre. However, if price of ground is high you has decide to buy a house outside the city centre. You are not alone, because many other people think the same. Then around Your new house are placing other new houses. This process is called an urban sprawl. That is source to increasing the price of food in the shops. New territories of houses around city has extend a way of food. That is important to show how is possible to reduce these costs.

1 Introduction

1.1 Why was the city created?

When the first cities had been created in the ancient times, about 10 millennium before our ages, the sources of the food was just behind the boundaries of the settlement.

The first information's about the oldest cities we can know from the archaeological research. We know that one of the oldest cities have been located on the Jordan river valley, today in Palestine (Israel) and the Catahuyuk in

Turkey. In both of these places, the archaeologists have found a similar structure – the granaries. The granaries are the special build structures (reservoirs) for warehousing the seeds, which are necessary to baking a bread. It means that the first permanent places occupied by the settlements have been created to protection of the results of collection of the agriculture products. Today similarly, structures we can see in the Caro culture in Omo river valley in Ethiopia and in others places in whole world (Fig. 1).

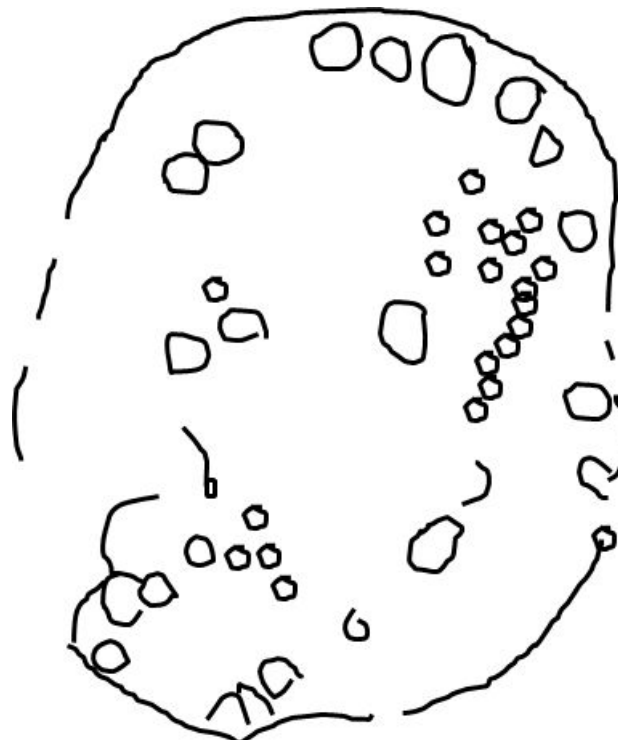


Figure 1 Scheme of Desenach village, the Caro culture, Ethiopia, based on Google Earth satellite view, small structures that are granaries (own work)

The source of the permanent settlement of people we can find in the changes of the climate. We know from drillings from glaciers of Arctic and Antarctica that about

10.5 kyr. BP the climate on earth have been rapidly changed. Rapidly means very fast. From the territory of the Ireland, we obtained information that on this island

URBAN LOGISTICS: SPREADING OF THE CITY INCREASES FOOD COSTS

Krzysztof Lewandowski

temperature changed from warm to subarctic in half of one year. The result was similarly when we moved the Ireland for the place of the Svalbard Island. The source of this was the hitting of the Earth with the space body in north Canada, Greenland Island [6]. This event changed the humidity in the air in whole Europe, north and middle part of Africa and on Near East. In these regions, have been decreasing a humidity in air and created a massive drought. Many animals escaped or was killed by people. This changed the accessibility of food. People have to change their culture of life, from gatherer hunting for agricultural breeding. People started to have the agriculture.

Probably problems of finding of the food was source of conflicts on this area. This suggestion are based from results from the massacre at Nataruk near Turkana Lake in Kenya dated on $9,680 \pm 805$ years BP [8].

When about 5 kyr BP the climate has been much more stable the people extended of the agriculture fields and started to breeding of the animals. Thanks, the agriculture the people have obtained a big volume of seeds and many people changed their professions. They started to be a Craftsman's which only produced things from skin, metal, or the clay.

Very shortly have emerged a people who only transported of these products for exchange, the merchants. That was source of trade and trade routes. Later in some villages was created a religion places and administration.

