



HAL
open science

Oil and Gas towns in Western Siberia: past, present and future challenges

Yvette Vaguet

► **To cite this version:**

Yvette Vaguet. Oil and Gas towns in Western Siberia: past, present and future challenges. Nordregio, 2013, 6 (125-132). <halshs-01779907v1>

HAL Id: halshs-01779907

<https://shs.hal.science/halshs-01779907v1>

Submitted on 22 Jun 2018 (v1), last revised 22 Jun 2018 (v2)

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire HAL, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



HAL Authorization



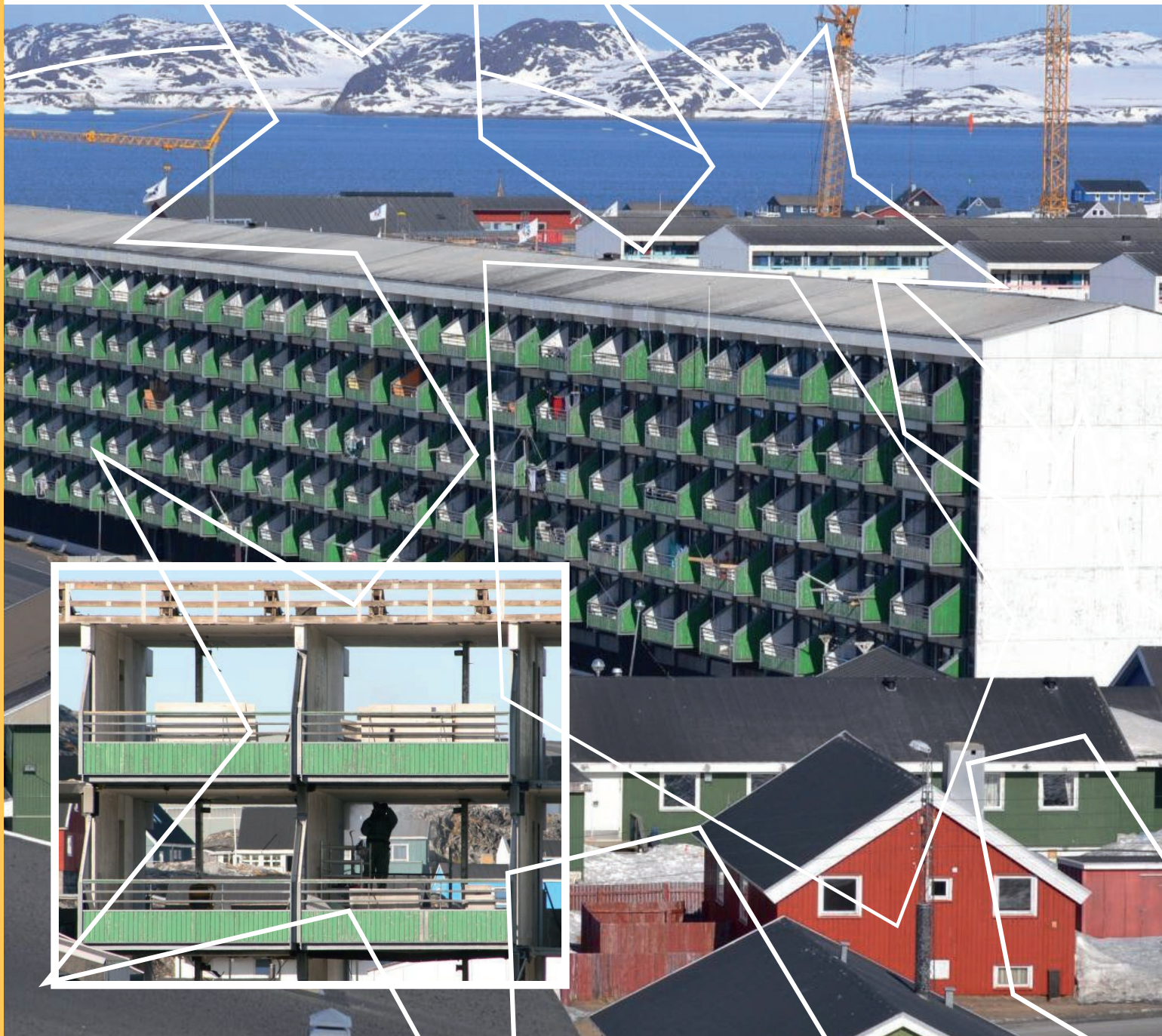
NORDREGIO
Nordic Centre for Spatial Development

Proceedings from the First International Conference on Urbanisation in the Arctic

Conference 28-30 August 2012
Ililmarfik, Nuuk, Greenland

Klaus Georg Hansen, Rasmus Ole Rasmussen
and Ryan Weber (editors)

NORDREGIO WORKING PAPER 2013:6



Proceedings from
the First International Conference
on Urbanisation in the Arctic

Conference 28-30 August 2012
Ilimmarfik, Nuuk, Greenland

Proceedings from
the First International Conference
on Urbanisation in the Arctic

