

Chapter 7

Area (size): a geographic “big idea” and some consequences in Russia

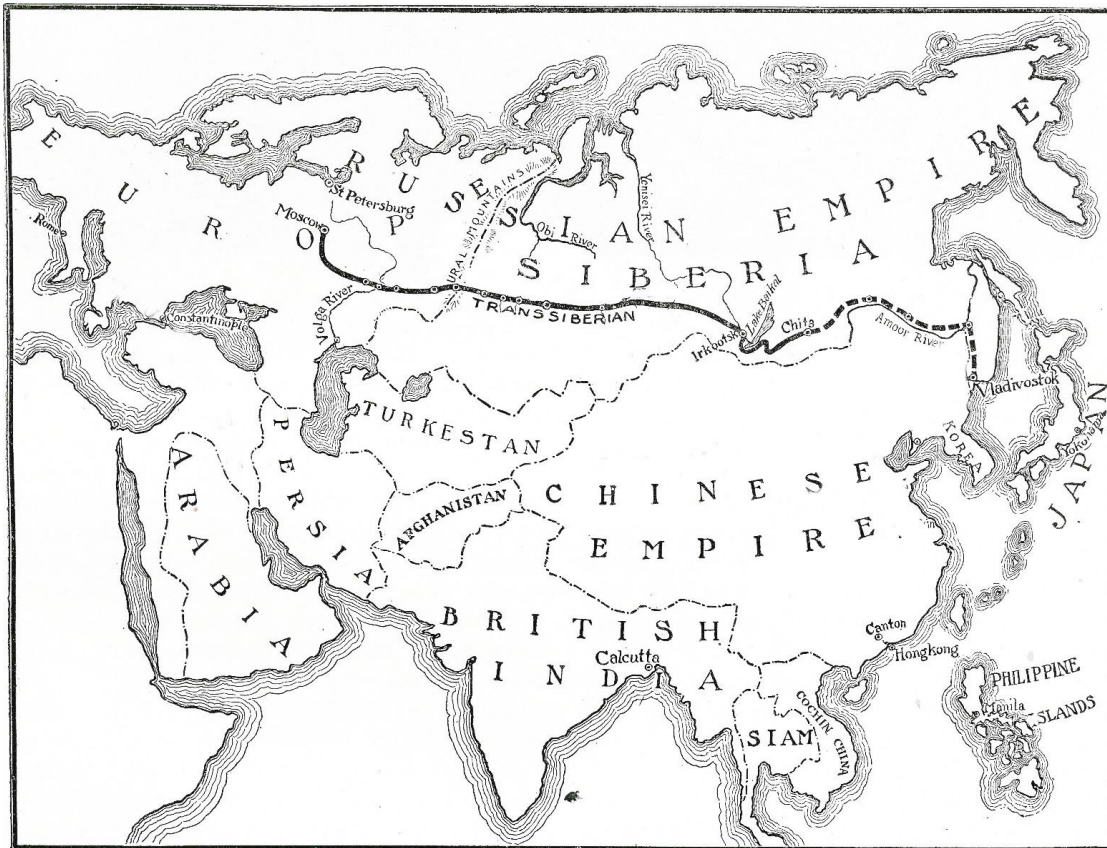
Size is important,
because large countries are likely to have plenty of resources,
but they also have high costs for transportation and communication.

These facts have consequences that can be seen
when you look at many maps of Russia and its neighbors-
e.g., maps that show growing season, permafrost, nomads,
farmland, minerals, railroads, cities, military invasions,
and political control at different times in history.

Our goal in this chapter is to learn how to interpret maps like these.



Building the Trans-Siberian Railroad Photo from the Paris Exposition, 1900



This map came from an 1894 story about a ride across Russia on the Trans-Siberian railroad.

It's a long ride. The train stops several times every hour. There may be people selling food at the stops, but don't count on it. Take a metal bowl, a spoon, and some packets of oatmeal or macaroni. Every car on the train has a *samovar* that makes hot water for cooking.

The train has small rooms, with seats that turn into beds. Take a flashlight and something to read. In November this far from the equator, the sun sets in mid-afternoon. Sunrise is after 8 a.m. That's more than 16 hours of darkness every night.