When peoples had built, the walls the region outside the town was used for placed of the manufactures or had settlements by the pauper peoples. The region of the source of the food has been moved outside. The distance of the agriculture fields to the city walls had have less than 2 kilometres. When in the beginning of the 20th century had increasing the structure extension of the rail and later of the motorization many people had decided to living outside the town and placed on the former places of the agriculture fields. The distance of the agriculture fields to the city walls had have over 10 kilometres. In this time had been created the mass production of the food.

1.2 The present seen to the city

Today when we go for shopping something to eat, we do not take into consideration what is source of the still increasing of the price of food. Current understanding of urban logistics (pol. *Logistyka miejska* - LM) relates primarily to optimize the transport and supply of state of the media with the already existing state of urban infrastructure. LM began its life in the first half of the nineteenth century, and so at greatly the existing urban development. His first steps LM started from of transport of the people by public transport and water supply and electricity, and sewage and litter. With time, the LM began to include strategic planning cities.

The city as an entity of economic and socio-economic needs to provide transportation as the determinant to maintain the basic conditions of life for residents and visitors, according to the data of the Athens of Le

Corbusier of 1933, the city is the sum of the many functions [5] (1):

$$\text{City} = \text{apartment} + \text{work} + \text{leisure} + \text{services} + \text{communication} \quad (1)$$

On local scale administrative functions of the city, they are carried out by the offices of authority municipal, treasury, judiciary, etc. The task of LM is the distribution of offices close to each other in the city centre, while other authorities assigned districts to assign the location to form the district administrative centres, located near the centre of communications or geographic region of the city.

Cities also act as centres of cultural, educational and entertaining. LM boils down to ensure good public transport and road network links and ensure a sufficient number of parking spaces in the immediate vicinity of educational centres. With regard to entertainment venues, LM involves the construction of parking spaces on the property in order to relieve the centre of the neighbourhood.

Currently, the main role of the urban logistics sees in order to minimize the external costs of transport, among others in ensuring the mobility of the population of public transport and the supply of merchandise for trade and manufacturers in the city. City logistics changes its meaning in order to meet the needs of residents and visitors due to do the coordinating the spatial plan of the city development communications plan. Translated into practice, this means that all the authorities' actions are coordinated with each other in terms of long-term goals including determining priorities for development of the city.

City logistics takes of the integrated transportation of goods is recognized as a factor influencing the fluidity of movement of goods in transit through the city, as well as the liquidity of the supply to consumers in the city and collection of the products from the manufacturers and their export outside the city limits.

Getting stronger and faster development of cities brings about a distancing the areas where is produced the food which is transported from the increasingly longer distances. This creates a conflict with the city community formed of due to increased external costs of transport supply. Effective reduction of the causes of the conflict is one of the main objectives of urban logistics.

2 Definition of the problem

The price of food in the shop is the sum of many elements.

The first is the cost of production for the farmer pf . It is sum of the seeds, fertilizers, food for animals, water, cost of the electricity ce for halls and machines, the fuel cf for the all machines, oil for lubrication of all machines and others. Based on these components is calculate the final price for the trader.

URBAN LOGISTICS: SPREADING OF THE CITY INCREASES FOOD COSTS

Krzysztof Lewandowski

The second is the profit p for the trader t and costs of the transport and management. Two last components needs electricity and the fuel.

The third is the profit for the merchant m . This is composed from the electricity and the fuel.

The fourth is the profit for the shopkeeper s . This is composed from the electricity and the fuel.

Then the total price of food is composed from (2):

$$tc = \sum_1^n cf\{pf + t + m + s\} + \sum_1^n ce\{pf + t + m + s\} + \sum_1^n p\{pf + t + m + s\} \quad (2)$$

As the conclusion is the question how changed the prices of fuel and the electricity for production of the food?

3 The analysis

3.1 Increasing of population in the cities

With the increase in the number of people living in cities is becoming increasingly important city in the supply of products essential to the life of residents in the city. Already in the 20s of the twentieth century, it was observed that the increase in population in the cities had affected by the necessity to ensure the supply of the household materials. The basic significance for urban settlements is the availability of water, sewage system and receiving rainfall and supply system in the food and highly processed elections - industrial equipment personals and household goods. Very interestingly has been wrote about in the paper of 1921. Author Eng. Adam Lewandowski pointed out that it is worthwhile to expand trade ties and expand rail transport systems that Bessarabia was part of Romania, could at its productive potential of agriculture for "provision all of Poland" in the corn [7].

