The Impact of Town-Forming Companies on the Urban Development of Monotowns, the Case of the Perm Region

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Abstract. This article presents the results of the retrospective study of city planning policies in the monotowns of the Perm region. We studied the transformation of the industrial towns in the Perm region from the pre-revolutionary period up to the current times based on the archive and cartographic data, the study of city planning documents, and field research. The monotowns in the Perm region have the typical features of soviet city planning, which did not consider terrain as a factor of people’s well-being. It was only assessed from the point of view of the convenient location of plants. This led to the current problems, including the deterioration of the urban environment and the partial de-urbanization of the territories. We found out that the existing general layouts do not take into account the changes in the impact of the town-forming companies on the urban environment and generally do not satisfy the existing demands.

1. The planning policies in monotowns

The city-planning policies of the soviet period formed a new type of urban settlements where an industrial company served as the basis of the urban structure. The impact of city-forming companies on the planning structure is underestimated and it is not considered during the development of general layouts, the key documents in land-use planning.

In this research, we studied the general layouts of the monocities in the Perm region as of 2018. Currently, there are 10 monotowns in the region.

A monotown is a phenomenon typical of the industrial stage of development in many countries, especially its earlier phases. In Russia, however, such towns were especially numerous because of the planned economy and the administrative territory zoning doctrine [1, 2]. The majority of Russian monotowns formed under a new legal framework introduced in the Soviet period, foreign threats, and the Gulag system [3, 4, 5].

During the Soviet period, many cities and towns were created in defiance of the ‘natural’ development process. They were built in places where they should not have been: in remote areas with harsh climate (Siberia and Ural). The key factor determining the establishment of a new township was industrial production opportunities [6].

The monotowns of the Perm region and their land-use planning documents show significant drawbacks that get carried over from the soviet general layouts to the modern ones without significant changes or the consideration of the current context.

The goal of this work is to demonstrate how relevant the general layout as strategic city planning and development documents are to the current situation and whether they create conditions for the...
2. The study of general layouts

The Perm region is old industrial territory. Its development started in the XVI century but it boomed in the XIX century due to the mining and metal industries [7]. The system of urban settlements in the Perm region emerged along the banks of larger rivers and near railroad stations. During the Soviet period, the location of cities and towns in the Perm region followed the pre-revolutionary patterns: larger settlements emerged near mining sites or former plant townships [8].

By the late 1930es, there emerged a trend to “improve” old plant townships using new general layouts based on the principles of the Athens Charter on functional zoning and the arrangement of sanitary protection areas around industrial facilities [9]. The industrial history of the Perm region became the basis for the construction of monotowns, whose lives were linked with their town-forming companies.

Depending on the industry, monotowns can be classified into 8 large groups [10]. Monotowns of the Perm region feature metal, timber, wood processing, as well as mechanical engineering and mining industries.

The specialization of towns, like their history, influenced their planning structure. As a result, 2 types of urban structure were formed: the pre-revolutionary one, where the settlement was built around the factory located on a bank of a river or an artificial pond; and the soviet one, where the city was build according to the functional zoning principle.

The planning structure of monotowns was based on the city-forming company. This company was surrounded by a sanitary protection area. The entrance to the plant became a landmark for the majority of the residents working at the plant. Small towns also built parade spaces for demonstrations. As production grew, so did the population of the city, which demanded the construction of social infrastructure in accordance with the existing standards. In new towns like Gornozavodsk, Krasnovishersk, and Uralsky, the number of social facilities was regulated from the very beginning. In the towns that appeared before the revolution, the urban structure underwent significant changes: city limits shifted, city centers migrated, religious buildings were knocked down along with others that “hindered” the development of the town.

The construction of the Kama and Votkinsk hydroelectric power plants also impacted the urban structure. The layouts of would-be monotowns, such as Nytre, Uralsky, Yugo-Kamsky, Ocher, and Chusovoy, were changed and their residents relocated due to the risk of flooding. This also led to the migration of the designed town center.

The field study of the urban structure of monotowns and the study of their general layouts showed that there were two urban development approaches in the Perm region: traditional and functional. This leads to the emergence of two designed centers: the old and the new one.

