Re-Tooling Knowledge Infrastructures in a Nuclear Town

edited by Siarhei Liubimau & Benjamin Cope



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Introduction: 'Knowledge Infrastructures' As A Guiding Notion in Urbanist Research

This book started in 2016 as a search for concepts, empirical registers and urbanist tools to tackle the dead-end of Soviet industrial modernist monofunctionalism. The empirical setting for this search was the energy town of Visaginas, planned and built in the 1970s and 1980s with the sole purpose of servicing the major electricity provider to Soviet Lithuania, Latvia and Belarus: the Ignalina Nuclear Power Plant.¹ From 2010, the INPP no longer generates energy and is in the process of being dismantled. Visaginas thus is facing dilemmas over its purpose after nuclear power.

The scaffolding that gave rise to the book is five applied urbanist summer schools on the town's future, organized by the European Humanities University's Laboratory of Critical Urbanism annually from 2016 to 2020. This period involved preparatory research to make the summer schools' work processes empirically grounded, as well as the research and urbanist proposals resulting from the schools themselves (each lasting for 10-14 days) and side projects of the schools' faculty, participants and social partners. The chapters of this book comprise both research centered and proposal centered contributions, aiming to set-up and sustain an intersection of research, educational and urban development approaches to Visaginas's manifold dilemmas: all subsumed under the prefix "post-", but opening up different horizons for conceptual and applied urbanist work. These horizons involve various perspectives on mono-functionalism, the nuclear, industrialism, modernism, Soviet socialism and the Chernobyl catastrophe, as well as on exceptionalism in terms of political decision making. In order to conceptually and empir-

> 1 From 1975 to 1992 the town's name was Sniečkus (after the LSSR communist leader Antanas Sniečkus). In the book the current name Visaginas is used, also in references to pre-1992 history.

ically saturate the "post-" prefix, we initially aimed to describe and make sense of the process of the de-hermitization of city/industry relations since the beginning of the INPP decommissioning.

In our work, we soon realized that the Ignalina Nuclear Power Plant was not only an aggregation of technologies, a source of revenue, a pool of wellpaid jobs and a locus of political power; but that it was equally a knowledge infrastructure: "a network of people, artifacts and institutions that generate, share and maintain specific knowledge about the human and natural worlds" (Edwards 2010, 17). This definition implies both that any massively shared knowledge is essentially a socio-technical system and that any socio-technical system creates and naturalizes a certain mode of knowledge. Paul Edwards himself writes mainly about the elements of science and a scientific outlook, such as acknowledged facts or theories, that need to be undergirded by wellinvested and stable knowledge sharing systems consisting of data storage capacities, conference rooms, laboratories, interfaces, fellowships, libraries, the requirements and procedures involved in joining the community of scholars, etc. Our research borrows this valuable observation and its notions in order to apply them to the opening up of city/industry relations. In contrast to most of the STS sympathizing scholars of the nuclear field, whose focus is mainly spatially limited within control rooms, laboratories and the loci of techno-political decision-making, we have tried to construct a wider relational research setting and to empirically trace the social reproduction of the Soviet nuclear socio-technical system in a complex Soviet and Cold War geography, as well as in its transitions in the independent Lithuania and the EU. The Ignalina Nuclear Power Plant not only created Visaginas's economic specialization and political function: it also disciplined its population, generating solidarity among them and defining the

perspective on here and there, past and future, us and them. In this light, de-industrialization leads to the disruption of the established modes to produce and distribute knowledge, for the closure of any industrial facility is a breakdown of specific forms of collectivity and of their relation to both their interurban and intra-urban environments. This is especially relevant in the Soviet context, where living and social reproduction environments were deliberately measured as expressing a given site's productive character in the frame of the all-Union economy.

When the Visaginas Business Incubator was launched in 2003 to tackle the negative economic consequences of the expected INPP decommissioning, its first challenge was that of the disorientation of the town's professionals, whose productive environment had become disconnected from the Soviet Ministry of Medium Machine Building (MMMB, Sredmash)² nuclear network, but remained part of the Soviet-made regional energy grid connecting Lithuania to Latvia, Estonia, Belarus and Russia. As the then Business Incubator director recalls, her first successful project was the creation of a Visaginas bookkeepers' and finance department workers' club: a forum for them to collectively make sense of and normalize the new institutional and legal reality of independent Lithuania. Visaginas bookkeepers at that time simply did not understand much Lithuanian language and could not follow the legislation changes, hence they needed a discussion platform to catch up with these changes in a rather informal format. In her interpretation, this was not only about adapting to the process of industry nationalization and getting access to relevant information, but also about countering the effects of the top-down

> 2 Sredmash – the Soviet 'nuclear' Ministry of Medium Machine Building (MMMB). In Russian: Средмаш, Министерство Среднего Машиностроения.

planning that had from the start been a key characteristic of Visaginas. This project worked well and paved the way for the Incubator's further work on re-tooling Visaginas as a business environment. This example of the bookkeepers' club is a confirmation and guiding sign for us that cities are generated as historically varying ecologies of knowledge creation, maintenance and transmission. It is thus an example of a short-term, but crucial, crisis driven knowledge infrastructure. In 2020, according to the ex-director, the Business Incubator's mission is different, as Visaginas professionals are already well integrated into the national legal and administrative processes, while vast amounts of information about starting and running a business are freely available.

Knowledge infrastructures constitute a distinct line of understanding and explaining the historical changes of city/industry relations. Any case of industry transformation (in terms of shifts in institutional regulations, expansion or shrinkage of markets, fundamental technical breakdowns and upgrades) creates a challenge to find appropriate scales and facilities for a meaningful information ecology. In this respect it is relevant that within discussions on perestroika in Visaginas local newspapers, the craft of sociology and the subject of public opinion was a prominent topic (for example, Peaceful Atom 1988, 11). Moreover, the articles emphasized that it was precisely the perestroika context that had strengthened the role of sociology by revealing that top-down planning and management result in an information vacuum. It was advocated that the different enterprises within the INPP and Visaginas structure should have a sociologist among employees to monitor the collectives' dynamics in rapidly changing administrative and economic conditions. The lack of publicly available and discussed information about Visaginas's social properties, economic base, cultural milieu, etc. was considered one of the risks



Fig. 1. Visaginas Educational Institutions.

facing the town. This was especially significant for the debates about the dis-integration of the INPP and Visaginas from the Soviet Ministry of Medium Machine Building organizational structure and their integration into the Lithuanian Soviet Socialist Republic.³ Such discussions of publicly shared and available knowledge were widely spread everywhere throughout the USSR in its final years. Yet the INPP and Visaginas are remarkable in this respect, because of their exclave socio-spatial properties and their institutional Cold War military lineage.

Making knowledge infrastructures a lens on the process of social reproduction has made it possible for this book to reveal the essentially networked character of Visaginas as a Soviet nuclear site. One can find uses of the 'Archipelago Sredmash' trope, in analogy to the 'Archipelago GULAG', in order to describe the networked, island structure and overregulation of the MMMB sites in the USSR.⁴ A knowledge infrastructure lens enabled distinguishing this MMMB

3 For example in the perestroika period debates about granting Visaginas the status of a town, instead of that of a settlement managed by the Ministry of Medium Machine Building and its Western Directorate for Construction.

4 Its initial military specialization determined the path of the MMMB's further development (see the chapter by Liubimau in this volume). For example, waste from the sites of the USSR Ministry of Defence in Hungary, Czech Republic or the GDR (not necessarily radioactive, but hazardous) were brought to other MMMB sites (primarily to Chernobyl). One of the first USSR nuclear locations, Chelyabinsk-40 was not only a productive site, but also specialized in processing used nuclear waste (from the USSR, Hungary, Finland, GDR, Czech Republic, Slovakia and Ukraine). site's networked character from the prevalent capitalism driven logic of connecting places via both industrialization and de-industrialization, growth and decline. Visaginas knowledge infrastructures today are the individuals, institutions, facilities, artifacts and strategies whose responses or passive uses create the network of meanings for the course of embedding the town into the institutional and infrastructural context of the EU economy. culture and techno-politics. This book recognizes the historical role of knowledge infrastructures in generating urban environments; but focuses primarily on the Visaginas condition after nuclear power. Although both research arguments and urbanist proposals are disciplined by historical facts, the major scope of the book is the period from 2016 to 2020. As a result, the book is a longitudinal overview of situated urbanist work with a vast array of methods employed. The main methods are expert, biographical and semi-structured interviews, participatory mapping, document analysis, feedback on urbanist proposals, excursions, and civic urban living labs as both umbrellas for a combination of different methods and as a tool to receive feedback on an urbanist proposal or provocation.

The multi-sited approach to knowledge infrastructures utilized in the book and the respective research and design methods made it possible to go beyond static depictions of Soviet nuclear towns as 'exemplary' or 'symbolic of the Soviet project' 'sotsgorods' (soc-towns), often proposed by both social scientists and by architectural history and heritage scholars (Baločkaite 2010; Brunn et al 2020; Cinis et al 2008; Guth 2018; Wendland 2019). In such depictions, the urban environment is often reduced to a curious exhibit, merely standing for previously defined principles. On the contrary, the focus of the book is on the dynamic process of the generation and negotiation of such an 'exemplary' urban form: both at the stages of planning and building, and at the stage of its institutional and infrastructural re-tooling to adapt to the new post-Soviet, EU conditions. The analysis of the Visaginas environment as one of dynamically changing knowledge infrastructures, as well as reflexive participation in this change has also allowed the co-authors of the book to go beyond and criticize the 'post-industrialist' lens on the town's current conditions. The complexity of the INPP dismantling process, the strategic issue of funding the INPP dismantling for Lithuania/EU relations and the re-industrializing ventures indirectly stemming from the human and material infrastructures associated with the INPP all suggest that in relation to nuclear technology the absence of economic productivity does not mean de-industrialization. Moreover, on a more abstract level, one could say that the temporal frame of nuclear waste makes the notion of post-industrialism irrelevant. In this respect, Visaginas today is not in ruins or decline, but a site whose high technological future is defined for decades or even centuries ahead.⁵

The main spatial site that framed our research and design work on Visaginas knowledge infrastructures relevant in 2016-2020 is the town's public library, which we see as a strategic institution and facility in the process of the disconnection between the INPP and the town. Although this work has resulted in concrete design proposals, the library building was only a starting point and a puzzle to identify and start redesigning spatial and social connections within Visaginas knowledge and cultural sectors, as well as their relations to other forms of spatiality. We have worked on the scale of a particular library building in

> 5 The temporal frame of nuclear waste has recently been articulated in the context of the broader environmental tensions of the early 21st century. See, for example, Vincent Ialenti (2020).

cooperation with its administration, but equally were studying related communities and institutions both in Visaginas and outside, whose functions actually or potentially overlap with those of the library. In our angle of research and our urban development scenario, the library is not so much strategic in itself, but rather a centre of attempts to develop modes of generating, sharing and maintaining knowledge among and about the Visaginas population, institutions and amenities independent from the INPP (Fig. 1). Because of this, our work was essentially a research grounded process of enhancing the multi-functionality of already existing facilities, institutions and informal initiatives. Although the focus was on a large and diverse range of functions to be married within the library infrastructure, in the book chapters it is the musealization function that gains most attention. This is the case because of the high political - both positive and negative - potential of this only evolving function. There is no town museum in Visaginas at the moment and no consensus vet about what should be memorialized and how.6 How should one include the history of the Soviet INPP in the Lithuanian national narrative? Is it a powerful instrument of occupation? Or is it the biggest and the most productive industrial facility in Lithuania ever? How to narrativize the Chernobyl catastrophe and its biological and political aftermath? The relations between archive and display in the light of a certain po-

> 6 The absence of any Visaginas urban history prior to the INPP aggravates the troublesome process of musealization and defines the possible paths of Visaginas identity building today. The town's first museum was opened in the library building already in 1987 and included photographs of the Visaginas construction process, as well as materials about the LSSR communist leader Antanas Sniečkus (from 1975 to 1992 the town's name was Sniečkus).

litical purpose is a function shared by both libraries and museums. In this vein, to regard these relations in the light of the puzzles of urban development after nuclear power is to exploit the knowledge infrastructure notion's potential in a process of reconfiguring city/industry relations.