Conference 28-30 August 2012
Ilimmarfik, Nuuk, Greenland

Klaus Georg Hansen, Rasmus Ole Rasmussen
and Ryan Weber (editors)



NORDREGIO
Nordic Centre for Spatial Development

Proceedings from the First International Conference on Urbanisation in the Arctic
Conference 28-30 August 2012, Ilimmarfik, Nuuk, Greenland

Nordregio Working Paper 2013:6

ISBN 978-91-87295-07-2

ISSN 1403-2511

© Nordregio 2013

Nordregio
P.O. Box 1658
SE-111 86 Stockholm, Sweden
nordregio@nordregio.se
www.nordregio.se
www.norden.org

Editors: Klaus Georg Hansen, Rasmus Ole Rasmussen and Ryan Weber

Front page photos: Klaus Georg Hansen

Nordic co-operation

Nordic co-operation is one of the world's most extensive forms of regional collaboration, involving Denmark, Finland, Iceland, Norway, Sweden, and the Faroe Islands, Greenland, and Åland. *Nordic co-operation* has firm traditions in politics, the economy, and culture. It plays an important role in European and international collaboration, and aims at creating a strong Nordic community in a strong Europe.

Nordic co-operation seeks to safeguard Nordic and regional interests and principles in the global community. Common Nordic values help the region solidify its position as one of the world's most innovative and competitive.

The Nordic Council

is a forum for co-operation between the Nordic parliaments and governments. The Council consists of 87 parliamentarians from the Nordic countries. The Nordic Council takes policy initiatives and monitors Nordic co-operation. Founded in 1952.

The Nordic Council of Ministers

is a forum of co-operation between the Nordic governments. The Nordic Council of Ministers implements Nordic co-operation. The prime ministers have the overall responsibility. Its activities are co-ordinated by the Nordic ministers for co-operation, the Nordic Committee for co-operation and portfolio ministers. Founded in 1971.

Nordregio – Nordic Centre for Spatial Development

conducts strategic research in the fields of planning and regional policy. Nordregio is active in research and dissemination and provides policy relevant knowledge, particularly with a Nordic and European comparative perspective. Nordregio was established in 1997 by the Nordic Council of Ministers, and is built on over 40 years of collaboration.

Stockholm, Sweden, 2013

Content

1. Preface	9
2. Program for the conference	11
3. Urbanisation – an obstacle or a precondition? Palle Christiansen.....	17
4. Megatrends in Arctic Development Rasmus Ole Rasmussen.....	19
5. A History of Urbanization in the Arctic Timothy Heleniak.....	23
6. Review of Russian Arctic Regions: urbanization, economy, demography Lyudmila Zalkind.....	25
7. Marginal places in discursive space: Political economies of development and urban space planning in the North, conceptual shifts Andrey N. Petrov	31
8. The history of urbanization and Urban Planning in the Faroes – the case of Tórshavn Sámal tróndur Johansen	37
9. Iqaluit – Growth of an Inuit Capital Rob Shields and Barret Weber.....	39
10. Un-Planning in Iqaluit, Nunavut Kirt Ejesiak and Alain Fournier	49
11. Arctic Urban Development and Climate Change: Past, Present and Future of Russian Urban Infrastructure in Permafrost Regions Nikolay I. Shiklomanov	57
12. Environmental Impacts of Urbanization: Policy Implications for Local Warming in Nuuk, Greenland Tony Reames.....	59
13. The Role of Winter/Ice Roads in Industry and Communities in Northern Alberta Scott Stephenson	67
14. Urbanization of the Alaskan Arctic: The Great Reversal? Hal Salzman	73
15. Greenlandic urbanization and urban life – Decline or development? Gitte Tróndheim.....	75
16. Urban Sámi and the City as a frame for the development of a new Sámi cultural form in Scandinavia Paul Pedersen and Torill Nyseth	79

21. Oil and Gas towns in Western Siberia: past, present and future challenges

Yvette Vaguet

Introduction

Western Siberia, lying mainly in a permafrost area, has been urbanised for two decades or thereabouts. Russia has had the most notable experience of urbanisation within the circumpolar zone and the landscape bears the most consummate signs of this experience in the region.

Oil extraction constitutes the major determinant of this urbanisation. The Ob' region is one of the biggest oil and gas basins in the world, and contributes up to 68 % of the national production of oil and 91 % of gas. Thanks to Western Siberia, Russia is the first gas producer in the world, and the second for oil. This exploitation started in 1964. During the Soviet era, the development of the oil/gas industry came with the spread of modern society northwards within the almost uninhabited taiga first, and the tundra later, as far as the Yamal peninsula along the coast of the Arctic Ocean. When the USSR collapsed less than 30 years later, 23 out of 28 towns had been created ex-nihilo and were associated with considerable in-migration. Building human residential and industrial infrastructure on this scale and at this pace within such a harsh natural environment, almost without any permanent human settlement nearby, was a challenge in itself. Town and country planning currently have new challenges to face.

