

# The Russian Federation: An Exploratory Assessment of Transport Connectivity

June 12, 2017



## THE RUSSIAN FEDERATION

An exploratory assessment of transport connectivity

### *Abbreviations and Acronyms*

	Definition		Definition
APR	Asia-Pacific Region	KnAAZ	Komsomolsk-on-Amur Aviation Plant
ASEAN	Association of Southeast Asian Nations	KK	Khabarovsk Krai
BAM	Baikal-Amur Mainline	MFC	Multifunctional Center
BRICS	Brazil, Russia, India, China, and South Africa	PPP	Public-Private Partnership
CGE	Computable General Equilibrium	PSEZ	Project Special Economic Zone
CIS	Commonwealth of Independent States	RGDP	Regional Gross Domestic Product
EEU	Eurasian Economic Union	ROSTAT	Russian Federal State Statistics Service
EU	European Union	SME	Small- and Medium-sized Enterprises
FDI	Foreign Direct Investment	SUEK	Siberian Coal Energy Company
FEFD	Far-Eastern Federal District	TASED	Territories of Advanced Social and Economic Development
GDP	Gross Domestic Product	UK	United Kingdom
GRP	Gross Regional Product	US	United States
HQ	Headquarters	USD	United States Dollar
ICT	Information and Communications Technology	WB	World Bank
JSC	Joint-Stock Company	ZK	Zabaikalsky Krai

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## **ACKNOWLEDGEMENT**

This Advisory Services and Analytics piece was carried out by a World Bank team led by Daniel Benitez and Jung Eun “Jen” Oh and consisting of Maria Claudia Pachon, Aleksandra Durova, Evgenia Epaneshnikova, and Megersa Abera Abate. The following consultants also contributed to this work: Adrian Scutaru, Kenneth Gwilliam, Ludmilla Istomina, Luis Jacob Suter, and William Shaw. This work benefited greatly from support from the Russia Country team, including Dorota Nowak, Mikhail Bunchuk, Sylvie K. Bossoutrot and Apurva Sanghi.

The team is grateful for the management’s support and guidance, especially from Andras Horvai (Country Director for the Russian Federation, ECCU1) and Juan Gaviria (Practice Manager, GTI03), as well as for the useful advice and suggestions from the peer reviewers: Birgit Hansl (Program Leader, EACPF), Baher El-Hifnawi (Lead Transport Economist, GTI03), Carolina Monsalve (Senior Economist, OPSPQ), Alberto Perez-Portugal (Senior Economist, GTCTC), Gözde Isik (Senior Transport Economist, GTI03), and Cecilia Briceño-Garmendia (Lead Economist, GTI04).

The team greatly appreciates the support and cooperation provided by the counterpart in Zabaikalsky Krai and Khabarovsk Krai.

## Executive Summary

**Access to transport infrastructure and services is critical to developing business and job opportunities. Moreover, focalized investments and policies to improve connectivity can also reduce spatial disparities.** Transport connectivity remains a core element of development strategy in the Russian Federation. Russia's unique features, such as large land size, a dispersed population as a result of a long history of policies designed to boost population in remote areas, and extreme weather shaped the provision of transport infrastructure and services. In this context, investments and policy actions are challenging and require difficult decisions balancing efficiency and equity. Despite efforts to promote regional growth convergence, large spatial inequalities remain in Russia. While transport is crucial to close the gap, other policies are also required.

**This study describes the performance of the sector vis-à-vis socioeconomic features of regions and discusses whether the development of market opportunities is limited by the availability of transport.** Specifically, this study has two main objectives. First, it provides an exploratory assessment of transport connectivity in Russia. Second, it assesses the impact of improved transport productivity on the Russian economy and whether such an improvement has different economic impacts in various regions of the country. The study is complemented by a market/industry analysis and the performance of transport infrastructure in two selected regions: Zabaikalsky Krai and Khabarovsk Krai. Transport connectivity, as defined in this study, mainly focuses on freight transport and not so much on how passengers in different parts of the country are able to access transport services. Furthermore, while this study assesses general relationships between transport connectivity and economic outcomes—such as growth, poverty, and productivity—it does not intend to formally or empirically establish a causal relationship between these variables.

**Russia's large spatial inequities in part reflect differences in transport connectivity measured by the time it takes to travel to markets.** The core transport network has a single-corridor structure, stretching along the southern border and connecting important industrial and trade centers as well as the largest transportation hubs. Consistent with the territorial disparities, there are notorious differences in the stock of transport infrastructure across regions. The western side of the country has a complex and sophisticated transport network, while in the Far East the trunk networks of transport (main roads and rail lines) are virtually non-existent. More than 40 percent of the Russian Federation lacks reliable access to the transport network, and one-third of the settlements lack all-season roads.

**Expectedly, the average economic distance to market is much less in the well-connected western and central regions than in the more isolated eastern and northern regions.** Similarly, trade volumes (measured in rubles) across regions in Russia are positively correlated with market size (measured by population). The correlation is higher for a subsample of western regions. On the other hand, half of the domestic regional trade happens between neighboring regions (those that share a border) although further analysis is necessary to conclude if this pattern is a reflection of lower travel cost or higher market opportunities. A domestic freight connectivity analysis indicates that it takes longer to ship freight in the northern and central eastern regions than in the western side of the country.

**An increase in transport efficiency, resulting from reduction of travel time or technological progress, can have a different impact on regional productivity and welfare.** This study presents some preliminary

results of a simulation of a positive shock in transport efficiency using a regional general equilibrium analysis for Russia. At the national level, a 10 percent increase in transport efficiency (labor, capital, and energy consumption) would raise GDP by 0.8 percent. Poor or underdeveloped regions enjoy the largest increase in gross regional product, and the two richest regions the smallest, suggesting that an improvement across regions could potentially contribute to regional convergence. These results are mainly driven by the share of transport in the total cost of different industries. In that sense, some industries are less or more affected depending on the share of transport cost and their location vis-à-vis their markets. Overall, households are better off in terms of welfare and poverty reduction, but the main beneficiaries are in the western part of Russia. Finally, productivity shift could be the outcome of some policy reforms, infrastructure investment, technological advancement (widespread adoption of GPS, autonomous vehicles), etc. The link between changes in these variables and impact on better connectivity requires further analysis, which is beyond the scope of a CGE approach.

**Russia's transport networks face considerable challenges, which may result in increasing the travel time and cost to markets.** The extensive rail transport network is the east-west backbone for transport of freight. It operates on an acceptable level of efficiency despite some bottlenecks and long shipping times, but it has proved difficult to maintain. Railroads are also an important source of long-distance passenger travel. On roads, despite some recent efforts to improve and modernize the network, more than 15 million Russians lack access to the federal highway system. Moreover, fewer than half of federal roads meet federal quality standards and the majority of roads cannot easily accommodate large, modern trucks. Road investment in Russia is below other middle-income countries and maintenance has been dangerously delayed. Port capacity is high, but efficiency can be improved. A massive investment in seaports has increased total capacity above current and medium-term needs. However, rail and road access to the ports is poor, and many ports lack modern logistic facilities. These issues are reflected in poor indicators of the quality of logistics. Russia is ranked 99<sup>th</sup> out of 163 countries on the 2016 Logistics Performance Index, the same ranking as in 2007.

**International surveys of manufacturing and services firms provide mixed evidence of the importance of transport for firm productivity in Russia.** The Enterprise Survey in 2012 indicates that high taxes, followed by access to finance, were the main constraints on business development. In contrast, only around 19 percent of the firms in Russia reported that lack of adequate transport was an important constraint on their operations. The share of firms reporting transport as an important problem fell from its 2009 level, perhaps reflecting the government's investments to enhance and modernize transport infrastructure. The extent to which access to transportation is viewed as an important constraint differs by region and by firm size and activity. Finally, the share of firms that view transport as a major constraint is higher for firms selling to international markets than for firms serving the domestic market.

**For a country as large as Russia, it does not suffice to provide an explanation of connectivity in the whole territory.** It needs to be complemented by more focused studies at the regional level as mentioned above. The case studies focusing on two eastern regions—Zabaikalsky Krai and Khabarovsk Krai—in the second part of this report tell a more nuanced story. Transport costs are greater and the benefits of agglomeration smaller in remote, sparsely populated regions than in the denser, better-connected regions. Moreover, the remote regions face several constraints on development such as access to transport for agriculture in rural areas and for the exploitation of natural resources. Railroad-related issues, in addition to non-transport-related issues, such as the high cost of energy and trade policies of key partners (such as China), affect the manufacturing and fishing industry, and port operation. The case

studies also highlight the social exclusion of communities that are poorly connected to their regional capitals, and the failure to reap the benefits of mineral deposits and farmlands due to the high transport cost.

**However, isolated regions, at least those located in areas far from markets in the European side of Russia, may not necessarily be “transport disconnected” from their markets.** For instance, the region of Zabaikalsky Krai is relatively well connected for freight transport with its main existing regional trade partners despite being far from the Moscow-St. Petersburg markets. Moreover, the domestic connectivity index for Zabaikalsky Krai is similar to that of the Moscow Oblast, but the trade volume (RUB) of the latter is 75 times larger than the former. That is, freight in both regions travel the same time but the ratio RUB/minutes of freight is much higher in the Moscow Oblast. On the other hand, the main trading partner for Zabaikalsky Krai is not the domestic market but China with which the region shares a border. In effect, Zabaikalsky Krai’s trade with China in rubles is almost 11 times larger than its trade with regions within Russia. A similar story can be described for Khabarovsk Krai, a region in the Far East, which has a maritime border.

**Finally, it is important to note that in a large country like Russia achieving a good level of connectivity depends both on the density of the national transport network and the level of population dispersion.** There are many regions in Russia where the transport network is thin while the population is highly dispersed. Connectivity in these regions can be increased either by investing in transport or by encouraging people to relocate to larger towns. In cases where building more transport infrastructure comes at a very high cost and small demonstrable benefits, the strategy should be to reduce population dispersion. In the western and central regions where there is better connectivity, road congestion continues to hamper urban-led regional growth. While transport investment plays a role in easing congestion in these regions, it should be directed towards secondary cities to make them attractive destinations for firms and people.

**This report is divided into two parts.** Part 1 considers the provision of transport services at the national level. We first summarize selected studies of the impact of transport services on economic growth and development, then discuss some relevant characteristics of Russia’s provision of transport services and transport sector performance. Part 2 of the report develops two case studies. Section 2.1 provides a deeper assessment of markets and sectors vis-à-vis the role of the transport services in Zabaikalsky Krai and Section 2.2 in Khabarovsk Krai. Section 2.3 concludes with some region-specific findings and policy recommendations.



## Резюме

**Доступность транспортной инфраструктуры и транспортных услуг имеет решающее значение для развития бизнеса и расширения возможностей трудоустройства. Кроме того, целевые инвестиции и экономические меры, направленные на повышение транспортной связности, могут способствовать сокращению территориальных диспропорций.** Формирование единой связанной системы транспортных коммуникаций остается одним из центральных элементов стратегии развития Российской Федерации. Транспортная инфраструктура и транспортные услуги Российской Федерации формировались под влиянием уникальных особенностей страны: значительная сухопутная территория, территориальная рассредоточенность населения как результат исторической политики, целью которой являлось увеличение численности населения в отдаленных регионах, а также экстремальные погодные условия. Это определяет сложность задач, связанных с инвестициями и мерами экономической политики, и требует принятия непростых решений, обеспечивающих баланс между эффективностью и справедливостью. Несмотря на предпринимаемые усилия, направленные на преодоление межрегиональных различий в темпах экономического роста, в России по-прежнему существует значительное территориальное неравенство. И хотя транспорт играет важнейшую роль в преодолении этого разрыва, принятие мер в других направлениях экономической политики также необходимо.

**В настоящем исследовании мы рассматриваем эффективность работы транспортного сектора с учетом социально-экономических характеристик регионов и проводим анализ того, является ли транспортная обеспеченность одним из факторов, ограничивающих возможности рынка.** В частности, наше исследование преследует две главные цели. Во-первых, мы проводим предварительную оценку транспортной связности территории России. Во-вторых, мы проводим анализ того, как повышение производительности транспортного сектора влияет на российскую экономику и различаются ли экономические эффекты такого повышения в разных регионах страны. Наряду с этим, мы проводим анализ рынка (транспортной отрасли) и показателей эффективности транспортной инфраструктуры в двух выбранных регионах. В рамках нашего исследования проблема транспортной связности рассматривается, главным образом, с учетом транспортного обслуживания в грузовом сообщении и в меньшей степени с учетом доступности транспортных услуг для пассажиров в разных частях страны. К тому же, проводя оценку общей зависимости между транспортной связностью и показателями экономического развития, такими, как экономический рост, уровень бедности и производительность, мы не планируем устанавливать (официально или эмпирически) причинно-следственную связь между этими параметрами.

**Значительное территориальное неравенство, которое существует в России, отчасти отражает различия в уровне транспортной связности, который оценивается по времени, необходимому для доставки грузов на рынки.** По своей структуре опорная транспортная сеть ориентирована в одном направлении: она протянулась вдоль южной границы и соединяет важные торгово-промышленные центры, а также крупнейшие транспортные узлы. Между регионами существуют небезызвестные различия в уровне развития транспортной инфраструктуры, отражающие существующее территориальное неравенство. В западной части страны расположена комплексная и хорошо развитая транспортная сеть, в то время как на Дальнем Востоке магистральных сетей транспортных коммуникаций (магистральные автомобильные и железные дороги) практически

нет. Более чем на 40% территории Российской Федерации нет надежного доступа к транспортной сети, а треть населенных пунктов не имеют круглогодичного автомобильного сообщения.

**Как и следовало ожидать, в западных и центральных регионах с хорошим транспортным сообщением среднее экономическое расстояние до рынка гораздо меньше, чем в более изолированных восточных и северных регионах.** Аналогично, объем торговли в российских регионах (оценивается в рублях) имеет положительную корреляцию с размером рынка (оценивается по численности населения). В западных регионах эта корреляция проявляется сильнее. С другой стороны, половина объема внутренней региональной торговли приходится на торговлю между соседними регионами (т.е. регионами, имеющими общую границу), хотя для установления причин такого характера торговли (низкие транспортные издержки или более широкие рыночные возможности) необходимо проведение дополнительного анализа. Как показывает анализ внутреннего грузового сообщения, перевозка грузов на севере и в центре восточной части страны занимает больше времени, чем в западных регионах.

**Повышение эффективности транспортной системы в результате сокращения времени перевозок или технического прогресса может оказать влияние на производительность и благосостояние регионов.** В настоящем исследовании представлены некоторые предварительные результаты моделирования положительного воздействия повышения эффективности российской транспортной системы с использованием региональной модели общего равновесия. На общероссийском уровне 10%-ное повышение эффективности транспортной системы (труд, капитал и потребление энергии) приведет к росту ВВП на 0,8%. Наибольший прирост валового регионального продукта будет отмечаться в бедных и слабо развитых регионах, а наименьший – в двух самых богатых регионах, и это позволяет предположить, что такое повышение эффективности на всей территории страны может способствовать сокращению межрегиональных различий. Эти результаты, в основном, связаны с долей транспорта в общем объеме расходов различных отраслей. В этом плане, эффекты в ряде отраслей будут меньше или больше в зависимости от доли транспортных расходов, а также местонахождения самих отраслей по отношению к рынкам. Что касается домохозяйств, то, в целом, они выиграют в результате роста благосостояния и сокращения бедности, однако основные бенефициары будут находиться в западных регионах России. Наконец, повышению уровня производительности могут способствовать экономические реформы, инвестиции в инфраструктуру, технический прогресс (широкое распространение технологии GPS, автономные транспортные средства) и т.п. Связь между изменением этих параметров и повышением транспортной связности требует дальнейшего изучения, которое выходит за рамки вычислимой модели общего равновесия.

**Существует ряд значительных трудностей, связанных с транспортными сетями Российской Федерации, которые могут привести к увеличению времени и стоимости доставки грузов к рынкам.** Разветвленная сеть железных дорог – это основной канал грузовых перевозок в восточно-западном направлении. Несмотря на некоторые существующие “узкие места” и большую продолжительность доставки грузов сеть работает достаточно эффективно, но при этом ее трудно содержать. Железные дороги также играют важную роль в пассажирских перевозках дальнего следования. Что касается автомобильных дорог, то несмотря на ряд мер, которые принимались в последнее время в целях повышения качества и модернизации дорожной сети, более 15 миллионов россиян все еще не имеют доступа к сети федеральных автомобильных дорог. Более того, федеральным стандартам качества отвечают менее половины автомобильных дорог

федерального значения, а большинство автомобильных дорог мало приспособлены для проезда современных большегрузных автомобилей. Объем дорожных инвестиций в России меньше, чем в других странах со средним уровнем доходов, а работы по содержанию дорог выполняются с опасными задержками. Порты имеют хорошую пропускную способность, однако эффективность их работы может быть повышена. В результате крупномасштабных инвестиций в морские порты совокупная пропускная способность портов превышает текущие и среднесрочные потребности. Но при этом подъездные железнодорожные и автомобильные пути к портам слабо развиты, а во многих портах нет современной логистической инфраструктуры. Эти проблемы находят отражение в низких показателях качества логистики. По результатам исследования «Индекс эффективности логистики» за 2016 год Россия заняла 99-е место в списке 163 стран, получив тот же рейтинг, что и в 2007 году.

**Международные обследования предприятий перерабатывающей промышленности и сектора услуг дают неоднозначные результаты в том, что касается значения транспорта для производительности российских предприятий.** Как показало Обследование предприятий 2012 года, главными факторами, сдерживающими развитие бизнеса, являются высокие налоги, а также ограниченный доступ к источникам финансирования. При этом только около 19% российских предприятий отметили, что отсутствие хорошего транспортного сообщения существенно ограничивает их деятельность. Доля предприятий, сообщивших о том, что транспортное сообщение является серьезной проблемой, сократилась по сравнению с 2009 годом: возможно, это отражает тот факт, что государство осуществляет инвестиции в расширение и модернизацию транспортной инфраструктуры. Оценка транспортной доступности как серьезного ограничения меняется от региона к региону и зависит от размера и рода деятельности предприятий. Среди компаний, поставляющих свою продукцию на мировые рынки, доля предприятий, считающих транспортное сообщение серьезным ограничением, выше, чем среди компаний, обслуживающих внутренний рынок.

**Единая оценка транспортной связности на уровне всей территории недостаточна для такой большой страны, как Россия.** Ее необходимо дополнить более углубленными исследованиями на региональном уровне, о чем говорилось выше. Исследования ситуаций в двух восточных регионах – Забайкальском и Хабаровском краях – изложенные во второй части настоящего доклада, позволяют получить более детализированную картину. В отдаленных регионах с низкой плотностью населения транспортные издержки выше, а выгоды агломерации меньше, чем в густонаселенных регионах с хорошими транспортными коммуникациями. Более того, отдаленные регионы сталкиваются с целым рядом факторов, ограничивающих процесс развития, включая доступность транспортных услуг для хозяйств в сельских районах, а также для предприятий, занимающихся разработкой природных ресурсов. Трудности, связанные с железнодорожными перевозками – наряду с проблемами, не связанными с транспортным сектором, такими, как высокая стоимость энергоресурсов и торговая политика ключевых партнеров (например, Китая) – отрицательно сказываются на перерабатывающей промышленности, рыбном промысле и работе портов. Кроме того, результаты проведенных региональных исследований свидетельствуют о социальной изоляции городов и поселков, не имеющих хорошего транспортного сообщения с административными центрами регионов, и о том, что высокие транспортные издержки не позволяют использовать преимущества, связанные с наличием месторождений полезных ископаемых и сельскохозяйственных земель.

**Вышесказанное не значит, что изолированные регионы – по крайней мере, те, которые расположены далеко от рынков европейской части России – не имеют транспортного сообщения со своими рынками.** Забайкальский край, например, несмотря на удаленность от рынков Москвы и С.-Петербурга, имеет относительно хорошее грузовое транспортное сообщение с основными региональными торговыми партнерами. Более того, у Забайкальского края такой же национальный рейтинг транспортной связности, как и у Московской области, однако по объему торговли (в рублях) Московская область превосходит Забайкальский край в 75 раз. Это значит, что продолжительность перевозки грузов в обоих регионах находится на одном уровне, но отношение объема стоимости грузов к продолжительности перевозок (руб./мин) в Московской области намного больше. С другой стороны, основным торговым партнером Забайкальского края является не внутренний рынок, а Китай, который граничит с этим регионом. По существу, объем торговли между Забайкальским краем и Китаем (в рублях) почти в 11 раз больше объема торговли между Забайкальским краем и другими российскими регионами. То же можно сказать и о Хабаровском крае, дальневосточном регионе, где проходит морская государственная граница России.

**И наконец следует отметить, что в такой большой стране, как Россия, возможность достижения высокого уровня транспортной связности зависит не только от плотности национальной транспортной сети, но и от плотности населения.** В России много регионов с небольшой плотностью транспортной сети и крайне рассредоточенным населением. В таких регионах для повышения уровня транспортной связности нужны либо инвестиции в развитие транспортного сектора, либо принятие мер, стимулирующих переезд жителей в более крупные города. В тех случаях, когда строительство дополнительных объектов транспортной инфраструктуры связано с относительно высокими затратами и приносит мало очевидных выгод, стратегия должна быть направлена на повышение концентрации населения. В западных и центральных регионах, где качество транспортного сообщения выше, помехой для экономического роста регионов, стимулом которого являются города, по-прежнему является перегруженность дорожной сети. При том, что транспортные инвестиции играют определенную роль в сокращении заторов на дорогах этих регионов, такие инвестиции следует направлять во второстепенные города, чтобы повысить их привлекательность для предприятий и населения.

**Настоящий доклад состоит из двух частей.** В первой части рассматриваются вопросы транспортного обслуживания на национальном уровне. Сначала мы обобщаем результаты отдельных исследований, посвященных влиянию транспортных услуг на экономический рост и развитие, а затем рассматриваем ряд актуальных характеристик транспортного обслуживания и показателей эффективности транспортного сектора в России. Во второй части доклада рассматриваются результаты исследований двух регионов. В разделе 2.1 представлена углубленная оценка рынков и отраслей с учетом роли транспортных услуг для Забайкальского края, а в разделе 2.2 – для Хабаровского края. В разделе 2.3 представлен ряд выводов и рекомендаций для исследованных регионов.

## Part 1 – Transport Connectivity in the Russian Federation

### 1.1 Introduction

**Transport infrastructure and services contribute to economic growth and development in different ways.** Improved access to reliable, affordable, and competitive transportation can increase firm productivity, improve access to markets and jobs, enhance the quality of life, increase the supply of labor and entrepreneurship, and lead to changes in land use and spatial patterns that may improve growth and welfare. At the national level, good connectivity to strategic nodes of global economic activity is critical for integration into regional and global value chains. Improved transport infrastructure and services provides important benefits across all sectors and users. These benefits are typically realized in the form of reduced transport costs (both monetary and time costs). They also accrue in the form of improved connectivity to existing national or international transport networks.<sup>1</sup>

**Part one of this study provides an exploratory assessment of transport connectivity in the Russian Federation followed by an analysis of the effect of an improvement in transport sector productivity on the country's economic growth.** Furthermore, it describes the performance of the sector vis-à-vis socioeconomic features of regions and discusses whether the development of market opportunities are limited by the availability of transport. Finally, to assess the role of transport on regional competitiveness, the study is complemented through a market/industry analysis and the performance of transport infrastructure in two selected regions in Part 2.

**This section is organized as follows:** Section 1.2 reviews the general literature on the relationship between transport and economic development followed by a broad assessment of Russian development challenges in Section 1.3. Particular emphasis is given to the disparities that exist between the leading western regions and lagging far eastern and northern regions. Section 1.4 and Section 1.5 focus on the transport sector and assess its role in regional disparity in Russia. Transport connectivity indicators are constructed in Section 1.4 to describe the level of transport access in different regions. In Section 1.5, salient sectoral issues are discussed for the different transport modes in Russia. Using the Enterprise Survey, Logistic Performance Index from the World Bank and other sources, we analyze the role of transport as a factor in doing business. Section 1.6 discusses results from a CGE model, which assesses the impact of transport sector productivity on the Russian economy. Finally, Section 1.7 and Section 1.8 conclude the first part of the study by discussing issues of regional convergence and making some policy recommendations and areas of future research, respectively.