In addition to a deliberate enhancement of the multi-functionality of existing institutions and facilities, this book documents authors' conceptual and design endeavours to guestion the spatial boundaries of knowledge infrastructures inherent in Soviet modernist spatial planning. Or, in the vocabulary of critical urbanism, to re-scale those infrastructures. These boundaries are anyway being increasingly destabilized by the ongoing expansion of the digital domain, in which all major forms of sociality - from statehood and job market to family, upbringing and interpersonal attention - are being transposed to new forms and spaces. Remarkably, the key factor increasing the interest in the notion of knowledge infrastructures today is digitalization and the risks to the habitual systems of knowing it poses (Edwards et al. 2013). Some call this process a 'platformization of infrastructures' (Plantin et al. 2018), suggesting that programmable, private, competitive and frequently updated digital platforms challenge the dominant logic of large, stable, universally accessible and administratively managed infrastructures. Here a space is open to hypothesize that the current path of digitalization largely continues and reinforces the neoliberal restructuring of human environments starting from the 1970s. At the same time, Plantin et al. point to a parallel process of the 'infrastructuralization of platforms', which means a solidification of the critical role of the most successful and ubiguitous digital services. Such a lens suggests that platforms like Google and Facebook are turning into infrastructures: i.e. are becoming as critical and publicly significant as railway and canalization in the 19th and early 20th centuries. The timeframe of the work on this book from 2016 to 2020 enabled an embracing of the platformization tendency, as both an instrument of manipulation and as a potential tool of emancipation.

Thus, the focus on the dynamism of constitutive knowledge infrastructures of Visaginas as a Soviet modernist MMMB town makes it possible to scrutinize the 2010s' intersection of infrastructuralization and platformization processes and their outcomes. The constitutive Visaginas knowledge infrastructures are: the institutions and technologies making the nuclear industry; negotiated through time urban planning approaches and templates; facilities and human capital for education and upbringing; cultural institutions: memorialization artifacts and initiatives: narrative and visual dimensions of outdoor and printed press design, etc. The most radical pragmatic guestion when thinking in such a direction is: what can and what cannot be platformized in the specific MMMB city/industry relations? Working with it allows the posing and unpacking of many interim and less pragmatically sharpened questions both about the urban form and process generated by the nuclear industry worldwide, and about the impacts of digitalization on modernist modes of inhabiting and knowing in an urban environment. The guestions and answers presented in the chapters of this book are focused on Visaginas empirical settings. but also address prevalent theories and approaches in urbanism in the early 21st century.

The introductory chapter by Siarhei Liubimau examines the institutional lineage of Visaginas and the dynamic process of the generation of its urban form, as well as the town's conditions after nuclear power. Based on this analysis, the chapter argues that there are four constitutive features of urbanism related to the Soviet nuclear industry. The first feature is the essentially planetary character of Soviet nuclear sites due to the potential consequences of nuclear fission and fusion for the global biosphere. This planetarity has a military Cold War foundation and is essentially a condition of controlled multi-scalarity. In this respect, it is different from the hegemonic conceptualization of planetarity as an outcome of capitalist globalization. The second feature is the factor of the Soviet nuclear Ministry of Medium Machine Building in the process of the institutional and normative generation of Visaginas city/industry relations. The chapter reveals and analyzes the socialization and professionalization environments available to the Visaginas population connected to a broader, exclusive, semi-closed Soviet nuclear 'archipelago' and to a broader energy system with economic and techno-political goals. The third feature is the exclave socio-spatial character of Soviet nuclear towns. The chapter focuses on specific notions of comfort, belonging and order crystallized in urban planning approaches rooted in the VNIPIET Institute as the main urban planning and engineering authority in the MMMB network. The fourth feature is the impossibility of the full de-industrialization of the nuclear facility due to the engineering and institutional complexity of nuclear power plant dismantling and due to the temporality of nuclear waste management.

The chapter by Andrei Stsiapanau analyzes Ignalina Nuclear Power Plant as a factor of politics and institutional change in the Lithuanian Soviet Socialist Republic and in independent Lithuania. In order to explain the specificity of the transition of the INPP from Soviet to Lithuanian rule, the chapter deploys the concept of a technopolitical regime and describes its main elements. It shows that in the period of planning and construction in the 1970s, the Moscow controlled INPP project provoked only weak resistance from the Lithuanian scientific community and bureaucrats. However, after the Chernobyl catastrophe in the late 1980s, it became one of the key themes in the struggle of Lithuanian civil society for sovereignty and for control over domestic resources. The chapter documents the INPP related institutional transformations since Lithuania obtained independence from the Soviet Union and dwells on the controversies in this transformation process. Already in the 1990s, the public discussions about the INPP shifted focus from the issue of nuclear facility control vis-à-vis the USSR to the issue of Lithuania's energy independence vis-à-vis Russia. In the 2000s, the INPP topic was re-politicized in the course of Lithuanian accession to the EU. The chapter concludes that in its post-Soviet context the INPP became more open for external impulses in the form of political decisions, referendums or reforms. as well as in the form of debates on social. ethnic and cultural issues. Nevertheless, the exceptionality of the nuclear facility was retained and reemerged in issues of nuclear safety, national energy security and Lithuanian membership in the EU.

In the third chapter, co-authors Iryna Lunevich and Lívia Gažová analyze the media packages of the INPP construction and dismantling processes. Based on empirical work with publicly available mass media materials, the authors show that, rather surprisingly given the different political contexts in which construction and dismantling occur, the two share striking similarities: both media packages accentuate the technical aspects of construction and dismantling, and stress mainly factual information, marked by the terminology describing equipment and materials (especially their quantitative aspects). Besides, both media packages prioritize the topic of the schedule: in the former case to motivate workers. and in the latter case to convince readers that the schedule requirements agreed with the EU as the major dismantling sponsor will be met. The differences in the two media packages identified by the authors lie mainly in the depiction of humans. In the

case of the construction media package, humans are in the centre of the story: not only in terms of personalized professional achievements in the course of the construction process, but also in terms of those persons', albeit highly schematic, life trajectories. In the case of the dismantling media package, workers of the INPP are deliberately excluded from the publicly available story. Moreover, the passive voice of the stories implicitly creates an impression that humans - excepting key political figures - are not involved in the dismantling process at all. Another difference between the construction and dismantling media packages that the authors identify is the articulation of the relationship between the INPP and the town taking place only in the case of the construction media package. According to the authors, in the dismantling media package the issue of the town is not present due to its inability to address the socio-economic consequences of the INPP closure.

The chapter by Michal Lehečka, Miriam Nessler and Siarhei Liubimau constructs the Visaginas environment as an empirical setting for a discussion of the process and outcomes of housing privatization in the CEE after socialism. By placing the Visaginas case in mainstream conceptualizations within this topic, the authors trace how the housing privatization process in Visaginas was impacted by the type of industry, ethnic and professional identity of the town residents, as well as by the urban planning decisions taken at the time of the town's founding. As a result, the Visaginas case is discussed as "a productive challenge for the application of a conceptual ensemble for tackling the privatization of housing in the CEE after socialism." First, the authors show how the strategic significance of the nuclear industry has suppressed the culture of privatism and a social Darwinist orientation both in late Soviet and post-Soviet contexts. This culture and orientation are often discussed as inevitable outcomes of transformations after socialism. Second. the authors observe that the scale of the INPP technology in the independent Lithuania and in the EU hindered the process of the de-centralization of resource acquisition characteristic to other urban environments linked to Soviet and socialist industrial enterprises. In 2020, the centrally secured INPP budget continues to be a major factor of well-being of Visaginas residents. And, third, the authors show that housing was not an unbundled arena central to social transformation (a configuration that gives rise to a privatism culture), but embedded in a wider holistic teleological urban planning template. This template enforced egalitarian values on Visaginas society via dense welfare infrastructures and well invested open public spaces.

Alla Pigalskaya's chapter dwells on the visual communication in the Visaginas outdoor environment and printed media. The author traces the significance of typeface for modernist design in general and singles out specific features of Soviet modernist visual communication. She reveals an unexpectedly artisanal nature of Soviet modernist typefaces and thus suggests that the production of Soviet modernism in a local context by manual labour is substantially different from the design practices in Western societies. If in the West creativity was mainly employed in the creation of the model to be copied, in the Soviet Union creativity meant manual fabrication of typefaces intended to look like mechanical copies. This reveals a situation when design creators' efforts (and those of other professionals too?) in the Soviet context was very much needed, but was not properly organized and moreover was constantly homogenized and de-personalized by the state according to its political and aesthetic principles. The universal rationalization and homogenization principles of modernist design, thus, had very different infrastructures in Soviet and Western societies. In the

modernist West, a design template was a means to homogenize, measure and tame the environment; while in Soviet modernism, the template was not the means, but the end to camouflage existing shortages and discrepancies with proclaimed values. As a result, the author poses more general conceptual questions not just about Soviet modernism as an aesthetic artifactual phenomenon, but about Soviet modernity as a normative phenomenon and about the role of designers in it.

The chapter by Siarhei Liubimau, Miodrag Kuč, Dalia Čiupailaitė, Paul Marx, Till Mayer, Thomas Rettig and Johanna Betz is a summary and reflection on the research and design work on the functional re-programming of Visaginas public library. This re-programming was disciplined by two strategic challenges the town's structural context poses: how to combine national Lithuanian and external nuclear dimensions in Visaginas development and planning in a long-term perspective, and how to build upon and strengthen the exclusive welfare infrastructures inherited from the town's nuclear energy period. These challenges were addressed by the "Knowledge Park": an urban scale scenario for the development of Visaginas public knowledge infrastructures. The library building served as a centre of this scenario: as a puzzle and as a material scaffolding for research and the design of a knowledge infrastructure which would appropriately address the town's current development dilemmas. In terms of values, we were guided by the principles that the library should significantly strengthen its role as a public agora and that it should more actively respond to the diversification of modes of knowledge production due to the prominence of the digital realm. When translated into design, these principles resulted in the institutional and infrastructural hybridization of the building in terms of combining digital and analogue formats, in terms of enhancing diversity of social groups of users through greater accessibility and

more appealing attractors, and in terms of merging already existing Visaginas institutions and initiatives in the projected uses of the library space. The resulting proposal implied a sensitive re-programming of a modernist building (without demolition), as well as an integrated development of Visaginas cultural and knowledge sectors on the scale of two micro-districts.

In the next chapter, Bogdan Kapatsila reflects on his involvement in urbanist projects which developed scenarios of turning public libraries' spaces and institutional set-ups into nodes of innovation and lines of alternative development in de-industrializing towns. He compares his work experience and results in Visaginas in Lithuania and in Kramatorsk in Ukraine; and positions these towns' current libraries in broader urban transformations and their challenges. He observes that it is most often not physical constraints, but the management and service provision practice in post-Soviet libraries that contribute to the creation of their image as static and outdated. He analyzes libraries' spatial forms and societal functions in a long durée in order to suggest how post-Soviet libraries can be turned into niches for spatial practitioners and social innovators who intend to initiate change on the city scale by means of acupuncture work at the level of a single building. In line with the current environmentally sensitive take on construction and demolition cycles in human activity, the author advocates a revamping approach in contrast to demolishing and erecting spectacular new buildings. Generally, Kapatsila's chapter offers an instrumental perspective of how to apply the popularization of urbanism and human oriented design thinking to problems in social and economic transformation after the USSR.