One can wonder if these urban centres were actual towns rather than just short-term settlements. The current debate concerns the future of these towns: whether they can survive beyond the peak oil or even earlier by flooding of the marshy Ob' basin due to global warming and its associated melting permafrost. However,

what lies in the future could also be a flourishing economy with the prospect of oil-and-gas development northwards to the Arctic Ocean. Awaiting a response, the region still presents a positive migration balance and nowadays Western Siberian towns are trying to diversify their economic profile. Municipalities are also trying to improve the quality of life in order to retain, if not attract, inhabitants, especially the more highly skilled. Moreover, here and there in these towns, there are evident signs of gentrification, with the spread of the detached house model, as in many parts of the world.

To sum up, upcoming challenges question the resilience of this urban geographical system. The answer is not as easy as it might appear. This article introduces the complexity of the subject. Because of its unique 50-year experience, Western Siberia is a key area when considering urban development in the Arctic.

1. Past challenges: Building an urban system on the edge

The study area in this article covers three constituent entities of the Russian Federation. It includes two producing territories, namely the Autonomous Okrug of Khanty-Mansi (mostly oil producing), and towards the north, the Autonomous Okrug of Yamalo-Nenets along the Arctic Ocean coastline (mostly gas producing). It also includes the southern Oblast of Tyumen, which is not hydrocarbon producing itself but has administrative functions (fig. 1). The whole study region is 70 % the size of Greenland.

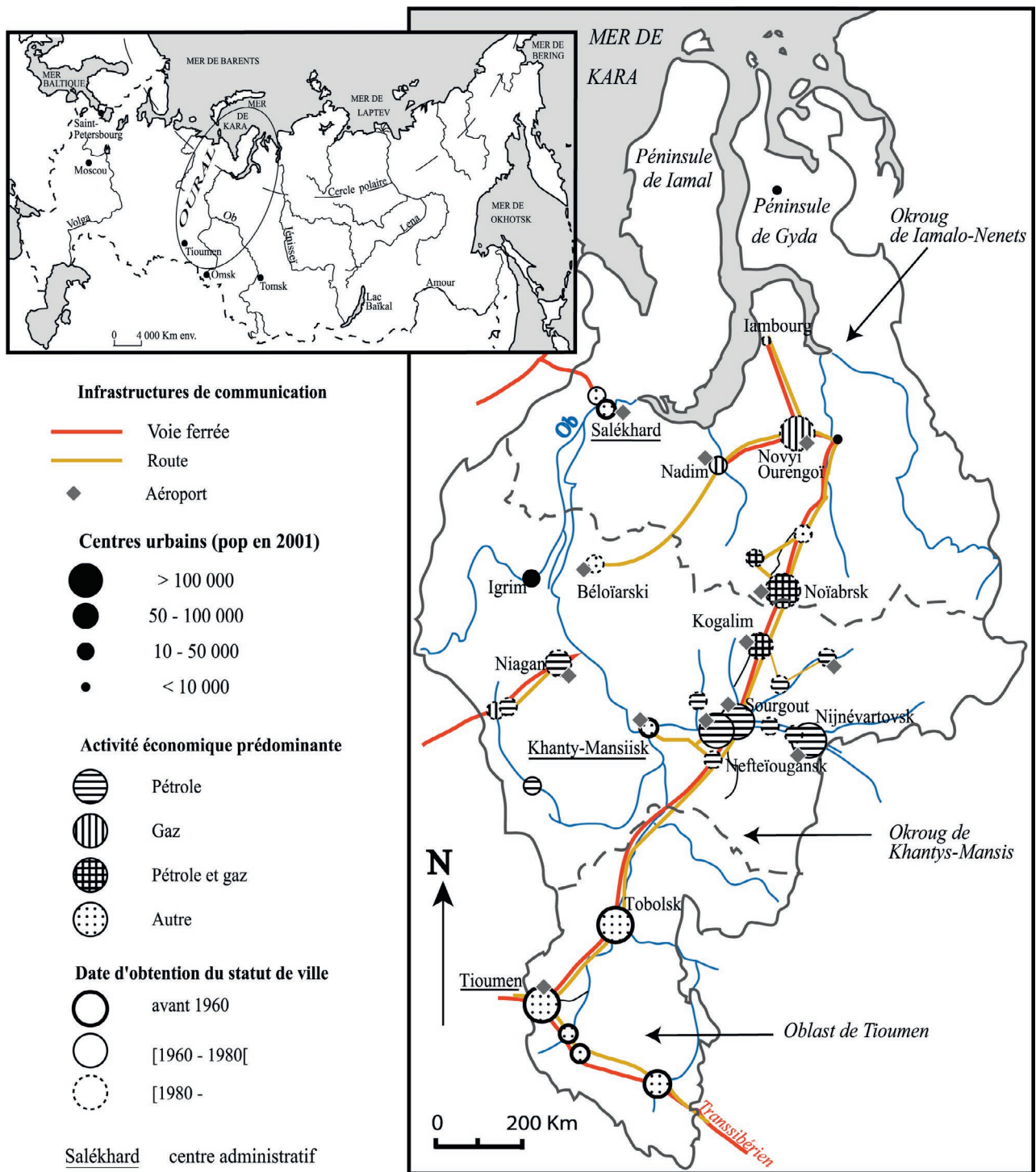


Figure 1: Western Siberia, its oil and gas towns

The development of industry started in 1964 at the Samatlor oil field near the future town of Surgut (61°15'N). This was the beginning of a fantastic human adventure, which was also, one should note, an environmental disaster. From the start, modern society, both urban and industrial, was to be found in the south, mostly along the Trans-Siberian Railway. Meanwhile, the two huge northern Okrugs were the territory of indigenous peoples (the Khanty, Mansi and Nenets). Their main sub-