### 1.2 Transport and economic development

**While it is almost impossible to understand how an economy can develop without transport services, it is difficult to measure to what extent improved transportation results in an increase in economic development.** This is because estimates of the relationship between a reduction in travel time and economic growth, for example, likely suffer from endogeneity problems. Rich economies are better able

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<sup>1</sup> See Section 1.4 for the definition of transport connectivity in this study.

to develop their transport network than poor ones, so greater availability of transportation may be the result, rather than a cause, of economic development. Moreover, the benefits of better transport tend to diminish over time (Helling, 1997), while the costs and negative externalities tend to increase. The benefits also depend on the kinds of investments made. For example, undertaking large investments in transport infrastructure that cannot easily adapt to a rapidly changing economic environment runs the risk of being trapped with the wrong technology (WDR, 2010). Realizing the potential contribution of transportation to economic development requires efficient and flexible services, and a decision-making framework that takes citizens' concerns for equity, self-determination, and stability into account. Moreover, transport interact in complex ways with trade, migration, information, energy, and financial flows as discussed in the next sections of this report.

**Increasing the availability and quality of transport services, along with a regulatory regime that encourages competition while limiting the administrative burden on operators, can boost growth in developing countries.** Transport prices tend to be much higher in developing than in high-income countries, and highest in the poorest countries. Reducing these prices increases the profits of firms selling goods, as well as those of firms purchasing intermediate goods. Improving transport can also have important dynamic effects. Improved access to markets and inputs enables firms to capture economies of scale and can increase efficiency by facilitating just-in-time inventory control.<sup>2</sup> Transport improvements can radically transform production processes. For example, lower transport costs have been an important driver of the development of complex global value chains, whereby developing countries can participate in the production of sophisticated goods. Improving access to output and input markets, and workers' ability to travel to absorb new information, can also encourage innovation.

**Improved transport, be it in the form of lower travel cost and time or better services, generates benefits beyond the immediate users.** Transport investment raises growth and welfare through agglomeration effects or through the benefits generated by concentrations of economic activity.<sup>3</sup> Historically, dense urban environments have grown around transport centers, most notably rivers and navigable harbors, but also railroad terminals and (more recently) airline hubs. The greater supply of skills in urban centers facilitates more specialized production and innovation,<sup>4</sup> while the availability of more diverse goods and services improves consumer welfare. Other economic benefits may include less-distorted markets as transport services are priced more efficiently (Helling, 1997), or benefits to firms or workers interacting with firms profiting from transport improvements.

**A number of approaches have been used to demonstrate the importance of transport for growth in developing countries.** The high transport costs facing producers in many developing countries have been extensively documented. For example, for Latin America, Guasch and Kogan (2006) find that logistics costs (as a share of GDP) in the 1990s were two to four times those in the OECD countries, and inventory levels in the region are three times that of OECD countries (Gonzalez, Guasch, and Serebrisky, 2007). Moreira and others (2013) document the impact of high transport costs on exports for several Latin American

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<sup>2</sup> For example, Datta (2012) finds that firms located near highway improvements achieve efficiency improvements by keeping inventories for less time than other firms.

<sup>3</sup> See Duranton and Puga (2004) and World Bank (2009) for a discussion of agglomeration effects from urban concentration.

<sup>4</sup> Ebert and Stone (1992) find that infrastructure improvements are associated with lower wages, because improvements in the quality of life from infrastructure investment attract more workers.

countries. Considerable anecdotal evidence of the high costs facing developing country producers also exists.<sup>5</sup> Firm surveys often show that improvements in transport have led to increased production, although such surveys cannot take into account either the impact on other firms of greater production by the firms surveyed, or the costs of the improvements.

**Macroeconomic modeling exercises find that improved transport can have a significant impact on growth.**<sup>6</sup> Other macroeconomic studies have found that improved transport encourages trade.<sup>7</sup> These studies tend to be based on regression analysis, where some indicator of transport is the independent variable and growth or trade is the dependent variable. Growth also affects the location, demand for, and ability to finance transport, so that a correlation between growth and transport (even controlling for other variables) can produce biased results. Various econometric strategies have been used to overcome this difficulty, which is referred to as endogeneity.<sup>8</sup> These studies are also limited by lack of data, particularly of measures of the economic cost and importance of linkages to markets.

**The impact of improved transport on production varies by product and sector.** For example, the smaller, lighter, and more valuable the product, the lower the sensitivity to trade costs (Arnold, 2009). The importance of rapid and reliable transport can be great for most agricultural commodities (both due to perishability and vulnerability to damage) and for intermediate goods that have to meet time-sensitive production schedules. Tourism services are also particularly sensitive to reliable and inexpensive transport.<sup>9</sup>

**Improving transport connectivity, however, can be a double-edged sword for remote, poor areas.** While poor producers expand their trading opportunities, they also face greater competition from goods produced in cities. For example, Faber (2014) finds that lower transport costs reduce industrial growth in peripheral areas that are connected to the central network, compared to areas that are not connected. Similarly, the concentration of production encouraged by transport investments may increase economy-wide inequality by increasing the incomes of rich cities and regions at the expense of poor ones.<sup>10</sup> However, the overall impact on poverty would have to take into account the opportunity for migration (and the ensuing remittances) from peripheral areas to help reduce poverty. One view is that transport

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<sup>5</sup> See, for example, World Bank (2012) for Costa Rica, Atkin, and Donaldson (2015) for Ethiopia and Nigeria, and Milner, Morrissey, and Rudaheranwa (2000) for Uganda.

<sup>6</sup> See Calderón, Moral-Benito, and Servén (2015) for Latin America; Boopen (2006) and Calderón and Servén (2010) for sub-Saharan Africa. Dorosh, Wang, You, and Schmidt (2012) find that reducing travel time to the closest market boosts agricultural production in sub-Saharan Africa. However, Straub (2008), in a review of empirical findings, concludes that estimates of the productivity and growth effects of infrastructure are uncertain, varying significantly according to the details of the particular sample and estimation methods used.

<sup>7</sup> See Buys, Deichmann, and Wheeler (2010) for the impact of improved roads on trade within sub-Saharan Africa.

<sup>8</sup> These strategies include the use of instruments (that is, variables that are correlated with transport improvements but are unaffected by growth, for example, physical features of the land) as independent variables; using military investments or ancient investments in transport infrastructure, which are unlikely to be driven by current growth; or transport improvements in a previous period.

<sup>9</sup> World Bank (2014) finds that investments in high-speed rail significantly increased tourism in China.

<sup>10</sup> This effect in China is a subject of controversy. Demurger (2001) finds that transport infrastructure is one of the main reasons for inequality in growth across Chinese provinces, while Banerjee, Deflo, and Qian (2012) find that transport investments had no impact on differences in per capita income growth among Chinese regions. Vickerman, Spiekermann, and Wegener (1999) and Puga (2002) argue that infrastructure investments in lagging regions have not reduced regional income disparities across Europe.

improvements initially worsen regional disparities by encouraging concentration of activities, but as the costs of congestion rise over time, this is followed by dispersion of activities and greater convergence (Roberts et al., 2009).

**Improving transport connectivity can also reduce welfare through damage to the environment and other unintended effects.** Good connectivity results in more movement of goods and people over longer distances. These movements generate negative environmental impacts, such as more energy consumption and greenhouse gas emissions (Spiekermann et al., 2015)<sup>11</sup>. Investments in transport infrastructure can be associated with deforestation, biodiversity loss, the degradation of ecosystems, the blocking of seasonal migration patterns, and, from a global perspective, climate change (Berg et al., 2016). While these environmental effects often can be mitigated, for example, by taxing fuel or car ownership, or regulatory restrictions on car use, developing countries often lack the administrative machinery required to do so efficiently. Transport links also can facilitate the spread of diseases.<sup>12</sup>

**Finally, the impact of transport infrastructure depends greatly on context.** While the average historical impact of transport improvements tends to be large, the marginal impact falls over time while the costs of improvements tend to rise.<sup>13</sup> Hulten (2004) argues that the impact of reduced transportation cost in built-up networks like the United States is to relocate economic activity to lower-cost regions, while adding transport capacity to underdeveloped networks will improve efficiency. The regulatory regime, for example, the competitive framework for transport services, the administrative/documentation requirements facing users of transport services (particularly concerning international trade and the ports), the existence of price controls or other constraints on market activities, also will affect the productivity of transport investments.

### 1.3 The Russian challenge

#### 1.3.1 Country context

**The provision of transport infrastructure and services is greatly affected by Russia's enormous size and dispersed population.** Russia has the largest land mass in the world, but extensive areas are sparsely populated. Russia accounts for 42 percent of the land mass of the BRICS countries, but its population is only about 70 percent of the population of Brazil and less than 5 percent of the total population of the BRICS, which is largely dominated in terms of population by China and India. While Australia and Canada also have large land mass and even lower population density than Russia, a large share of their populations live near the border or the sea. In Russia, the population is more dispersed inland.<sup>14</sup> Also, the population in Australia and Canada is concentrated in major cities: more than two-thirds of the population in these

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<sup>11</sup> Spiekermann, K., Wegener, M., Kveton, V., Marada, M., Schürmann, C., Biosca, O., Uliedsegi, A., Antikainen, H., Kotavaara, O., Rusanen, J. and Bielanska, D., 2015. Transport accessibility at regional/local scale and patterns in Europe. TRACC executive summary and final report. Luxembourg: ESPON.

<sup>12</sup> AIDS transmission in Africa was increased through truck drivers who had multiple sexual partners across long-distance routes (see, for example, Mark, 1999). And the spread of Ebola in West Africa was more limited in areas of Guinea, Liberia, and Sierra Leone that lacked all-weather roads (UNDP, 2014).

<sup>13</sup> See Briceño-Garmendia, Moroz, and Rozenberg 2015. Li (2011) estimates that the rate of return on transport infrastructure investments was quite high for cities affected by significant congestion in rail networks.

<sup>14</sup> As a consequence of policies during the Soviet time that sought to increase population in remote areas.



two countries live in the three largest urban centers. In Russia, on the other hand, Moscow, St. Petersburg, and Nizhny Novgorod are home to only about one-eighth of Russia's population (World Bank, 2011).

**Table 1: Russia in numbers from World Development Indicators (2015 or latest information available)**

Indicator	Australia	Canada	United States	Brazil	Russian Federation	China	India	South Africa
GDP (current US\$ billion)	1,340	1,551	17,947	1,775	1,326	10,866	2,074	313
GDP per capita, PPP (current international US\$)	45,514	44,310	55,837	15,359	24,451	14,239	6,089	13,165
Land area (1000 sq. km)	7,682	9,094	9,147	8,358	16,377	9,388	2,973	1,213
Population (mill)	24	36	321	208	144	1,371	1,311	55
Pop. density (people per sq. km of land area)	3.10	3.94	35.14	24.87	8.80	146.06	440.96	45.30
Rural population (% of total population)	10.58	18.17	18.38	14.31	25.99	44.39	67.25	35.20
Gini index (World Bank estimate)	34.94	33.68	41.06	51.48	41.59	42.16	35.15	63.38
Poverty gap at \$1.90 a day (2011 PPP) (%)	-	-	-	1.72	0.01	0.35	4.27	4.90
Poverty gap at \$3.10 a day (2011 PPP) (%)	-	-	-	3.14	0.09	2.52	18.46	13.09

**While Russia has transitioned from a planned to a market economy, some legacies of former Soviet location policies remain.** The Soviet government promoted population dispersion and these efforts continue through the promotion of regional convergence by subsidizing regions in the coldest and more remote areas of Russia. These policies may not sufficiently take into account transport costs and the cost of creating living standards and business conditions in cold climates. As discussed in the next section, the manufacturing firms placed in the coldest and most remote areas were not competitive and were not successful in attracting significant foreign investment (Gaddy, 2008).

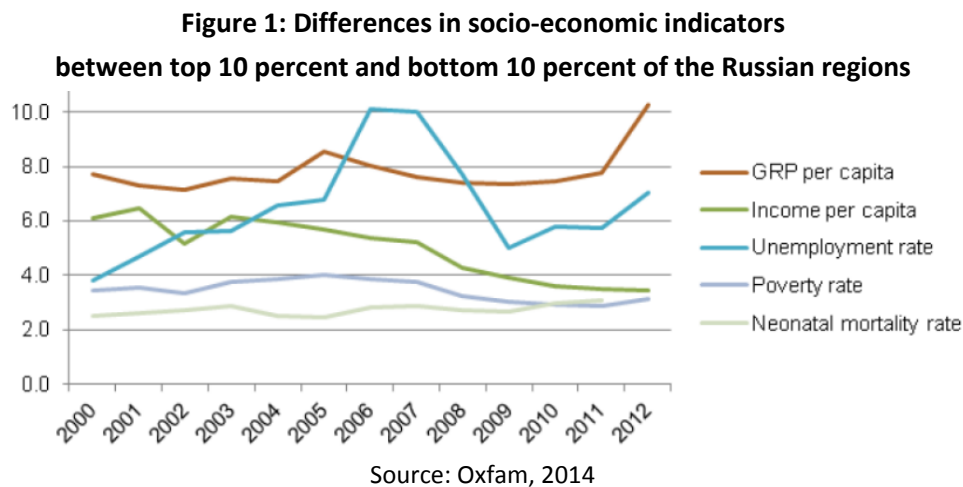
**Finally, Russia's extreme winter weather also greatly impairs transportation services.** The photos on the right show some images from the city of Yakutsk,<sup>15</sup> which holds the record for being the coldest city in the world.



<sup>15</sup> See the link below for some pictures and discussion on the coldest city in the world.  
<https://www.dogonews.com/2014/2/14/think-your-winter-is-bad-dont-tell-that-to-the-residents-of-the-worlds-coldest-city/page/2>.

### 1.3.2 Spatial and socioeconomic disparities

**Despite efforts to promote regional convergence, disparities in growth and development among regions remain high.** Based on Regional Gross Domestic Product (RGDP) per capita, the highest-income regions of Russia would be considered high upper-middle-income or high-income if they were separate countries, comparable to many OECD countries. The lowest-income regions are comparable to lower-income countries such as those in sub-Saharan Africa. The level of per capita GDP among regions is correlated with economic dependency on natural resources. The RGDP per capita at purchasing power parity in resource-rich regions, such as Tyumen and Sakhalin Oblasts (and in Moscow) is about ten times the level in the regions of low population density, remoteness, unfavorable development conditions, and significant population decrease due to migration outflow (e.g. the Republic of Ingushetia, Ivanovo Oblast, and Altai Republic). Figure 1 shows the differences in socio-economic indicators between the top 10 percent and bottom 10 percent of Russian regions.



**Russia's regions can be divided into a set of leading, middle-range, and lagging regions based on real GDP per capita, mineral and non-mineral exports, and FDI inflows.**<sup>16</sup> Other than Moscow and St. Petersburg, Russia's leading regions are located in a broad swath across the north, while the lagging regions are concentrated in pockets in the south and southwest (See Figure 2). This pattern is explained by the uneven distribution of oil and other mineral resources. The areas with the highest shares of lagging regions are North Caucasus, where all are lagging, and Southern and Volga Federal Districts, both of which have a larger share of lagging federal regions than Russia as a whole. The best-performing regions are located in the Far East, which has the second-highest share of leading regions and no lagging ones; Ural, with the largest share of leading regions at 50 percent; and the North West, with the third-highest share.

<sup>16</sup> Dairabayeva, Ferrantino, Portugal-Perez, and Schmidt (2016), "Export Competitiveness and FDI Performance Across the Regions of the Russian Federation" World Bank (2016).

**Figure 2: Leading and lagging regions of the Russian Federation**



Source: Dairabayeva et al. (2016)

*Notes: Numbered regions: (1) Yaroslavl, (2) Kaluga, (3) Vladimir, (4) Ivanovo, (5) Perm, (6) Moscow City, (7) Tula, (8) Nizhniy Novgorod, (9) Ryazan, (10) Mari El, (11) Udmurtia, (12) Mordovia, (13) Chuvashia (14, 16) Tatarstan, (15) Penza, (17) Ulyanovsk (18) Saratov, (19, 20) Samara, (21) Volgograd, (22) Kalmykia, (23) Adygea, (24) Stavropol, (25) Karachevo-Chercheskia, (26) Kabardino-Balkaria, (27) North Ossetia, (28) Chechnya, and (29) Ingushetia.*

**Similarly, levels of poverty and income distribution differ greatly among regions, as shown in Figure 3.** Poverty is higher in the Far East and Siberian Federal Districts, which border China and Central Asia. These regions do not have the lowest GDP per capita, suggesting that poverty coexists with opportunity. Income inequality, as measured by the Gini coefficient, tends to be higher in the more economically successful regions, and is not correlated with dependence on natural resources (Glazyrkina and Klevakina, 2014).

**Spatial disparities also can be analyzed in terms of different groups of Russian cities depending on their levels of growth and development during the post-Soviet era.**<sup>17</sup> First, many cities have developed rapidly because they could produce goods at quality sufficient to compete in world markets and had access to transportation infrastructure at a reasonable cost. These cities competed by providing cutting-edge solutions based on high technology to serve global markets, rather than simply meeting local demand. Many cities near Moscow are within this group. A second group of successful cities managed to diversify production and rapidly adapt to changing market conditions but focused on domestic markets. A third group of cities is characterized by their location, including proximity to markets, good climate, or possession of natural resources, as well as access to transport infrastructure. Examples include small cities

<sup>17</sup> This grouping of cities is based on Becker et al. (2012): Becker, Mendelsohn, and Benderskaya (2012), Russian urbanization in the Soviet and post-Soviet eras, Urbanization and Emerging Population Issues Working Paper 9, International Institute for Environment and Development, United Nations Population Fund.

in large agglomerations—i.e. cities near Moscow and St. Petersburg—which serve as transport, supply, and logistics hubs to the center while also providing goods and services, and small cities in rural areas of southern Russia with favorable climatic conditions for agriculture and hence for food-processing industries. Many cities have also benefited from stable institutions, a favorable investment climate to attract foreign direct investment, and other factors.

**Figure 3: Poverty incidence by region (including estimation of pockets of poverty)**



Source: Own mapping based on Rosstat 2012

**Another group of cities has had only limited growth.** Most of these cities rely heavily on government subsidies or public procurement, or production is concentrated in a single product, produced on a non-competitive basis. Some are poorly-connected cities in the north and east that depend on forest products, but poor infrastructure makes their products uncompetitive. A combination of long distances, limited road and rail connectivity in the northern and eastern regions, and often poorly chosen routes together make it very difficult for remote cities to grow without the support of the government.

**Spatial disparities declined in the Soviet era, but this came at a cost.** Policies that shifted production from the old industrial areas in the western part of the country had increased the share of the eastern part of the country in production from 4 percent in 1925 to 28 percent by 1989 (World Bank, 2009). While increasing spatial equity, these policies undermined efficiency. Many manufacturing enterprises were placed in remote (and cold) regions, which seriously impaired productivity (Gaddy, 2008). In addition to facing high transport costs to reach large markets, firms in remote areas often have to produce a large

number of intermediate goods (at inefficient scale) to ensure that production can continue in the face of breakdowns in logistics.

**The transition to capitalism opened opportunities for the manufacturing and service industries to shift to the higher-productivity urban markets of western Russia.** There is evidence that production and population are shifting toward locations with larger markets and more efficient business environments despite persistent policy efforts to distribute the population across the country (Becker et al., 2012). This trend has accelerated with the decline of subsidies and non-competitive incentives. One sign of this shift was the high rate of internal migration during the first half of the 1990s, right after the breakup of the Soviet Union. For instance, the Komi Republic lost one-fifth of its population, and Chukotka (at the far northeastern tip of Russia) lost two-thirds. Immigration to the large regional capitals of Yekaterinburg, Krasnoyarsk, Samara, and Novosibirsk slightly increased from 2003 and 2007. The shift in population is consistent with market-driven forces and suggests that Russia's secondary cities could grow as markets become more effective if institutional obstacles to mobility can be lifted. But the rate of internal migration has slowed in recent years. In sum, the overall shift in population is likely to be explained by the existence of business and job opportunities, some of them fueled by the improvement in the enabling framework. Nevertheless, firms' inability to compete given the long distance to large markets, lack of access to transport, and low quality of transport services are also factors that determine the entry, exit, and location of firms in the market (Brown et al., 2008).

#### 1.4 Connectivity analysis

**The concept of transport connectivity is multidimensional and varies depending on the mode in question.** At a basic level, it can be defined based on the availability and capacity of transport infrastructure between two locations. In this sense, connectivity is characterized based on the physical properties of a transport network. The mere existence of transport infrastructure, however, does not indicate the level of transport connectivity. As such connectivity should also be defined based on the availability and capacity of transport services (Calatayud et al., 2016).<sup>18</sup> In what follows, the effectiveness of transport in improving market connectivity of people and goods in Russia is discussed from three dimensions: 1) physical infrastructure, 2) quality of infrastructure and service availability, and 3) (economic) distance to markets.

##### 1) Physical Infrastructure

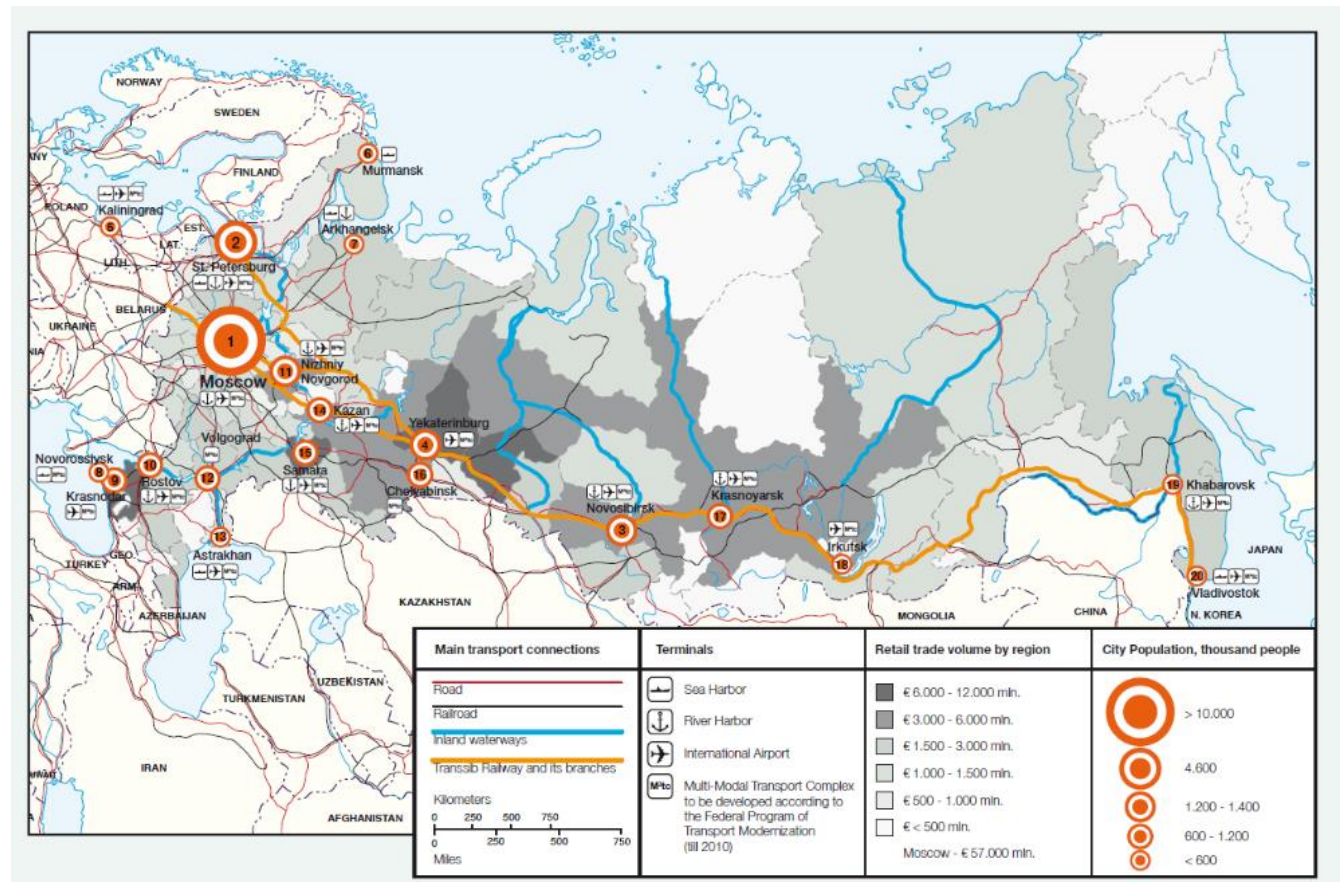
**Russia's large spatial inequities, in part, reflect differences in transport connectivity.** The core east-west transport network has a single-corridor structure, stretching along the southern border and connecting important industrial and trade centers as well as largest transportation hubs (Figure 4 and Figure 5). Rail, the primary mode of transport infrastructure that connects east and north with the western part of the country, is mainly used for long-haul cargo traffic. Waterways connect the north-south axis of the country, while the road network is more developed in the west. Large strategic infrastructure projects serving

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<sup>18</sup> Calatayud, A., Palacin, R., Mangan, J., Jackson, E. and Ruiz-Rua, A., 2016. Understanding connectivity to international markets: a systematic review. *Transport Reviews*, 36(6), pp.713-736.

high-density corridors such as highways and national roads, and freight and passenger railway links constitute the backbone of the country's transport network.