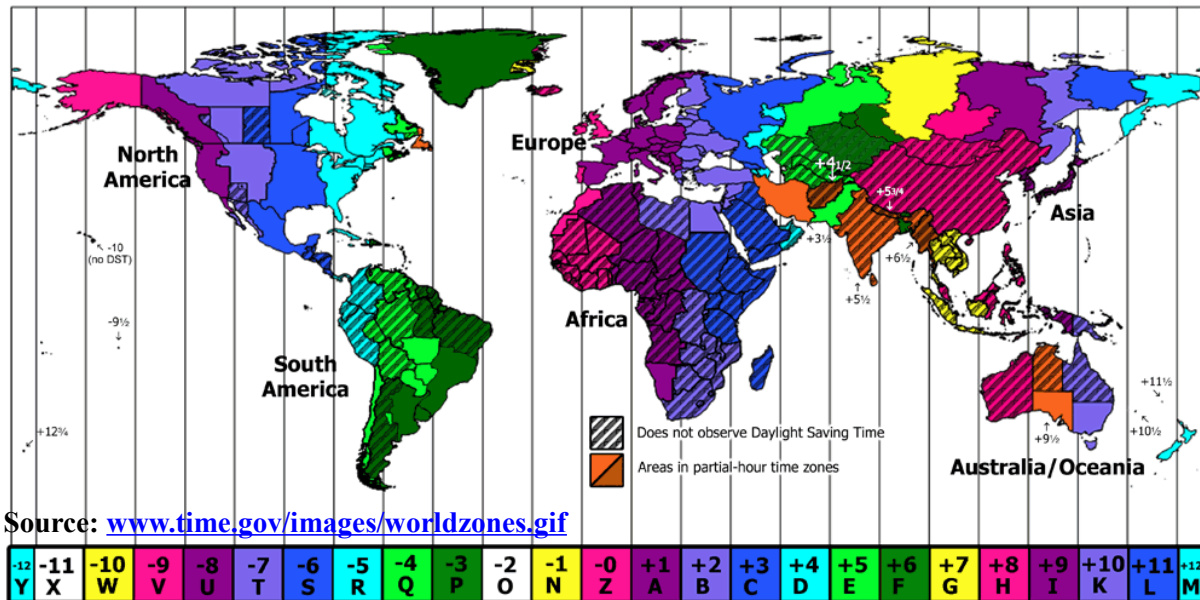
The train averages about 40 miles an hour, if there are no problems. That means the trip will take at least a week. If there are no problems!

This is Russia. It is really big, and it can be really cold.

How big is Russia? It is the largest country in the world. Russia extends nearly halfway around the globe. It has 10 time zones. When it is noon in western Russia, it is nearly midnight in eastern Russia. (Comparison: the lower 48 states of the United States have only four time zones – noon in Los Angeles is 3 p.m. in New York.)

How cold is Russia? Its capital, Moscow, is more than a thousand miles farther from the Equator than New York is. Nearly all of Russia is much closer to the North Pole than any part of the United States except Alaska. As a result, the ground in more than half of Russia is permanently frozen.

These two geographic facts – huge size and northern position – help us understand many facts about Russian history. They also shed light on some key issues in modern Russia.



Investigating some consequences of size.

Russia is a good “laboratory” to study the effects of size.

Let’s start by asking: why is Russia so large? One reason is that few people want to live in such a cold place. Many times in history, rulers from warm places claimed parts of this vast land. It was often easy to capture the land, because there were few people to defend it.

Every country that is far from the equator has large areas with few people. Many of the statements in this chapter, therefore, also apply places like Greenland, much of Canada, and the northern parts of Norway, Sweden, and Finland (and most of Alaska!)

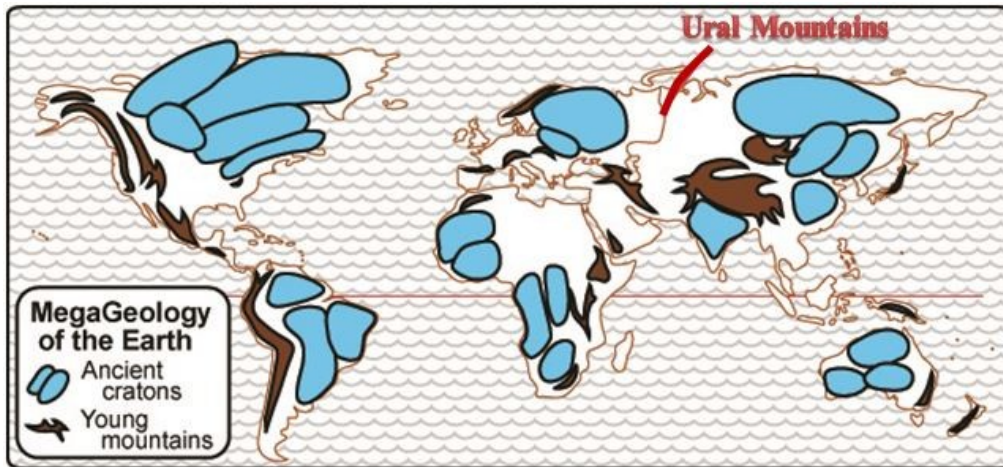
This chapter will use Russia as a “laboratory” to explore several consequences of large size.