sistence came from hunting, fishing, gathering and reindeer herding, as it still does today. Their territory was structured by rivers. There was neither major road nor airport, and their administrative centres (Khanty-Mansiysk (61°00'N) and Salekhard (66°32'N)) resembled fishing villages.

This economic transition brought not only industrialisation and urbanisation but also a rotation of the main regional strategic axis: from the east-west Trans-

Siberian, it developed northwards towards the Arctic. New hydrocarbon fields progressively opened up in these environments, which were increasingly difficult for humans and human activities. In the mid-1960s, the first oil pipelines were laid in the middle of the Ob River in marshy areas, in the discontinuous permafrost and an active 80 cm thick layer. In the late 1980s, the Urengoi gas basin opened up in an area where permafrost is up to 400 m thick and contains up to 50 % of ice. It produces more gas than all the European countries put together. Its associated town, Novy-Urengoi (66°05'N), is one of the biggest cities within the polar region (pop.≈100 000). Northwards, more recent gas fields extend across the continuous permafrost area, up to 500 m thick and containing up to 90 % of ice. Since 2000, a gas pipeline has connected the Yamal peninsula to Western Europe.

In-migration was high and directed towards the two northern Okrugs. The regional population increased from 1.1 million in 1959 to 5.2 million in 2002. In-migration reduced the gap between North and South

in many ways. First, numerically speaking, the picture of an empty Okrug was no longer a reality. If 83 % of Western Siberia's population were to be found in the southern Oblast of Tyumen in 1959, the northern two Okrugs had 57 % of the regional population by 1989. Secondly, in qualitative terms, the image of an urban and industrial Russian society in the southern part alongside a nomadic and rural indigenous society in the northern part is no longer true either (Zaitseva A.N., 2002; Vaguet-Marchand Yv., 2004; Vaguet Y., 2007). Out of the 28 towns, 23 are new, created for the needs of the economic transition. Among those, 21 were created within the northern two Okrugs that registered the biggest urban increases within the country for half a century (fig. 2). Their population became urban (>77 %). Moreover, the new population came from all over the USSR and was unrelated to indigenous peoples, their lifestyle and arctic environment. Meanwhile, a complex transport network emerged with a major north-south railway, a main north-south road and airports in every town.

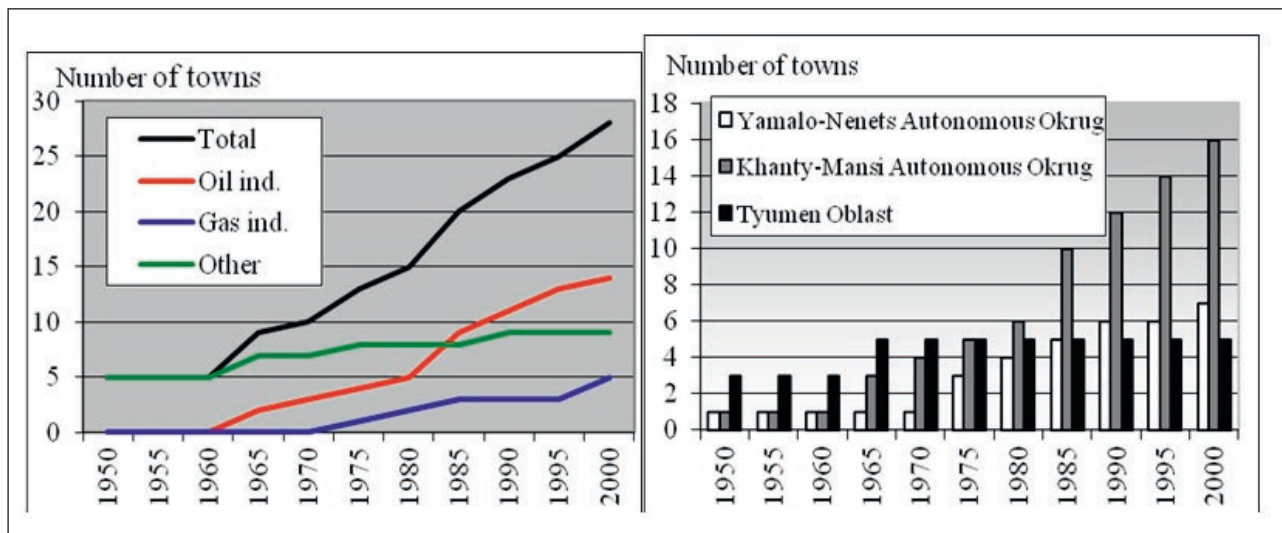


Figure 2: The urban transition (database: SiberCities ©Yv. Vaguet)