**Figure 4: Main transport connections of the Russian Federation and neighboring countries**



Source: Logistics Map of Russia, Cap Gemini S.A.<sup>19</sup>

**There are notorious disparities in the stock of transport infrastructure among regions in Russia.** The western side of the country, including Moscow and St. Petersburg, which account for a large share of GDP, has a complex and sophisticated transport network, while in the Far East, the trunk networks of transport (main roads and rail lines) are virtually non-existent and overall road density per 1,000 km<sup>2</sup> in the smaller and poorer regions is low. Regions are connected either by air (for passenger travel), secondary and even tertiary roads, most of which are deemed inaccessible during the winter, and Arctic sea routes, accessible only part of the year. More than 40 percent of the land mass lacks reliable access to the transport network and one-third of the settlements lack all-season roads.

<sup>19</sup> [http://www.nl.capgemini.com/resource-file-access/resource/pdf/Logistics\\_Map\\_of\\_Russia\\_0.pdf](http://www.nl.capgemini.com/resource-file-access/resource/pdf/Logistics_Map_of_Russia_0.pdf).

Figure 5: Main road and rail network in Russia



Source: Own mapping

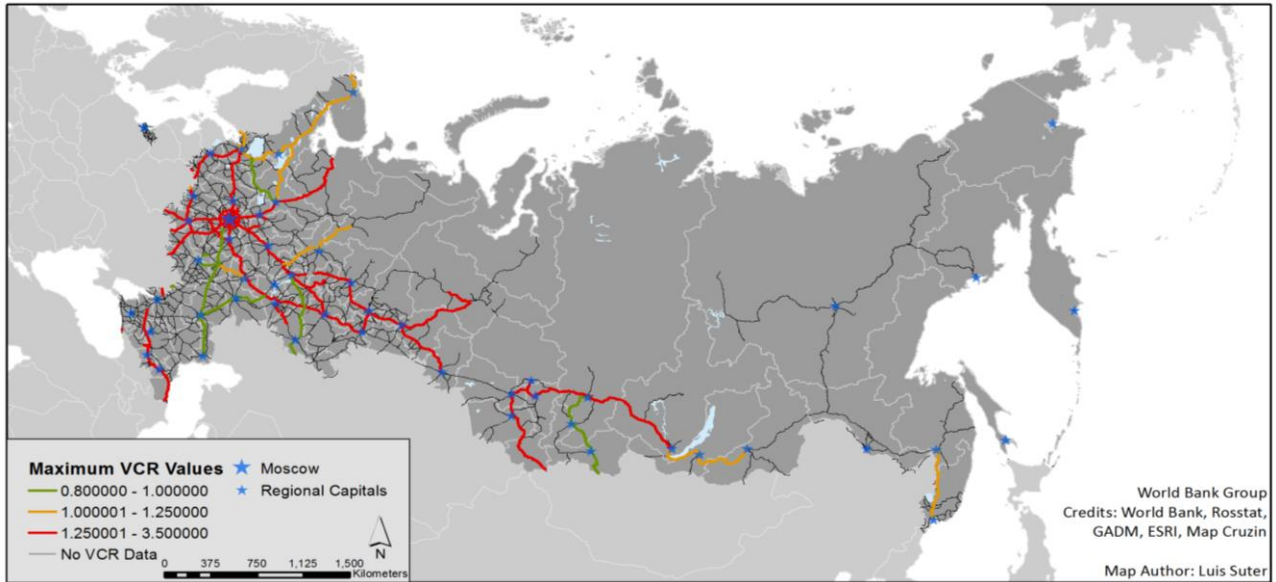
## 2) Quality and service availability

To have a more nuanced measure of connectivity, the level of transport service given capacity has to be considered. In the western and central regions with apparently good connectivity, measured by a good transport network, road congestion hampers urban-led regional growth. In Figure 6, the road sections marked in red carry traffic volumes that exceed the designed capacity and thus experience serious traffic congestion. Moreover, the available connections and service frequency is highly uneven.

## 3) Economic distance to markets

Two sets of connectivity indicators are produced to characterize the level of connectivity of major urban centers to their surrounding regions and major trading partners. First, figures 7, 8 and 9 show the travel-time isochrones around 11 selected urban centers across Russia for the rail network, road network, and air transport, respectively. A travel-time isochrone is defined as the boundary of a region surrounding an urban center that can be accessed within a given amount of time spent traveling; in this case five, 10, and 15 hours.

Figure 6: Volume-capacity ratio of national highways



Source: Own mapping

Figure 7: Travel time isochrones by railway network



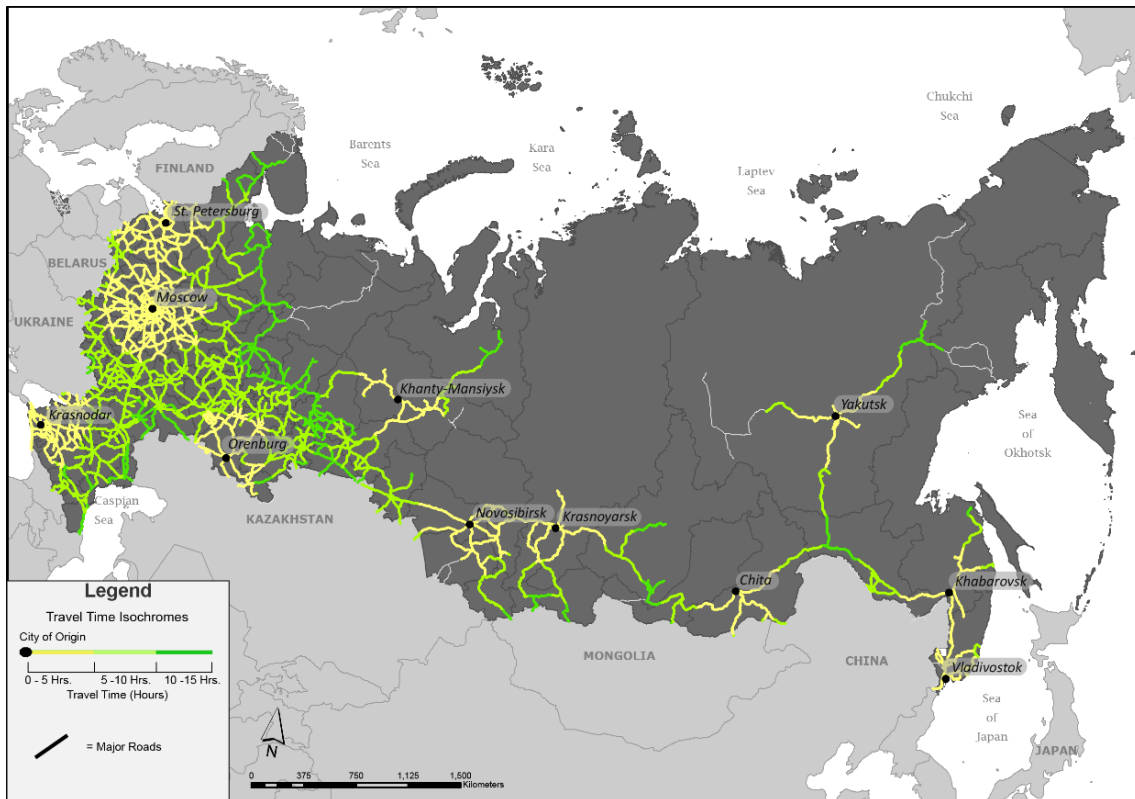
Source: Own mapping.



Note: The figure shows the travel-time isochrones for the rail network around 11 selected urban centers across Russia. A travel-time isochrone is the boundary of the region surrounding an urban center that can be accessed within a given amount of time spent traveling.

As seen in Figure 7 and Figure 8, the distance to market is much less in the well-connected western and central regions than in the more isolated eastern and northern regions. In the western regions, it is possible for those living in rural areas to reach one if not several major urban areas with no more than 5-10-hour travel time. By contrast, the eastern regions have a much smaller “web” of major rail and road lines around them, so they are far less accessible for the surrounding rural populations. As for air connectivity, Figure 9 shows travel times between major eastern cities are greater than between western cities. The western regions are once again more interconnected, with a high density of short, regional flights. The eastern cities are much less interconnected, having few short-to-medium-range flights to other eastern cities. Most flights connecting the east are long-haul trips to the Moscow Oblast. Travel times to the main trade partners can take over eight times longer for some of the least-connected regions than in the best-connected regions. In addition to transport issues, long travel times may reflect low economic density and diversification: some eastern regions do not have much to trade among themselves and hence are forced to trade at longer distances with western regions.

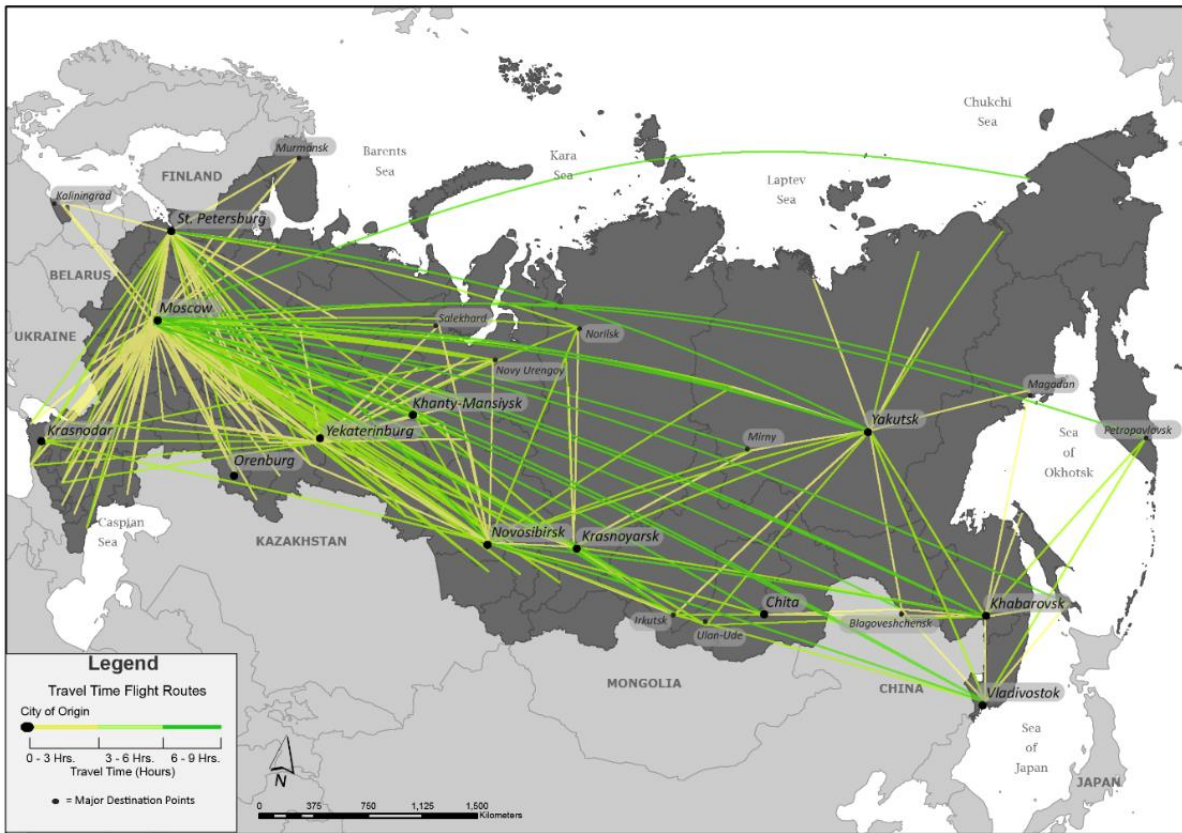
**Figure 8: Travel time isochrones by road network**



Source: Own mapping.

Note: The figure shows the travel-time isochrones for the road network around 11 selected urban centers across Russia. A travel-time isochrone is the boundary of the region surrounding an urban center that can be accessed within a given amount of time spent traveling.

**Figure 9: Travel time isochrones by air transport**

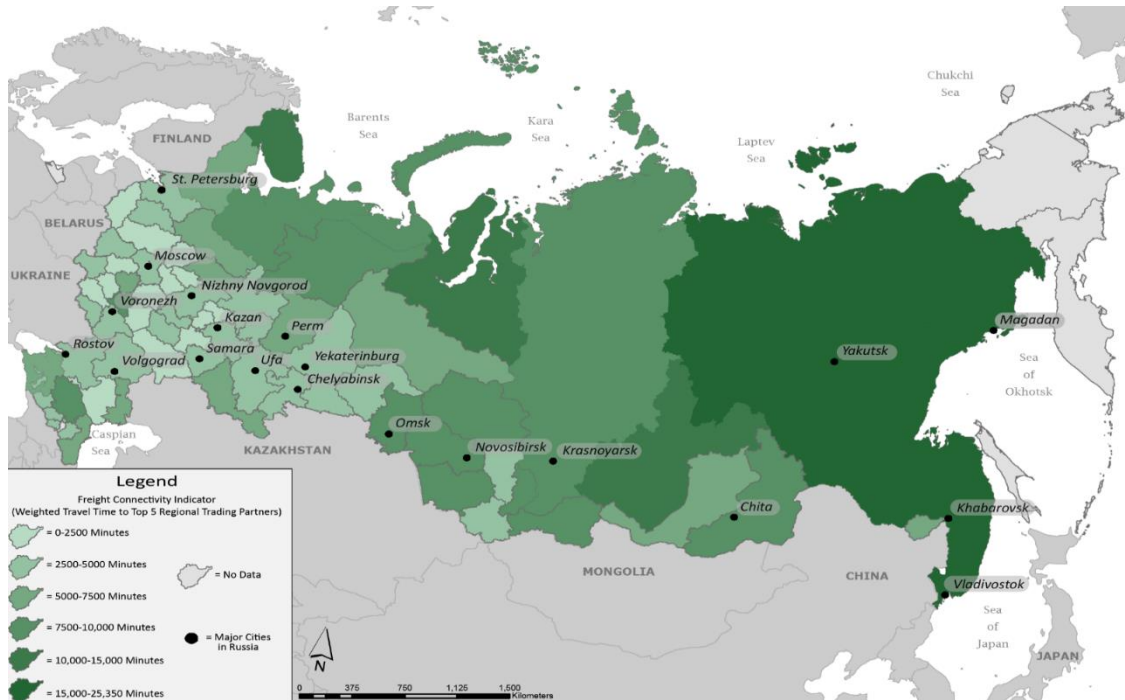


Source: Own mapping.

Note: The figure shows the travel-time isochrones for the air network around selected urban centers across Russia.

**Second, freight connectivity index is produced to characterize how quickly goods can move to/from regions.** The index shows that the average time required to ship goods in the northern and central eastern regions is significantly higher than in the western side of the country. (For more on the freight connectivity index calculation see Box 1). Figure 10 shows a clustering of regions as a function of the weighted travel time. For instance, for Sakha Republic/Yakutia, the sum of the travel time to the top five regional trade partners exceeds 11 days, while for Moscow the comparable figure is 4.6 days. Disparities also exist in the western side of the country. All in all, disparities in ground travel time across regions underline the transport difficulties facing the more remote regions. Trade volume and travel time are positively correlated, meaning that more time is required to ship goods on routes with larger trade volumes. However, there is no correlation between trade volume and origin and destination measured by distance. Interestingly, half of the regions have as top-five trade partners a neighbor region while the others are trading with regions where they do not share a border. Unfortunately, due to a lack of information, it is not possible to track exports and imports from these regions.

**Figure 10: Freight connectivity (weighted average time to five most traded regional partners), 2014**



Source: Own mapping

**Methodology for calculating domestic connectivity**

The official statistics used to calculate “freight connectivity” comes from Rostat, and uses the travel times estimated through network analysis (GIS tool). Origin/Destination (O/D) Cost Matrix was used to create routes along the network, and in this case calculates the cost value, which was set to travel time in minutes. The OD Cost Matrix functions by calculating the routes between every given origin and any given destination. The resulting cost matrix connected each regional capital to every other regional capital in Russia and provided the cost as travel time in minutes. Estimates were prepared for all modes of transport.

“Freight Connectivity” is defined as the weighted travel time between regions using volume of trade, and the modal share of each transport method as key descriptive variables. For each region, the top five trading partners were considered. The formula used was:

$$\text{Freight Connectivity} = \text{Percent of Trade by Mode: Road} * \text{Travel Time to Destination by Road} + \text{Percent of Trade by Mode: Rail/River} * \text{Travel Time to Region A by Rail/River}$$

This calculation was repeated for top five trade partners of each region and the values added together. The final number is the weighted travel time to each region’s top five internal trade partners.

**Isolated regions, at least those defined in areas far from markets in the European side of Russia, may not be necessarily “transport disconnected” from their markets.** For instance, the region of Zabaikalsky Krai has relatively high freight connectivity with its main existing regional trade partners despite being far from the Moscow-St. Petersburg markets. Moreover, the domestic connectivity index for



Zabaikalsky Krai is similar to the Moscow Oblast but the trade volume (RUB) of the former is 75 times lower than the latter. That is, freight in both regions travel the same time but the ratio RUB/minutes of freight is much higher in Moscow. On the other hand, the main trading partner for Zabaikalsky Krai is not the domestic market but China with which the region shares a border. In effect, the trade with China in rubles is almost 11 times larger than its domestic trade with regions. A similar story can be described for the Khabarovsk Krai, a region in the Far East, which has a maritime border. These issues are discussed in more detail in Part 2 of this report and, in particular, other transport and non-transport related issues that explain the barriers for further development in both regions.

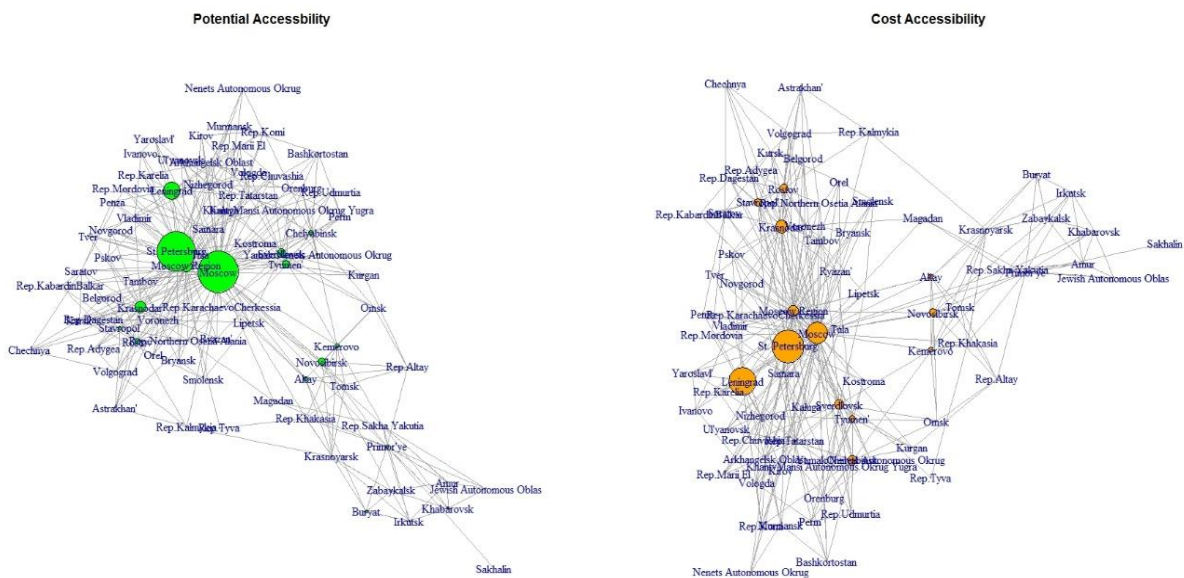
**The centrality of Russian regions based on the volume of trade and travel time to their top five domestic trade partners is visualized in Figure 11 using network analysis.**<sup>20</sup> The left panel depicts the centrality of regions based on potential accessibility.<sup>21</sup> The size of each node is weighted by the total trade volume divided by average travel time. The regions around Moscow and St. Petersburg constitute the core of Russian regional trade flow. On the other hand, Sakhalin and Chechnya and others in the republics of the Northern Caucasus play peripheral roles. Interestingly, in terms of cost accessibility (i.e. the average time to reach top five domestic trade partners) St. Petersburg and Leningrad Oblast perform better than the capital region. Again, the republics of the Northern Caucasus appear to have the highest access cost to their trading partners.

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<sup>20</sup> The network analysis is conducted using a measure of network centrality called PageRank. The algorithm is the basis for Google’s search engines and works by counting the number and quality of links to a page to determine a rough estimate of the importance of a website. The underlying assumption is that more important websites are likely to receive more links from other websites. There are three distinct factors that determine the PageRank of a node (regions in this context): (i) the number of links (trade partners) it receives, (ii) the link propensity of the linkers, and (iii) the centrality of the linkers.

<sup>21</sup> Potential accessibility of locations is typically measured as the sum of activity (opportunity) in locations weighted by a measure of generalized transport cost (GTC). In this context, trade volumes and travel time are used as proxies for opportunity at destination and GTC, respectively.

**Figure 11: Network Map of Russian Domestic Trade, 2014**



Source: Own mapping

#### 1.4.1 In-depth look at regional connectivity

The analysis of the transport network in countries with large territorial extension can be divided in country-wide connectivity, as discussed above in this section, and region-wide connectivity. The country-wide connectivity in Russia is provided by large strategic infrastructure projects serving high-density corridors such as highways and national roads. Freight and passenger railway links constitute the backbone of a country’s transport network. On the other hand, connectivity within and across neighboring regions in Russia is not uniform. Western regions enjoy a dense network of rural roads and better access to rails as opposed to the Far Eastern and Northeastern Federal Districts.

Region-wide connectivity requires focusing on the specific characteristics of each region to identify the markets and opportunities that cannot materialize because of poor access and quality of transport services. However, given the large number of regions in Russia, a sample of representative regions can be selected as case studies to identify common patterns related to transport issues and define policy recommendations. This report follows this approach in two regions—Zabaikalsky Krai and Khabarovsk Krai—as the local authorities were interested in being part of the study. The analysis shows some interesting findings on transport and non-transport issues that affect two regions that are far from the main markets in the western side of Russia. There are a few region-specific findings described below, but more information can be found in Part 2 of this report.

a. *Zabaikalsky Krai*<sup>22</sup>

**The assessment of freight connectivity of Zabaikalsky Krai with the existing main region's markets shows that although the region is more isolated from the markets of European Russia, it is relatively well connected with its main regional trade partners.** Zabaikalsky Krai's main domestic trade partners are primarily the regions of the Siberian Federal District. Connectivity with those regions is provided by the federal highway system and the railway.