Monika Pentenrieder and Benjamin Cope look at the Visaginas environment as constituted as a result of human migrations. They trace and explain different logics and trajectories that these migrations have had in the town's different historical periods. The authors note that despite the crucial role migration had in constituting the town's material and human infrastructure, the migration factor is hardly addressed by the town's cultural and knowledge sector institutions. According to the authors, as a small town with intense mobilities and a multi-ethnic heritage, as well as international (both highly institutionalized and informal) connections. Visaginas deserves an institutional and infrastructural set-up that would analyze, make visible and steer the migratory aspect of urban development. The chapter summarizes the authors' fieldwork in Visaginas in 2016 and explains the relations between migration and knowledge production in the town's particular settings. This summary is discussed in the context of current broader debates about cities as super-diverse due to migration; and in the context of Visaginas's current organizations only partially managing to address the variety of implications migration has for the town today. This fieldwork informs the authors' proposal for a hub of municipal translocalism potentially embedded into the public library. The basic form of this hub is an interactive map and its supporting human infrastructure that stimulates civil society horizontal and inclusive control of various Visaginas anchored migration processes and outcomes.

In a similar fashion, the chapter by Martynas Germanavičius and Mažvydas Karalius develops a design proposal based on an analysis of the problematic political and cultural reception of the aftermath of the Chernobyl catastrophe by Visaginas dwellers. With the help of approaches to memory work by Halbwachs, Ricoeur and Nora, the authors conceptualize the Visaginas environment as a set of memory infrastructures; and reflect on the aspects of nuclear modernity that provide possibilities for memorialization in the Visaginas landscape. They write about the inevitable trauma of the Visaginas population resulting from the Chernobyl catastrophe: not only due to the risks it posed to Visaginas as a nuclear town, but also due to the town's connection to the Chernobyl settlement Pripyat via the group of disaster liquidators who went to work in the aftermath of the accident in 1986. The analysis of this group's activities and frustrations clearly shows that the question of the political meaning of the Chernobyl disaster in wider Lithuanian society is still open. In order to unpack the political question of "how to memorialize nuclear disaster?" and the design guestion of "how to represent contamination and its effects?", the authors review and interpret political controversies of existing urban artifacts constituting Chernobyl memory infrastructure in Visaginas. Based on this, they suggest alternative ways to memorialize this tragic event and to speculate about the future of the nuclear industry and the urban settlements this industry gave rise to. The overarching design goal is thus to curate an open remembrance process which addresses all the variety of society in Visaginas and beyond.

Finally, the chapter by Benjamin Cope, Oksana Denisenko and Alla Pigalskaya reports and reflects on a series of research and design workshops with the goal of developing styles and formats of Visaginas musealization. The results of this research and workshops were presented at a public exhibition in Visaginas Cultural Centre in 2018. Critical cartography and silk printing were two realms of practice that guided the exhibition designers to the final form of their objects. Besides, the chapter's authors explain the experimental cross-sectoral character of the exhibition: relevant both on the level of teaching and learning design, and on the level of real-world organizational work in a municipal cultural sector organisation. In their interpretation, although the exhibition project became possible due to the author's positions in their respective educational and cultural institutions, in realizing their cooperation the authors had to act in spite of those institutions' established modes of activity. This chapter's authors suggest that design and institutional dimensions are intertwined, and thus show how the cultural sector is a knowledge infrastructure which can be opened for re-tooling.

In 2020 there are 408 nuclear reactors operating worldwide, with the mean age of a reactor being 31 years old and 20% of the nuclear reactor fleet being over 41 years old (The World Nuclear Industry Status Report 2020). In addition to this, there are 31 reactors worldwide in the phase of being closed down. Given the fact that the mean age of decommissioned nuclear reactors between 2015 and 2019 is around 42 years; the fact that 40 years is considered to be a conventional lifespan of a nuclear reactor; and the fact that the mean age of a nuclear reactor has been rising since 1984, the issue of planetary futures after nuclear power is increasingly acute. One could expect more and more cases where research grounded urbanist re-conceptualization and re-tooling after nuclear facility decommissioning is required. Such potential cases are located in different world regions, with specific sets of nuclear entangled economic, political, military and scientific complexities. This book proposes to scrutinize variable and invariable space/society relations inherent in nuclear development in order to build a multi-scalar research and design scaffolding for nuclear industry sites after their productive phase. Both the temporal and spatial complexity of these sites has strong resonance with attempts to think and practice social and natural worlds with a planetary sensitivity. In the chapters below, we show how critical urban studies as a research agenda and critical urbanism as applied work on the environment nurture such sensitivity by re-tooling the knowledge infrastructures of this particular site with its real-world dilemmas.

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Nuclear Urbanism: Visaginas As A Research Field

Is There a Nuclear Urbanism?

Introduction⁷

This chapter argues that there is a distinct mode of urbanism characterizing the Soviet nuclear industry. Its four co-constitutive features are: first, an embeddedness of nuclear sites into a Cold War planetary infrastructural totality via the risks nuclear technoloav poses: second, an institutional and normative isomorphism of the network of Soviet nuclear sites via the controlled distribution of a mobile workforce and strategic technologies; third, the particular meanings of comfort and belonging, as well as respective planning practices, crystallized within this network that result in the exclave socio-spatial condition of a Soviet nuclear town: and. fourth. an impossibility of full de-industrialization due to the highly demanding standards that need to be met when dismantling nuclear facilities and due to the necessity of nuclear waste management in a timeframe of hundreds and thousands of years. The empirical setting for the development of this argument is the town of Visaginas in Lithuania, built from 1975 to 1990 to service the Ignalina Nuclear Power Plant, From 1975 to 1992 the town's name was Sniečkus (after the Lithuanian communist leader. Antanas Sniečkus): and from 1992 - Visaginas (after the adjacent lake).⁸ The Ignalina Nuclear Power Plant produced power from 1983 to 2009; and is expected to be fully dismantled by 2038.

I started research work on Visaginas transformations after nuclear power in 2015, and soon realized that in order to adequately study its urban form and

> 7 I advanced the arguments of this chapter thanks to the comments of Benjamin Cope, Andrei Stsiapanau, Asta Vonderau, Katja Mueller, Nikolaos Olma and Miodrag Kuč.

> 8 Throughout the paper the current name Visaginas is used, also in references to pre-1992 situations.

social processes I have to ask both empirical and conceptual questions about the wider network of Soviet nuclear sites. This network was developed by the Soviet Committee for State Security from 1945 to 1953 and by the Ministry of Medium Machine Building (MMMB)⁹ from 1953 to 1989 (in post-Soviet Russia, this was succeeded by the Rosatom corporation). Empirically, my argument is disciplined by nearly a hundred biographical and semi-structured interviews with different generational and professional cohorts of the Visaginas population.¹⁰ These semi-structured interviews concerned urban planning and development possibilities, constraints and conflicts in Visaginas at different historical moments. Research partners were chosen from those involved in the town's planning and building, and in its transformation after the INPP decommissioning decision in 1999. Biographical interviews concerned the trajectories of professionalization of different generations of Visaginas dwellers and of their family members. This made it possible to identify and interpret Visaginas's material and human infrastructure as essentially MMMB networked in the Soviet period. as well as to identify and interpret the individual and institutional responses to Visaginas's disconnection from the MMMB network after 1991. Additional sources of empirical material were expert meetings with Visaginas governance personnel, entrepreneurs and civil society members focused on the issue of the town's strategic development agendas; the analysis of particular investment packages aimed at re-tooling and re-valorizing the town's facilities or at the creation of new production facilities; as well as public feedback to the results of applied urbanist summer schools on Visaginas futures after nuclear

> 9 Министерство Среднего Машиностроения, Средмаш.

10 The interviews were conducted in the period from 2016 to 2020.

power, co-organized by me on behalf of the European Humanities University's Laboratory of Critical Urbanism annually from 2015-2020. On a conceptual level, the aim of this paper is to show that the nuclear industry and the concomitant institutional and cultural context of the Cold War have created a demand for a deliberately multi-sited and multi-scalar study of the urbanization process. In contrast to the hegemonic urban research strand promoting a multi-sited and multi-scalar lens on how capitalism constitutes the planet, I develop an alternative lens focused on an exceptionally controlled multi-scalarity of Cold War military lineage.

Nuclear Urbanism as a Way of Life Without an Outside: the Cold War and the Planetary Urbanization Perspective

Isomorphism between socio-economic systems and technical systems is widely documented in social studies of technology." In the last two decades, exploration of this isomorphism has become a source of innovations in social studies of urban development and planning (Graham 2000; Guy, Marvin and Moss 2001; Graham 2001; Hodson and Marvin 2010; Murphy and Carmody 2019). Often the focus on energy infrastructures is especially fruitful in shedding light on interrelations between politics of urban transformations and transitions of technical systems (Moss 2014; Becker, Beverige and Naumann 2016). Prioritization of energy infrastructures in social research on cities is particularly relevant for the former Soviet Union, where the development of the energy sector was a major instrument of domestic state building from the 1920s (Scott 1998; Josephson 1999; Collier 2011; Rogers 2015) and of international relations

starting from the Cold War (Bouzarovski and Bassin 2011; Hoegselius 2013; Cederlof 2020). One of the outcomes of this role of the energy sector in USSR statehood is the situation whereby Soviet energy infrastructures are over-centralized in comparison to the West.¹¹ Some scholars like Paul Josephson (1995) point out that industrial gigantomania is one of the features of Soviet society.

On an urban scale, such over-centralization has manifested itself in the aggregation of energy infrastructures in monofunctional settlements. This type of settlement has fundamentally different relations to its wider surroundings than the organically growing urban settlements of modern capitalist societies. The towns and cities of capitalist modernity are the results of the accumulation of material wealth based primarily on private interest. The infrastructural solutions which frame and direct such cities' organic growth are common public goods, resulting from complex mediations of private interest by means of public re-distribution. The varying degree and solutions of such re-distribution depends on many factors from political cultures and institutional set-ups to historically rooted ethnic and class relations. David Harvey in his classic *Social Justice and the City* shows the complexity and variety of these factors (2009). A Soviet energy town – like the empirical case of this book, Visaginas – has no factor of private interest mediation at all. On the contrary, it is totally pre-planned and teleologically inserted into the infrastructural totality of energy production and distribution.

In such a light, settlements like Visaginas should be seen as strategic points in a wide inter-urban ecology specific to the USSR, with its large-scale

> 12 This is certainly relational. For example, Hughes observes that energy infrastructures in Berlin are more centralized than in London (1987, 69-70).

11 A classical argument with this regard can be found in Thomas P. Hughes (1987).

industrialization and hence equally large-scale de-industrialization projects. On a societal level, this inter-urban ecology gives rise to a solidarity that functions, or malfunctions, on the scale of the all-Union economy. This feature of Soviet spatial development and planning thus provokes a question about the difference between urban and non-urban. This question resonates with the attempt by Neil Brenner and Christian Schmid to set up an alternative epistemology of the urban by means of a critique of "methodological cityism" (which they consider a legacy of the Chicago School in social research on cities), as well as by suggesting a planetary urbanization agenda. This agenda is based on the refusal of a difference between the urban and non-urban. justified by the observation of four tendencies: the creation of new scales of urbanization, the blurring and rearticulation of urban territories, the disintegration of the "hinterland" and the end of the "wilderness" (Brenner and Schmid 2015, 161-162). In this vein, to make sense of the current "urban age" is not really about the percentage of the population formally living in cities, but about revealing the interdependence between urban environments and other seemingly non-urban spaces: spaces of extraction, connecting infrastructures, spaces to or from which surplus value is transferred, etc.