Apart from towns, there are other kinds of settlements that were introduced by the economic transition. In order to get an official town status, an urban centre needs to apply for this status from the government when its population is greater than 12,000 inhabitants. While there are 28 urban centres with town status, there are also about 40 urban settlements without this official status. They have all arisen since the mid-1960s for the needs of the economic transition; they are gas plant or road maintenance facility centres, etc. Besides these, long distance commuter settlements should also be mentioned. They are small outposts in the taiga or tundra where oil and gas shift-workers come to work for a

month or so, before going back home. Workers arrive mainly by air in the nearest town and the company picks them up at the airport by bus and drives them straight to the base. Thus, the town of Noyabrsk (63°12'N) for instance, had up to 10 % of its population employed as shift-workers, which is to say about 10,000 in 1991.

In this process of industrialisation and urbanisation of Western Siberia, the creation of a settlement follows a model. First, prospectors arrive and if hydrocarbons are found, human settlement starts. Newcomers are mostly young men (20-30 years old) and possessing few skills. They build all the required human infrastruc-

ture (roads, pipelines, industrial plants, houses, etc.). Shortly afterwards, women arrive and the settlement registers a baby boom. Meanwhile the building stage is still ongoing. Finally, skilled and white collar workers arrive to run the industry. During this process, priority is given to the industrial production. Social infrastructure is always under-developed and the need for housing prevalent. Thus, there is never an end to the housing construction process. Finally, the increase in the population slows down owing to the natural growth rate rather than the migration balance.

The population of Western Siberia is consequently young (median: 32.3 years). Newcomers are mostly single, from 20 to 30 years old, and childless. There is mostly an absence of elderly people except in the case of family reunifications. Men are over-represented (up to 113 men to 100 women). This fact is common in all frontier areas around the world, but this particularity occurs here in a country that has the lowest sex ratio in the world (88 men to 100 women). Nowadays, this demographic increase is still high (+10 % between 1989 and 2002). This results from a natural increase, among the highest in the country, as well as from a migration balance which is still positive. It is unique in Northern

Russia, which registered dramatic out-migration during the 1990s.

The city of Noyabrsk is a good example of this process. In 1973, oil flows and the first pioneers arrived. To start off with, people and material arrived by helicopter. The population suddenly soared when, a year later, the first train arrived at Noyabrsk from Surgut in the south. The latter city was the base town during the emergence of the new Noyabrsk settlement. Surgut was already an established settlement and provided the logistics for the new northward settlement. Every year, more than 15,000 people arrived in Noyabrsk. The rate of population increase culminated in 1977-78 with a mighty +224 %. The baby boom appeared in the 1980s with a maximum in 1987. Noyabrsk obtained the status of a city in 1982. Nowadays, the town maintains a population of about 100,000 residents, and the annual increase is due mostly to the natural growth rate. The town's population presents an average age of 26 years and elderly people are almost absent. On the 1999 age pyramid, the limited number of inhabitants aged 15-20 years marks the time of the first arrivals without children. The wide base of this pyramid marks the baby boom period (fig. 3).

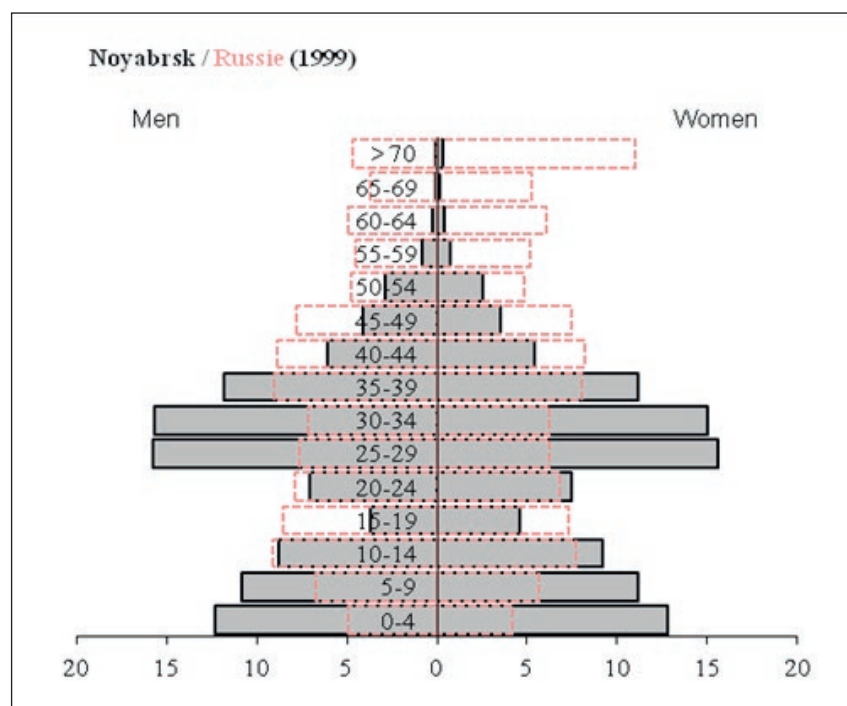


Figure 3: Age pyramid of Noyabrsk (database: SiberCities ©Yv. Vaguet)