**Connectivity between China and Chita, the capital city of Zabaikalsky Krai, is reasonably good and therefore not a binding constraint in a region in which connectivity with China is critical to its development.** As far as the main trunk routes are concerned, connectivity between Chita and the Chinese border crossing, both by road and by rail, is good. Neither is there any notable deficiency in the capacity of the customs post, though the complexity of administration for non-bulk cargoes can be time consuming and hence increase transport costs. One must, therefore, look elsewhere for the main reasons why the region is not thriving off its relationship with its raw-material and food-hungry neighbor.

**Overall, the past 15 years have seen an impressive development of the road network in Zabaikalsky Krai that has led to some positive social impact.** The Amur federal highway has been completed and intensive reconstruction work is going ahead on regional and municipal roads. The opening of the Federal Highway Amur has had a positive social impact on the living standards in the areas adjacent to the highway. Public transport services have improved and communities have become more accessible to transport. Small businesses, such as road services, have begun cropping up along the highway. But these appear to be essentially only services catering to the increased level of road traffic, rather than activities which might be the core of a new sustainable development. There are arguments, moreover, that the Amur project was poorly designed with no exits to communities planned.

**However, the remoteness and low population density threaten social sustainability in Zabaikalsky Krai.** These factors, which impede economic development, also make it difficult to sustain the quality of life in large parts of the region. The capital city, Chita, is 1,000 km from Chara, which has an airport but is not accessible by road. While the Trans-Siberian Railway provides some passenger services along its main axis, as well as some long suburban services from Chita, it is primarily a freight carrier and does not generally serve the more remote areas. The problem of low population density is also associated with remoteness.<sup>23</sup> The average population density of the region is only 2.5 persons per square kilometer. The problem of connectivity for this remote, sparse, and declining rural population is addressed in three main ways—by inter-municipal bus services, by air services, and by communications technology.

**Agricultural exports are partly inhibited by deficiencies in connectivity, as well as Chinese policies and trade restrictions.** Low density of population and of the secondary road system raises the costs of agriculture and hence reduces its competitiveness on the international market. Low density, high collection, and fuel costs also discourage the development of food processing in the region. The expansion of agricultural production to some extent depends on road conditions. The development of meat and dairy farming is also hampered by transportation problems. Some investments have been made to

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<sup>22</sup> See Section 2.1 for background information on the region.

<sup>23</sup> Regional tourism could be a source of growth as there is some Chinese interest in tourism in Zabaikalsky Krai. However, most of the natural and cultural landmarks are far from the regional center, federal motor roads, and railway stations.

facilitate agriculture trade. For example, a major export facility is under construction. Construction work has begun on the first grain railway terminal, Zabaikalsk-Manchuria, which will be a multi-modal grain storage and shipping center.

However, trade restrictions related to veterinary and phytosanitary standards and regulations are an important impediment to the export of agricultural produce.

**The expansion to new mining fields for the exploitation of natural resources requires large investments in transport infrastructure.** Today, the exploitation of natural resources with limited value add accounts for the largest share of total industrial output. Many of the mineral resources are located in the north, less accessible to the Chinese market.<sup>24</sup> Minerals are expensive to transport in the unprocessed form and it is increasingly common in equivalent mining areas, for instance in northern Canada, for as much processing as possible to be done at the mining site in order to reduce transport costs. However, this requires both water and electric power. The high power costs in Zabaikalsky Krai often preempt this solution.

**Timber is one of the most important exports to China.** For this product, some of the reserves are in the south of the region and a substantial trade already exists. The administration of Zabaikalsky Krai noted 10-20 percent annual growth in demand in the domestic market for the realization of wood products. Since the introduction of regulations on the export of unprocessed timber, more emphasis has been placed on various forms of processing to increase the value add in the product even if it does not, in this case, significantly reduce the cost to transport the product.

**While an important border crossing was improved (Zabaikalsk-Manchuria), other border points remain poor.** The time taken for gauge changeover is a major physical constraint on the rail traffic. As for infrastructure constraints on motor traffic, the main problem is that cargo and passenger traffic flows were not separated.

*b. Khabarovsk Krai*

**Khabarovsk Krai (KK) will have an important role to play as a transit region for exports to the Asia-Pacific Region (APR).** The region is a transit center of the Far East in particular and Russia as a whole. Its role has been increasing due to the growing interregional cargo turnover resulting from the development of trade relations between Russian territories and the APR countries. The transport system holds prominent place in the structure of GDP of KK, with its share varying in the recent years between 11 percent and 14 percent.

**It is, therefore, important to assess connectivity constraints in relation to the railway and port capacities, and competitiveness of the logistics sector.** Development policy for KK is part of a broader strategy for the Russian Far East. The federal government's priority is to strengthen Russia's economic ties with the APR. The southern part of KK is likely to be the primary focus for economic development. It has significant reserves of natural resources, the most advanced and diversified industrial potential, including defense machinery building, human capital, and a reasonably well developed fuel and energy complex. Moreover, it has reasonable road, rail, air, and sea transport links. In this area, it is feasible to think of the

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<sup>24</sup> Alternative trade route for these materials are by the Baikal Amur Mainline railway and through the Khabarovsk Krai seaports.

development of mutually sustaining economic clusters. While there are substantial natural resources in the north, their exploitation is viewed more as a case for limited and very specific support.

**Regional trade, largely oriented toward foreign markets, has declined in recent years. On the other hand, foreign direct investment has increased.** This is largely due to the territory's public policy aimed at creating a favorable investment climate. The most attractive types of economic activities for foreign investments are: extraction of minerals, logging, metallurgy, wood processing, oil products, and geological exploration of subsurface resources.

**The development of the Bolshoy Ussuriysky Island link and border crossing would potentially give agricultural and other products access to a large Chinese market.** The Chinese part of the island now has a border post and a bridge to the Chinese mainland where the island borders Fu Yuan area, which is part of the city district of Jiamusi. Jiamusi is a large industrial center and transport hub, where important water, road, and railway routes cross. On the Russian side, a road bridge crossing the Amur channel has been commissioned, but further development has not been undertaken due to a lack of protecting hydraulic structures.

**KK is the leading producer of forestry products. However, the development of forestry resources is restrained by a lack of road infrastructure.** For effective development of forestry resources, it is necessary to build up to 600 km of new roads additionally a year and to modernize a significant part of the existing roads. Commissioning of logging roads in 2013-2014 was only 40 percent of real demand.<sup>25</sup>

**KK is one of the leading regions in fishery in Russia and the output of fish products has only been growing. Products of primary fish processing are exported mainly by rail, which does not provide adequate consolidated refrigerated cargo logistics for companies engaged in deep processing.** The logistics system of Russian Railways targets large wholesale lots. As SMEs in KK do not have large shipments of ready products, they have to narrow the radius of their supplies to 1,000 km—the maximum distance that can be covered with road transport for such load. Small lots of ready deep fish processing products are also shipped by air. Such shipments are only made to cities which have direct connections with Khabarovsk (due to product storage requirements).

**Fishery development will require investment in the port's infrastructure.** The fisheries industry in KK appears to have some development potential. However, transforming this industry into a more highly technological sector of the economy may prove difficult. It would require a substantial investment in port infrastructure to solve the problem of infrastructure bottlenecks in collection, storage, and transportation of fish products. Moreover, poor road infrastructure hinders the development of port-based fish processing, and lack of adequate logistics services limits the radius for distribution of products. Primary fish processing products from KK are exported mainly by rail, while products of deep processing are transported by road transport on a limited radius.

**The mainline rail capacity is generally adequate for the level of the current industrial activity and exports, but is likely to require expansion and improvements on the Baikal-Amur Mainline (BAM) railway in case of increased exports of coal and other mineral ores.** Projected development of the ports of Primorsky Krai also requires increasing the capacity of the Trans-Siberian Railway. The development of ports' capacities and manufacturing facilities requires adequate improvements of the existing railway

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<sup>25</sup> According to the draft Strategy of Socio-economic Development of KT (2015).



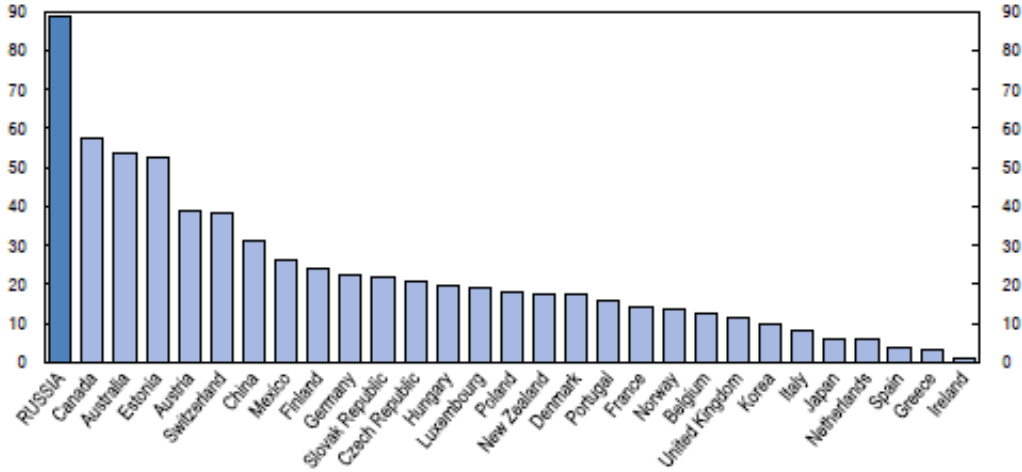
infrastructure, as well as logistics facilities and services. Beside capacity, the existing rail transport is surprisingly unattractive to the manufacturing sector. The transport problems of this sector are exemplified by a machinery company with production facilities in Khabarovsk and Komsomolsk-on-Amur. Up to 50 percent of its materials for production is imported from western regions of Russia. Products are shipped to all regions of Russia, Kazakhstan, Uzbekistan, and Belarus, other European and Asian countries.

1.5 Sector performance

**Russia’s railroad network is large and extensive.** Railroads accounted for 85 percent of Russia’s freight transport in 2012 (in terms of volume), compared to 61 percent for Canada in 2010, 47 percent for the United States in 2011, 41 percent for China in 2011, and 4.2 percent for Japan in 2011 (Murray, 2014). Railroads are heavily devoted to the shipment of raw materials, which often have no alternative means of transport.

**Railroad productivity is high—the system is the third-largest in the world after the United States and China—but maintenance has not been adequate.** As a result, the rise in demand has resulted in significant system degradation and capacity problems are severe (World Bank, 2011). The extensive transport networks built during the Soviet period proved difficult to maintain with the shift to market prices, causing a rapid deterioration in the stock of transport capital (Gill et al., 2014). Railroads are also an important mode of long-distance travel, serving about 40 percent of passengers. Various high-speed rail links between major cities have been planned.

Figure 12: Railway share of freight transport in 2010, percentage in total inland freight ton-km



Note: The figure excludes oil and gas pipelines. 2009 data is used for Canada, China, Greece, Luxembourg, Switzerland, and 2008 data for Australia, South Korea, New Zealand, and the United Kingdom.

Source: Reprinted from OECD (2015)

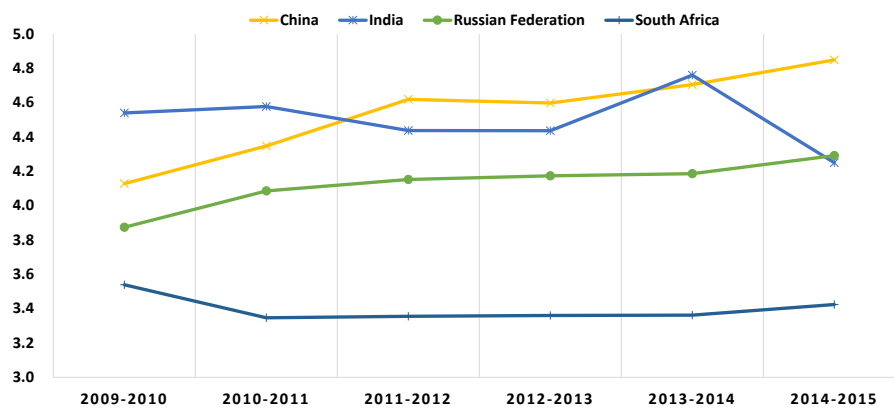
**Table 2: Railways productivity, 2015**

	Staff productivity (ton-kilometers and passenger kilometers per employee)	Track productivity (ton-kilometers and passenger kilometers per km of track)	Freight track productivity (ton-kilometers per km of track)	Locomotive productivity (ton-kilometers and passenger kilometers per locomotive)
Canada <sup>26</sup>	12,585,533	9,397,023	9,365,759	172,830,833
China	1,349,981	40,217,029	29,459,932	136,202,106
European Union	738,188	3,138,483	1,235,785	35,901,883
<b>Russian Federation</b>	3,119,693	28,443,750	27,031,479	138,494,147
United States (2011)	n/a	11,108,480	11,062,164	104,866,805
India	1,379,250	27,697,804	10,324,035	170,446,039

\*\* The data source is UIC unless specified otherwise.

**Competition in railways is limited.** While 80 percent of freight is carried by privately-owned wagons, the state-owned company, Russian Railways (RZD), retains a monopoly over the operation of locomotives. This arrangement has greatly impaired the efficiency of railway operations, leading to thousands of empty wagons and thus additional bottlenecks and long shipping times, according to the OECD (2015). Similarly, the passenger rail network is almost entirely controlled by RZD, which faces rail competition only on the Moscow-St. Petersburg route. Efforts to complete the introduction of private sector participation in the railway network are thus important. Still, the perceived quality of the rail sector has increased since 2009, according to the World Economic Forum (see Figure 13).

**Figure 13: Evolution of the perceived quality of railroad in selected countries**



Source: WEF. The perception index ranges from 1 (worst) to 7 (best)

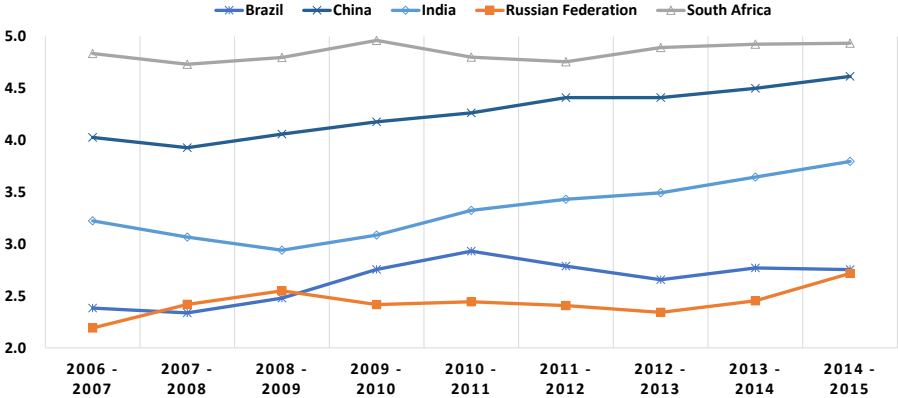
<sup>26</sup> [http://www.railcan.ca/assets/images/publications/Rail\\_Trends\\_2016/Rail\\_Trends\\_2016.pdf](http://www.railcan.ca/assets/images/publications/Rail_Trends_2016/Rail_Trends_2016.pdf).

**The road network faces major challenges.** In contrast to the railroads, the road network was relatively underdeveloped in the Soviet period, although investment in roads has since risen (OECD, 2015). The highway system is inadequate to provide rapid connections between cities. For example, it takes about six hours to travel the 250 km between Chelyabinsk and Magnitogorsk by road. Moreover, more than 15 million Russians lack access to the federal highway system and fewer than half of federal roads meet federal quality standards (World Bank, 2011), and the majority of roads cannot easily accommodate modern, large trucks (OECD, 2015). Road investment in Russia is much below levels in other middle-income countries, and maintenance has been dangerously delayed.

**Poor roads are constraining growth.** The poorly-maintained highway system has compelled firms to locate in the major cities in order to maintain access to suppliers and government. As a result, congestion in these cities has been exacerbated and opportunities for firms to benefit from lower wages and cheaper land in secondary cities reduced (World Bank, 2011). As Russian firms switch from the production of low-value commodities (the transport of which depends largely on rail) to just-in-time delivery of high-value goods (which is largely shipped by trucks), the poor road system will increasingly limit production.

**The perceived quality of the roads in Russia remains low compared with that in other BRICS countries, according to the World Economic Forum (see Figure 14).** However, some small progress can be observed since 2012-2013, probably as a consequence of major and focused investments through the Federal Highway Program.<sup>27</sup>

**Figure 14: Evolution of the perceived quality of roads in selected countries**



Source: WEF. The perception index ranges from 1 (worst) to 7 (best)

**The road network has a poor safety and environmental record.** The bad state of the roads, a sharp decline in road police personnel, and alcohol abuse (HSE, 2013) have made it perilous to drive on Russian roads. Road mortalities are five times the level in several European Union (EU) countries and twice that

<sup>27</sup> The total budget spending on road infrastructure (including federal and regional roads) in Russia was 1.5% of GDP in the 2011-15 period (Ganelin et al 2015: Russian Infrastructure- To build or not to build, that is the question. Gazprombank [http://www.gazprombank.ru/upload/iblock/0ba/GPB\\_Infrastructure\\_update\\_030715.pdf](http://www.gazprombank.ru/upload/iblock/0ba/GPB_Infrastructure_update_030715.pdf) ).

of the United States (OECD, 2015). Road transport accounts for about 40 percent of carbon emissions (MNRE, 2012). More efficient vehicles are making up a growing share of the fleet, while fuel emissions standards are being tightened. Nevertheless, monitoring and enforcement of the quality of motor fuel remains ineffective (Dieselnet, 2013). In addition, the weakening of vehicle inspections requirements in 2012 (enforcement was delegated to insurance companies, which often issue policies despite the lack of the required inspection) has impaired enforcement of safety and environmental standards (OECD, 2015).

**The resources for an expanded investment and maintenance program could, in part, be gained by more efficient pricing policies.** World Bank (2011) reports that gasoline prices in Russia were only slightly higher than in the United States and well below levels in Western Europe; the maximum price of gasoline in Russia from July to October of 2016 was about half the average global price for that period.<sup>28</sup> Greater revenues also could be gained through tolls on the most densely-used highways (e.g. the route from Moscow to St. Petersburg) and vehicle licensing fees.

**Urban transport networks also face serious challenges.** Traffic congestion is high in many Russian cities. The average speed is 20 km/h in downtown Moscow, compared to 40 km/h in large European cities (Ganelin and Vasin, 2014). In a survey of Russian cities, road traffic was viewed as accounting for over 50 percent of total carbon emissions (Oh and Gwilliam, 2013). Pollution is a severe problem in almost all of the larger cities, particularly in Moscow and St. Petersburg (Donchenko, 2013).

**Public transit is heavily used in Russia.** Eighty-five percent of motorized trips in Russia are through public transit, compared to 20 percent in Western Europe and 3 percent in the United States. Nevertheless, the quality of transit systems has deteriorated as greater emphasis has been placed on building roads to accommodate the growing supply of private cars (World Bank, 2011).<sup>29</sup> Most municipal bus, tram, and trolleybus companies in major Russian cities have significant financial deficits, usually accompanied by aging and deteriorating fleets (Oh and Gwilliam, 2013). Private road transit companies also play an important role in Russian cities—mini buses serve up to 15 percent of all the urban passengers (OECD, 2015). However, these companies are poorly regulated. One useful improvement would be to provide private bus company franchises of sufficient duration to encourage investment.

**Improvements in management could reduce congestion.** Designating reserved lanes and priority at traffic signals for buses, trolleys, and trams could speed public transit and thus increase its attractiveness (World Bank, 2011). The division of responsibility for urban traffic issues between regional and municipal authorities impedes the development of a coordinated program for large metropolitan areas, while within municipalities transport sector responsibilities are often split between different agencies, further impeding coordination (Oh and Gwilliam, 2013). Finally, the availability of parking in many urban areas could be increased by greater reliance on meters. Street parking fees in Moscow “appear to be too low to encourage a more efficient use of land and transportation systems” (World Bank, 2011).

**Port capacity is high, but efficiency is poor.** Massive investment in seaports has increased total capacity above current and medium-term needs. However, rail and road access to the ports is poor, and many lack modern logistic facilities (Rosmorport, 2012). Further, most Russian ports lack the ability to handle containers and wheeled cargo (OECD, 2015), which is important to establish an efficient link between land transport and shipping. These deficiencies will limit the effective use of ports, particularly for high-value

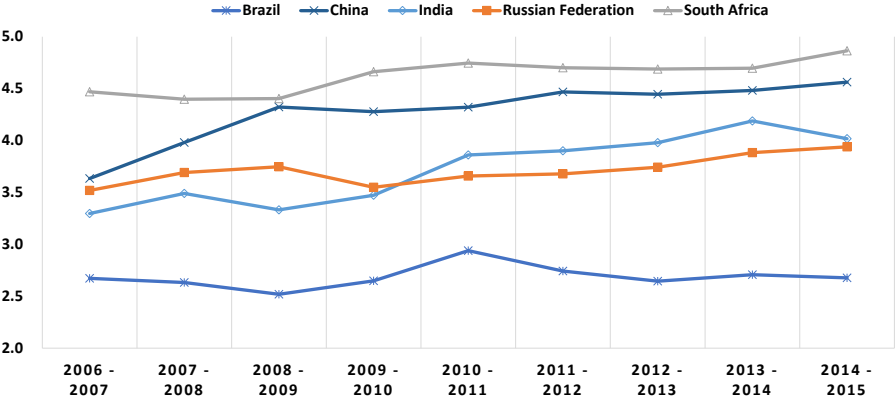
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<sup>28</sup> See [Globalpetrolprices.com](http://Globalpetrolprices.com).

<sup>29</sup> Car ownership has doubled since 2000 (OECD, 2015).

goods. This will impede the transition from reliance on natural resources to manufacturing, which is becoming more feasible with the recent price declines for Russia’s oil and mineral exports (World Bank, 2016). Customs and other procedures at the border continue to impose lengthy delays, and despite numerous projects, traders still lack access to a single window to handle administrative requirements (OECD, 2015). Also, many Russian ports are located near congested city centers and have limited operating space, and in some cases, inadequate depth to handle modern ships. These constraints may ultimately require relocating ports to facilitate access (World Bank, 2011).

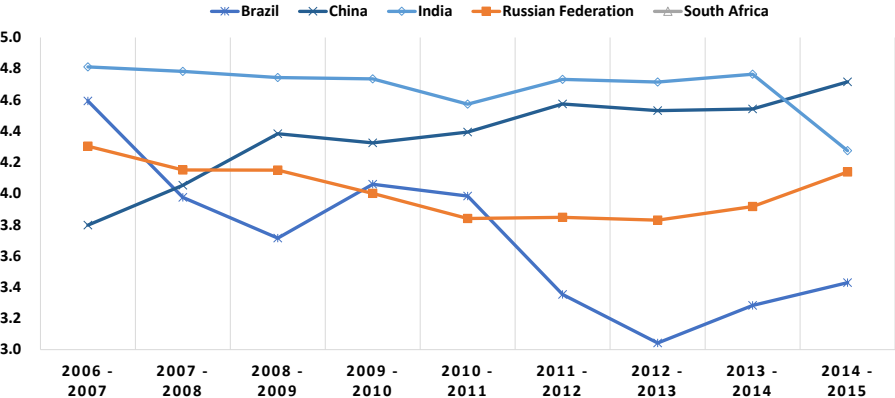
**Figure 15: Evolution of the perceived quality of ports in selected countries**



Source: WEF. The perception index ranges from 1 (worst) to 7 (best)

**The efficiency of airport services is low.** The number of take offs and landings per runway at Moscow airports is less than half that in London and two-thirds that in some airports in China (Katchan, 2011). Lack of competition in the provision of services at airports has led to high prices for air fuel and other airport services. The degree of inefficiency that results is reflected in the common practice of importers flying shipments to airports in neighboring countries and then transporting the goods to Russia via trucks (OECD, 2015). Finalizing the separation between airports and airlines, as well as strong regulation of remaining monopolies, is important to reduce prices and improve services.