From this perspective, the planetary urbanization research agenda is a radicalization of the scale question. In an instrumental sense, scale makes it possible to measure space, to understand it in comparison. In a political sense, scale makes it possible to establish a hierarchy between different units of space (and by setting such a hierarchy, to control social processes). In the 1990s and 2000s, the notion of scale was crucial in discussions of what happens to regions, cities and particular neighbourhoods when the national scale is challenged as the central spatial arena for organizing social process. In their mainstream, these discussions' intention was to make sense of the impact that capitalist globalization makes on geography – the unbounding of the nation-state, changing power hierarchies between different levels of governance, the economic, political and symbolic rise of cities (especially of metropolitan regions), the diversification of localities via the intensification of relations between them, etc. One of the main milestones of this conceptual work was the notion that cities need to be systematically studied as embedded in a wider hierarchy of bounded spaces of various size and status (territorial blocks, nation-states, regions, etc.). In the 2010s, this notion is being radicalized by means of the operationalization of cities as merely one of many interdependent forms of multi-scalar urbanization processes. It is from here that an argument arises that an urban versus non-urban distinction does not make much sense anymore.

For Brenner and Schmid (2015), 'planetary urbanization' is essentially an outcome of the capitalist appropriation of space. However, the features of Soviet energy settlements gain a lot of conceptual depth when confronted with a planetary urbanization perspective. In the Soviet spatial configuration of state building, the urban is precisely not an organically growing settlement, but embedded - conceived, planned, constructed and functioning - in a wider pre-determined teleological system of growth and exchange. Thus, the empirical settings of towns like Visaginas are especially relevant in a discussion about the epistemology of the urban which is more open-ended and inclusive than a naturalized vision of a "nodal, relatively large, densely populated and self-enclosed" socio-spatial condition (Brenner 2014, 15). The nuclear energy specialization of Visaginas makes the reference to the planetary urbanization research agenda even deeper and more suggestive. Because, from the perspective of this research agenda, a 'nuclear' site (in its productive, extractive, scientific, residential, etc., aspects) is a clear showcase of how urban life in the second half of the 20th century turns into an infrastructural totality enabled by multi-scalar economic, power and military co-embeddedness. This chapter shows that the planning logic behind a nuclear energy site is different not only from a settlement organically growing in a capitalist context in a longer historical perspective, but also from a Soviet type industrial settlement.

The most groundbreaking impact of nuclear energy settlements in the world-wide history of urbanization is the globe's unprecedented vulnerability. This vulnerability resulted from the risks of the amounts of energy and radiation produced by nuclear fission, as well as from the risks of the military uses of nuclear technology. It was nuclear fission that first co-articulated immediate individual experience with the fate of the entire planet (Masco 2006). The resulting fragility of the global biosphere laid the foundation of treating both 'nature' and 'society' as infrastructures that have to be managed in planetary scope. The degree of nuclear technology risk re-defined the notion of co-location characteristic to the previous relations between industry and the city, requiring rather a multi-sited and multi-scalar understanding of industry's spatiality. As a result, a sensitive dialogue between spatial sciences and social sciences is required in order to make sense of how nuclear technology changes modes of co-existence.¹³ The planetary urbanization research agenda is thus adequate to conceptualize and interpret the impact of nuclear technology through the perspective of the historical rise of multi-sited and

13 Grabher et al. (2017) interestingly discuss how co-presence and co-location change in the process of digitalization and thus require new exchanges between a so-ciological and a geographical imagination.

multi-scalar interdependencies. Neil Brenner is working on an epistemology that makes it possible to do "urban theory without an outside", i.e. to trace urbanization process beyond the immediate agglomeration (2014). To paraphrase Louis Wirth (1938), nuclear urbanism is precisely a way of life without the outside, given the nuclear settlements' core technology's potential to damage the globe.

From the space user perspective, 'no outside' manifests itself in the 'red lines' as one of the main tropes to describe nuclear sociality in Visaginas today. People servicing nuclear infrastructure are expected to be cold-blooded, obedient and strictly follow instructions. In ethnographic work on nuclear sites, to hear a research partner talking in terms other than a scientific brochure-like language is available to a researcher only occasionally (Zonabend 2003). Practiced at nuclear facilities, the ALARA principle (As Low As Reasonably Achievable) of the cautious attitude to the technological system and to its immediate surroundings in safety critical environments is the obvious example of the normativity thus emerging. Nuclear power facilities frame how and what space users know about their interaction with the environment. As an extreme example, current Chernobyl NPP engineers and technologists plan the Exclusion Zone as having strictly determined itineraries, without a possibility to change the course of movement. All movements are channelled and GPS-documented. Video and thermographic cameras are necessary technological instruments of motion control. Such measures are applied in distinctly defined environments, but are determined by the possible impact of those environments on processes of a planetary scale.

'No outside' manifests itself not only in the users' experience perspective, but also in the institutional set-up of a nuclear settlement. The fact is not merely that the Visaginas population is and was much more exposed to the decisions of international organizations, such as the IAEA or later the World Association of Nuclear Operators.¹⁴ Being critical Cold War infrastructures, nuclear power plants and their settlements are sources of Cold War universalism: only partially can they be considered Soviet. American, etc. Kate Brown (2013) shows how similar is the organization of Soviet and American atomic towns. The Cold War as a way to do international politics defined by nuclear technology and by the resulting mutually assured destruction doctrine is thus the institutional reality of the planetary scale. From this angle, the planetary condition essentially belongs to the state of exception. As noted by Joseph Masco. nuclear statehoods turned out to be exceptional as they gained a great deal of unaccountability within national democracies (2006). Soviet nuclear energy settlements are an empirical domain which enable work with a lineage of urbanism 'without an outside' that is an alternative to the research strand according to which planetary urbanization stems from capitalist globalization and a concomitant rescaling of statehood from the 1970s.

Soviet nuclear science and engineering were from the beginning connected to the industrial military complex, a factor which created the foundation for the distinct disciplinary regime practiced in nuclear energy sites. In the 2010s, dozens of my Visaginas research partners born in the 1930s-1950s were emphasizing that they always felt exceptionally safe in their town, and that this is their privilege. Many of them in their interpretations linked this directly to the fact that a large amount of the Visaginas

> 14 WANO was created to promote nuclear safety culture after the Chernobyl catastrophe (it has regional centres in Atlanta, Tokyo, Paris and Moscow, with a coordinating centre in London).

population had experience living and socializing in closed, off-map towns characterized by 'strict order'. It would no doubt be stretching the point too far to repeat those research partners in saying that in Visaginas there was no crime or deviance. However, it is indeed true that rates of crime were lower here than elsewhere in Soviet Lithuania. For example in 1988 the amount of crimes (mainly drug addiction and petty hooliganism) was much lower in the town than the average for the wider Ignalina region (and twice as low as in adjacent Ignalina town) - 3.7 crimes per 1000 inhabitants a year in Visaginas, and 7.4 - in Ignalina.¹⁵ Although all Soviet shock construction projects had a strong ideological message of strict discipline and exemplary behavior in line with communist values, it is evident that in the nuclear towns there were much more instruments to make the population actually follow this discipline and values.¹⁶ Although Visaginas is a civic and not off-map town, its sociality continues the isomorphism between technical system, socio-economic system and mode of governance characteristic to the wider Soviet and Cold War nuclear network.

Visaginas Institutional and Normative Lineage

It was the RBMK type of nuclear reactor (channel graphite) that defined Visaginas's scale of energy production and industry/town relations. The amount of energy generated by the RBMK was a big leap forward economically and symbolized the re-orien-

> 15 "In Plenum's Materials". July 26, 1989. Mirnyi Atom 30(51).

> 16 For example, Bahovadinova writes that in the Tajikistan energy town of Nurek, another Komsomol shock construction project, drunken fights and even stabbing were common. As a result, the residents were often afraid to walk at night (2018 p. 283). In Visaginas, such a situation was certainly unimaginable.

tation of the Soviet nuclear industry to civic ends. A crucial technical feature of the RBMK was that it could be transported in sections and assembled on the construction site (Dollezhal and Emelyanov 1980). This was the foundation of a greater spatial mobility of the nuclear industry's technology and workforce, and it made any prior urban history of the future Ignalina Nuclear Power Plant site irrelevant. The INPP and its settlement Visaginas were built in the periphery (just adjacent to the Saint Petersburg-Warsaw 19th century railroad) to provide electricity to the Soviet Republics of Lithuania, Latvia and Belarus. Their precise spot was defined by Lake Drūkšiai right on the border between Lithuania and Belarus, with almost 45 sg, km of water available for cooling the reactor. According to one journalist and historian of the Soviet 'nuclear' Ministry of Medium Machine Building, Karl Rendel, the initial idea was to locate the INPP on the Belarusian shore of Lake Drūkšiai and call it the Belarusian Nuclear Power Plant (2007, 80), yet the final decision was to build on the Lithuanian side. Visaginas historian Algirdas Kavaliauskas writes that the first idea was to call the nuclear power plant not 'Belarusian' or 'Ignalina', but 'Drūkšiai' (1999, 27).

The institute within the Ministry of Medium Machine Building structure which was responsible for the wholistic planning and construction of both the RBMK reactors and of their satellite settlements was the All-Union Research and Design Institute of Energy Technologies, VNIPIET.¹⁷ The first ever RBMK reactor was conceived on the shore of the Gulf of Finland near Leningrad in 1966. This location was defined by the VNIPIET headquarters in Leningrad, by the big amount of water in the Gulf of Finland to cool down the reactor and by the adjacency of the

> 17 ВНИПИЭТ, Всесоюзный Научно-Исследовательский и Проектный Институт Энергетических Технологий.

railroad. The first unit of the Leningrad Nuclear Power Plant was launched in 1973, and the second unit in 1975. The team working on the LNPP planning and construction was the same as in the earlier VNIPIET projects on the off-map sites Arzamas-16, Chelyabinsk-40, Tomsk-7 and Krasnoyarsk-26 (Rendel 2007, p. 70). This lineage started in 1946 when the site for the construction of the first Soviet atomic bomb near Karachav Lake in the Ural Mountains was chosen and named Chelyabinsk-40. The director of this off-map site (in the documents - Kombinat 817) was Efim Slavsky. In 1957, Slavsky became head of the Ministry of Medium Machine Building. founded in 1953 to supervise Soviet nuclear technology development. The scientists, engineers and spatial planners involved in building Chelyabinsk-40 later moved to the construction of Tomsk-7 (a site in Siberia specializing in enriching uranium and plutonium), and then later to the other nuclear sites up to the Leningrad Nuclear Power Plant. After the LNPP was launched in 1973, many of its governance staff, military personnel, energy engineers and construction specialists, as well as their spouses and children, came to build the INPP and Visaginas in Soviet Lithuania.

The predecessor of the VNIPIET institute was the Special Project Bureau Dvigatelstroy,¹⁸ founded in Leningrad in 1933 to construct and test torpedoes. Hence, from the start the Institute had a defence specialization. Since 1944, one of the Institute's main engineers was Alexander Gutov, who during WVII organized arms production facilities in the USSR hinterland. During the war, most of the Soviet defence specializing factories were moved to the Ural region, to Siberia or to Central Asia. In 1945, Dvigatelstroy was renamed as the State Construction and

18 Двигательстрой.

Design Institute (GSPI)¹⁰ and was commissioned to develop research, raw materials and the engineering base for nuclear technology. Formally, both the GSPI and the nuclear facilities with their settlements were part of the KGB: the First Chief Directorate of the USSR Committee for State Security. The GSPI was led by the People's Commissar responsible for military ammunition, Boris Vannikov. Partially because of this, the first Soviet nuclear infrastructures were located near military ammunition plants. This is how the town of Sarov (whose name in documents is Arzamas-16), which hosted a military ammunition plant during WWII, became a nuclear weapons laboratory: an off-map, 'regime' town with strict rules. Some part of its population had to resettle, and the remaining part was forced to obey new restrictions. Institutional and infrastructural back-up for Sarov was provided by Snezhinsk (referred to in documents as Chelyabinsk-70). The status of these first Soviet nuclear towns was distinct from other towns and cities in the USSR. The groups of residents enacting their urbanity were distinct too - in varying proportions, these were groups of nuclear scientists. technical engineers and builders, military engineers and builders, prisoners of war and young people coming from Komsomol shock construction projects, as well as sometimes the residents of adjacent small towns and villages.