Noyabrsk became a supporting city in its own right for Muravlenko and other new settlements. Western Siberia illustrates the Soviet policy of industrialisation and urbanisation during the period from 1955-1975. The process directed entirely by Moscow developed towards the north. The concept of supporting city is well

documented (Engel B., 2007; Gavrilova N.O., 1997; Radvanyi J., 2000).

A new identity of Western Siberia emerged in this transition period. Economically, the region was far behind central Russia, like the whole of Asian Russia. Nowadays, the region resembles a “Siberian emirate”

ranking in the top ten richest provinces of the Russian Federation, often just below the central regions (Moscow and St Petersburg) according to economic indicators (Direct Foreign Investment, Regional Gross Product). Although the high cost of living greatly outweighs high salaries, and the lack of housing leads to further disillusionment, the region is still attractive. It has gained an image of a rich, dynamic territory with real economic forces and young people showing entrepreneurship. However, the Soviet policy of regional planning has now been over for decades and all these towns face new challenges for the future.

2. Present and future challenges: Becoming a sustainable town

Filling up the tank of your car at a petrol station would cost far more than it would had the USSR not conducted this incredible challenge of populating the Arctic and Subarctic Western Siberia. The urban system of Western Siberia might therefore not have been in a market economy. Some settlements were still sustaining rapid growth when the USSR collapsed and the growth process stopped at this point. The Soviet government encouraged the development of small cities all over the national territory and hundreds of cities were created. Nowadays, the Russian government no longer

supports territorial equity and goes rather for supporting the development of regional metropolitan centres. The decade of the 1990s presented a multi-faceted crisis (political, economic, demographic and social) that had a greater impact in the northern part of the country. People were more exposed to the crisis when they lived in a single industry town in the remote north. Many settlements emptied as people went back to the central parts of Russia. Thanks partially to huge oil and gas consumption in the world, Western Siberia is well known as an exception within circumpolar Russia. Its 2002 census shows a healthy demographic situation, increasing its population both by natural growth and a migration balance. However, one of the main challenges for the future facing these new towns is sustaining themselves beyond the peak oil.

The price of a barrel of oil has to remain high in order to cover the costs of extraction in such a harsh environment (\$14/barrel compared to \$4 in Kuwait and The United States). Every year, depending on the production, reserves and the price of oil, these towns are threatened with closure. Looking at both hydrocarbon production and population over time illustrates how much town and industry are linked together (fig. 4). Noyabrsk is associated with an oil field estimated to last 50 years and it has been exploited for 40 years now.

Nevertheless, oil and gas will continue to support

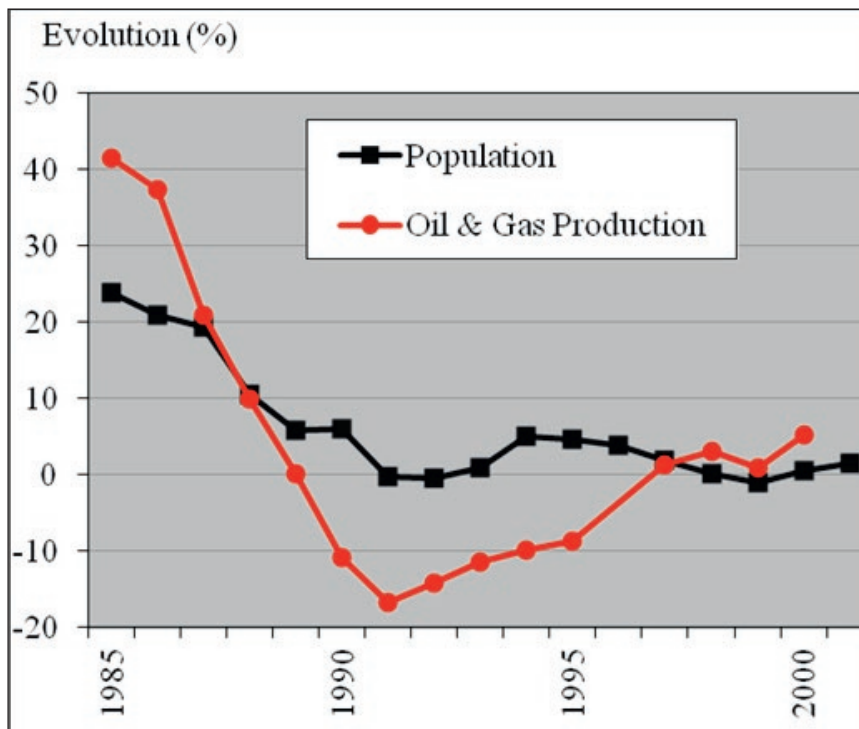


Figure 4: Population and Oil/Gas Production in Noyabrsk & Muravlenco (1985-2001) (database: SiberCities ©Yv. Vaguet)

the development of Western Siberia for some time and one can be optimistic when thinking about what West-

ern Siberia will look like in 2050 (Smith L.C., 2011). Reserves are vast especially over the continental shelf