Another article indicated that are needs building trade halls in the cities due to the search for "new opportunities

for sales of agricultural products from the agricultural sphere". because in towns and cities are such these problems [12]:

a) The increasingly growing number of inhabitants in the cities, especially where are over 200 thousand. People, which causes congestion and braking of traffic, which causes problems for "retail sales in the trade points and also for the trade halls or to retailers"

b) The existence of the problem of "regularity of the self-support" and "regularity of the delivery" due to the fact that the agricultural production is seasonal of which affect for the "stability of prices" for the sold products,

c) Ensure adequate conditions of hygiene for product sales,

d) The growing importance of trade in large cities, especially the "vegetables, fruits, dairy products, poultry and others" in the wholesale and retail trade,

e) Widening export capacity "of different foods, such as poultry, fish, crayfish, mushrooms, forest berries and other goods".

3.2 Urban sprawl

Studies conducted in several cities have shown that the current radius of transporting of basic foodstuffs is at least 25 km. These are mostly fresh products with a short shelf life. Other products, particularly industrial, electronics, chemicals in use are from outside these areas. These are products with a long shelf life for use and is not relevant here the date of packaging or production. The distance of the limit of 25 km has been adopted here the administrative boundary of the city. Therefore, the actual distance from the city centre to the locations of manufacture can be from 50 to 150 kilometres (Fig.2).

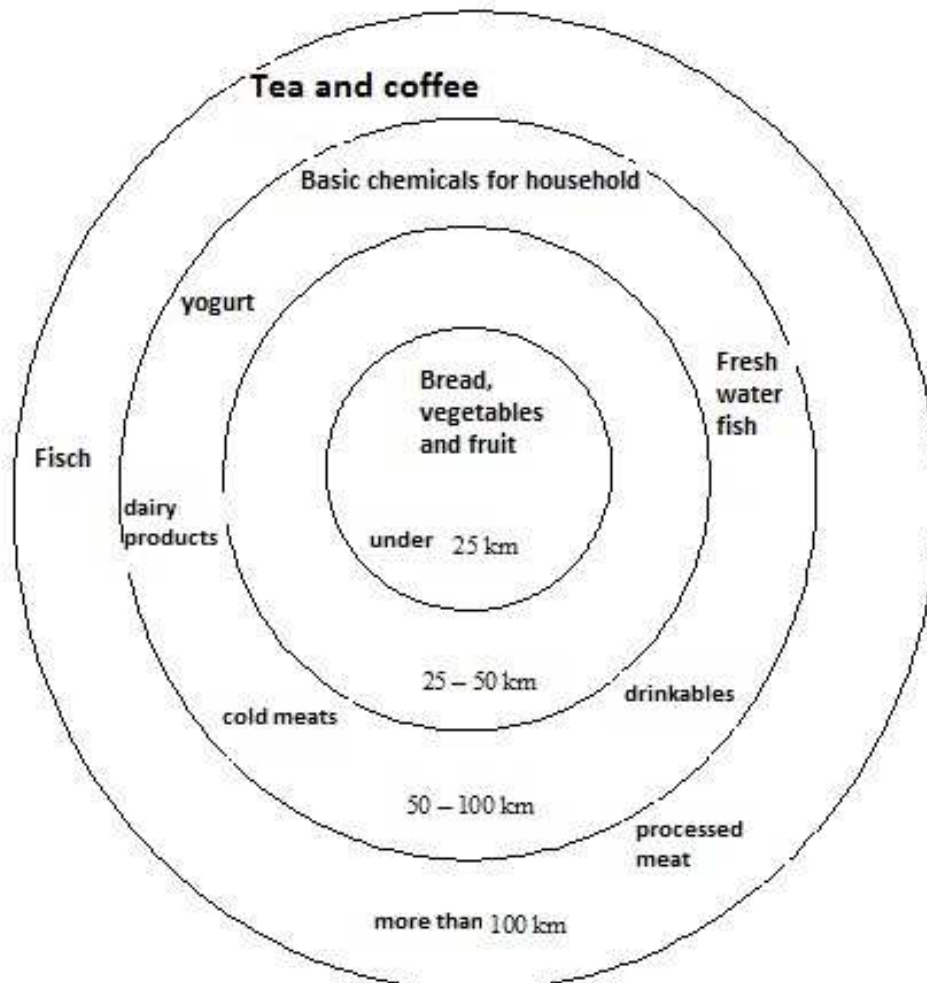


Figure 2 Radius of self-sufficiency of city and its agglomeration (own work)