From the late 1950s, when Soviet nuclear development was already directed by the Ministry of Medium Machine Building created in 1953, most of the MMMB towns were built from scratch, because of secrecy and because there was an orientation towards as high a quality of life as possible on the designated territory. One of my research partners had worked as a journalist in Krasnoyarsk-26, an off-map MMMB town in Siberia. In the 1960s, he was

> 19 Государственный Строительно-Проектный Институт, ГСПИ-11.

doing military service in the Soviet army after 4 years of university studies on the Journalism Program in Minsk, Belarus. It was during his time in Krasnovarsk-26 when, after several months of hard physical work in the mine, thanks to his literary training he was recruited to the 'politotdel': the general political department responsible for propaganda. In the mid-1960s, he prepared a propaganda brochure about the 'heroic construction work' of Soviet army builders in MMMB towns. In the process of this work, he visited many other nuclear sites in the USSR (both in Siberia and in the European part). He said that he had written around 300 pages, yet after censorship only a thin brochure was published in 1966. His day-to-day task was to prepare a two-page bulletin to be read internally on the nuclear site among the military contingent. As he recalls, most of his publications were about 'labour glory', 'the heroism of shock construction', 'the fulfilment of plans', etc. In addition to this, he also organized a literary club for soldiers who would write poetry to be published in the bulletin and discuss their poems. In terms of informing about accident prevention, he received instructions from civic engineers. However, his censor, a KGB colonel (to whose apartment my research partner used to bring the bulletin's text for approval) would take care he would not share much technical information about the construction process.

My research partner could not even mention site-forming nuclear facilities. Besides, he could not name the site he was about to describe, but could only give the number of the appropriate military unit: like "BY/xxx" or "the unit of Colonel XX". The head of the military building facilities of Krasnoyarsk-26 was General Petr Shtefan – a career soldier with an engineering education background. After WWII, Shtefan worked in a variety of MMMB sites: in Leninabad (now Khujand in Tajikistan), Novosibirsk, Sverdlovsk-45 and Chelyabinsk-40. It was standard practice for my research partner's communication to be limited to army people (his contact to civic employees at the MMMB sites was rare). He was officially part of the army's general political department and lived in barracks with other soldiers. During the research interview, he emphasized that he could not leave for holidays. At the same time, his job implied travel to other MMMB sites: Chelyabinsk-40, Podolsk, Arzamas-16, Obninsk, Dubna, Serpukhovo, etc. Moreover, at that time Krasnoyarsk-26 did not have its own printing house, so he had to go to the adjacent 'civilian' town to print the bulletin he was working on. He recalled that he often brought deficit goods (meat products, sweets, etc.) with him to have informal priority treatment in the printing house. This was possible, because the provision of goods was of much higher quality in MMMB towns: these were 'islands of communism' as this research partner ironically described them. In terms of urban planning, he referred to Krasnoyarsk-26 as to "little Leningrad". The settlement was qualified in official documents as a "Sotsgorod".²⁰ Now it is known that the Krasnoyarsk-26 plant (including the nuclear reactor) was located more than 200 metres below the ground.

The VNIPIET department for architecture and urban planning was created in 1946, when work on the "uranium project" started. Now it is known that in the 1980s around 650 people were employed in that single department (Rendel, 2007, 170). It was an exceptionally guarded, secretive organisation. As the chief architect of Visaginas formulated it in a research interview, the "MMMB was a military ministry, there was no way to disobey". When he was going to Leningrad to meet the Visaginas project chief in VNIPIET (this was long-term leading Institute architect and planner, Victor Akutin), he had to pass through military guards with guns. Sonja Schmid (2019) focuses on the materiality of nuclear technology in order to criticize the distinction between its civic and military uses. She talks about the security community (presumably military) and safety community (presumably civilian) as two artificially distinguished modes of nuclearity. This chapter's focus on the mode of urbanization related to Soviet nuclear development equally questions this distinction by dint of a multi-scalar social analysis of the institutional and material lineage of MMMB spatiality. Such a lens is still compatible with Schmid's focus, as nuclear energy materiality should not only signify the aggregation of materials and tools in a particular location, but also concern the relationality of its infrastructures (Balmaceda et al. 2019).

The specificity of Visaginas among the other VNIPIET towns was the fact that it was mono-functional: specializing only in electricity generation. For example, construction materials were not produced on site. but brought from Vilnius, Kaunas or Obninsk. In this sense, Visaginas is an embodiment of a later, 'cleaner' stage of nuclear development in the USSR. This determined its size. Earlier VNIPIET towns (often combining extractive, manufacturing and research specializations) of the 1940s, 1950s and 1960s were bigger than Visaginas: as a rule, by 1990 these had populations in excess of 100,000 people. Besides, they also integrated into their fabric some of the functions of punitive settlements. Although officially penal labour was abolished in 1956, prisoners were used in construction and mining at remote extractive MMMB sites long after Stalin's death. An example of this is Shevchenko/Aktau on the Mangyshlak Peninsula in Kazakhstan, which in the period of the 1950s and 1960s is deemed by Stefan Guth to be partially "a camp" (2018). In the cases of the 1970s construction projects, to which Visaginas belonged, the use of penal labour was no longer present. However, the labour of military construction workers was used widely in Visaginas, as was the case in other MMMB sites.

20 "Соцгород" – Soctown.

The workforce (and thus the crystallizing human infrastructure), architectural and planning principles (and resulting social welfare infrastructure), as well as the key technologies were shared between the different MMMB sites (Liubimau 2019). The majority of the builders' workforce was channelled to the nuclear sites via the MMMB Special Directorate for Construction, the 9th Directorate, which had several regional branches. The headquarters of the Northern Directorate for Construction were in Sosnovy Bor near Leningrad, and of the Western Directorate for Construction in Visaginas in Lithuania. The Western Directorate for Construction was founded only in 1975. That is why the first steps of Visaginas planning were still managed by the Northern Directorate. and were connected to the projects of the Leningrad NPP and of its satellite Sosnovy Bor. As a result of this, most of the employees of the Western Directorate for Construction came to Visaginas precisely from Sosnovy Bor. Based on my research interviews, as well as on the published memoirs of Visaginas construction workers and nuclear technicians. it is possible to claim that other popular locations from which the workforce to Visaginas was attracted were the closed nuclear towns of Krasnoyarsk-45, Krasnoyarsk-26, Navoiy, Shevchenko/Aktau, Arzamas-16, Dimitrovograd, Tomsk-7, as well as Novosibirsk Academgorodok and the multi-industrial town of Angarsk (Pamyat serdca, 2006).

The first director of the Ignalina Nuclear Power Plant (at the stage of its siting and construction) was Konstantin Zakharov. In the late 1970s, he moved to Visaginas from Tomsk-7 and stayed after retirement. A lot of professionals from Tomsk-7 followed Zakharov to Visaginas, and these were not only nuclear specialists, engineers and construction workers, but also social sector workers. As my research interviews suggest, it was common to move to Visaginas following a director getting a position at the INPP or at the Western Directorate for Construction. The director of the Ignalina Nuclear Power Plant just before its launch in 1983 became the former director of the Leningrad Nuclear Power Plant, Nikolai Lukonin. Before working at the LNPP, Lukonin was employed at the Mining and Chemical Plant in Krasnovrsk-26. The INPP general director in independent Lithuania from 1991 to 2010 was Viktor Shevaldin, a graduate of the Ivanovo Energy Institute (of the Automation of Nuclear Power Plants Program). He started his career in the MMMB network in the late 1960s, as a computer specialist in one of the Moscow based research institutes. After this, he worked in constructing and servicing the Leningrad Nuclear Power Plant (1971-1982). In 1982, he came to Visaginas to work at the Ignalina Nuclear Power Plant as a shift supervisor. From 1986 to 1991, he was the INPP deputy director. The director of the Western Directorate for Construction just before the INPP launch was Yuri Zhilin, whose previous workplace was at the Northern Directorate for Construction at the Leningrad Nuclear Power Plant in Sosnovy Bor; and earlier. he had worked in Krasnovarsk-45. After Lithuanian independence, Zhilin moved to Novovoronezh (another Soviet nuclear power plant town), and after this returned to Sosnovy Bor.

Similar work mobility patterns can be identified not only among figures in governance, but also among all kinds of professions in MMMB towns: from energy engineers and technicians to railroad and construction workers. Employees of the welfare sector most often were spouses of nuclear energy and construction specialists, and hence also had socialization and professionalization experience in the MMMB network. For construction workers and low skilled workers, resettling to MMMB towns was an available option too. One of my research partners from the cohort of construction workers first arrived to work at an off-map MMMB town (Krasnoyarsk-45 in Siberia) in 1976 and stayed there till 1987. The town's main enterprise was an electrochemical plant for enriching uranium, deliberately built amidst high mountains in order to block a possible nuclear explosion wave. Before Krasnovarsk-45, this research partner had a higher-middle ranking position at a brick making plant (hazardous work, mainly done by political prisoners) in a medium-sized town in Siberia, 120 kilometres away from Krasnoyarsk-45. In this position, he managed to build a reputation and was invited to join the strategic MMMB enterprise. For him as a construction specialist with no direct expertise in nuclear technology, Krasnoyarsk-45 was primarily an environment of exclusive Soviet welfare, with an abundance of consumer goods (like high quality meat from New Zealand, chocolate, exotic fruits like bananas, etc.) and high-quality spatial planning ("all amenities are one step away", "all our towns are ideal").

Mobility was one of the crucial elements in the process of the proletarianization of the Soviet population in general. Construction sites attracting labour from different parts of the USSR were strategic in creating the material connection of Soviet citizens to the Soviet state via labour. For example, Bahovadinova focuses on the Nurek construction site in Tajikistan and writes about construction workers who were professionalized and socialized when building hydroelectric power stations elsewhere in the USSR (2018). She observes that such a mobile proletariat would be "particularly appealing to the state, inasmuch as it provided the professional skills necessary to complete planned projects on time, while also literally building socialism on the ground through their actions and example" (2018, 281). It has been noted that, especially in the case of large-scale construction projects in the USSR, ministries preferred to import a skilled workforce than to train it on site (Guth 2018, 111). Starting from Lenin, energy infrastructures were the most popular projects for attracting mobile labour for the quick realization of state strategic tasks: almost half of the all-union Komsomol shock construction projects were focused on energy infrastructures (along with metallurgy and transportation facilities, as the other most popular shock construction goals). This suggests that the Soviet state was strategically materially enacted through infrastructures with large geographical impact and critical significance.

The tendency of relying on a mobile proletariat created the conditions which have led to Visaginas being widely recognized as an ethnic, professional and social exclave: the Lithuanian town with the highest percentage of foreign-born inhabitants and the only place in Lithuania today where the Russian language dominates (Valatka and Liubimau 2016). In the 1970s and 1980s, it was not so easy to re-settle here from other Lithuanian towns and villages. Equally, the higher positions at the INPP were not available to Lithuanian specialists, a fact which makes it more appropriate to consider the power plant through an anti-colonial than a post-colonial lens.²¹ On the other hand, there was a directive of the Lithuanian Soviet Socialist Republic government banning recruiting low-skilled workers to the INPP and Visaginas from adjacent regions of the LSSR to avoid depopulating kolkhozes and small towns. Moreover, memoirs and research interviews clearly suggest that among those Lithuanians sent to the INPP construction site, only a few actually stayed. The vast majority of such fresh graduates of vocational schools soon left for elsewhere. As my research partners suggest, Lithuanians were too suspicious about the technology

> 21 See Hecht (2002); Edwards and Hecht (2010); Liubimau (2019) and Wendland (2019) on different registers of nuclear technology deployment in colonial and anti-colonial politics.

of nuclear energy generation. Besides, as one of the ethnic Lithuanian specialists working in Visaginas in the 1970s and 1980s put it, Lithuanians were not ready for the "wild life" of shock construction (one had to live in portable trailers for months and even years). They were used to and expected a different degree of comfort whether in the newly constructed Lithuanian industry driven towns and micro-districts, or in rural areas. Whereas for those coming from other parts of the USSR for shock construction projects, such "wild life" conditions were considered normal. Thus, even in terms of pace of construction and the degree of prior urbanization of the region, the INPP and Visaginas did not constitute a mainstream case of industry driven urban development in Lithuania. The living conditions here were far from those expected by local workers.