Cities that were founded before the revolution and specialized in metal production often feature artificial ponds (Aleksandrovsk, Nytre, Ocher, Pashiya). Teplaya Gora and Gornozavodsk appeared because there were the railroad and industrial enterprises in nearby towns belonging to the Kizel coalfield. Uralsky and Krasnovishersk are located on the banks of large rivers. Their city-forming companies deal with wood processing and paper production. They appeared because of the repressions of the 1930-40es, rather than because it was necessary to construct them.

The emergence of factories led to the arrangement of sanitary protection areas (SPA) According to the existing standards, their size varies between 300 and 1000 meters, depending on the industry and
the hazard class (see Table 1). The analysis of general layouts showed that the sanitary protection areas did not change since the early 2000s, although some companies closed and some changed their specialization.

Table 1. Sanitary protection area sizes.

| Facility type                        | Settlement                      | Hazard class | SPA size (m) |
|--------------------------------------|---------------------------------|--------------|--------------|
| Chemical facilities                  | Krasnovishersk                  | I            | 1000         |
| Industrial companies, utility and warehousing organizations; metal production and processing, mechanical engineering facilities. | Chysovoy, Pashiya, Aleksandrovsk, Nytva, Ocher, Yugo-Kamsky, Gornozavodsk | II           | 500          |
| Construction industries              | Uralsky, Krasnovishersk, Gornozavodsk, Teplaya Gora | III          | 300          |
| Wood processing                      | Chusovoy, Gornozavodsk, Teplaya Gora | IV           | 100          |
| Quarries, gravel, sand, and clay mining companies | Chusovoy, Gornozavodsk, Teplaya Gora |             |              |

The city-forming companies are the main sources of air and water pollution in monotowns. According to yearly environmental reports, we can see that the atmospheric pollution in the monotowns of the Perm region reduced significantly since 2012 due to the crises at enterprises and the reduction of outputs [11]. The chart is shown in Figure 1. This did not impact the quality of the environment because the company reduced both the production rates and the upgrade and emission reduction expenses.

![Figure 1. Atmospheric emissions of pollutants from stationary sources in the monotowns of the Perm region, tons.](image)
The Russian laws regulate the sizes of sanitary areas but there are no standards for their upkeep. Thus, city-forming companies located within the city, especially in the city center, impact the visual image of the city and its landscape. Sanitary protection areas spanning from the factory fence to the urban territory may look differently. Our experience shows that they usually feature warehouses, unkempt wastelands, or impassable thickets (Figure 2, 3).

City forming companies influenced the development and location of the factories themselves, as well as social and recreational facilities. Each of the companies obtained presentation territories, i.e. entrances. Currently, they are all in different conditions depending on the economic situation at the company and the town budget. Today, the squares in front of industrial companies lose their importance for urban life and deteriorate as the city-forming companies decline or close down. Monuments dedicated to soviet leaders and heroes are replaced with more politically neutral ones, squares turn into parking lots and transport hubs, and sometimes quiet green areas.

In the 1990es, the majority of industrial companies abandoned their social functions and handed over their social, community, and recreational facilities to the municipal authorities. The lack of funding and population decrease in the monotowns of the Perm region led to the problem of excessive social facilities that were impossible to keep in proper condition. Over 20% of public facilities were lost. It proved impossible to support social infrastructure in the context of personnel deterioration at municipal authorities. Mayor reports speak directly about the lack of qualified teachers and doctors. This leads to the merging of schools and clinics and the shutdown of kindergartens. This problem is absent from the general layouts, even though they touch upon the possible uses of the vacant territories and buildings.