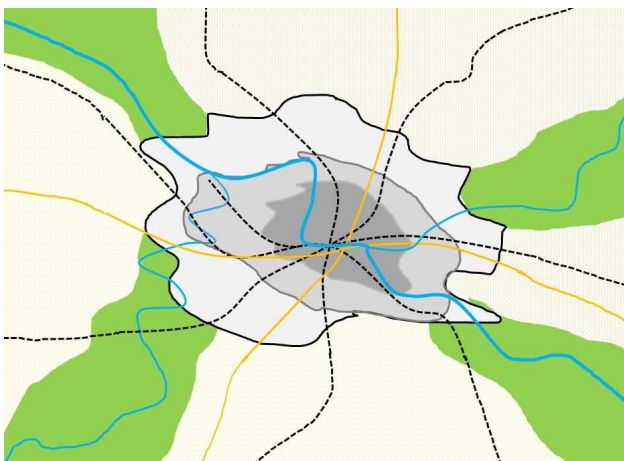


Figure 3 City and its region (own work)

More dangerous is the fact that currently approx. 70% of the food products is outside the administrative borders of the land district of the city, if not in this zone manufacturing or processing. Only the economy of scale

allows to maintain the low price of food products imported from far distances. This changed the usage of the regions, which are placed close to border of the city. Many fields had changed from the agricultures for the resident regions. Only of the regions which are placed close with the water streams or river and where are placed the wet meadows have still without the resident buildings (Fig.3).

4 How to decrease of the price of the food in the city centre?

4.1 The first step is the change of the regulation of the usage of the areas around of the city

Managers of this region should change their opinion that extended of the journey to the agriculture fields from the city can increased of the price of food. Then if the distance will be shorter, the price of transport will be cheaper.

4.2 The second step is the change of the regulation of the free trade in the city centre

Is very good known that are many countries which have small agriculture fields on the city area – the allotments. It is possible that these people's will to sell of the products – the vegetables and fruits. In addition, the owners of the small agriculture fields close to the city may sell their products. It may to create of the small fresh products markets. There may be sell by the famers with the milks and meat products based on the traditional fabrication of them.

4.3 The third step is to create of the small artificial agriculture farms on the city area so called the urban farming

It is possible to use the modern technologies of small agriculture fields. It may be:

- The house balcony vegetable gardens. It may be made from pallets or pvc pipes and other materials placed on the house balcony for supply for the kitchen into vegetables or small fruits. It may be of the horizontal or the vertical garden (Fig.4, Fig.5, Fig.6, and Fig.7).
- The vegetables houses for the small private gardens or the social gardens (Fig.8).
- The automatic containers for vegetables and fishes, as the mobile urban farming units as the community gardens for group of people from one high-rise building (Fig.9).
- The farms on the roofs of the city buildings as the "Rooftop Farms" as the community gardens for group of people from one high-rise building. Thus usage of the flat roofs is possible to builds the vegetable farms and to place of the beehives (Fig.10).

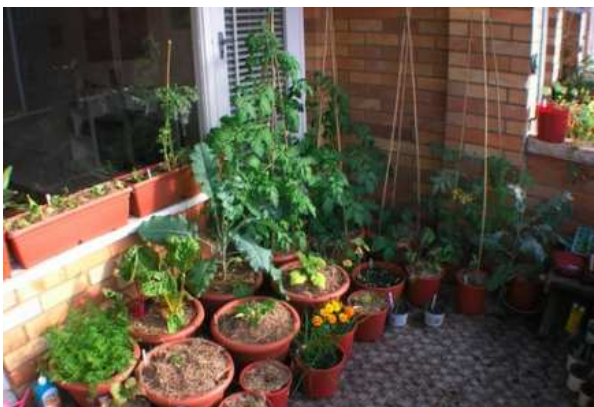


Figure 4 Balcony vegetable garden in the flowerpots [3]