The partial exodus from Visaginas after the end of the USSR was also channelled in the MMMB network. According to INPP ex-general director Shevaldin, around 10% of the workforce left independent Lithuania in 1991-1992 (see also the chapter by Andrei Stsiapanau in this volume). Most of the nuclear energy specialists moved to Novovoronezh in Russia to build and service the new unit of the nuclear power plant. Not only people, but also technologies and materials travelled from Visaginas to Novovoronezh after the end of the USSR.²² These professional migration trajectories suggest that the current Visaginas residents who were integrated into the world of work in the Soviet period have a path of socialization and professionalization different than the residents of the majority of Soviet towns. Visaginas residents socialized and were professionalized in a much broader, exclusive, semi-closed nuclear 'archipelago', and in a much broader energy system

> 22 Before the end of the USSR, the reverse migration of specialists from Novovoronezh to Visaginas also occurred.

with particular economic and techno-political goals. These residents were also more strictly channelled by KGB and Komsomol. The core of the town's human infrastructure (people having access to exclusive technology, institutions and knowledge) was essentially governed not in a civic, but in a military way. For residents, this meant much more exposure to Cold War technological, military and ideological principles. The combination of relative welfare opulence and lack of private property was also unique in the Soviet context. This institutional and normative lineage makes Visaginas distinct both from other Western capitalist and Soviet modes of industry driven urbanization.

Generating Visaginas Urban Infrastructures

As was explained by looking at the town's institutional lineage, its relational embeddedness in a largescale strategic energy production and consumption grid, as well as the lack of a gradual organic growth history, has turned Visaginas today into an exclave in several ways. Functionally, it is a high-quality dormitory town with the absence of a pre-Soviet private property factor, a situation which has implications both on registers of planning/building and inhabiting. As the Visaginas chief architect said during a research interview, the first urban planning project for Visaginas that in fact won the competition within VNIPIET was for only three long 9 floor buildings that would host a population of 18,000. This was a project created by Mikhail Grishin, who emigrated to the USA later in the 1970s. This project involved a schematic solution for housing, with ground floors for social functions, but with no systemic solutions for social infrastructure like schools and medical facilities. This futurist project was soon abandoned in favour of a micro-district planning approach, as the micro-district was generally the main unit of

VNIPIET town planning. Visaginas's specificity in comparison to other VNIPIET settlements was that it was the first settlement with a pedestrian street as a central axis in the urban structure. In the overregulated sphere of Soviet planning and construction, VNIPIET planners and architects enjoyed a greater degree of freedom, as some exceptions could in fact be made for them.

According to the plan that was actually realized, the first three micro-districts were supposed to host 25,000 inhabitants. But after the 4th micro-district was conceived (the current Festivalio Street pocket, with housing, a vocational school and its dormitories, a music school and open market), the number of planned inhabitants rose to 27,000.²² The idea for the 5th, 6th and 7th micro districts appeared in 1988, when a proposition emerged to open a new plant to produce equipment for MMMB purposes. In this case, Visaginas would host around 45,000 inhabitants. But this idea emerged already in the context of Perestroika, after the success of the "Ring of Life" protest,²⁴ and hence the town's chief architect and

> 23 In terms of timeline, the 4th micro-district was built at the same time as the 1st.

24 The 'Ring of Life' was a mass mobilization of Lithuanian civil society to block the construction of the third block of the INPP that took place on 16-18 September 1988. Its organization involved tens of thousands of people camping around the INPP, and it turned out to be a success: the construction of the INPP third block was actually stopped. My research partners from governance positions in Visaginas at the time recall that this event was a big change, as it was the expression of a previously unthinkable amount of liberty. The Visaginas chief architect himself took part in the Ring the Lithuanian communist bureaucracy already had leverage to delay this new plant project, and then to block it totally. The total housing stock of Visaginas is currently around 10,000 flats, accommodating around 19,000 inhabitants. As the Visaginas chief architect said in interview, all the VNIPIET towns were meant to develop through the same phases: 25,000 inhabitants, 45,000 inhabitants, 75,000 inhabitants and a maximum of 150,000 inhabitants. For instance, Sosnovy Bor (which in addition to the LNNP also hosts the Scientific and Technological Research Institute, NITI, later named after A.P. Aleksandrov) was initially supposed to accommodate 25,000 inhabitants. But it was later updated, and the plans expanded to up to the maximum 150,000 inhabitants.

As my research partners involved in Visaginas planning and construction tend to repeat, the settlement was built in "virgin nature". In a similar spirit, the retired in Visaginas MMMB Western Directorate for Construction employees proudly call themselves pioneer-builders.25 This pioneer-building trope is generally part of VNIPIET identity. The first idea of VNIPIET architects was to locate the INPP settlement right on Lake Visaginas, yet Lithuanian architects resisted it, saying that in local tradition it would be appropriate to preserve the forest on the shore. At the very first steps of the Visaginas planning process, there was a disagreement between the VNIPIET architects on the one side and the Lithuanian architects (whose colleagues had just received the highly prestigious Lenin prize for the

of Life event (together with only a few other ethnic Lithuanian Visaginas dwellers).

25 Первостроители. There are many dimensions of institutionalization of the networked character of MMMB towns. From 2000, there exists an Interregional Civic Movement of Veterans of Atomic Energy and Industry.



Fig. 1, 2, 3, 4. Visaginas. Photos: Siarhei Liubimau.

Lazdynai district in Vilnius) on the other. However, this disagreement was smoothed over in process. Soon the preservation of the forest from the 1920s and the integration of the settlement into the natural environment became the main arena for consensual negotiations and for the creativity of all the parties involved: the VNIPIET planners (the chief of the project was Viktor Akutin, and the authors' on-site supervision representative was Vladimir Gorbunov), the Lithuanian planners (the chief architect of Visaginas was Algimantas Lapenas²⁶) and builders from the MMMB Western Directorate for Construction (the head of the Directorate from 1975 to 1981 was Gennady Sereda, and from 1981 to 1991, Yuri Zhilin). As a result, forest constitutes 43% of the space of Visaginas (Kavaliauskas 1999, 29).

Gennady Sereda came to Visaginas from another MMMB site: the Novosibirsk Akademgorodok. As one of my research partners (a VNIPIET revision committee member in the 1980s) suggested, one of the factors key to preserving the forest within Visaginas's urban structure was Sereda's previous work experience in the construction of the Novosibirsk Akademgorodok in the midst of a forest. In his New Atlantis Revisited: Akademgorodok, the Siberian City of Science (1997), Paul Josephson emphasizes the experience of walking down beautifully wooded paths everywhere in town. Similar to Visaginas, this was not a closed, off-map town. In Josephson's argument, Akademgorodok was a symbol of de-Stalinization. As Stalin has moved research centres from Leningrad to Moscow (to better control them), one of the responses of de-Stalinization

> 26 Lapenas was one of few Lithuanians in Visaginas. He was born in Vilnius and encouraged to work in Visaginas by Anatolijus Rasteika, who at the time was deputy head of the LSSR Committee for Construction.



was to free scientific work from controlling pressures as much as possible by means of a spatial distance from the political centre. In this respect the Novosibirsk Akademgorodok was the embodiment of the de-centralization process, as well as of a greater trust in science on the part of Soviet leaders (of Khrushchev in comparison to Stalin). However, despite the political momentum for the Akademgorodok project, the resources available and the financing scheme were different from the privileged conditions of Visaginas. Akademgorodok resources were scarce and from scattered sources: from Novosibirsk Sovnarkhoz (Regional Economic Soviet), from the construction budget of the Siberian division of the Academy of Sciences, and from several other sources with the MMMB as merely one of them (Josephson 1997, 14). As a result, in the 1960s the Akademgorodok was far from being a comfortable and well-invested town. Josephson documents all kinds of shortages: from places in kindergartens and guality of medical services to food provision. Moreover, there was no one single institution responsible for planning and building the town, as these included: Novosibirskproekt, Novosibgesstroi-2. Sibakademproekt (as the Siberian branch of VNIPIET was called from 1977) and Sibakademstroi.

As Novosibirsk Akademgorodok was deliberately oriented towards innovation, there was more space here for freedom and disobedience in comparison to other Soviet MMMB sites. This freedom, however, was limited after the Prague Spring in 1968. The significant difference from Visaginas was that in Akademgorodok a crucial function was to enable spontaneous encounter and free exchange between different specialists. Its ethos was to integrate science, engineering and education. In contrast, in the case of Visaginas, where cautiousness rather than creativity was the overarching value, the planning solution was to locate the resort-like living spaces





further from the nuclear workplaces of the energy production site. Still, there was a similarity between the two in terms of design solutions: in Akademgorodok "planners and architects had hoped to create an architectural as well as an intellectual oasis in terms of numbers of architectural styles and their blending with the forest" (Josephson, p. 16).²⁷ Making urban forest one of the key solutions of Visaginas urban planning makes it similar not only to Novosibirsk Akademgorodok, but also to Sosnovy Bor, a satellite of the LNPP.²⁸ Both of these settlements were strategic nodes for attracting professionals, technologies and planning solutions from the MMMB network to Visaginas from the mid-1970s. Both on the Akademgorodok and on Sosnovy Bor sites, planners and builders did all they could to preserve pine trees. In the Sosnovy Bor case, a lot of experience of planning and building resort settlements around Leningrad was used to achieve this aim.

The consensual decision to preserve as much forest as possible during the Visaginas construction process provoked an urban planning solution whereby each housing yard has its own structure defined by already existing greenery and includes only a children's playground; while other public functions are located in proximity to schools or kindergartens. VNIPIET architect Vladimir Gorbunov called this "yard development".²⁰ Another explanation of the reason behind this planning solution is a reference to the style of the dense and diverse spaces of pre-modernist Lithuanian towns. As Visaginas chief architect Lapenas said in interview, his intention was to create a feeling of closed yards, characteristic to

27 On the variety of architectural styles in Visaginas see Ruseckaitė (2016).

28 In 1970, one of Sosnovy Bor's micro-districts received the RSFSR State Prize.

29 Память сердца (2006), 95.

the pre-Soviet urban structure of Vilnius old town. In Soviet planning practice, yards were conceived and planned as open, and in the case of Visaginas, the VNIPIET architects initially also proposed such an open yard structure. However, Lapenas's vision of somewhat closed, self-contained yards prevailed. In a 2020 interview, Lapenas said that in the beginning of Lithuanian independence he thought that the logical continuation of his idea would be to close the yards with fences. Yet this idea was not embraced by other municipal politicians and Visaginas dwellers. This kind of negotiation of urban planning solutions under the supervision of a high modernist in its political function and a militarily disciplined in its institutional organization planning institute challenges the mainstream understanding of modernism as an erasure of the past.³⁰ It also challenges arguments that from the first steps of Soviet statehood collective life was conceptualized as "a space of total planning" (Collier 2011, 21).

There are more examples of transgressing planning templates in the process of generating Visaginas's urban form. There is a myth that the acrobatics school was a rather unexpected outcome of an abundance of building materials. It was not in the master plan, but the acrobatics coach found out that there is a surplus of building materials and convinced architects and builders to erect facilities for acrobatics classes. The Visaginas chief architect did not confirm it entirely, but said that both the school of acrobatics and the music school were the result of the enthusiasm of pedagogues, and not of master

> 30 Such references to pre-modern spatial organization could be found in many other cases of emblematic modernist European architectural projects of the 1970s (for example, the Evry pyramides in southern Paris suburbs referring to the structure of pre-modern seaside towns).

planning. This implies that Visaginas today cannot be considered as a mere illustration of high modernism (see the discussion on the compatibility of the Visaginas case with the notion of high modernism in the chapter by Alla Pigalskaya in this volume). Although the town is indeed a showcase of teleological topdown planning, there certainly were ways to humanize it and to find a possibility of digression in line with eve-view human needs and interests. A similar observation about the local adjustment of a reproduced template is made by Artemy Kalinovski in his study on the hydroelectric power plant town of Nurek in 1960s Tajikistan (2016, 845). At the same time, the MMMB towns' foundational industry and urban planning solutions make it possible to challenge a view of Soviet history as a timeline of an increase of both discursive and infrastructural individualization (Bertaux and Malysheva 2002; Krylova 2014). An attempt to explain the persistence of collectivism culture in Visaginas urban form is made in the chapter by Lehečka, Nessler and Liubimau in this volume.