**Figure 16: Evolution of the perceived quality of air transport infrastructure in selected countries**

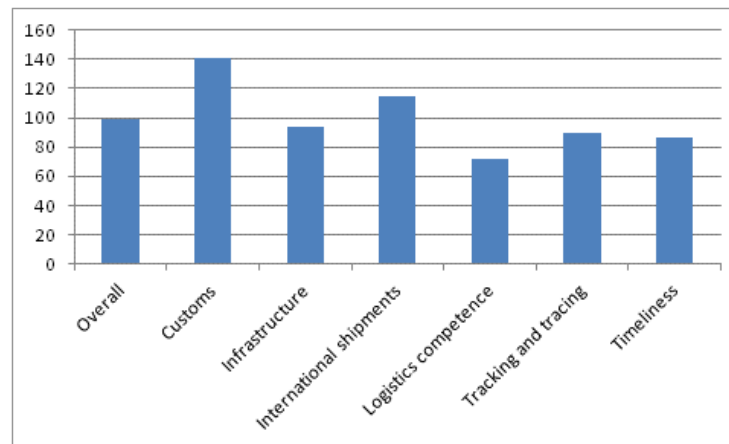


Source: WEF. The perception index ranges from 1 (worst) to 7 (best)

**There are important efficiency opportunities as a result of better transport services in Western markets.** Russian transport and trade facilities are heavily devoted to natural resource exports and trade with non-European countries. A reorientation toward the West will require greater integration with the EU, including development of ports, road links, and transshipment options through the Black Sea and the Far East (World Bank, 2011).

**Overall, there is considerable potential to improve physical connectivity in Russia.** An estimate of the benefits of transport improvements finds that the greatest return would come from upgrading all connecting regional roads to a minimum standard of 74 percent paved surface (50 percent increase in trade), compared to reducing customs documentation requirements for the region (20 percent increase in trade) and lowering all tariffs to 8 percent or less (6 percent increase in trade) (World Bank, 2011). Planned transport improvements will benefit from the law on public procurement, which increased the transparency of the process. However, the law needs to be complemented by improvements to project evaluation, management and control, better use of the public-private partnerships, and efforts to reduce corruption (OECD, 2015).

**Figure 17: Logistic Performance Index 2016 for the Russian Federation**



Sources: World Bank (2016)

**Russia fares poorly on indicators of the quality of logistics.** Russia is ranked 99<sup>th</sup> out of 163 countries on the 2016 Logistics Performance Index (LPI) in Figure 17, the same ranking as in 2007. This represents a deterioration from two years ago (90<sup>th</sup> out of 160) after a steady improvement since 2010. This ranking puts Russia below many middle-income countries, as well as a couple of low-income countries. However, Russia's average score on the LPI is the result of significant differences in rankings among the types of logistic services. Russian ranks 141<sup>st</sup> in the world for customs operations, putting the country below, for example, lower-income countries. By contrast, Russia's rankings on the other indicators of logistics performance tend to be much closer to, although for the most part still worse than, the average. According to the World Economic Forum's Global Competitive Index, Russia is ranked 44<sup>th</sup> out of 144

countries for transport infrastructure, which reflects a high ranking for railroads (26<sup>th</sup>), a very low ranking for roads (124<sup>th</sup>), and somewhat below average rankings for ports (81) and air transport (79).<sup>30</sup>

### 1.5.1 Transport as one of the obstacles for doing business

**Investments in transport infrastructure have been widely used to improve economic integration and reduce spatial income disparities. However, improved transportation may be a necessary, but not sufficient, condition to increase growth in lagging regions.** Transportation investments such as new roads may or may not improve regional development; such investments may also have negative effects on equity and income distribution.<sup>31</sup> In effect, there are other factors that interact with transport infrastructure and are likely to contribute to economic growth by creating business opportunities and jobs. There is a bundle of resources (labor, land, minerals, entrepreneurship capacity, location, etc.) and policies necessary to achieve more rapid development. An analysis of obstacles to business development in the manufacturing and service industry can provide some important information.

**Data from international surveys of manufacturing and service industry firms, particularly in the BRICS countries, provides mixed evidence on the importance of transport on firm productivity.** Unexpectedly, most firms do not identify transport as among the most important constraints on their activities (Table 3). In the case of Russia, the World Bank Enterprise Survey in 2012 shows that high taxes, followed by restrictions on access to finance, are the main constraints on business development. Only a small share of firms report transportation as a major constraint, similar to the results in the other BRICS countries (only in China does the share of firms reporting transportation as a major constraint exceed 7 percent). Note, however, that other important sectors, such as agriculture and natural resource extraction, are not covered in this survey.

**One reason transport may not be reported as a major constraint is that poor connectivity leads firms to locate near their markets or near a transport facility if focusing on exports.** Thus, inadequate transport services may affect firm size and productivity by constraining firms' choice of location. This is less of an issue for firms exporting natural resources, which often benefit from dedicated transport infrastructure. In the case of Russia, Brown et al. (2008) find that market size, along with proximity to Moscow and regional infrastructure, are important determinants of productivity for new and private sector firms. Evidence of the importance of agglomeration effects in Russia is that improved transport has the highest gains in productivity in areas around Moscow and the lowest in peripheral regions, particularly in the Far East.

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<sup>30</sup> One issue with the World Economic Forum rankings is that Russia is ranked 11<sup>th</sup> for the availability of airline seats, which is given equal weight in the computation of the overall transport infrastructure index with the other components. Excluding this category, Russia's ranking would be significantly worse.

<sup>31</sup> See, for instance, the discussion on the effects of increasing rural road and rail access in France in Quinet (1992).

**Table 3: Main obstacles for manufacturing and service firms (in percentage)**

Country	Brazil (2009)	China (2012)	India (2014)	Russian Federation (2012)	South Africa (2007)
Access to finance	7.5%	22.4%	11.7%	14.8%	7.5%
Access to land	0.5%	5.6%	4.6%	3.6%	2.7%
Business licensing and permits	0.6%	0.2%	2.1%	4.5%	2.9%
Corruption	3.3%	1.2%	19.9%	8.2%	7.1%
Courts	1.8%	2.0%	1.6%	0.6%	1.2%
Crime, theft and disorder	6.6%	0.3%	1.1%	0.9%	40.4%
Customs and trade regulations	2.6%	1.8%	1.2%	2.1%	1.1%
Electricity	0.3%	4.8%	15.3%	1.8%	14.7%
Inadequately educated workforce	12.6%	13.0%	3.4%	6.4%	6.7%
Labor regulations	7.4%	1.9%	4.9%	0.5%	5.6%
Political instability	3.0%	0.8%	3.5%	7.8%	1.1%
Practices of the informal sector	12.4%	19.6%	12.1%	7.0%	4.9%
Tax administration	6.7%	4.2%	3.7%	1.9%	0.1%
Tax rates	33.5%	15.1%	13.0%	36.1%	1.7%
Transportation	<b>1.3%</b>	<b>7.2%</b>	<b>2.1%</b>	<b>3.7%</b>	<b>2.3%</b>
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>

Source: Enterprise survey, the World Bank

In 2012, around 19 percent of the firms in Russia recognized that transport had some impact on doing business (Table 4).<sup>32</sup> The regional average for Europe and Central Asia is 9 percent and for all the countries in the sample the average is 18 percent. Note, however, that in 2009 one-third of the firms reported that transport represented a major constraint. The improvement in the period 2009-2012 could reflect government investments to enhance and modernize transport infrastructure (see discussion in Section 1.7).

**Table 4: Firms identifying transportation as a major constraint (%)**

Brazil(2009)	27.9%
Russian Federation(2009)	32.2%
Russian Federation(2012)	19.0%
India(2014)	9.6%
China(2012)	2.1%
South Africa(2007)	3.9%

Source: enterprise survey, the World Bank

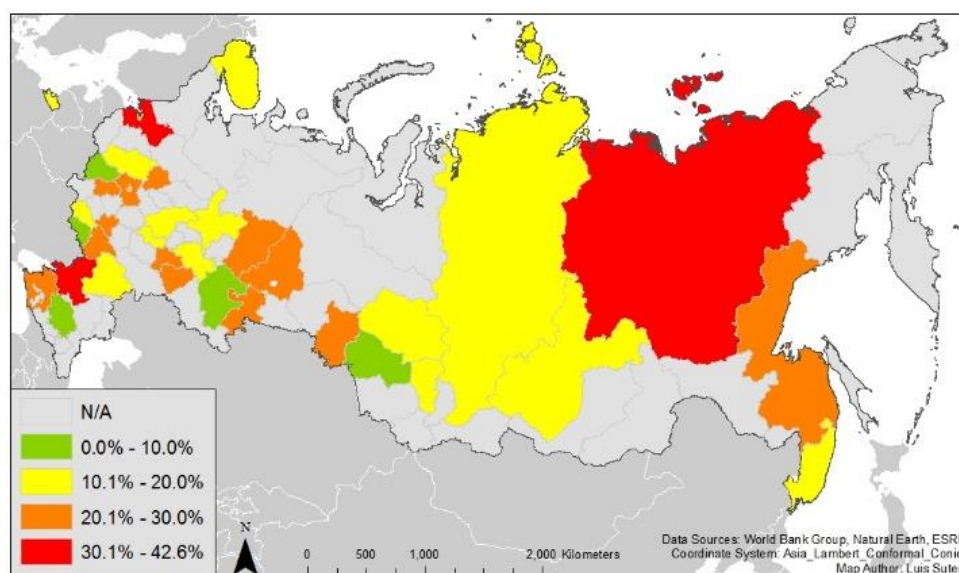
The number of firms that identify transport as a main business obstacle varies greatly across regions (Figure 18). For instance, more than 42 percent of the firms in the Rostov Oblast, but only 2.5 percent in

<sup>32</sup> Also in terms of the share of products lost to breakage or spoilage during shipping to domestic markets, Russia is placed slightly below the regional average (0.7 percent), and well below the global average (1.2 percent).



the Belgorod Oblast, identified transport as a major constraint. This survey does not include all regions. However, a simple correlation with the freight connectivity index (Figure 10) shows that firms in regions where the travel time required for trade was high tended to identify transport as a key constraint. Moreover, a simple correlation of this perception and the RGDP is close to zero, while the correlation is positive with the volume of intraregional trade and negative with road density (Table 5). A possible interpretation is that firms in regions with higher levels of trade are more likely to view transport as an important constraint, while firms in regions with a plentiful supply of roads are less likely to do so. However, this analysis cannot provide evidence of causality between these variables.

**Figure 18: Percentage of firms identifying transportation as major constraint (2012)**



Region or city	Percent of firms	Region or city	Percent of firms	Region or city	Percent of firms
Rostov Region	42.6	Lipetsk Region	23.4	Krasnoyarsk Territory	15.5
Republic of Sakha (Yakutia)	39.5	Ulyanovsk Region	22.8	Kemerovo Region	15.2
Leningrad Region	39.0	Yaroslavl Region	20.7	Irkutsk Region	15.0
Voronezh Region	29.0	Kaluga Region	20.2	Republic of Mordovia	13.6
Sverdlovsk Region	28.0	Moscow City	19.6	Primorsky Territory	13.4
Khabarovsk Territory	27.7	Kursk Region	17.7	Nizhni Novgorod Region	13.3
Moscow Region	25.7	Republic of Tatarstan	17.3	Tomsk Region	12.3
Perm Territory	25.6	Tver Region	16.9	Saint Petersburg	9.9
Chelyabinsk Region	25.1	Kaliningrad Region	16.8	Novosibirsk Region	8.2
Samara Region	24.6	Murmansk Region	16.4	Republic of Bashkortostan	5.3
Krasnodar Territory	24.5	Kirov Region	15.6	Stavropol Territory	3.9
Omsk Region	24.4	Volgograd Region	15.6	Belgorod Region	2.5

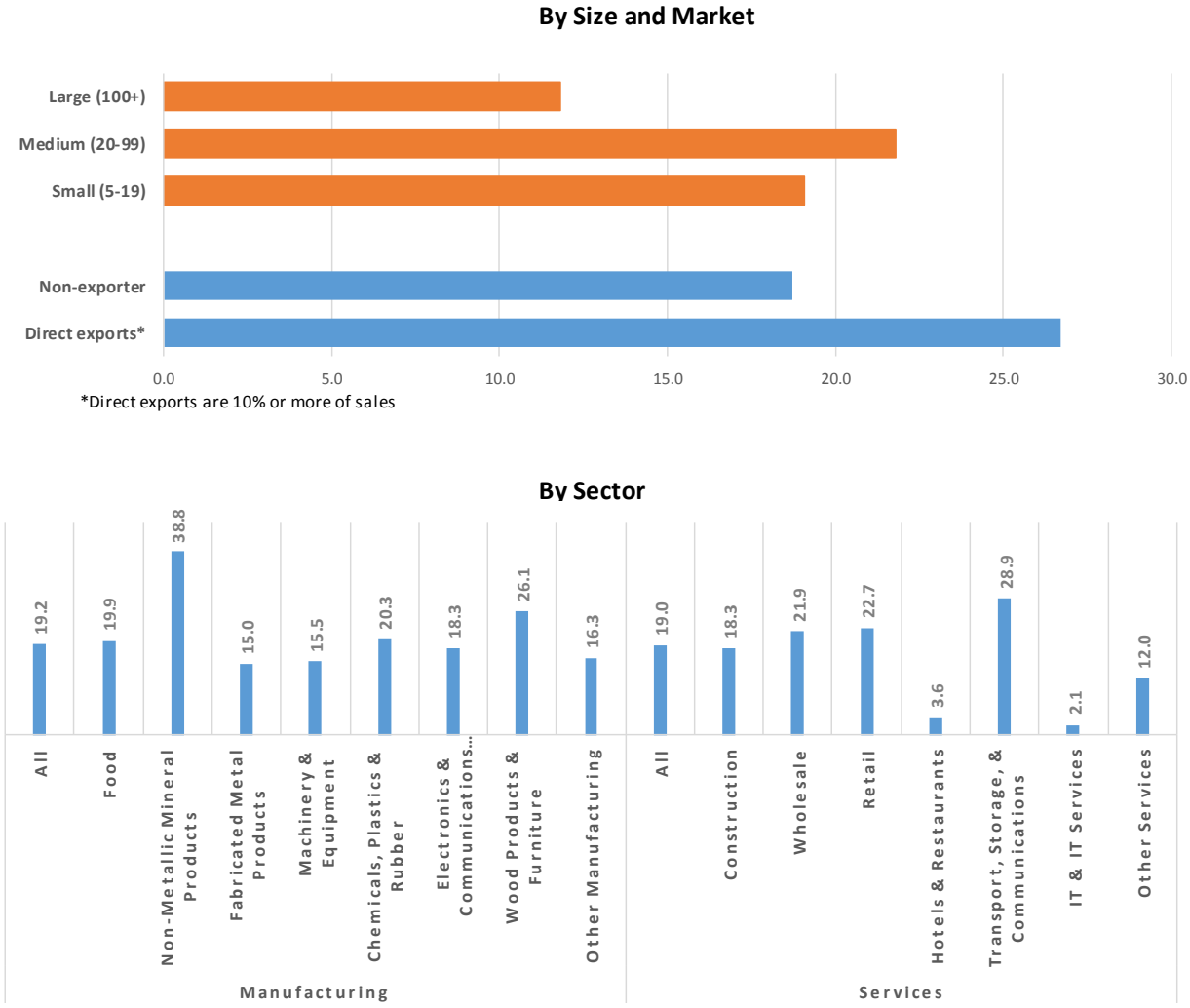
**Table 5: Regional correlation analysis (2012)**

Percent of firms identifying transportation as a major constraint	
RGDP (current, RUB)	0.04
Domestic Trade	0.11
Road Density	(0.14)
Number of Cars	(0.02)

Source: own estimation

**The extent to which access to transportation is viewed as an important constraint differs by firm size and activity.** Around 20 percent of small- and medium-sized enterprises identify transportation as a major constraint, compared to 12 percent for large firms (Figure 19). The survey does not identify whether the problem reflects poor access to or quality of infrastructure, rather than transport services. In general, large firms are able to select their location depending on various concerns, including access to domestic and international markets. Large firms also may be able to secure better transport services and minimize the disruption in services by diversifying the transport modes used. Still, large firms are more likely to suffer from poor transport services and infrastructure quality, often a particular constraint on the development of new markets, rather than from a lack of access. By contrast, small- and medium-size firms are not likely to benefit from economies of scale in production and are less able to compete in large (or distant) markets because of the cost of transport.

**Figure 19: Percentage of firms by size, market, and sector that identify transportation as a major constraint (2012)**



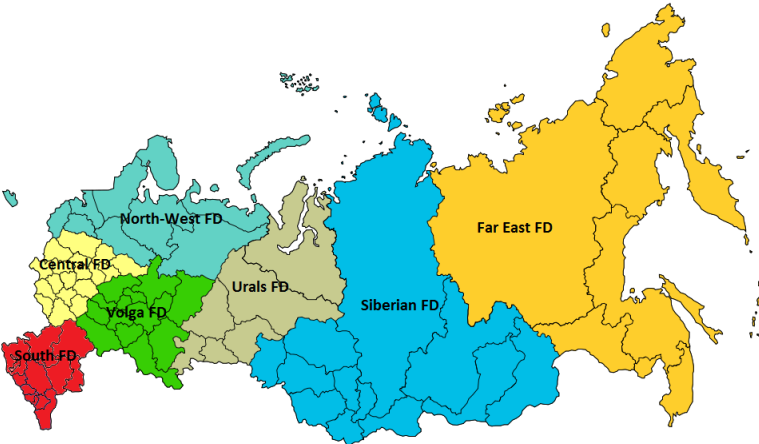
Source: Enterprise survey, the World Bank

**Exporting firms perceive that transport is a major constraint for their business.** A significant share (26.7 percent) of exporting firms perceive that transport is a major constraint for their business, eight percentage points more than for non-exporter firms (Figure 19). Firms in the non-metallic mineral sector appear to be the most constrained by poor access or quality of transportation, followed by firms in the wood products and furniture sector. Finally, the transport, storage, and communication sub-sector has the largest share in the services sector of firms showing transport as a constraint.

1.6 Improving transport efficiency: A preliminary analysis through a regional CGE model

**This section presents some preliminary results of a simulation of a positive shock in transport efficiency on regional productivity and welfare.** The analysis is based on estimations from a computable general equilibrium model at the regional level of the Russian Federation (SUST-RUS, 2017).<sup>33</sup> The model is divided into seven regions each with representative households divided by quintile of income. The production sector includes 32 goods and services, and there is a federal government and external sector.<sup>34</sup>

Figure 20: Russian regions used in the computable general equilibrium model



Source: SUST-RUS project

	Central FD	North-West FD	South FD	Volga FD	Urals FD	Siberian FD	Far East FD
GRP, bln RUB	17 988,82	4 950,79	3 650,62	8 142,10	8 833,38	4 979,55	1 991,60
GRP per capita USD	18 356,88	13 876,65	6 087,22	10 190,23	27 429,25	9 653,95	11 620,81

<sup>33</sup> The study includes some simulations using a computable general equilibrium model based on the SUST-RUS project deliverable D3 “Description of the economic model, mathematical formulation and derivations,” available at [http://sust-rus.org/wp-content/uploads/2010/08/wp3\\_sust-rus-model.pdf](http://sust-rus.org/wp-content/uploads/2010/08/wp3_sust-rus-model.pdf). Natalia Turdyava, one of the authors of the model, reproduced new simulations for this report.

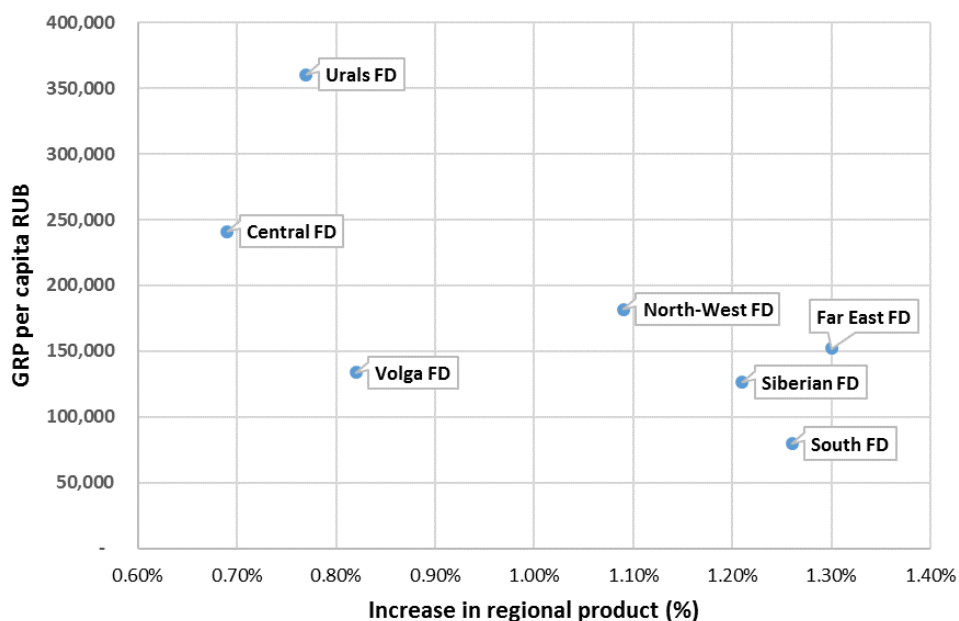
<sup>34</sup> The description of the model can be provided upon request to the authors of this report.

<b>Population thousand</b>	37 218,00	13 550,00	22 777,00	30 346,00	12 231,00	19 590,00	6 509,00
<b>Area, 1000 sq km</b>	652,80	1 686,97	589,20	1 038,00	1 788,90	5 114,80	6 215,90

The regional division in the SUST-RUS model coincides with federal districts of Russia in the year 2006. In 2010, the Southern Federal District was divided into Southern and North Caucasian Federal Districts. These Russian regions are quite different. The biggest gross regional product is produced in the Central Federal District. This is the most densely populated region of Russia with 52 persons per Km<sup>2</sup>, which is six times higher than the national average density of 8.4 persons per Km<sup>2</sup>. The Far East is the least developed region of Russia. It has the smallest GRP and the biggest territory. The Southern Federal District is the poorest of the Russian federal districts with GRP per capita 2.3 times less than the national average. The Ural Federal District is not only a manufacturing heart of the Russian economy; it is also rich in natural resources. Khanty-Mansi and Yamalo-Nenets Autonomous Okrugs of the Ural Federal District have the country's largest oil and gas fields, which belong to the West Siberian oil and gas province. This province contains 66.7 percent of Russian oil reserves (or 6 percent of the known world oil reserves) and 77.8 percent gas reserves (or 26 percent of the known world reserves). The Ural Federal District has the largest GDP per capita.

**A 10 percent increase in the productivity of transport inputs (labor, capital, and energy consumption) would raise GDP by 0.8 percent.** Poor or underdeveloped regions would enjoy the largest increase in GRP, and the two richest regions (Central and Ural Federal Districts) the smallest, suggesting that a uniform improvement across regions contributes to regional convergence (Figure 21).

**Figure 21: Impact of 10 percent increase in transport sector efficiency on federal districts**

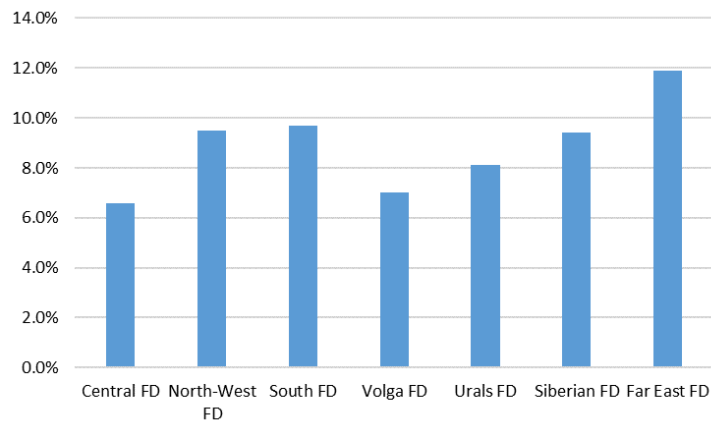


Source: SUST-RUS

Although the effects of a positive shock in productivity is a result of complex interactions in a general equilibrium framework, the overall results are likely to be driven by the transport demand as shown in the Figure 22. For instance, the transport cost in the Far Eastern Federal District represents 12 percent of the total regional product—almost twice that of the Central Federal District. At the same time, an increase of the transport productivity creates a regional GDP growth of 1.3 percent in the Far Eastern Federal District and 0.7 percent in the Central Federal District.