(more than 18,000 billion m³ of gas for the Siberian part). Nowadays, the oil and gas sector contributes up to 23 % GDP in the circumpolar zone. As producers, the combined two Okrugs of Western Siberia and Alaska are among the top four strongest circumpolar economies. Together with the Republic of Sakha (Russia), these four regions provide 60 % GDP in the circumpolar zone (AMAP, 2007).

Towns in Western Siberia would benefit from ongoing developments of the industry, moving northwards into offshore extraction and transportation. Already, there is a very large-scale project in view for the Yamal peninsula. It includes building a gas processing plant, a seaport and an international airport. The new port is planned for 2018. Russia's Minister of Transport, Maxim Sokolov, says: "For Russia, this project will [...] change the very position of Russia in the world's economy. This project will make Russia one of the leaders in developing the natural riches of the Arctic region." (The Voice of Russia, 2012). Global warming could help in this way especially with increasing shipping in the Arctic.

In a less optimistic point of view, global warming could lead to higher frequency of icebergs, a danger for extraction and shipping activities. Also, it could be responsible for sea and river flooding. It could also lead to the melting of permafrost, especially the newest, thinnest and most discontinuous parts that coincide with the oldest human installations. Therefore, oil and gas fields and towns of the low, marshy Ob' basin could end up under sea level or river water or otherwise could disappear due to subsidence from the effect of permafrost melting. Some authors have already registered several indicators of climate change in this region (Grebenuk G. N. & Rjansky F. N., 2006). Human activity has to cope with a fast changing environment.

The diversification of the local economy is another challenge. Indeed, Western Siberian towns, like many Soviet cities, are mainly mono-industrial and linked to the military sector (Lyubovnyi V.Y. & Pchelintsev O.S., 2006). Worse, some towns are mainly company-owned, therefore raising the question of the definition of a town. All 23 new towns were created ex-nihilo in response to the needs of the industry. Very few of them are not directly oil or gas producing centres. All of them struggle with economic diversification and see hardly any positive results especially for the most recent towns close to the Arctic Circle. For instance, Novy-Urengoi was created 35 years ago and has a population nowadays of approximately 100,000 inhabitants. Gazprom, the biggest gas company in the world, employs up to 70 % of its population. Thus Novy-Urengoi is often called a Gazprom-town. Its residents have the advantage of

living off and being employed by the first Russian company. The company is more or less in charge of many key sectors such as health, education, sport, transport, and the municipality authority is hardly independent. The economic market tends to push the company into reducing its support for the social aspects of the city's life and to concentrate its activity on extraction. However, the municipality has neither the budget nor the knowledge to tackle transport issues, for instance, such as road maintenance, the tremendous increase in cars, or the strange new forest of electric cables connecting indoor power sockets in flats to car batteries at the base of buildings.

Southwards, Surgut, on mid-river Ob, is a good example of the first generation of these towns. Created for the oil industry in the 1960s, the town still depends mainly on this sector. Out of its 320,000 inhabitants, 100,000 are employed in this sector and Surgutneftegaz employs 80,000 of them. The company largely supports local infrastructure such as the stadium as well as health and cultural centres. Considering its geographical position, at the southern part of the permafrost and along the Ob River, river flooding and permafrost melting threaten Surgut. As one of the oldest oil centres, the aging of industrial installations is also a matter of concern.

Between Novy-Urengoi and Surgut, Noyabrsk is a third example showing a typical intermediate case among these towns. Noyabrsk is two decades younger than Surgut and boasts 100,000 inhabitants. The town produces both oil and gas. The industrial installations are getting old here too where the climate is harsher. Moreover, the municipality is facing the aging and the depressed state of its population. People rarely settle for long. Out-migration has always been high. A survey conducted during Soviet times showed that residents of Yamalo-Nenets Okrug where Noyabrsk lies, tended to stay fewer than 5 years in the same place (Logunov E.V., 1999). In the survey conducted in 2003, the wish to leave was ever present among adults and town officials note that the highly educated classes leave (survey Vaguet Yv. 2003; Noyabrsk official web site). The urban population is not indigenous. Therefore it is not well adapted to the local Arctic environment and has no affective links with it. People are always ready to move on, looking for a better salary and living conditions. The regular announcements of the forthcoming closure of the urban centre by the municipality itself contribute to maintaining local pessimism.