The MMMB minister Efim Slavsky repeatedly emphasized the need to create a high quality urban environment in the Ministry's towns.³³ As a result, people rarely left the MMMB network, as the quality of life was higher than average in the USSR. There was an overabundance of resources: both in terms of salaries, of housing distribution and of welfare infrastructures. In Soviet times, it was the Western Directorate for Construction and the Ignalina Nuclear Power Plant who were responsible for the retail facilities, urban transport and communal facilities of Visaginas. It is significant in this respect that Visaginas and the INPP administratively were a single whole and were managed by the INPP director. Pragmatically, the fact that formally Visaginas was

> 31 In my research partners' recollections, Slavsky visited Visaginas 3-4 times to control the construction process.

a settlement, i.e. it did not have a town status, made it possible for welfare workers to have the privileges of rural areas: they were provided with communal facilities for free. In autumn 1988, the issue of a town status for Visaginas was discussed by the Council of Ministers of the LSSR, and rejected, because then those privileges would be lost. Additional reasons for the rejection were the fact that Visaginas did not reach the size of 50,000 inhabitants (the USSR requirement to receive town status, with exceptions made for smaller towns that were significant for industrial, cultural, historical or health-resort reasons), and the fact that it was an NPP satellite.³²

Thus, Visaginas was a social, professional and institutional exclave, owned and accountable directly to the MMMB, and not to the Lithuanian communist bureaucracy (Liubimau 2019).33 This exclave-like sociality with geographically hyper-distant connections has created a particular property effect and affect. One of the crucial features of the town construction process, repeatedly articulated in the research interviews and in the available memoirs, was that the builders realized they are doing it 'for themselves, with love', hence the quality of construction was often higher than elsewhere. VNIPIET teams included not only architects and planners, but also dendrologists and sculptors (amongst the latter were also "freelance" artists). It was common practice for brigades from other MMMB sites to build particular blocks of flats or public facilities in Visaginas. The professionally and socially privileged type of families settling in Visaginas were those from other MMMB

32 Visaginas received town status in 1994, in already independent Lithuania.

33 This is how the status of nuclear power in Lithuania differs from the status of nuclear power in Ukraine, as the Ukrainian nuclear community managed to 'ukrainize the atom' (Wendland 2019). locations. They frequently knew each other or even influenced each other's decisions to move from one MMMB site to another. And, even if they were not friends already, they knew other MMMB construction sites and thus easily found shared topics and experiences. Among those from other MMMB locations, a separate group was constituted by military engineering officers. The geographical scope of proletarianization for then Visaginas inhabitants was much bigger than in most cases of capitalist or mainstream Soviet industrialization. The town's families were embedded in a larger scale solidarity of Soviet nuclear energy production and internalized Cold War political culture.³⁴ Families (and family decisions concerning relocation. children's career choices. etc.) in this respect were also an effect of the networked character of Soviet 'nuclear' spatiality.

As the level of the education of the workforce servicing the INPP was high, spouses of nuclear engineers and technologists were usually highly educated too. The fact that there was a well-developed social infrastructure for a town of only a small scale - without established cultural and social institutions, such as a university, research institutes, theatres or the bureaucracy characterizing big or capital cities encouraged non-nuclear professionals to invest their energies and actively develop extracurricular activities for children in sports, arts and science. The fruits of such investments include the already mentioned cases of the acrobatics and music schools. This phenomenon is shared with the other MMMB towns, where rich investment into welfare infrastructures (both in terms of the provided resources and

> 34 One could develop an argument of hyper-organic solidarity (building on a classical Durkheimian approach), wherein people internalize their function and identity in a broader division of labour in a truly planetary Cold War context.

the motivated individuals forming a highly educated human infrastructure) have brought oasis-like results. Examples of this can be found in the range of successful sportsmen and women from these small peripheral towns: in swimming and judo, in the case of Krasnoyarsk-45 (Rendel, p. 180), or canoeing and acrobatics in the case of Visaginas, etc. In terms of specifically nuclear sector extracurricular activities, one of the crucial MMMB factors in Visaginas welfare infrastructures is the Physics and Technology School, which in 1988 opened courses in physics and mathematics with an affiliation to the Obninsk Institute of Nuclear Power Engineering.³⁵ The goal of these courses is to prepare school graduates to enter one of the universities related to the MMMB network (now the Rosatom network in Russia).

Today, the density of welfare infrastructures both in material and in social terms is inherited by Visaginas from Sniečkus. In terms of users' perceptions, the density of Visaginas built structures is associated with the density and homeliness of the town's welfare infrastructure. Here, the most evident observation (drawn from the research interviews, especially with parents of younger school kids) is the perception of the town's urban space as safe for children. As one of the research partners formulated it, she has no need to be on the phone with her child, as she knows that he is either at school or at one of the extracurricular classes or on the short way from one to another. The trope of the "safest" and "quietest" town where violence is possible only in "small drunk companies", but never in public space is repeated by research partners of different generations living in Visaginas today. As one of my research partners, whose parents were employed in various Soviet nuclear sites from the late 1940s (she herself was born in the late 1930s and thus raised in the MMMB network), said: "In our towns, there was always order

35 ФТШ (Физико-Техническая Школа).

and safety." The upgraded, integrated into national Lithuanian funding and policy priorities, and often EU funded welfare infrastructures continue the path of a town planned and built for collectivist living by residents socialized and professionalized in closed military towns with exceptionally strict disciplining and with strategic wider embeddedness.

Therefore, the crucial factors that generated Visaginas's urban form - in addition to the institutional and technological lineage of an MMMB RBMK town - are: the scale of its enterprise in a wider energy grid; the possibility to build on a site in the forest without prior urbanization (except the railroad); the meanings of comfort brought most immediately from Novosibirsk Akademgorodok and from Sosnovy Bor; the Lithuanian pre-modern urban structure inspiring a seemingly closed yard planning solution; and the material and human resources for exclusive welfare infrastructures. Besides, it would be safe to argue that in spatial terms the nuclear field in the 1970s and 1980s (and especially after the Chernobyl catastrophe) became much more infrastructural than before: better zoned, more regulated and technologically fixed. These factors were supplemented by the deep personal relations of Visaginas families (especially of the privileged ones, socialized in the wider MMMB network) to their close environment: to the town itself as a common public good, enabled in a wider all-Union Cold War network. This resulted in a strong exclusive belonging without a culture of privatism (see the chapter by Lehečka, Nessler and Liubimau in this volume).

A Nuclear Town after Nuclear Power: A Critique of the Post-Industrialism Lens

In Central and Eastern Europe, the view on urban history of the late 20th and early 21st century is de-

fined by the rupture of the end of the Soviet Union and state socialism. INPP ex-director Shevaldin, on the other hand, stated that for Visaginas and the INPP there was not one rupture, but three: the Chernobyl catastrophe, the end of the Soviet Union and the accession of Lithuania to the European Union. The Chernobyl catastrophe provoked a mobilization of Lithuanian civil society against the INPP, which grew into a popular front that achieved the independence of Lithuania from the USSR. The Baltic states joining the EU and NATO (with the INPP being one of the most strategic and costly infrastructures in all three countries) was one of the strongest symbols of Russia's defeat in the Cold War. The decommissioning of the INPP was a compulsory requirement Lithuania had to meet in order to integrate into the EU. The relevant decision was taken by the European Commission in 1999; and the actual decommissioning of the last working nuclear reactor took place at the very end of 2009. As throughout all the 1990s and 2000s, the INPP was still producing power, de-industrialization in economic terms [of no longer generating and selling electricity took place only in the 2010s. Visaginas's ruptures in this respect are different from most other post-Soviet industrial infrastructures and are more deeply connected to Cold War politics (Liubimau 2019). At the same time, there are arguments that despite the end of the Soviet Union political regime, Soviet nuclear modernity has endured (Guth et al. 2019). The nuclear modernity notion is intended to foreground the interrelationships between the development of nuclear energy, international politics and societal transformation of the period when the USSR became a scientific and technological superpower.³⁶ In

> 36 Vladimir Putin after 2014 is constantly suggesting the endurance of the Cold War: the adjective 'nuclear' was repeatedly used during his 2018 presidential campaign.

this perspective, Visaginas after 1991 is an exclave characterized by rather unique interpositions with a wider socio-geographical context, and thus less constrained by the path of transformation characterizing mainstream post-Soviet city/industry relations.

Visaginas nuclear urbanism today is characterized by the town's strategic embeddedness in the Cold War planetary infrastructural totality; by its lineage to the defence specializing secret institutions key for Soviet state building; and by its multi-sited MMMB spatiality in which the social meanings of comfort, order and productivity are crystallized. At the same time, Visaginas's condition after nuclear power - no electricity is produced and sold by the INPP since 2010 - can hardly be considered post-industrial. There are at least four features that make Visaginas different from most other mono-industrial towns transforming after the Soviet Union. Firstly, dismantling the INPP is a very long process. The plan is that it will take 39 years following the decommissioning decision in 1999. Secondly, in this 39 year period, the INPP hosts around 2000 well-paid jobs and hence operates a considerable budget (around 3 billion euros for all this period). Thirdly, new technological inventions are needed to fulfil the dismantling plans. Fourthly, various types of nuclear waste will provoke engineer solutions for hundreds and even thousands of years ahead, thus overstepping any human-centred plans for the future (in the long term, this is the most certain future specialization of the INPP and Visaginas site).³⁷ These points raise doubts as to whether nuclear energy producing facilities (and their settlements) can at all be considered post-industrial after decommissioning.

Visaginas's condition after Soviet nuclear power cannot be properly narrativized as neoliberal either. Neo-

37 Especially with the construction of the geological disposal of spent nuclear fuel.

liberal transformations after the USSR were about the re-binding of possibilities and constraints for individual and institutional agencies by inserting these agencies into supra-national market conditions. The built environment, production facilities and land-uses were re-valorized by dint of being re-positioned within a broadened international competition context. The specificity of nuclear energy production facilities is that they were not really subjected to market competition.³⁸ The decision to close the INPP was based on a political and security logic, not on a market competition logic. Indeed, from an economic perspective the INPP could have been a considerable asset for the Lithuanian nation state. Moreover, the decommissioning and dismantling of the INPP are happening in top-down fashion, with vast resources of almost 3 billion euros secured via top-down planning, with the European Union covering around 80% of the entire budget. Thus, it would be problematic to discuss the process of nuclear power plant dismantling in terms of de-regulation and unbundling. This again indicates a continuity of nuclear modernity and raises questions about the meaning of the end of the USSR and of socialism for the Soviet MMMB network.