It is worth mentioning that an increase in productivity requires, by definition, the production of the same output while utilizing fewer resources or increasing output with the same inputs. This productivity shift could be the outcome of some policy reforms, infrastructure investment, technological advancement (adoption of GPS) etc. The link between changes in these variables and impact on better connectivity requires further analysis, which are beyond the scope of a CGE approach.

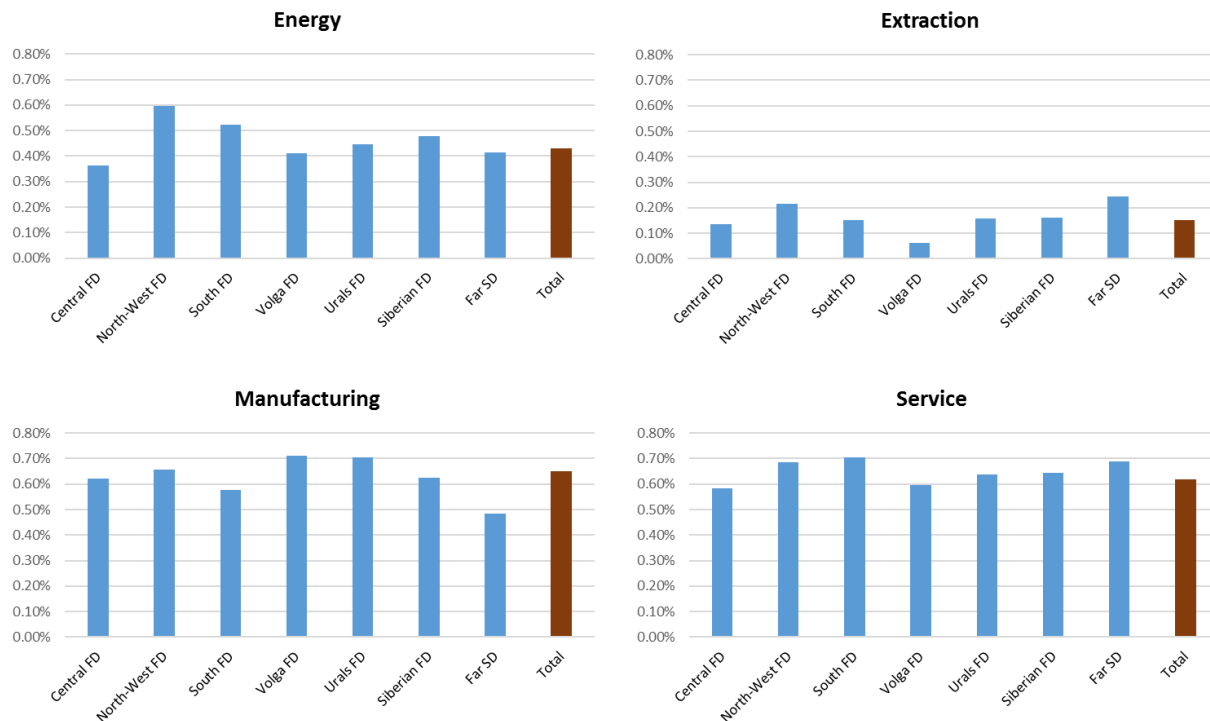
Figure 22: Share of transport sector in regional product



Source: SUST-RUS

Figure 23 shows the effect of productivity growth on the regional and sectoral growth. The lowest impact is in the extraction industry and the result is driven by the large share of others inputs, mainly energy, in the production cost.

**Figure 23: The effects of a positive productivity shock on sectoral and regional growth (%)**



Source: SUST-RUS

**Households are also better off in terms of welfare as measured by the Equivalent Variation.** There are some minor improvements in income distribution measured by the Gini coefficient and poverty reduction (poverty intensity). In terms of regional impact, the main beneficiaries are the Central Federal District as compared to the households in the Volga Federal District even though the latter are better off. In the end, the largest benefits accrue mostly in the highly populated central region. There are multiple channels in which the increase in the transport productivity is translated into an improvement in welfare and an alleviation of poverty. Households are better off because the price of goods and services is reduced because of an improvement in the efficiency of transport. The model assumes that the return on capital is distributed within the households—the richer ones receive most of the shares. These benefits depend on the demand for transport in each sector and the final impact of the return on capital in each sector. The reduction in poverty is a direct consequence on the increase in household revenues.

**Table 6: Impact of 10 percent increase in transport sector efficiency on welfare and poverty**

	Central FD	North-West FD	South FD	Volga FD	Ural FD	Siberian FD	Far Eastern FD
<b>Income by household QH</b>	1.05%	0.97%	1.06%	0.78%	0.84%	0.91%	1.01%
<b>Income by household QM</b>	1.02%	0.94%	1.02%	0.76%	0.82%	0.90%	0.99%
<b>Income by household QL</b>	1.03%	0.96%	1.04%	0.76%	0.81%	0.92%	0.99%
<b>Mean income</b>	1.04%	0.96%	1.05%	0.77%	0.83%	0.91%	1.00%
<b>Poverty intensity</b>	-0.01%	0.00%	-0.01%	-0.01%	-0.02%	0.01%	-0.01%

<b>Equivalent variation</b>	0.16%	0.12%	0.05%	0.06%	0.13%	0.06%	0.09%
<b>Atkinson coefficient</b>	1.76%	1.50%	0.81%	2.00%	1.94%	2.86%	1.41%
<b>Gini coefficient</b>	0.01%	0.01%	0.02%	0.02%	0.02%	0.00%	0.01%

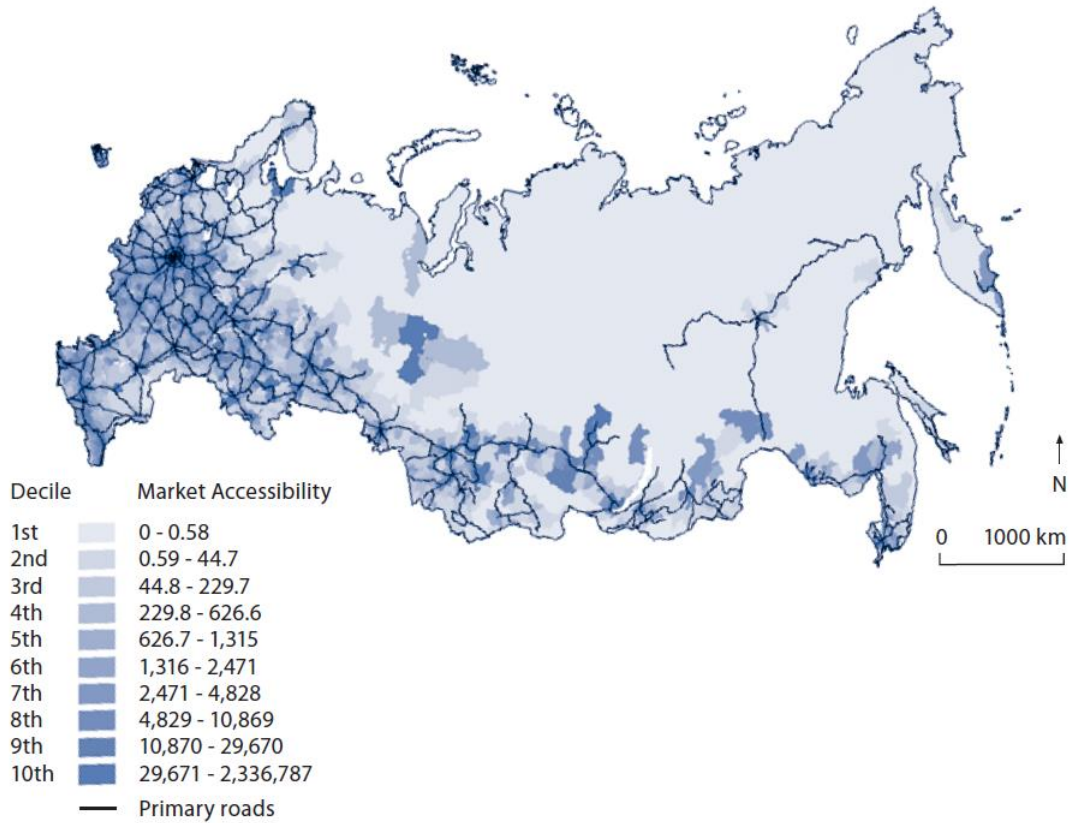
Source: SUST-RUS

## 1.7 Regional convergence: An equity/efficiency trade-off

**Do investments in transport infrastructure facilitate regional convergence and reduce disparities in Russia?** This is a difficult question to answer as there are different factors that interact in a complex way as drivers of economic growth and development. The 2009 World Development report states this complexity succinctly: “Interregional infrastructure improvements can bring higher economic concentration. The potential benefits of improving market access for peripheral areas may instead accrue to firms in larger agglomerations. And improving transport connectivity can further concentrate economic activity. Roads and rails run both ways—better transport connectivity not only provides market access to firms in lagging areas, but also allows firms in leading areas to reach markets. A decline in transport costs helps competitive firms in leading areas easily scale up production to reach these new markets at lower cost relative to local producers in lagging areas. So, improving market access may hurt the production of standardized goods in lagging areas. But lower prices and better access to new products are likely to improve consumer welfare” (WDR, 2009, page 252).

**Brown et al., 2008 finds that shifting resources from areas with high population to peripheral regions to support transport infrastructure may not contribute to regional convergence.** The analysis is based on a model of agglomeration economies to study how transport connectivity affects the productivity of existing and new private firms in the manufacturing sector. The analysis uses data at the firm level (Russian Enterprise Registry Longitudinal Database), of all large and medium-sized and many small industrial enterprises covering mining, manufacturing, and utilities from 1985-2004. The data geo-references each firm down to the third level of Russian administrative units. Such a process allows the observation of the spatial distribution of firms in two different economic environments: i) pre-transition, when firm location was a decision made by central planners; ii) and post-transition, when firm location was the product of profit-maximizing behavior of private entrepreneurs. The authors of this study develop a measure of market access where the relationship between two places is directly proportional to the population or some other index of social or economic activity, and inversely proportional to distance—physical or economic—between them.

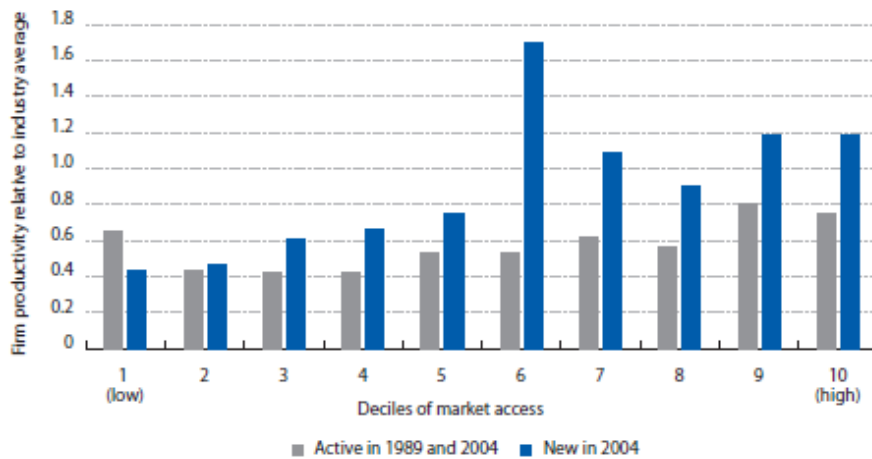
**Figure 24: Market access estimation by decile**



Source: Brown et al., 2008

Using the market accessibility index together with the data on firm productivity and also entry and exit, Figure 26 shows that new firms have not only located closer to markets, but also have higher productivity, according to this study. The authors of this study are able to conclude that economic distances are shrinking as firms move physically closer to markets.

**Figure 25: Market accessibility and productivity of new and existing firms**





**In their analysis of new and private sector firms, the authors concluded that transport investments are unlikely to have a major impact on growth in peripheral regions.** In this case, shifting infrastructure funds from central (Moscow and St. Petersburg axes) to peripheral regions reduces the overall productivity of infrastructure investment while generating little improvement in regional equity. This result does not necessarily contradict the outcome of the CGE analysis.<sup>35</sup> There is no prior reason to expect that regions that gain the most in terms of productivity will necessarily have the highest gain in terms of growth as a result of change in transport costs (productivity in the CGE case). The benefits for transport improvement for remote/poorer regions is not realized in the form of agglomeration benefit, but in the form of access to basic services. It may be the case that although the gain in terms of productivity, as suggested by Brown et al., 2008, is the lowest in these regions, the overall effect in terms of growth, as captured by the CGE model, could be higher than those in the Moscow Oblast.

## 1.8 Some policy conclusions and areas for future research

This section presents some preliminary policy conclusions from the analysis of transport connectivity and poverty, growth, and productivity. It also proposes some areas of future analysis to validate the recommendations and to expand the study to passenger transport connectivity.

### a) Transport connectivity and poverty

**While it is difficult to draw a concrete causal relationship, our findings suggest that the level of transport connectivity is negatively correlated with poverty incidence.** The Far Eastern and Siberian Federal Districts, which border China and Central Asia, have the highest rates of poverty and lowest rates of transport connectivity. In particular, the main lagging regions in the Northern Caucasus and Volga Federal Districts face longer travel time for domestic trade compared to leading regions in the Far East, the Ural, and the North West. For some of these regions there is an obvious case to be made for greater investment to improve connectivity. Improving transport connectivity, however, can be a double-edged sword for poor, remote areas. While better connectivity enables producers to expand their trading opportunities, it exposes them to greater competition from goods produced in cities. The overall impact of connectivity on poverty would have to take into account the opportunity for migration (and the ensuing remittances) from remote areas to help reduce poverty.

**An increase in transport efficiency could have some positive impact on welfare and poverty reduction as suggested by the results of CGE model.** There are multiple channels in which the increase in the productivity of transport is translated into an improvement in welfare and poverty. On one side, households are better off because the price of goods and services are reduced because of the shift in the efficiency of transport. Also, the model assumes that the return on capital is distributed within the households—the richer ones receive the most. The benefits depend on the demand for transport and the

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<sup>35</sup> It is important to note here that Brown et al.'s study focuses on two sectors only as opposed to the whole economy in the CGE model.

impact on the return on capital in each sector. The reduction in poverty is a direct consequence of the increase in household revenues.

#### **b) Transport connectivity and growth**

**The estimates from the CGE model suggest that if the productivity of transport inputs were to increase by 10 percent and all inputs in the other sectors of the economy were to stay constant, then realized growth in GDP (output) would be 0.8 percent.** This is a significant effect and is in line with orders of magnitude of effects found in other countries. The spatial distribution of the realized GDP growth rate is quite revealing. While the poor regions enjoy the largest increase in GRP, the two richest regions in the country gain the smallest.

**This uneven distribution suggests that boosting productivity in the transport sector through, for example, infrastructure investment, will help regional convergence.** However, a word of caution is in order regarding transport investments' long-term economic effect. As rightly pointed out by Venables et al. (2014, pp 16-17)<sup>36</sup> *“transport investments typically affect the level of welfare and income, not the rate of growth of these variables. To have an increase in the rate of long-run economic growth, a strategy of a sequence of transport improvements is needed. While a transport project may not change the long-run growth rate, in an economy in which the fundamentals of productive capacity—technology and human skills—are improving, a sequence of transport improvements is typically needed to affect this rate.”*

#### **c) Transport connectivity and productivity**

**The productivity gains in the transport sector assumed in our CGE model could come from a number of sources, including regulatory reforms, technological innovations, and infrastructure investments.** All these channels boost transport connectivity, which is central to the realization of the economic benefits of scale and agglomeration (density). A typical example of such benefits are productivity gains that accrue to firms and workers. Studies show that doubling city size (a proxy of density or agglomeration) increases productivity roughly by 3-8 percent (Rosenthal and Strange, 2004). For new and private sector firms in Russia, Brown et al. (2008) find that market size, along with proximity to Moscow and regional infrastructure, are important determinants of productivity. They also find that improved transport has the highest gains in productivity in areas around Moscow and lowest in peripheral regions, particularly in the Far East.

**The spatial distribution of productivity gains in the agglomeration model appears to contradict the CGE results in which poorer regions are shown to gain the most in terms of economic growth.** As mentioned above, there is no prior reason to expect that regions that gain the most in terms of productivity will necessarily have the highest gain in terms of growth as a result of change in transport costs (productivity in the CGE case). However, in future analysis, it is important to explain the source of such differences to help policy makers in their decision on the spatial focus of transport investments.

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<sup>36</sup> Venables, A., Laird, J.J. and Overman, H.G., 2014. Transport investment and economic performance: Implications for project appraisal.

**Finally, it is important to note that in a country as large as Russia achieving a good level of connectivity depends both on the density of the national transport network and the level of population dispersion.** There are many regions in Russia where the transport network is thin while the population is highly dispersed. Connectivity in these regions can be increased either by investing in transport or by encouraging people to relocate to larger towns. In cases where building more transport infrastructure comes at a very high cost and small demonstrable benefits, the strategy should be to reduce dispersion. In the western and central regions where there is better connectivity, road congestion continues to hamper urban-led regional growth. While transport investment plays a role in easing congestion in these regions, it should be directed toward secondary cities to make them attractive destinations for firms and people.

### **Further areas of research**

Transport connectivity, as defined here, mainly focuses on freight transport and not so much on how passengers in different parts of the country are able to access transport services. The second phase of this study could look at passenger transport connectivity at the domestic, regional, and international levels. Specifically, the following questions are worth pursuing to answer key policy issues: What is the link between connectivity at the three spatial levels for different modes? How has this link changed over time? Does the strength of this link differ across the country? While the present study assesses general relationships between transport connectivity and economic outcomes—such as growth, poverty, and productivity—a more formal and nuanced approach is needed to establish and estimate a causal relationship between these variables.

Finally, one possible avenue for future research is investigating the effect of transport infrastructure between and within regions on the weight and value of bilateral trade between Russian regions. Knowing these effects will help policy makers in their cost-benefit analysis of transport investments.

## Part 2 – A regional assessment of transport connectivity

**This section narrows the focus of this report to analyze how access to infrastructure and transport quality impacts growth and development in the two selected regions.** The approach looks for the drivers of inter- and intra-regional connectivity and the performance of key industries. It focusses on the different elements that affect sector competitiveness, beyond connectivity and access to markets.

**Zabaikalsky Krai and Khabarovsk Krai were selected from among a few regions that were interested in participating in this study and could readily provide inputs.** The two regions were picked based on their geographical location, markets, network connections, and availability of natural resources. While both regions are served by trunk railway, Khabarovsk Krai also has access to seaports. Unlike regions in the European part of Russia, the main trading partners for the selected regions are neighboring countries in Asia, which is representative for the Far Eastern and Siberian Federal Districts. Each case study looks at two dimensions:

- **First, it focuses on inter-regional and international connectivity.** Connectivity is explored in relation to the existing major sectors of the regional economy, as well as sectors that might be unlocked should connectivity be enhanced.
- **Second, it explores connectivity within the region,** covering physical infrastructure, the quality of connections, and accessibility to transport.

**The case studies<sup>37</sup> were carried out through stakeholder interviews and a desktop review of available information.** Representatives of regional government agencies, freight forwarders, business, and academia were interviewed and consulted. Both regions were visited twice. On the first visit, the team had introductory meetings with the regional administrations, identified key stakeholders, and collected background statistics and materials to review. On the second visit, the team carried out in-depth interviews with stakeholders and visited various sites to address the key questions described above, based on the preliminary analysis performed after the first visit.

**The structure of the case study section is as follows.** The case studies of the two regions are presented separately in the two following sections. They have similar structures. In each case a distinction is made between economic development and social sustainability. The factors relating to economic development are treated for each productive sector while taking into consideration the transport and other infrastructure needs and problems of each industrial sector that have been identified. The factors related to social needs and the impact of the transport sector are then discussed. Finally, transport infrastructure initiatives and sector policies that affect economic development and social sustainability of the region are considered.

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<sup>37</sup> While significant volume of quantitative data was also obtained it was not sufficient to support formal modelling of the causal relationship between connectivity and socio-economic indicators.

## 2.1 Case study of Zabaikalsky Krai

**Zabaikalsky Krai (ZK) is a land-locked region located in eastern Russia, far from major Russian markets and centers of economic activity.** ZK's total area is 431,892 km<sup>2</sup>, larger than Germany and nearly twice the size of the United Kingdom. The region shares extensive international borders with China (998 km) and Mongolia (868 km); its internal borders are with Irkutsk and Amur Oblasts, as well as with the Republic of Buryatia and the Sakha Republic.

**Figure 26: Zabaikalsky on the map**



**The region is sparsely populated with average density of less than 2.5 persons per square kilometer.** About two-thirds of its 1.1 million inhabitants live in urban areas, including about 330,000 in the capital city, Chita. Only two municipalities have densities above 100 persons per square kilometer with Chita dominating with a density of 650 persons per square kilometer. Moreover, this density is declining in all but Chita and one or two other urban settlements. The region lost 8.8 percent of its population from 2000 to 2014, in part due to the migration of military personnel and of younger cohorts to the European parts of Russia or neighbouring regions in Siberia that have higher living standards and better access to tertiary education. Between 2013 and 2015, the total population declined at a rate of about 0.7 percent per year while Chita's population has been increasing at the rate of about 1 percent per year.

**The region is relatively poor and its working age population is shrinking.** In 2013, GDP per capita in real terms in the region was 44 percent below the national average, though it increased by 5.9 percent a year from 2000 to 2013. The poverty level in recent years has been higher than the national average, despite the rapid decline in poverty (from 23.6 percent in 2008 to 18.0 percent in 2014), while inequality (indicated by the Gini coefficient) has risen consistently since 2002, reflecting the relatively slow growth in incomes of the poor.

**Investment in the region has been highly volatile.** This reflects a recent cutback in investment in two sectors that had accounted for the bulk of investment—transport and communication (40 percent of total investment from 2003-2013).

**The share of exports in ZK's gross regional product is low, despite the region's rich endowment of mineral resources.** This reflects the region's heavy dependence on the business that it provides for the

Trans-Siberian Railway (an intra-Russian sale) and the low value of the natural resource exports of the region. Machines and transportation, a part of which is refurbished military equipment, account for more than 20 percent of the region's exports. Wood and timber account for 13 percent of exports, and resource extraction and metals about 11 percent each. Imports are predominantly manufactured consumer goods and there is a substantial trade deficit in financial terms. With Chita located at a major junction on the Trans-Siberian Railway serving two alternative routes to China, its major export flows are by rail to China.

**ZK's main domestic trade partners are primarily regions of the Siberian Federal District.** Based on the analysis of trade in 2015, imports from the Siberian Federal District constitute 84 percent in financial terms of all imports from the Russian regions. These regions are all connected with ZK via the Trans-Siberian Railway and the federal highway P255 "Siberia" and P258 "Baikal". ZK exports mainly to the Republic of Buryatia, Kemerovskaya Oblast, and Omskaya Oblast in the Siberian Federal District, Sverdlovsk Oblast in the Ural Federal District, and Amur Oblast and Republic of Sakha (Yakutia) in the Far Eastern Federal District. The federal highway system and the railway provide connectivity with those regions.

**The assessment of freight connectivity of ZK with the main region's existing markets shows that although the region is more isolated from the markets of European Russia, it is relatively well connected with its main existing regional trade partners.** An analysis of trade in financial terms over the past three years shows that ZK's main trade partners are China, Japan, Mongolia, South Korea, Switzerland<sup>38</sup>, Venezuela, and Vietnam. ZK's main exports are to China. These remained stable and even increased, while imports from China dropped significantly in 2015 mostly due to devaluation of the local currency. The largest value of exports is represented by wood and wooden products, minerals, and fuel. In 2015, the Chinese market opened for grains and other types of foods due to changed sanitary regulations. ZK's imports mainly come from China and are largely represented by vegetables, nuts, and machinery.