A similar situation can be observed in the residential development of monotowns and the buildings on the premises of city-forming companies. The changes in the economic situation in the country and at the city-forming companies impacted the planning structure of industrial territories. Today, less than 40% of industrial territories belonging to city-forming companies are used. The majority of the buildings are deteriorating. This can be seen from the photographic evidence taken at the paper factory in Krasnovishersk, the cement works in Pashiya, and the factories in Teplaya Gora, Yugo-Kamsk, Ocher, and Chusovoy. This is also not reflected in the general layouts of the settlements. The land-use planning documents are largely standardized and formalized. The land-use planning sections describe the road network condition, city planning, and development types at best. A specific section is dedicated to the arrangement of sanitary protection areas and industrial safety. The declarative nature of these sections and the lack of analysis do not allow the administration to take relevant decisions and include them in the targeted funding programs [12].
When studying the urban structure in the monotowns of the Prikamye region, we found the following problems: the lack of a clear center and town limits, areas with the large-scale simultaneous deterioration of buildings, the destruction of historical legacy. As the population decreases, we can observe the sprawling of new developments and the formation of abandoned spaces within the city limits. Industrial cities typically lack the opportunities to engage with water bodies, as they were often occupied by factories that made them restricted and dangerous for the residents. The changes in the importance of the industrial companies proved negative for the urban structure. It leads to a number of problems ranging from the uncomfortable spaces at the factory entrances to the deterioration of plant buildings. Besides, the industrial stage of the XX century led to the formation of specific industrial landscapes, such as waste piles, dams, and buffer zones, that harm the perception of cities and make them less permeable [13].

Up until the end of the 1920es, monotowns were built as plant towns around factories. The functional zoning changes as the concepts of “garden city” and “socialist township” appeared but the basic principle of relying on the city-forming company remained. The paternalism interfered not only with accommodation and social services but also with the engineering and public infrastructures. Since the mid-1950es, the principle of microdistrict development has been applied intensively, which resulted in a “loose”, disconnected urban environment. The center of the city migrates or becomes unidentified.

3. The key drawbacks of modern general layouts of the monotowns in the Prikamye region

The analysis of general layouts and maps of the monotowns in the Perm region shows a trend to preserve the urban development approaches of the late Soviet period: the planners are certain that the population will grow, they form homogeneous functional zones, they commit to the development of the city-forming company, extensive development of new territories, and the development of infrastructure in compliance with documented standards, which are irrelevant to the current situation. The unregulated development of small towns results in the deterioration of the quality and value of urban space:
- maintaining enormous urban sprawls is beyond the means of municipal budgets, which leads to their deterioration.
- the fragmentation of urban territories forces people to spend more time in transit, often using cars;
- the population density and business place distribution in a fragmented city prevent the efficient use of the existing and newly constructed engineering and social infrastructure facilities.

We found out that strategic land-use planning documents do not consider the impact new and city-forming companies have on the appearance of the city. The analysis of general layouts from ten monotowns in the Perm region showed that there are five consolidated types of city-forming company impact on the urban environment that do not consider the existing land-use planning documents: city structure, environmental aspects, factory appearance, logistics, and infrastructure.

1. The location of city-forming companies is not viewed from the perspective of a uniform urban space. No one is concerned with how a territory of 1 to 164 hectares can fit the city structure. In seven cases out of ten, the company owns the plots next to the rivers, which leads to the devaluation of cities’ landmarks. The general layouts do not take into account the formation of an anthropogenic landscape, such as waste piles and profiled metal fences, which make the urban environment unattractive. Artificial ponds in Ocher, Nytna, and Aleksandrovo are unkempt and bogged up, which calls for their cleaning and maintaining the treatment works. The reduction of corporate responsibility of the city-forming companies to the cities leads to the destruction of waterfronts (Krasnovishersk, Uralsky, Nytna, Ocher, and Pashiya) and the deterioration of recreation sites because municipal authorities find it difficult to maintain large public spaces.

2. Environmental aspects found their way into all of the covered general layouts. The documents specify the levels of air and water pollution, the quality of vegetation and soil but they do not bring up the construction of waste treatment facilities, the regeneration of cut-down forests, and the recultivation of industrial territories. The sizes of sanitary protection areas are transferred from one
general layout to another without changes since the 2000s, even though we established that some companies changed their industry sector and large proportions of land and buildings on their premises fell out of use. For instance, there are no sanitary protection areas in Aleksandrovsk, even though the general layout developers established that some apartment blocks built in the 1950s and some family homes ended up in the area subjected to the negative effects of the Alexandrovsk Machine-Building Plant OJSC. The general layout lacks the relocation mechanisms for residents and any proposals on the creation of favorable living conditions.

General plants on the monotowns do not specify the chemical hazard classes of their respective companies. For example, there are 2 facilities in Chusovoy that present emergency threats: sewage treatment works and water supply intakes using chlorine. The metal plant in Nytva uses ammonia in production. As such, Nytva has a class I chemical hazard company, Chusovoy has a class II company, and Uralsky (Nytvenskiy district) has a class III company.