In this respect, it is revealing to regard the impact of Perestroika on Soviet nuclear facilities. In the late 1980s, there were attempts to introduce principles of self-governance and incentivization at the INPP in line with the Perestroika idea that innovations are not implemented if they are not incentivized. How-

> 38 Joseph Masco interestingly discusses the American nuclear bomb from Marx's perspective on commodification, to conclude that the nuclear bomb as an industrial institution/infrastructure and a national fetish cannot be really considered a commodity (2006, 21-22). In this context, he refers to Marcel Mauss and talks about the "Cold War nuclear gift economy" (23).

ever, these attempts did not change the situation much. Most of the values of self-governance were applied to minor renovation works at the INPP or to services in town. They did not impact on essential elements of nuclear energy production. The only thing that changed in terms of governance organization in the post-Soviet period is that much more responsibility was placed on the general director, as several higher governance positions present in the Soviet period were liquidated (see the chapter by Andrei Stsiapanau in this volume). In a memoir interview published by Ergali Ger (Ger 2015), the INPP ex-director Nikolai Lukonin recounted how he resisted the Perestroika practice of NPP directors being elected by the collectives and how he managed this. There are justified doubts about whether the democratic governance of nuclear facilities is possible at all (articulated among others by Joseph Masco or by Kate Brown). At the same time, it remains an open question as to whether such resistance to self-governance and incentivization values is a Soviet society feature or a universal nuclear feature.³⁹

The legacy of the highly centralized, zoned and disciplined organization of the Ignalina Nuclear Power Plant is present after decommissioning too. As one of the current employees of the Visaginas Vocational Training Centre who previously was employed by the INPP put it in a research interview: the INPP was

39 As the US nuclear energy expert
Joseph F. Pilat put it in early 1980s, "in
the West there is a nuclear debate; in the
East there is a nuclear dictate" (1981,
10). The lack of democratic politics was a
competitive advantage of Soviet nuclear
development vis-a-vis the West as until the
late 1980s in the USSR there was no anti-nuclear protest and no public pressure
regarding issues of safety, nuclear waste
or power plant location.

always technologically advanced and highly automatized in comparison to the Lithuanian industrial context. Yet with labour and fields of expertise strictly divided at the nuclear power plant, there was absolutely no space to propose innovations. There is a colloquially spread perception that nuclear specialists are trained rather to supervise and surveil than to invent something, although it is documented in both historical and ethnographic work that a crucial part of nuclear specialist profession is to creatively resolve crisis situations beyond instructions (Schmid 2008, 2015; Wendland 2019). Prior to the INPP, this research partner was working for a telecommunications company. And after work experience as an electrician at the INPP, he was happy to move to the more entrepreneurial and innovation incentivizing educational institution of the Vocational Training Centre. This research partner is today crucial in making the Training Centre a Lithuanian leader of teaching mechatronics and robotics' skills. In this way, he is crucial in the process of training the workforce that has attracted the most tangible post-INPP investors to Visaginas, such as a British company "Intersurgical", producing medical equipment.

As another research partner, the ex-director of the Visaginas Business Incubator, recalls, the main challenges facing her in starting to re-tool Visaginas's economic specialization in the 1990s were an absolute lack of experience of private property and therefore no business spirit (as the town had a single highly strategic function). Moreover, this had a very tangible material articulation: there were literally no premises for starting a new business, as the settlement was totally planned and densely built to be just a resort-like dormitory of a nuclear power plant. This remains relevant as in Visaginas development strategies the sources of growth and employment repeatedly tend to be projected outside town, thus leaving the town itself with the role of just a passive supplement to the employer. The Visaginas Business Incubator's ex-director adds that in the 2000s the nuclear identity of Visaginas was rather a hindrance to attracting investment, as the place was associated with being hazardous in terms of radiation. Today, the situation has changed and the main feature of Visaginas now (and its competitive advantage) is the availability of a relatively well-qualified and relatively cheap workforce.

This change of Visaginas perception in the 2010s makes it possible to argue that in terms of city/industry relations the INPP did not disappear, but its assets have been re-scaled. The automatization of the INPP as a large complex industrial facility has indirectly given rise to robotics and mechatronics as current key specializations of the Vocational Training Centre. The fact of a relatively inexpensive workforce, well trained in mechatronics and robotics has determined the ongoing construction of the Intersurgical plant in Visaginas with a plan to employ up to 2000 workers. In a similar way, the peculiarity of the INPP as a large industrial facility which has to be dismantled in a detailed and careful way has given rise to welding as another skill taught to a high-quality level in Visaginas. And the high-quality teaching of welding has made Visaginas trained welders competitive in an international context (they are stably attracted abroad to large industrial facilities in countries like Netherlands, Norway, Japan, etc.). This has also defined a mode of work migration widespread among Visaginas males and characterized by well-paid shifts spent working overseas that allow longer rest in their home town (see the chapter by Pentenrieder and Cope in this volume). On an empirical level these two paths of Visaginas development reveal the type of resources that were mobilized by individual and institutional actors to adapt to new circumstances after nuclear power. On a conceptual level, phenomena like the Intersurgical

company or Visaginas welders' competitiveness on an international labour market show how professional assets associated with the Nuclear Power Plant are re-scaled. The epistemology of approaching city/industry relations not in terms of rupture, but in terms of transforming their embeddedness into a wider socio-geographical formation is especially relevant for nuclear towns where a shutdown is not a singular event, but a process of complex planetary significance.

Conclusion

In conceiving of nuclear settlements in terms of urban history, their most striking specificity is an articulation of relations between a particular site and the entire globe via the unprecedented risks of nuclear technology. This feature resonates with the current increase of interest in urbanism not only as concentrated in the boundaries of a settlement, but also as relational in wider environments of space uses. In contrast to the dominant approach to present capitalism as the overarching logic of this relationality of urbanization processes (that have accelerated from the 1970s), I have suggested that such a relational lens was first demanded by the Cold War as an institutional and infrastructural context evolving together with nuclear fission and fusion. This chapter has shown that Soviet nuclear industry has given rise to a specific mode of planning, designing and inhabiting urban settlements. Nuclear technology was a factor of state instruments to assemble and discipline these settlements' populations, of these settlements' organic spatial and institutional connection to the industrial military complex, of the exclusively rich material and human resources available to develop them infrastructurally, and also of their close connection to an archipelago of other

nuclear settlements strategic for the Soviet Union role in the Cold War.

The Soviet nuclear program gave rise to the Ministry of Medium Machine Building (MMMB) network of sites as institutional and infrastructural reality, as well as to the All-Union Research and Design Institute of Energy Technologies (VNIPIET) as the network's main urban planning and engineering authority. The mobile workforce was socialized and professionalized in the MMMB industrial. construction and living sites, thus creating the techno-political meanings of economic productivity, of a comfortable environment and of order and belonging. The critical part of the human infrastructure of such towns (those with expertise in exclusive technology and institutions) was essentially governed in a military way. The empirical setting of this chapter, Visaginas in Lithuania, constitutes a later moment in the MMMB and VNIPIET historical lineage - a cleaner, more civic, more strictly zoned and regulated settlement. Its foundational technology and ministry have determined its long-term status as an exclave: a high quality dormitory town without a pre-Soviet history and geography of private property; embedded into a large regional scale energy grid; extensively integrating natural amenities (building on the values of natural amenities crystallized in the MMMB construction sites of Novosibirsk Akademgorodok and Sosnovy Bor, as well as in Lithuanian pre-modernist urban planning practice); enacted by the population's personal material engagement and solidarity in an all-Union Cold War military industrial network.

The condition of Visaginas's urban-industrial entanglement after nuclear power from 2010 equally demands its conceptualization through a relational multi-scalar lens. The long, 29 year process of dismantling the nuclear power plant with around 3 billion euros total budget and around 2000 workplaces, the need of new highly sophisticated technological inventions in dismantling and a timeframe of thousands of years for nuclear waste management suggest that this condition cannot be depicted as a consequence of the characteristic rupture of post-industrialism. On the contrary, it rather involves the continuous re-embedding of technological, professional and social assets crystallized around Soviet nuclear power generation and nuclear urbanism into the wider geographical configurations of the EU. The top-down planning and resource re-distribution of the INPP dismantling remain one of the crucial factors of the town's urbanism after nuclear power.

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Acknowledgments and Afterword

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Visaginas institutions and/or have made our logistics much smoother than it might have been.

Re-Tooling Knowledge Infrastructures in a Nuclear Town is a result both in the sense of the research and design arguments it generated, and in the sense that its long-term tested mode of merging academic and non-academic work processes is itself also an outcome. Firstly, the book presents a conceptual and applied response to the condition of Visaginas as a nuclear town after nuclear power. And secondly, it suggests a way to organize long-term urbanist work as systematically triangulated: as legitimized simultaneously for a community of professional researchers, for students engaged in the process of learning and for social partners in the field. The two dimensions of the result are closely interconnected: the triangulation on which it is based amplifies an awareness of and sensitivity to the possibilities, hindrances, pains and hopes out of which urbanist research settings are composed.

In the mid-2010s, the choice of Visaginas as a setting for longterm urbanist research looked unusual, for the town was largely perceived as an exotic exhibit from the Soviet past with its initial purpose in course of ruination and, at the same time, as a clean slate posing no constraints for outsiders to fill it in with new ideas, objects and activities. The first lens stemmed from the popularity of the visual and narrative discourse of 'failed Soviet utopias', and was widely cultivated mainly by photographers and visual artists. The second lens was part of an urban animation and informalization movement, which prioritized creation over research (Visaginas was an appealing target for this, on account of its abundance of open space and the decrease of its population density). The EHU Laboratory of Critical Urbanism approach formed an alternative to these two lenses: our purpose was not to represent or to fill in the site, but first of all to understand how it hangs together. This is why the 2016 book documenting the initial step of LCU work in Visaginas was designated as mapping "sources of urbanity in a former mono-functional town". This angle prioritized attention to what constrains urban form and processes over attention to the to-be-filled niches of the town's urban form and processes.

In a conceptual sense, the prioritization of constraints over niches is one of the features of the 'infrastructural turn' in urban studies as a research agenda and in urbanism as an applied agenda. Instead of public space as the main arena where urbanist work is expected and where spontaneity is the main value in urban processes, the focus is increasingly shifting to the not immediately visible provisions and measures that connect

different sites, and thus relationally pool and discipline these sites (along with the practices inherent in them). In this respect, Visaginas 2015-2020 turned out to be a highly rich setting to study the infrastructural dimension of urban processes. Firstly, this period was marked by Russia's war in Ukraine, which made the issue of shared infrastructures among former Soviet states especially acute. In Lithuania, the war has accelerated the ongoing, uneasy process of disintegration from the Sovietmade power grid. Second, the construction and launch of the Astravets Nuclear Power Plant in Belarus, in the close vicinity of the Lithuanian border, has made the issue of nuclear technology one of the key dimensions of international politics in the region. Third, this period was also marked by a strengthening understanding in Visaginas that the end of the Ignalina Nuclear Power Plant's productive phase is not the end of the town, and hence by attempts to re-use different INPP related assets in new conditions. Fourth, these years were also marked by the growing prominence of the climate change issue and hence by an increasingly central role of energy and energy infrastructures in discussions about possible and desirable socio-political futures. Finally, the late 2010s also saw an increasing fragility of modern welfare states' knowledge infrastructures vis-à-vis digital platforms and a strengthening of digital profiles as a new

revolutionary form of knowledge formation and of structureagency relations in general.

We want to finish this book by briefly suggesting directions for further cooperative work of the EHU Laboratory of Critical Urbanism, informed by the results we have obtained from our Visaginas projects. First, we expect more urbanist attention to cases where knowledge infrastructures are fragile: in the sense of spatially embedded material facilities for knowledge production, maintenance and exchange not anymore sufficiently coinciding with current social processes of knowledge production, maintenance and exchange. Second, we expect more urbanist recognition of the 'infrastructural turn' as resulting from military strains worldwide: i.e., not only from the privatization of resources and unbundling of large systems inherent in neoliberal restructuring. Third, we expect more urbanist work on sites considered unconventionally 'urban', in terms of their purpose, growth/decline history and their relations to the outside, as well as on the dynamics underlying such sites. Fourth, we expect a greater prominence of the dimension of power grids, among other aspects of recent urban history and future-oriented urbanist thinking; as well as a more detailed understanding of the conditions of possibility and long-term effects of the integration and disintegration of power grids. And, fifth, we expect further

diversification and expansion of the range of 'stakeholders' acting as 'tuning forks' to triangulate the purposes and results of academic applied urbanist research.

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