## 2.1.1 Development of key sectors of the economy

### *a) Mining*

**Zabaikalsky Krai is one of Russia's major sources of minerals and raw materials.** Most of the ores mined in the region are multi-metal ores, which produce placer gold and concentrates of other metals. This should add substantially to the profitability of the mining industry. However, the absence of local processing facilities means that the exports are of relatively low value compared with those from other parts of the Russian Far East.

**Exploitation of natural resources accounts for the largest share of total industrial output. The development of new fields requires large investments in transport infrastructure.** Although ZK produces a considerable amount of minerals, there are only a few processing facilities that have been in operation since the Soviet period. Among them is a plant that is part of the Priargunskoye mining and chemicals agglomeration in Krasnokamensk (producing uranium oxide  $U_3O_8$ ) and the Zabaikalsky mining and ore-dressing combine. In recent years, however, some mineral-processing plants have begun to be constructed at newly opened fields; for example, NorNickel has built the Bystrinsky and Bugdainsky plants.

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<sup>38</sup> Trade partners are listed based on the three-year turnover. However, Venezuela and Switzerland had only exports from ZK in 2013 with no trade in the following years. Thus, stable trade partners among those listed are China, South Korea, Japan, Vietnam, and Mongolia.

There is also a project to process coal in Krasnokamensk, and gold-recovering factories are being built (e.g. at the Aleksandrovskoye field, where Dore gold is produced). However, as indicated during interviews with government officials, considerable power inputs are required for advanced mineral processing. Since power costs in ZK are high, minerals will continue to be exported elsewhere for processing.

#### *b) Agriculture*

**Zabaikalsky Krai is a high-risk farming area that suffers frequent droughts.** Until recently it has been in a state of depression. Large farm producers have left the area, and up to 70 percent of all farming output comes from private subsidiary plots. The government supports training programs and allocates grants. Cattle breeding has picked up, and new wheat strains that are more resistant to drought have begun to be sown. The Priargunsky District bordering China has good yields of durum wheat. A railway line cuts across the district and there are grain reception centers. Agriculture is making progress in the Akshinsky District as well; the Darasun-Khapcheranga motorway (A-167) runs through that area and output can be shipped by rail.

**A major export facility is under construction.** Construction work has begun on the first grain railway terminal, Zabaikalsk-Manchuria, which is a multi-modal grain storage and shipping center. Grain grown in ZK and other regions of Siberia will be exported to China via the Zabaikalsk-Manchuria grain terminal (which will have an initial capacity of up to 900,000 tons a year). Private investment is being used to build the terminal. There are also plans to establish an industrial farm produce processing center on the basis of the Mogoituisky agricultural holding located in the district that has road and railway connections with Chita and China.

**Expansion of agricultural production to some extent depends on road conditions.** According to the executives of the Zabaikalsky Krai Chamber of Industry and Commerce, the areas suitable for farming have access to the main network of hard-surface roads. However, a representative of private business said he decided not to purchase land to grow rapeseed in the Priargunsky District, despite the fact that the area is famous for its arable land, because of poor road quality.

**Transportation problems also hamper the development of meat and dairy farming.** Private subsidiary plots are very small producers scattered over the area. Collecting their produce is costly because of the poor quality of rural road networks. There are no aggregated specialized centers to receive meat and milk. Meat packers and milk processors prefer growing their own stock, which does not involve large transportation costs. For example, in 2015, the Zabaikalskaya Investment Company located in Chita started its own livestock growing business, selling wool to China and livestock (by motor transport) to the Amur Oblast and Khabarovsk Krai. The location of the farm next to Federal Motor Road M-58 Amur helps facilitate the distribution and sale of produce.

**Trade regulations largely define the direction for expanding processing in the region.** Chinese phytosanitary concerns remain to be settled. ZK's government hopes to see a long-term interstate agreement on livestock breeding products (in particular, on processed meat).

**Chinese trade policy is another impediment to the development of local processing.** Previously, Russia only supplied China with maize and soybeans from Primorsky Krai and soybeans from ZK. According to interviews with business representatives, China has no interest in processed farm produce: Manchuria, for example, has several factories that produce oil from rapeseed grown in ZK. Produce is shipped from

the krai to China mostly by rail, with the transportation costs amounting to 20-25 percent of the selling price.

*c) Food processing*

**The prospects of the regional food-processing industry significantly depend on the Russian-Chinese trade relationship.** It has been asserted that in the Soviet period every district in Zabaikalsky Krai had a meatpacking factory, a dairy, and a brewery. Today, very few of them operate. The Zabaikalskaya Investment Company produces beer and soft drinks not only for the regional market, but also for export to Buryatiya, Irkutsk, Khabarovsk, and Vladivostok as well as to China and Mongolia. However, the slump in farming in the krai is associated with a more general decline in food processing. On the other hand, some food exports to China are growing. These include bottled drinking water, mineral water, vegetable oil, and flour. Further growth of volume and expansion of the product range depends on policy decisions, namely, on the volume of Russian food exports that China will allow into the country.

*d) Forestry and timber working*

**Chinese demand for unprocessed timber has remained static** over the past few years, though its import of wood products has been increasing. Apart from that, in 2009 the Russian federal government introduced quotas and licenses for timber exports (the duty for above-quota export of the main types of unprocessed coniferous timber amounts to 80 percent of the customs value). For this reason, Zabaikalsky Krai is now developing wood processing and consistently cutting back unprocessed timber exports.

**Local advanced wood processing is being developed.** One example of such a development is the construction of the Amazarsky pulp and paper works “Polyarnaya” in the Mogochinsky District; the first stage of the project became operational in 2012. Today, finished products, planks, and profiled log are sold in neighboring areas and on foreign markets. When the project reaches its full capacity, it will make unbleached kraft pulp. However, the plant is poorly served by border crossings to its potential market in China. The nearest border crossing is 100 miles away, lacks a road connection, and is not operational.

*e) Building materials*

**Zabaikalsky Krai has apparent potential to develop the building materials industry thanks to promising deposits of appropriate minerals.** Investment plans have been drawn up to build a cement plant on the border between the Olovyanninsky and the Mogoituisky Districts. There are some studies to develop a cement plant in Krasnokamensk in the south of the region, a location served by both rail and road connections. However, building materials production fluctuates depending on the construction industry and has been affected by the economic crisis triggered by the drop in oil prices. For example, the Zabaikalskaya Investment Company ceramic brick factory, which accounts for about 16 percent of the total brick sales in ZK, was expanding production before the crisis buying an argil deposit and starting production of colored brick. The company sells its products domestically and outside the krai, in particular, in Blagoveshchensk, Vladivostok, Khabarovsk, Ulan-Ude, and Mongolia. As for modal split, shipments to Mongolia and the Far East go by rail and to Buryatiya by road transport. Based on interviews, transportation costs amount to 20-25 percent of the price of the finished products.



## *f) Tourism*

**There appears to be some Chinese interest in tourism in Zabaikalsky Krai.** However, most of the natural and cultural landmarks are far from the regional center, federal motor roads, and railway stations. For example, the Krasnochikoisky District, which has many archaeological monuments, is a 14-hour drive away from Chita on a rough road. Nerchinsk's famed Butinsky Palace and the Daurisky Nature Preserve in the Borzinsky District are not easily accessible by road either. It, therefore, appears difficult for tourism development prospects to materialize in the short term due to a lack of transport infrastructure.

### 2.1.2 Transport infrastructure and services

#### *a) Roads and motor transport*

**Zabaikalsky Krai has a sparse road network.** In a region of 430,000 square km, the road network consists of 1,840 km of federal roads, 7,547 km of regional roads, and around 20,000 km of municipal roads. It should be noted, however, that there are still 120 communities in the krai that do not have hard-cover road connections. The federal roads are controlled, financed, and maintained by the federal budget. However, until 2012, the maintenance of regional and municipal roads was funded through the general regional and municipal budgets. While there were occasional injections of capital investment through special programs, the regional road network was essentially self-supported and poorly maintained.

**Overall, the past 15 years have seen the impressive development of a road network in Zabaikalsky Krai that has led to some positive social impact.** The Amur federal highway (Chita-Khabarovsk) has been completed and intensive reconstruction work is going ahead on regional and municipal roads. The opening of the Amur federal highway has had a positive social impact on the living standards in the areas adjacent to the highway, public transport services have improved, and communities have more access to transport. Small businesses, such as road services (retailing, public catering, and vehicle servicing), have begun cropping up along the highway. But these appear to be essentially only services catering to the increased level of road traffic, rather than activities that might be the core of a new sustainable development. There are arguments, moreover, that the Amur federal highway project was poorly designed, with no exits planned to communities along the route.

**Freight motor transport services are not well developed to fully satisfy the needs of SMEs.** They are used mostly for small batches of goods and express deliveries within and outside the region. Although it is generally costlier than rail, road transport has the benefit of being able to deliver goods to more than one location using the same vehicle. There are many small operators on the freight transportation market. Local producers prefer them over large federal companies because of the latter's high rates (almost double those of small companies).

#### *b) Rail transport*

**Rail transport is critical for Zabaikalsky Krai's economy.** As Chita is a major junction in the Trans-Siberian Railway, the rail system not only serves the regional economy but is also a major source of income for it. Large shipments of non-express bulk cargoes mostly go out of the krai by rail. In contrast, SMEs appear to use rail only to ship goods to China and Mongolia.

**Major trunk rail movement is well served.** Over the past few years, modernization work has been carried out on the Eastern Siberian railroad through a Russian Railways investment program with the goal of increasing its tonnage and carrying capacity. However, while this may increase the contribution of the rail sector to the regional budget, it does not appear to offer a major benefit to regional carriers. Small- and medium-sized enterprises expressed dissatisfaction with rail service, complaining about having to wait for a week to book cars for their cargo. Officials said the Zabaikalskaya Railroad welcomes shippers, always tries to meet their needs, and that it only wants requests for cars to be filed in a timely manner.

**Improvements to the rail system, particularly to the Trans-Siberian Railway, have permitted increased flows of international transit trade, which have, in turn, sustained Chita's rail-related economy.** While the Baikal Amur Mainline railway in the north of the region is, as yet, of less significance, it does offer a trunk route to the ports of Vanino and Sovetskaya Gavan in Khabarovsk Krai, to which development of northern mining areas can be connected. However, it is still a single-line railway, and the prospects for its development are closely tied to the future of the coal export business. With a declining Chinese market for coal and an increasing concern about the environmental effects of coal-fired electricity stations, this might turn out to be far less promising than the federal government currently seems to expect.

**The socially important rail passenger carriage sector is declining.** Population mobility is constrained by commuter railway traffic losses and the unwillingness of the Russian Railways to address these issues. The Zabaikalskaya Commuter Passenger Company is responsible for commuter passenger carriage. In 2011, it operated 30 commuter routes, but in 2016 only 21 routes (categorized as socially important) remain. These remaining routes were optimized in terms of the number of cars and time intervals: there are fewer cars left and only two pairs of trains per day have remained on some of the routes. It should be noted that some of the communities in the krai, especially in the north, are only connected with other areas by rail. Additional bus routes have been opened to the communities where commuter trains have been cancelled.

### *c) Air transport*

**Air transport is used mostly for passenger transportation. Air freight is non-existent with only mail and experimental cargo samples shipped by air.** Zabaikalsky Krai has two airports—Chita (private) and Chara (federal government). There are federally-owned airfields in the krai, but the federal authorities do not provide funds for repair and maintenance. At present, the krai's authorities are pressing for the transfer of ownership of the airfields to the municipalities so that the regional budget can be used to finance repair and maintenance costs.

**Regular international flights are limited.** Chita is linked with Hailar and Harbin in China but there are charter flights to China as well. A Russian operator runs flights from Irkutsk to Manchuria, but these are subsidized by the government of China. Aeroservice is seeking similar financing to launch a Chita-Manchuria flight. Some passengers use the Irkutsk and Ulan-Ude airports in neighboring regions, which offer cheaper rates and a better selection of nonstop flights.

**Inter-regional flights are served by regional air companies and often require subsidies to operate.** In 2015, the large federal carrier, Aeroflot, left Chita, officially citing an unacceptably low operating margin as the reason. However, there remain two large carriers, Ural Airlines and Sibir Airlines, and the locally owned Aeroservice operating in the region, servicing nonstop flights from Chita to Moscow, Novosibirsk, Yekaterinburg, Vladivostok, and Simferopol, all supported by federal subsidies. Aeroservice operates one long-distance federally subsidized flight on the Chita-Irkutsk route. Regional authorities would like the

carriers to expand their operations with direct nonstop flights to St. Petersburg, Sochi, Anapa, and Omsk and have asked the federal government to consider subsidizing such operations in 2016-2017.

*d) River transport*

**River transport is limited and the only available mode of transport for some communities.** The regional budget subsidizes river shipping. The municipal enterprise carries freight and passengers during the summer period only over a 135-km stretch of the Shilka River, from Sretensk to the Nizhniye Kularki village. The river is the only link to the outside world for 17 communities in the krai with a total population of between 3,000 and 4,000 people. The main problem of the sector is the age and deterioration of the steamer fleet. Maintenance is a problem. Sretensk did have a shipyard that was part of the military industrial complex, but today it is no longer in production.

*e) International border crossings*

**International border crossings are important for the regional economy.** There are nine border-crossing points on the territory of Zabaikalsky Krai: three on the Mongolian border, five on the border with China, and one at Chita airport. They are organized separately for motor, railway, and air transport.

**The Zabaikalsk-Manchuria customs station has been modernized and works relatively well.** About 60 percent of all Chinese exports to Russia go through this station. In recent years, the capacity of the station has been upgraded.<sup>39</sup> Under the Federal Targeted Program, “State Border of the Russian Federation,” the station has been modernized, the gauge changeover system on the Zabaikalsk-Manchuria line expanded, the southern line of the railroad to Borzja converted to electrical traction, and Federal Highway A 166 Chita-Zabaikalsk reconstructed. The major physical constraint on the rail traffic is the time taken for gauge changeover. As for infrastructure constraints on motor traffic, the main problem is that cargo and passenger traffic flows were not separated.

**Other crossing points are poor.** Crossing points at the other customs posts have not been rebuilt or modernized for the past 20 years, nor are there any plans to do so under the federal program. This restricts tourism and constrains production growth in parts of the krai that are far away from Zabaikalsk-Manchuria station. It is suggested, for example, that the pulp-and-paper mill, Polyarnaya, currently under construction in the Mogochinsky District will find it difficult to export its output because transportation through the Zabaikalsk post will be unprofitable due to a long haul. At the same time, the capacity of the closest post, Pokrovka-Loguhe, will not be enough because at present it is just an ice crossing and there is no good road connection with the border crossing. While Russia and China have not yet signed an agreement on the joint construction and operation of a bridge over the Amur at the Pokrovka-Loguhe border crossing, the crossing point infrastructure on the Chinese side has been modernized and feeder roads reconstructed. On the Russian side, there has been no progress on modernization and rebuilding either the facilities or the roads leading to them.

**Some border-crossing improvements are under consideration.** For example, there are plans to build a railway line from Manchuria to Mongolia within the framework of cross-border cooperation between the three countries—Russia, China, and Mongolia. However, this does not appear to be an immediate prospect.

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<sup>39</sup> The World Bank team did not visit the border crossing. This statement is based on the interviews.

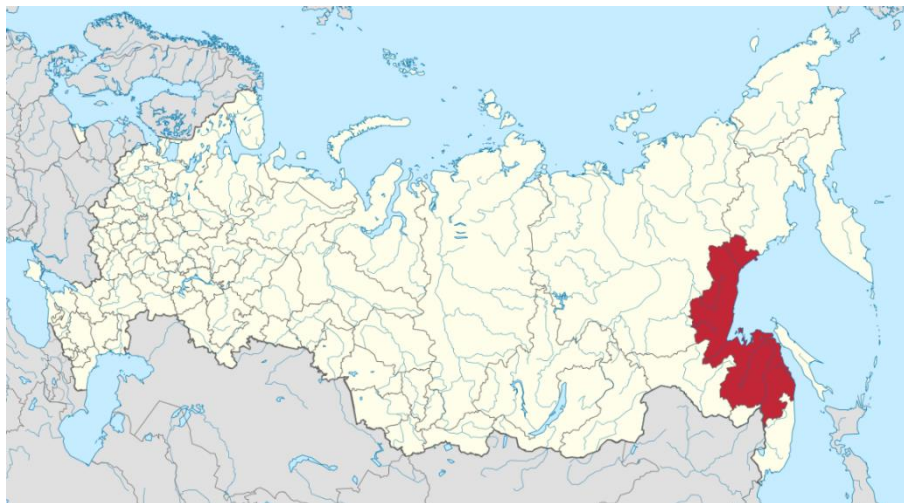
**The problems of border crossing are not only those of transport infrastructure.** For non-bulk goods exported to China either by road or rail, customs procedures are typically very complex and time consuming despite the development of a specialist freight-forwarding capacity in Chita. Moreover, unlike the situation in Western Europe, where specialist logistic agencies and freight vehicles operate across national boundaries, the Chinese and Russian systems are separate.

## 2.2 Case study of Khabarovsk Krai

**Khabarovsk Krai (KK) is located in the central-eastern part of Russia's Far East.** KK borders the Magadan Oblast in the north, the Republic of Sakha (Yakutia) in the northwest, the Amur Oblast in the west, the Jewish Autonomous Oblast in the southwest, and the Primorye Krai in the south. On the southwest side, along 240 km of the Amur and Ussuri rivers and Bolshoy Ussuriysky Island, KK shares a border with China. On the eastern side, KK borders the Sea of Okhotsk and the Sea of Japan, with a coastline of almost 2,500 km.

**Spatial development of the territory is uneven.** Economic activities are concentrated along the course of the Amur River and are sparsely distributed over smaller municipal regions located in inner mountainous areas of the territory and along the coast of the Sea of Japan and Tatar Strait. KK is a transport transit center of the Far East, in particular, and Russia as a whole, and its role has been increasing due to the increasing interregional cargo turnover as a result of growing trade between Russian territories and the Asia-Pacific Region countries. The transport system holds a prominent place in the structure of GDP of KK. In recent years, its share has varied between 11 and 14 percent.

**Figure 27: Khabarovsk Krai on the map**



**KK's population is sparse, aging, urbanizing, and declining.** At the beginning of 2016, KK's population was 1,335,000 and the urbanization rate was 82 percent. The average population density is 1.7 per square km, which is one-fifth of the national average. Two-thirds of the population is concentrated in Khabarovsk and Komsomolsk-on-Amur urban districts. The overall population is declining across the territory except in Khabarovsk. A decrease of 4.6 percent between 2008 and 2014 was entirely due to outmigration.

**The region is relatively poor.** The average per capita income in KK increased 2.4 percent from 2008 to 2015, to 38,400 rubles per capita a month. However, the growth of real income was only 30.4 percent. The ratio of average per capita income to subsistence level in KK was 2.87, compared with 3.2 in the south, 3.37 in the northwest, and 3.87 in the central federal districts.

**The region's international exports are dominated by raw materials and goods with minimum processing.**<sup>40</sup> High-value-added products (machines and equipment, pharmaceuticals, etc.) account for only about 1 percent of the regional exports. However, since 2007 customs statistics do not account for exports produced in KK if the company's headquarters or sales division is registered in a different region.

**Trade, largely oriented toward foreign markets, has declined in recent years.** More than 75 percent of KK's exports go to North-East Asian countries (China, South Korea, Japan) and another 15 percent to Bangladesh, France, Germany, Italy, Thailand, the United Kingdom, and the United States. As a result of the global financial crisis, as well as a recent slowdown of the Chinese and Russian economies, the region's exports have fallen by 43.5 percent (to USD 967.3 million) and imports have fallen by 50.8 percent (to USD 537.8 million) since 2008.

**Foreign Direct Investment has been buoyant.** As of January 1, 2014, the total foreign investment inflow was USD 2.6 billion. Between 2009 and 2013, the territory attracted USD 1.25 billion of foreign investment. This is largely due to the territory's public policy, which is aimed at creating a favorable investment climate. The Bahamas, Cyprus, Malaysia, South Korea, and the United States were key investing countries in the 2009-2013 period. The most attractive types of economic activities for foreign investments are extraction of minerals, logging, processing (metallurgy, wood processing, and oil products), transport and communications, real-estate operations, and geological exploration of subsurface resources.

## 2.2.1 Development of key sectors of the economy

### a) *Forestry and wood processing*

**KK is the leading producer of forestry products in Russia.** Extensive use of resources and high frequency of fires led to a contraction of the area and deterioration of the quality of forests in the developed part of the territory where key logging companies are located.

**A lack of road infrastructure restricts the development of forestry resources.** For effective development of forestry resources, it is necessary to build up to 600 km of new roads additionally a year and modernize a significant part of the existing road network. Commissioning of logging roads in 2013-2014 was only 40 percent of real demand.<sup>41</sup>

### b) *Mining industry*

**KK's mining industry generates 4.4 percent of gross regional product from a wide range of minerals.** The region has 34 types of minerals, 24 of which are being extracted. Key minerals are precious and non-ferrous metals, which are important not only for the territory, but also for the country. KK is among the

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<sup>40</sup> Unprocessed timber, hard coal, oil products with low refining depth, frozen fish, steel, and metal scrap.

<sup>41</sup> According to the draft Strategy of Socio-economic Development of KT (2015).

top 10 Russian regions producing precious metals (gold, silver) and is the only region in Russia where tin is extracted. Between 2009 and 2014, its volume increased 2.5-fold and continues to grow. Besides extraction of precious and non-ferrous metals, KK has been developing the exploitation of common minerals (limestone, building and facing stones, brick clay, sand, and sand-and-gravel mixes).<sup>42</sup> However, proven reserves of precious metals are being depleted. According to KK's draft socio-economic development strategy, the problem of operation and development of extracting industries is inadequate supply of raw materials, which has not been resolved.

### *c) Fishing*

**KK is one of the leading regions in fishery and the output of fish products has been growing.** Although output constitutes less than 5 percent of total industrial output in the territory by value, KK ranks fourth in Far Eastern Federal District (FEFD) by volume of extraction of aquatic biological resources and fifth in Russia. At present, 135 companies, 95 percent of which are small- and medium-sized enterprises, employ 4,200 persons in fishing, fish farming, and fish processing in KK. Eighty-five percent of the fish caught belongs to traditional species (pollock, herring, and Pacific salmon), but there is also a considerable catch of halibut, codfish, smelt, and shellfish. Between 2008 and 2014, the output in physical terms increased by 57.9 percent, value of output doubled, and the range of products included more than 300 items. Fish farming is also currently being developed. At present, there are seven salmon-breeding farms, and one sturgeon-breeding company—the Anyuisky fish farm.

**Domestic fish consumption is growing fast and contributes to the budget of the region.** The share of product sales in physical terms in foreign markets fell from 61 percent to 49 percent between 2008 and 2014; the fact that exports grew by 27 percent over this period implies a relatively high growth of domestic consumption. The fisheries industry also plays an increasingly significant role in contributing revenue to the territory's budget. In 2014, contributions to the budget were 520 million rubles, having increased 2.4-fold against 2008, and the share of tax revenues increased from 0.6 percent to 1 percent.

**Deep processing of fish in KK is done primarily in Khabarovsk rather than in the port area.** It is argued that poor development of the road infrastructure hinders the development of port-based fish processing capacities as there is a risk of spoilage of ready products when they are transported on roads without hard surface. In addition, because of the difficult ice situation, fishing companies at the Sea of Okhotsk ports try to ship all catch after the fishing season to warehouses in Khabarovsk or Primorye Krai.

**While products of primary fish processing from KK are exported mainly by rail, the railway does not provide adequate consolidated refrigerated cargo logistics for companies engaged in deep processing.** The logistics system of Russian Railways targets large wholesale lots. As SMEs in KK do not have large shipments of ready products, they have to reduce the radius of their supplies to 1,000 km—the maximum distance that can be covered with road transport for such load. Small lots of ready deep fish processing

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<sup>42</sup> Large recent projects include construction of mining and processing facilities at gold deposits Albazino, Belaya Gora, and construction of Amur hydrometallurgical plant. Projects that are in process of implementation: extraction of hardrock gold at deposits Noni in Verkhnebureinsky area, Svetloye in Okhotsky area, Kutynskoye in Tuguro-Chumikansky area, Krasivoye in Ayano-Maisky area, commissioning of Festivalnoye tin ore deposit in Solnechnoye area.

products are also shipped by air. Due to product storage requirements, such shipments are only made to cities that have a direct connection with Khabarovsk.