Figure 5 Balcony vegetable garden inside horizontal wood pallet [11]



Figure 6 Vertical vegetable garden in the pvc pipes on the balcony [9]



Figure 7 Vertical vegetable garden inside the wood pallet on the balcony [1]

URBAN LOGISTICS: SPREADING OF THE CITY INCREASES FOOD COSTS

Krzysztof Lewandowski



Figure 8 View of the “eatable house” [10]

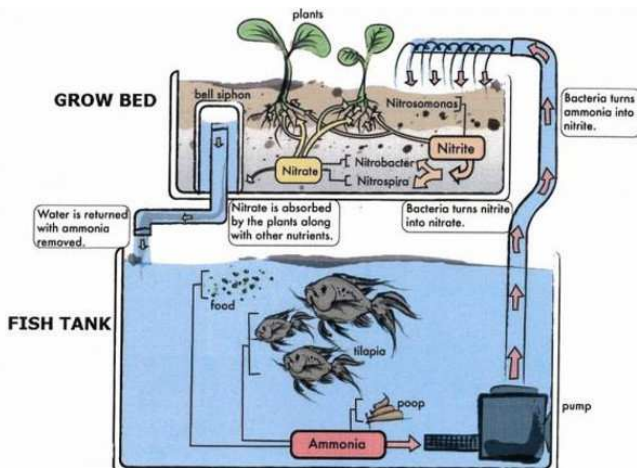


Figure 9 Scheme of the mobile urban farming unit [13]



Figure 10 View of the Rooftop farm on Long Island, NY US [4]

4.4 The fourth step is to build the special buildings for vegetables – the plant-scrapers for one city district

It will be special constructions which will be operate hydroponically farms, meaning vegetables (mostly greens) will grow without soil in a nutrient-rich, water-based solution (Fig.11).



Figure 11 View of planned plant-scraper in Linköping, Sweden [2]

4.5 Rainwater collection and usage of the treated wastewater

The increasing of the climate warming on the world may change of accessibility of the fresh water. Today we see that in many cities is the problem with this: see Capetown. Solution for this is collecting of the fresh rain water or use of the water from treated wastewater with usage of the sunlight. Thanks directly usage of the treated wastewater is possible to place the farms for production of the vegetables or seeds for bread on the city is possible to reduce the price of food.

4.6 Production of the meat

Today this is based in the animal husbandries farms. Is possible than in future we will be eat of the insects or the small animals: snails, guinea pigs or rats. Today they are eaten in the east Asia and South America. In Peru the traditional grilled dish is the guinea pig is so called in Spanish language as the cuy. It's very lean delicate meat as the young chicken. I have been tasted it in Peru in 2012 (Fig.12).

URBAN LOGISTICS: SPREADING OF THE CITY INCREASES FOOD COSTS

Krzysztof Lewandowski



Figure 12 The guinea pig as the cuy dish with potatoes on the local marketplace bar in Peru (own work)

5 Discussion

This points to the need for a strategic look at the city in the long term.

In order to ensure that in a crisis situation of supply for basic foodstuffs to life in the metropolies, their authorities can pursue a policy of logistical support for the city by:

- Coordinated management of space within urban areas in terms of land area under agricultural production and the accompanying industry.
- Spatial planning policy coordination within the city limits, part of the space should be remain as the regions and as the fields for potential security of food production in a crisis situation.
- Encourage of the traders to firstly receive any food from the nearest metropolitan region which will result in a double positive effect, will have job around there, and will be work in order to sell.
- Settlement policy coordination in the region towns, so as to achieve the effect of load-balanced of the transport axes and preventing of the urban sprawl process.
- Long term planning of the self-production for the food in cities.

6 Conclusion

Desire to stop increasing the price of food in big metropolises requires raising safety of supporting in the food from the close areas. This require the total coordination in management of space in city and its neighboring areas. This required to teach urbanists in the understanding about of the supply in the food for habitants in the designed cities. Thanks the reduction of the costs of transport of the semi products or ready products is possible to reduce the price of food.