The data on waterworks that are subject to state supervision and Emergency Ministry monitoring is recorded only. There are no suggestions to facilitate strategic decisions, although Pashiya, Gornozavodsk, and Ocher feature class III facilities, which means that possible hydrodynamic accidents there may affect up to 500 residents and disturb the lives of up to 2000 people.

3. The changes in the economic situation at the city-forming companies call for the redevelopment and recultivation of the land owned by industrial companies [13]. None of the ten general layouts brings up and dwells on these questions, even though the cartographic analysis and the photographic evidence taken at the industrial companies showed a significant discrepancy between the allocated and developed territories, as well as the presence of unused and desolate capital buildings (Figure 4).

Figure 4. The premises of former city-forming company Visheralbumprom in Krasnovishersk

4. The next aspect that is not covered by contemporary general layouts is the changes in the logistics of raw material, product, and workforce transportation. Previously, city-forming companies provided their transport to commute to work. Nowadays, the commute is either funded by the city or the residents themselves, which leads to a demand for new public transport routes and infrastructure, including private garages and parking places. In many monotowns, the car became a source of income and a way to commute to work in other cities. Therefore, soviet standards on the garages and parking places used by general layout developers cannot satisfy the demands of the residents.

The logistics of raw material and product deliveries also changed along with the marketing arrangements. In some towns of the Perm regions, railway and air services were discontinued because the city-forming companies became uninterested in those and their low profitability rates. The latter
aggravated the urban planning mistakes of the Soviet period and made the remote towns hard to access.

5. The developers of monotown general layouts stay away from the problems with infrastructure. For the reasons of cost reduction, the engineering networks in all of the monotowns were tied with the city-forming plants as those were built and cities were reorganized. Such supported spaces, buildings, and infrastructure facilities proved unprofitable under the market economy, so the majority of immovable properties were handed over to the cities but they were often in disrepair [1414]. Without attempting to revise and rethink the use of such facilities, the general layout developers leave the administration with unsolved problems that can lead to major accidents, like the one in Gornoazovodsk where an accident in a boilerhouse belonging to Gornoazovodskcement led to a shutdown of heating in apartment blocks during winter. The housing infrastructure in monotowns also evades critical analysis during the development of general layouts, although the cities that were built very quickly are bound to see massive simultaneous dilapidation [15]. New technologies are ignored, even if they could improve the quality of life and reduce the costs of operating the city [15].

We established that general layouts do not interact with other municipal programs that are supposed to ensure funding and implementation of the key land-use planning document to facilitate the well-being of the residents.

4. Conclusions

The existing system of strategic and land-use planning yields inefficient standard solutions that are non-flexible and neglect environmental problems to the disadvantage of sustainable development.

The developers are still using the standard-based approach to assess the intensity of usage of various functional zones, which neglects the existing development resources and opportunities in a given territory. This one-dimensional view of a city prevents from identifying and creating opportunities for urban activity concentration and diversification depending on the structural elements of the city, such as the transport network and the city center system. The existing functional zoning ignores the uneven nature of the spatial distribution of the social activities of the residents. Traditional functional zoning methods were preserved in the post-soviet system of the urban development system. They were included in the MDS 30-1.99 Guidelines on the development of urban zoning layouts that are often used in general layout development.

The availability of a complete standard set of land-use planning documents does not warrant any successful implementation of the activities, as they are purely formal and lack the budgetary support. The developers do not use the opportunities of contemporary urban development strategy as an urban environment regeneration tool that employs master planning as an approach that is based on the consensus between the residents, administration, and interested parties, and enriches the planning system. This approach seems more efficient than the existing one, as it provides a chance to refuse centralized decision making in favor of local community interests.

The study of the existing general layouts of the Prikamye monotowns showed that they are standardized, which reflects the same uniform strategies being applied to territory development. Their formalistic and standardized nature is aggravated by the lack of correlation between these documents and their inconsistencies.

With this approach, general layouts undermine themselves as balanced urban development tools because they essentially impose generic principles of territory development without unlocking the potential of a given territory.

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