**Fishery development will require an investment in port infrastructure.** The fisheries industry in KK appears to have some potential. However, it may be difficult to transform the fisheries industry into a more highly technological sector of the economy. That would require a substantial investment in Sovetskaya Gavan port in order to solve the problem of infrastructure bottlenecks in collection, storage, and transportation of fish products. For this purpose, it would be necessary to build new berthing facilities in Sovetskaya Gavan as well as port-based storage refrigeration capacities.

*d) Manufacturing industry*

**The share of manufacturing in KK's GRP is insignificant and decreasing.** Thirty-five percent of the processing industry's shipped products of own production is made for aircraft and ship building, 22 percent for production of coke and oil products, 15 percent for food processing, and 12 percent for metallurgy. Production of non-metal mineral products accounts to 4 percent of output, wood processing 3 percent, and machinery and equipment manufacturing 12 percent.

**The main challenge to manufacturing machinery in KK is how to achieve the necessary increase of local production and development of spatially concentrated clusters for component production.** Machinery manufacturing is highly concentrated. Komsomolsk-on-Amur Aviation Plant (KnAAZ) is the core of high-technology generation and application in aviation. Amur Shipbuilding Plant and Khabarovsk Shipbuilding Plant are the maritime engineering centers. The current share of imported components in the territory's aircraft construction is 52 percent for a Russian manufactured civil aircraft. The only iron and steel company in the Far East has been bankrupt since 2013. A shortage and the high cost of raw materials have been the main factors constraining development of the plant.

**The local Far East market is the main market for civil vessel building.** This area has a prevalence of frozen water areas, undeveloped coastline infrastructure over a considerable length of coastline, and availability of a river network with access to the sea. The need for domestic fleet renewal is high and reaches about 2 million tons in deadweight in dry cargo, fishing, and oil tanker fleet. Ice-going vessels are competitive in the regional market due to a relatively high level of ice technology development in Russia.

**There are some prospects for broadening the high-tech core.** It is believed that the designation of Komsomolsk-on-Amur as a Territory of Advanced Social and Economic Development will encourage this development. The prospects for development are closely linked to development of a cluster of related industries—high-tech aircraft building, new materials, instrumentation, and automation. In the high-tech aircraft-building cluster, space technology has been actively developing. This has included rocket components, satellite systems, and ground equipment for collection of space information. More specifically, commissioning of a launching site in Amur Oblast creates prospects for developing a segment of the rocket and space industry in the territory.

**Rail transport is a surprisingly unattractive option to the manufacturing sector.** The transport problems of this sector are exemplified by a machinery company with production facilities in Khabarovsk and Komsomolsk-on-Amur. Up to 50 percent of its production materials is imported from western regions of Russia. Products are shipped to all regions of Russia, CIS countries (Belarus, Kazakhstan, and Uzbekistan), and other European and Asian countries (Bulgaria, India, Poland, Ukraine, and Vietnam). In recent years,

shipments of ready products have shifted from railway to motor transport and the railway siding at the company's facilities has been disassembled. This is explained by the more complicated documentation required for shipments, with numerous approvals needed, absence of shipment tracking, higher tariffs for oversized cargo, and no option of payment in instalments. The company has, therefore, transferred its business to the more competitive road-haulage sector and mainly uses the services of five road transport companies. For product supplies to APR countries, the company also uses sea transport.

*e) Agriculture*

**KK is located in an area of high-risk farming.** Northern areas are suitable for limited production of potato, growing vegetables under glass, and breeding livestock. Farming is undertaken by 25 agricultural organizations (producing more than 20 percent of the total commercial output), peasant farms (producing less than 3 percent), and household farms (producing the largest share of the output). Currently, there is a decline in cattle, pigs, and poultry stock. Livestock breeding output has also been decreasing.

**The potential for agricultural production in the southern parts of KK highlights the importance of an export link to China through Bolshoy Ussuriysky Island.** The western part of the island was transferred to China in 2005. This part now has a border post and a bridge to the Chinese mainland where the island borders Fu Yuan area, which is part of city district Jiamusi. Jiamusi is a large industrial center and transport hub where important water, road, and railway routes cross. On the Russian side, a road bridge crossing through the Amur channel has been commissioned, but further development has not been undertaken due to a lack of protecting hydraulic structures. Completion of the link would potentially create access to a large Chinese market for agricultural and other produce, and contribute significantly to balanced development of the region.

**The absence of adequate facilities at the Pokrovka border crossing also prevents the export of locally produced foodstuffs to China.** The expansion of food processing will require good access to the Chinese market to realize its full potential.

**Local food processing is not necessarily supported by local agricultural production.** For example, officials at a food processing company that brings raw materials for production of ice-cream from various regions of the European part of Russia in interviews cited inadequate development of dairy livestock breeding in KK. In fact, due to better logistics, consolidated refrigerated cargo can be shipped from Moscow. The company, therefore, uses rail to ship condensed milk and butter to Khabarovsk. Shipping time is up to 20 days, but the cost by railway is lower than by road.

## 2.2.2 Transport infrastructure and services

*a) The network of federal, regional and inter-municipal roads*

**Khabarovsk is the junction point of three main federal roads**—Amur (Chita-Khabarovsk), Ussuri (Khabarovsk-Vladivostok), Vostok (Khabarovsk-Nakhodka)—that connect the road network of Russia with ports of the Far East. With the completion of the 2,100-km Amur section, the trans-Siberian Highway now offers an all-weather road route to the western part of Russia. The three roads are planned to be connected, together with the regional road, Komsomolsk-on-Amur, by the Khabarovsk bypass.



Construction, which is planned to start through a PPP arrangement in 2017, is scheduled to be completed within three years.

**The road network connecting main settlements requires upgrades.** Out of 4,000 km of regional and inter-municipal roads, about 40 percent has asphalt-concrete or road mix pavement with the remaining network being predominantly gravel and Macadam pavement. This network has more than 1,000 bridge structures of which one-third are of durable material and the rest wooden.

**The existing road network in KK fails to provide year-round connection between the southern and central areas and the northern part of the region.** Three districts of the territory (Ayano-Maisky, Okhotsky, and Tuguro-Chumikansky) do not have general road connection with the central part of KK. The Verkhnebureinsky District is not linked by year-round road connections.

#### *b) Road transport*

**Freight road transport in KK was boosted with the commissioning of the Amur federal highway (Chita-Khabarovsk).** Prior to that railway had a significant advantage over road transport for connections outside KK. Large federal freight forwarding companies entered KK's transportation market after the highway was commissioned.

**Highway improvements have stimulated service development.** Completion of 2,100 km of Federal Highway Amur (Chita-Khabarovsk) has strengthened a competitive alternative to railway. This has greatly improved service for less-than-rail-wagonload consignments for which the rail system is not well adapted. A secondary consequence of this is that it has attracted some national freight-forwarding companies to the region.

**Low density of the road network and road conditions constrain the development of intraregional cargo road transportation, which is largely susceptible to economic changes.** Poor road conditions lead to low operating speeds. The economic crisis is reflected in fewer orders to road carriers and delays in payments for services. Ruble depreciation resulted in a higher cost of imported spare parts. Fuel and lubricant costs have also been growing. All these factors significantly decrease profitability of transportation services for road transportation companies. Fleet age is another problem for development of the sector: about 70 percent of the total number of trucks has been in use for more than eight years. There are no affordable financing tools to buy new vehicles.

#### *c) Rail transport*

**Two main railway lines crossing the region (Trans-Siberian and Baikal-Amur Mainline) serve more than 90 percent of regional cargo turnover and form part of the international transport corridor.** They connect the whole network of Russian Railways with the ports of Khabarovsk and Primorye Krai. The main lines also form part of a "West-East" international transport corridor that connects Europe and the central regions of Russia with APR countries. The length of railway in the territory is 2,126 km where 9.3 percent is electrified (196 km of the Trans-Siberian mainline) and the rest is diesel-operated.

**Investments have increased the capacity of both lines in the recent years.** In 2008, Russian Railways implemented a PPP-based project to facilitate future cargo flows to Vanino and Sovetskaya Gavan ports with the construction of the Kuznetsovsky Tunnel at Komsomolsk-on-Amur. In November of 2009, Russian

Railways also commissioned the second stage of a bridge crossing over the Amur River near Khabarovsk, thereby increasing the capacity of the railway by 50 percent.

**Passenger facilities are being improved.** There are ongoing activities to reconstruct the railroad complex of Khabarovsk 1 Railway Station, including reconstruction of an underground tunnel and passenger platforms with pavilions in tunnel exits. The work is expected to be completed in August of 2017.<sup>43</sup>

**Further mainline improvements are planned.** Trans-Siberian and BAM capacities are to be increased through reconstruction of the tunnel under the Amur River, and the construction of a second line of the Northern Latitudinal Railway, with its further electrification, construction, and development of stations.

**More rail capacity is needed to support the development of the Vanino-Sovetskaya Gavan transport and industrial hub.** Low railway capacity on the Komsomolsk-on-Amur-Sovetskaya Gavan section leads to annual seasonal bunching of trains at access to the seaports.

**Freight service quality can be unsatisfactory for some consignors.** While bulk freight services appear satisfactory, many consignors complain about problems when shipping their cargo on the railway. These problems include long and complicated documentation, long waiting times for wagons, lack of an option to send consolidated refrigerated cargo, no cargo tracking along the way, and long delivery time to destination.

**Lack of consolidated logistics arrangements for refrigerated freight.** In the context of a strategy to diversify the economy of the region it will be necessary to facilitate the movement of refrigerated products both south to China and west to the rest of Russia. At the moment, this is very difficult as Russian Railways do not offer an adequate service for this type of freight, while road movement has been inhibited by the lack of consolidated logistics arrangements.

**Inadequate tracking of rail freight has been identified as a serious impediment to the use of rail to transport manufactured goods, as well as for obviously time-sensitive goods such as refrigerated cargoes.** The problem appears not so much a problem of tracking technology but one of organization. Russian Railways' focus on long-distance bulk traffic, and its ability to fully use existing line capacity with these bulks, is viewed by many as blinding the organization to the threat posed by developing road haulage capability. Completion of the Chita-Khabarovsk section of the Trans-Siberian Highway is allowing many manufacturers to shift away from rail.

#### *d) Air transport*

**Air transport is important for both external and internal connectivity of KK.** There are 16 airfields of various categories in the territory—12 are general-purpose airports and four used for corporate transport.

**Khabarovsk (Novyi) is the main airport for external connectivity.** This is a Class A airport, the largest in the Russian Far East, and can serve all types of passenger and cargo aircraft, including Boeing-747 and AN-124. The airport can accept aircraft in any weather. The airport annually serves more than two million passengers and ranks first by volume of passengers among Russian Far East airports.<sup>44</sup> Airside infrastructure (runway, taxiway, ramp, and auxiliary infrastructure facilities) are federally owned. In 2015, design works for construction of a new passenger terminal for domestic and international airlines with

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<sup>43</sup> <http://erofeydv.ru/vokzal-stantsii-habarovsk-1-preobrazitsya-cherez-god/>.

<sup>44</sup> [http://www.airkhv.ru/index.php?option=com\\_content&view=article&id=166&Itemid=214&lang=ru](http://www.airkhv.ru/index.php?option=com_content&view=article&id=166&Itemid=214&lang=ru).

capacity of 1,900 passengers per hour were completed. The government of KK, together with the Federal Air Transport Agency and JSC “Khabarovsk Airport,” are working to create the Far Eastern air transportation center at Khabarovsk Airport.

**Khabarovsk Airport’s regional role is under threat.** In 2014, a new airport was commissioned at Fuyuan Dongjin China, 60 km from Khabarovsk. So far, it has not received the status of an international airport and only serves flights within China. However, it should be recognized that availability of an airport in close proximity to Khabarovsk will be one of the challenges for development of Novyi Airport if passenger crossing at the Russian border in Bolshoy Ussuriysky Island is permitted. Already there have been complaints about the level of service for freight shipments through Novyi. One freight-forwarding company pointed to such problems of air cargo transportation citing long transfer-of-cargo waiting time (up to three hours) and delays in cargo dispatch from the airport (more than a day).

**Airports in Komsomolsk-on-Amur also serve some intra-regional flights.** Dzemgi is an experimental airport only for the use by JSC “Sukhoi Civil Aircraft” in Komsomolsk-on-Amur. Khurba is a joint deployment aerodrome, acting as a regional airport of Komsomolsk-on-Amur and as an air base for the Ministry of Defense.

*e) Sea and internal water transport*

**With a coastline of more than 2,500 km and a navigable river of 970 km, ports are expected to play an important role in the regional economy.** In fact, while Vanino, Sovetskaya Gavan, De-Kastri, Okhotsk, and Nikolayevsk-on-Amur (a river port situated in an estuary of the Amur River) serve both intra-regional and international movements of freight and passengers, sea traffic has generally been declining. Ports have virtually turned into highly specialized hubs for transfer of exports of Siberian coal and oil. The growth of coal export transshipments in Vanino port threatened cargo handling and shipping to the Sakhalin Island (cargo traffic in Vanino-Kholmsk direction has reduced by 44 percent).

**Few containers are handled at KK ports despite large container terminal capacities.** For example, Khabarovsk consignors occupy only 7.8 percent of the KK seaports’ capacity, and most container cargo is transferred through the ports of Primorye. Undeveloped trade and logistics services in KK and the lack of integrated organization of multimodal cargo delivery leads to container downtime in the ports (up to 15 days).

**Vanino seaport is the largest transport hub in the region with increasing capacity.** It handles more than 60 percent of the cargo volume of all seaports in KK. Total volume of cargo handled in 2011 was 18.95 million tons. The port already has an oil refinery that specializes in maritime fuels and will probably attract other ancillary maritime functions as its throughput increases. A new project envisages the expansion of capacity to 24 million tons of coal per year by 2020 to handle the export of coal by companies that are part of the Volga Group holding to APR countries. The Vanino seaport has extensive transport connections. The Baikal-Amur Mainline connects it with the entire railway network of the country. The port is also connected with Khabarovsk by the Lidogo-Khabarovsk road that is under reconstruction and also connects to Komsomolsk-on-Amur. An all-season railway and road transport ferry operates from Vanino to Kholmsk on Sakhalin Island.

**Sovetskaya Gavan is a fishing and commercial seaport with potential to become a transport hub.** It is located in the natural deep-water bays of Sovetskaya Gavan gulf. The navigable depth of the gulf reaches

23 meters, which allows vessels with deadweight of up to 50,000 tons to enter into the water. The existing port infrastructure could be increased up to 300,000 tons through adequate development of the port infrastructure. The port has high potential for repair and refitting of sea vessels and for operating as a transport hub. The port area is connected to BAM by a railway line and to Khabarovsk by a road. Further development of Sovetskaya Gavan is constrained by limitations of the existing transport infrastructure. The maximum axle load of the rail link between Sovetskaya Gavan and Vanino, which is currently about 900 tons, would need be increased to handle heavier freight.

**The second port of KK in terms of throughput is De-Kastri.** Its main facility is an oil export terminal that receives oil through a 226-km pipeline from the Sakhalin 1 onshore field, north of Sakhalin Island, and transfers it into a specially-designed fleet of double-hull Aframax tankers. The remaining cargo of the port is forestry products. While there is a Selikhino-to-Nikolayevsk-on-Amur road connection, the low density of the network limits prospects for the port to expand its cargo business.

**Passenger flows and cargo volumes transported by river transport have been declining.** Water transport in the region operates in the southern direction to the northeastern provinces of China and in the northern direction to the Tatar Strait. The largest river ports are in Khabarovsk and Komsomolsk-on-Amur. Volume of passenger traffic in internal water transport decreased partly due to inadequate capacity of the border posts. Cargo transshipment at river ports decreased threefold due to lower demand for construction cargo in the region.

## 2.3 Findings and policy implications for Zabaikalsky Krai and Khabarovsk Krai

**The case studies focusing on two eastern regions, Zabaikalsky Krai and Khabarovsk Krai, tell a more nuanced story.** On one hand, remoteness is undoubtedly a disadvantage in that the costs of remoteness and low density will impose a burden on the prospects of economic development. Transport costs will be higher and the benefits of agglomeration less than for denser and better-connected regions. On the other hand, constraints facing these regions are multidimensional and include various non-connectivity-related issues, including, most prominently, high cost of energy and trade policies of key partners (such as China). The case studies also afforded an opportunity to “zoom in” and look at the intra-regional issues. The studies highlighted the social exclusion of isolated communities that are poorly connected to their regional capitals, and mineral deposits and agriculture lands that do not meet their potential due to the high cost of transport.

### 2.3.1 Connectivity and economic development

**External connectivity issues need to be seen in the broader context of development policy for the region.** As discussed earlier and as set out in a strategy document, this combines a focus on exporting to China and the APR with a shift to greater local processing of export materials and rejuvenation of the industrial capacity of the region through attraction of foreign investment in special zones.

**External connectivity is not just a matter of physical infrastructure.** For domestic traffic, the services provided on the infrastructure must be appropriate to the needs of the industries being served. For international traffic both border-crossing facilities and modal transfer arrangements must be efficient.

**Trans-Russia infrastructure links are not the prime problem.** In both regions, the major centers of industrial and agricultural activity are in the south. Hence, for both regions external connectivity with western Russia and the rest of Europe appear to be adequately provided for through the Trans-Siberian Railway. Even for road-borne freight the completion of the Federal Highway Amur, part of the Eurasian international transport corridor Transsib, to a reasonable standard of all-weather possibility creates a link that will prove increasingly competitive with the rail link for all except bulk movements and containers. While the Baikal Amur Mainline (BAM) presently has some capacity limitations, it also provides a direct link to the ports—particularly Vanino, but also Sovetskaya Gavan and the Primorye ports—for bulk coal and mineral exports from the north of the region and from Siberia. Also, given the plans to expand the flow of coal and other minerals through Vanino port, and the designation of Sovetskaya Gavan as a Port Special Enterprise Zone, the dueling and electrification of BAM appears to be a high priority.

**However, transport services appear to be generally inadequate for some types of traffic.** Russian Railways do not provide an adequate service of consolidation of refrigerated cargo. This limits the market for deep processing of fish products to 1,000 km, which is the economic scope of road haulage. Nor does the rail system provide an adequate system of consignment tracking, which is important for more highly-valued and time-sensitive consignments. Oversized cargoes are also considered by industrialists to be difficult to consign by rail. Insofar as the development strategy for the Far East is to move away from sole dependence on exports of unprocessed raw materials to a more balanced, process-oriented industrial base, these defects will increasingly constrain the size of the effective market for the regions.

**Border crossings.** While the number of these crossings is limited in both regions, and there are arguments for speeding up the development of some crossings into China, a much more pressing need appears to be the improvement of administrative arrangements. Movement of freight across national borders involves not only the physical movement of goods to, and through, the border, but also the movement of information between consignors and transporters, between transport modes, and most significantly between consignors, transporters, and the customs authorities. Unlike the arrangements for the Special Economic Zones (SEZ), where the promoters advertise a “one-stop shop” for freight movements, normal freight movements across national borders are seriously delayed by existing administrative arrangements. The fact that simplified documentation is one of the inducements offered as part of the Freeport and PSEZ schemes shows that it can be done. An important aspect of any attempt to improve connectivity, and implement the regional development policy, will need to be the simplification of customs procedures and certainly the development of a common documentation that can see freight move quickly through international borders. It is also suggested that in all of the SEZ initiatives, including the TASEDs, incentives should be extended to attract foreign third-party logistics providers.

**Information technology and logistics services** will be increasingly important as the product of the regions is diversified and as the importance of bulk raw materials in the exports of the region diminishes. It is already clear that these services are not well developed as far as processed agricultural and fish products are concerned. The undeveloped nature of the logistics systems will become an increasing disadvantage for the region as the federal government’s strategy of diversification is pursued. A regional program should be introduced to identify the needs for improvement in logistic services and make proposals for actions to remedy the deficiencies.

**Modal interchange is involved in most of the export traffic of the regions.** Traffic through the ports has to be transferred from rail or road vehicles to ships, while the southerly traffic from Zabaikalsky Krai into

China faces a change of mode in the case of rail transport and in most cases a change of operator in the case of road shipments. To make such flows “seamless,” which is the case in many border crossings and modal transfers in Western Europe, there needs to be a parallel flow and exchange of information between land carrier, customs, and sea carrier, which precedes the physical arrival of the goods and does not impede their movement.

**This is not just a question of information technology.** In some cases—for example, the movement of freight traffic from Russian Railways to the maritime sector—there appear to be systems of advance information transmission that facilitate the timely physical movement of freight. But more generally there does not appear to be the degree of standardization of documentation requirements to support an efficient border-crossing arrangement. This needs to be attended to as part of a strategy to regenerate the Russian Far East. A similar challenge has been successfully addressed in a number of countries in Southeastern Europe.

**In some cases, the promise of connectivity remains unfulfilled.** For example, for the Vanino/Sovetskaya Gavan PSEZ the local road capacity remains inadequate for a substantial increase in road-borne manufactured product exports, while both the capacity and the technology of BAM need to be upgraded to handle the projected increase in coal exports and further development of the potential to export mineral ores and products. As the success of the strategy depends on the provision of the attractive conditions for foreign investment, these may have to be given priority status in national policy. It is also important to consider more integrated planning and development of special economic/energy zones and port areas in regards to development of transport links and sufficient capacity of infrastructure, modern logistics services, adequate energy supply and distribution, tax and other incentives.

### 2.3.2 Connectivity and social sustainability

**Both regions have small isolated pockets of settlements.** In some cases, these reflect industrial or military location decisions under the Soviet regime that have been abandoned or have become economically unsustainable in a more market-oriented economy. In other cases, they reflect the labor needs of extractive activities that have already been exhausted or are foreseeably of limited life. Also, as for example at Nikolaevsk-on-Amur, there may be coastal locations with a limited economic base but one that is unlikely to be developed into a viable cluster of sufficient size to justify the development of land transport connections. In all of these cases there may be a group of people locked in economically unsustainable locations.

**In more extreme cases, the sensible strategy may be one of assisted voluntary relocation.** This issue has been addressed by the Ministry of Social Services in Zabaikalsky Krai, but only in the case of emergency response to the sudden withdrawal of the basis of livelihood (for example, relocation of a military unit). It would seem sensible to explore the economic justification for a wider application of that strategy, bearing in mind that voluntary relocation may reduce the demands on the budget by maintaining some form of connectivity if they remain in the original location. Even that policy, however, would be unlikely to eliminate—at least in the short term—the need to sustain some remote settlements.

**Social sustainability depends primarily on internal connectivity**, and particularly on development of the most economic ways of overcoming the density and distance constraints in the delivery of the social and economic services required for daily life in remote regions.

**For very remote locations, which have land transport infrastructure connections, the focus can be on maintaining basic land transport service.** While it is common in Russian cities (including Khabarovsk and Chita) for municipal enterprises to be subsidized, and often for private enterprises to be compensated for the carriage of concessionary fare passengers (particularly students and the elderly), inter-urban transport typically does not get such favorable treatment.

**Where land transport links do not exist air transport services may be the most cost-efficient solution.** In both of the studied regions the public sector had entered the aviation market to supply social services to some very remote locations. For normal aircraft, even light aircraft, this may be constrained by the unavailability of an adequate and safe landing strip. In those cases, access may still be maintained through the use of helicopters, as in Khabarovsk Krai.

**Internal connectivity is a perennial problem for the northern remote areas.** Connection over the “last mile” (which in the Russian Far East may be the last 100 miles) may make or break the viability of new fields of extraction. Federal joint funding of major infrastructure has already resulted in some new rail links, which may have wider benefits than those to the mining companies that fund them. The use of incentives, such as the sharing of the costs of feeder links between the private investor in the resource exploitation and the federal government, appears to have worked reasonably well and should be continued in promising cases. However, in the context of a broader strategy for expansion of the region, it might be sensible to look at lower limits for the minimum industrial investment in infrastructure, especially where road infrastructure that might serve other settlements is involved. In particular, this approach might be adopted to address the issues of the inadequacy of investment in logging roads. The same approach might be adopted to links to the BAM where such links would contribute to the development of a more viable corridor of development.

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