References

- [1] Admin: Feeling crafty? Make your own pallet garden, Posted on August 2, 2017, Categories Uncategorized, Online, Available: <http://www.gemlife.com.au/news/2017/08/02/feeling-crafty-make-pallet-garden/>, [21.03.2018], 2017.
- [2] Architektura.info: Wieżowiec do uprawy roślin, 19/03/2012, Online, Available: http://www.architektura.info/index.php/architektura/polska_i_swiat/wiezowiec_do_uprawy_roslin, [21.02.2018], 2012. (Original in Polish)
- [3] BAJCZYK, D.: *Warzywniak na balkonie - czy to możliwe?*, Online, Available: <http://nowydom.pl/warzywniak-na-balkonie-czy-to-mozliwe-artykul,180.html>, [21.03.2018], 2016. (Original in Polish)
- [4] Dachy Płaskie.: Urban farming, czyli witaminy z dachu, *Dachy Płaskie*, Vol. 22, No. 2, 2014. (Original in Polish)
- [5] Karta Ateńska: Urbanistyka C.I.A.M, wyd. Koło Naukowe Wydziału Architektury Wnętrz ASP Warszawa, wydanie ok, 1956. (Original in Polish)
- [6] KJÆR, K.H., LARSEN, N.K., BINDER, T., BJØRK, A.A., EISEN, O., FAHNESTOCK, M.A., FUNDER, S., GARDE, A.A., HAACK, H., HELM, V., HOUMARK-NIELSEN, M., KJELDEN, K.K., KHAN, S.A., MACHGUTH, H., MCDONALD, I., MORLIGHEM, M., MOUGINOT, J., PADEN, J.D., WAIGHT, T.E., WEIKUSAT, Ch., WILLERSLEV, E., MACGREGOR, J.A.: A large impact crater beneath Hiawatha Glacier in northwest Greenland, *Science Advances*, Vol. 4, No. 11, eaar8173, 2018. doi:10.1126/sciadv.aar8173
- [7] LEWANDOWSKI, A.: W sprawie rynku rumuńskiego, *Przemysł i Handel*, Warszawa, Zeszyt 6, 1921. (Original in Polish)
- [8] MIRAZÓN L.M., RIVERA, F., POWER, R.K., MOUNIER, A., COPSEY, B., CRIVELLARO, F., EDUNG, J.E., MAILLO FERNANDEZ, J.M., KIARIE, C., LAWRENCE, J., LEAKEY, A., MBUA, E., MILLER, H., MUIGAI, A, MUKHONGO, D.M., VAN BAELEN, A., WOOD, R., SCHWENNINGER, J.-L., GRÜN, R., ACHYUTHAN, H., WILSHAW, A., FOLEY, R.A.: Inter-group violence among early Holocene hunter-gatherers of West Turkana, Kenya, *Nature* 529, p. 394-398, 2016. doi:10.1038/nature16477
- [9] ogrodwcentrum.pl: Wertykalny ogród w rurze, 18.03.2014, Online, Available: <http://ogrodwcentrum.pl/wertykalny-ogrod-w-rurze/>, 2014. (Original in Polish)
- [10] ogrodwcentrum.pl: Dom do zjedzenia, 23.02.2015, Online, Available: <http://ogrodwcentrum.pl/wp-content/uploads/2015/02/domek-jadalny.jpg> (Original in Polish)
- [11] SATI: paleta - dekoracja balkonu, 25.05.2017, liveitloveitblogit.com, Online, Available: <https://zszywka.pl/p/paleta--dekoracja-balkonu-3740376.html>, [21.03.2018], 2017. (Original in Polish)
- [12] SIKORSKI, B.: Miasta muszą budować hale targowe, znaczenie hal w dziedzinie komunikacji, higieny i rozwoju handle, I. Apropozycji, *Tygodnik Handlowy*,

URBAN LOGISTICS: SPREADING OF THE CITY INCREASES FOOD COSTS

Krzysztof Lewandowski

No.4. r 45. 1931, Warszawa, 1931. (Original in Polish)

[13] Urban Farmers: UF Box, Online, Available: <https://urbanfarmers.com/>, [21.03.2018], 2014.

Review process

Single-blind peer review process.