However, across Western Siberia, as in Russia, if a municipality finds it difficult to conduct an urban plan, the urban landscape changes as the result of the inhabitants' response to the new world order. The retail sec-

tor is booming all over Russia, as well as in the Arctic region which goes to show that residents have become producers of their own urban space and are taking part in the economic diversification process. Concerning the residential function, the social mix of Soviet times is less and less the rule. Here and there, signs of gentrification can be noted. Some Soviet buildings have

been renovated, with private access and a guard at the entrance. Looking at both satellite images and on the ground, urbanisation is visibly spreading. At the town's periphery, the detached house model is spreading as it is in many parts of the world. The boom in cottages shows the upper class is ready to invest here.



Figure 5: *The changing urban space (photographs: Y. Vaguet & A. Gaye)*

In addition to the points mentioned above, it is important to bear in mind that young people feel at home and do not want to leave. They were born in these towns, which are now as old as them. If their parents play with the idea of going back south one day, the teenagers questioned do not share this desire (survey Vaguet Yv., 2003).

All the above challenges are of equal importance when questioning the ability of these towns to remain alive. It is now a question of inventing a sustainable town in an extreme environment. From this study, it is obvious that a young, talented, adaptable and entrepreneurial population is present in this region.

Conclusion

Western Siberia is exceptional, being one of the most important regions for oil and the biggest for gas production in the world system. There are about 30 towns and 2/3 of them were created in connection with the

industry during Soviet times at a rapid pace in an extremely harsh environment for humans and human installations. This urban network would probably not have been created in Western Siberia if it had not been a communist country. However, these towns still attract workers and nobody can be sure that they will close one day. Global warming could be a positive factor locally though it could also announce natural and human disasters.

Because of its fifty-year experience, Western Siberia is a key area when considering urban development in the Arctic. The single-industry-, and sometimes the single-company-, economy is an often-shared characteristic of the (sub) Arctic urban centres. In addition, this trait is often an industry based on a non-renewable resource. The cost of extraction is always higher than at lower latitudes. The question of profitability is therefore more acute here. The diversification of the local economy can be difficult considering that it would imply fewer links between the major employer and the

municipality. What is important is to invent now and tomorrow a long-term town in an extreme environment. Once again, humans have to face a challenge in Western Siberia. The right demographic blend is an asset for these towns. Residents are tackling the debate: they are inventing new functions, transforming Soviet urban landscapes and creating new urban spaces on the periphery.

References

AMAP, 2007. Arctic Oil and Gas 2007. Arctic Monitoring and Assessment Program (AMAP), Arctic Council, <http://www.amap.no/oga/>.

ENGEL B., 2007. «Public space in the 'bule cities' of Russia», 285-300, in STANILOV K. The post-socialist city. The GeoJournal Library, vol 92, 490 p.

GAVRILOVA N.O., 1997, Le complexe des villes pétrolières et gazières de Sibérie occidentale et sa mise en œuvre (1960-1980). Actes de la conférence Espace social, 73-84 (en russe).

GREBENUK G. N., RJANSKY F. N., 2006. New Challenge of the Modern Civilization and Global Economy in the North of the Western Siberia. in Vogtmann H. & Dobretsov N. (eds), Environmental Security and Sustainable Land Use, Springer, 353-363.

LOCATELLI C., 1998. Energie et transition en Russie: les nouveaux acteurs industriels. L'Harmattan, coll «Pays de l'Est», 280 p.

LOGUNOV E.V. (1999), Demographic and social consequences of oil and gas development in Siberia. PhD thesis, University of Fairbanks, Alaska, 264 p.

LYUBOVNYI V.Y., PCHELINTSEV O.S., 2006. Macroeconomic Factors of Growth of Russian Cities and Town Planning Policy Objectives. Studies on Russian Economic Development, 17, 5, 465-480.

MCGEE R.W., BREOBRAGENSKAYA G.G., 2005. Recent Developments in corporate governance. In Accounting and financial system reform in a transition economy –A case study of Russia, Springer, chap. 4, 53-77.

NORDREGIO, 2011. Megatrends. Nordic Council of Ministers. TemaNord 2011:527, 207 p.

NOYABRSK, Official Web Site: <http://www.noyabrskadm.ru/>

PITERSKI D., 1997. The cities of Russia: some recent trends and experience of regional and urban planning. Geojournal, 43, 4, 385-388.

SMITH L.C., 2011. New North: The World in 2050. Profile Books, 320 p.

VAGUET-MARCHAND Y., 2004. la conquête des hydrocarbures en Sibérie occidentale, le modèle centre-périphérie revisité. Espace Géographique.

VAGUET Y., 2007. Les Hydrocarbures, les villes et les hommes dans le Nord-Ouest Sibérien. Actes du Festival International de Géographie, St-Dié des Vosges, http://xxi.ac-reims.fr/fig-st-die/actes/actes_2007/vaguet/hydrocarbures_siberiens.pdf

VOICE OF RUSSIA (The), 2012. http://english.ruvr.ru/2012_07_24/Yamal-gas-project-a-breakthrough-for-Russia/, July 24th.

ZAITSEVA A.N. (2002), Population of Tyumen region in XXs. Social Space, Tyumen, 20, 5-6, 65-70 (in Russian).