- **Large areas usually have plenty of mineral resources.**
Large areas are likely to have a variety of geologic structures of different ages.
- **Large areas have expensive transportation.**
It costs a lot of money to build long roads, railroads, or pipelines. The costs are especially high *per person* in places where there are few people to pay.
- **Large areas usually developed late in history.**
Russia did not become a country until the ninth century. That was thousands of years later than Egypt, India, Mexico, and other warm places.
- **Large areas can survive military invasions.**
Some of the most powerful armies in history have tried to conquer Russia. They usually failed.
- **Large areas can be hard to govern.**
Governing a large area is hard, because communication is difficult. In the 20th century, Communist leaders had trouble making and enforcing their plans for such a large area.

Since the breakup of the Soviet Union, the Russian government has had to send troops to deal with independence movements in several regions.

Consequence #1: Large size means plenty of mineral resources.

Russia has nearly one eighth of all the land on earth. If resources were spread evenly, Russia would have one-eighth of the mineral resources. But that is not the whole story. When people did geologic surveys in Russia, they found that things were even better than they expected.



This simple map shows just the latest chapter in the long story of Asian geology. Several times in the geologic past, enormous pieces of old rock (called *cratons*) slid together to form larger continents. East of the Ural Mountains, in Siberia, there are several areas of low mountains. These are the worn-down “stumps” of at least three of those old collisions.

The details are not well known, partly because it’s hard to study geology in a large, cold place like Siberia. Geologists do know, however, that Russia had two really lucky breaks.

Lucky break #1: The forces that cause cratons to collide and make mountains also make metal ores. Russia has many of the world’s largest deposits of gold, iron, nickel, lead, chromium, and other metals. Selling metals to people in other countries can bring a lot of money into Russia.

Lucky break #2: The ancient mountains were surrounded by shallow seas at just the right times in geologic history. These were the times when coal, oil, and natural gas were being formed. You can get the details from an earth science book or website. Here, we just note that Russia is one of the top oil producers in the world. Let’s make a simple comparison. The United States spends 165 billion dollars a year to buy oil from other countries. Russia makes more than 100 billion dollars a year selling oil and gas to other countries.

Warning: numbers like these can change over time. Go to the CIA Factbook on the internet to get up-to-date data about mineral exports and imports. For now, we will just repeat the main point. Russia makes a lot of money selling gas, oil, and metals to countries like Germany, Japan, or China.

Conclusion. As long as people want things made from minerals, people in large countries like Russia can make money by mining. In fact, their main problem is another consequence of large size. It can cost a lot of money to haul minerals out from the middle of a huge country. We'll say more about that later – after we look at the effects of latitude on solar energy.

Consequence #2: The high latitude of Russia means a low amount of solar energy to warm the ground or help plants to grow.

In the chapter about Africa, you learned that the sun rises high in the sky every day near the Equator. This provides plenty of energy to warm the ground and help trees grow tall.

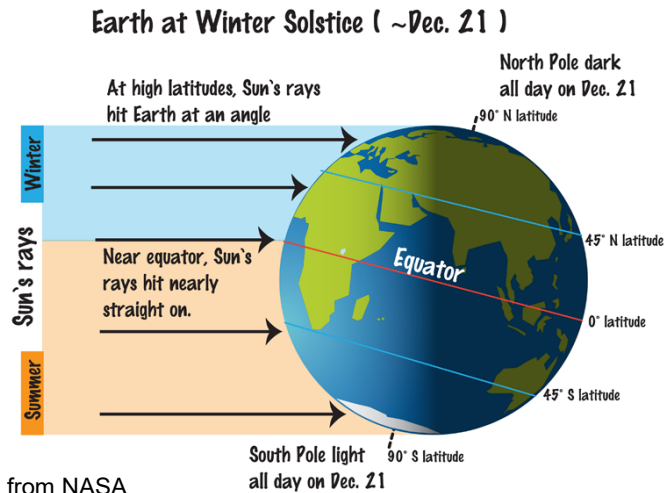
The sun also drives the global wind system.

Russia does not get much sunlight, because it is far from the equator.

Far from the equator, the noon sun does not rise very high above the horizon even in mid-summer.

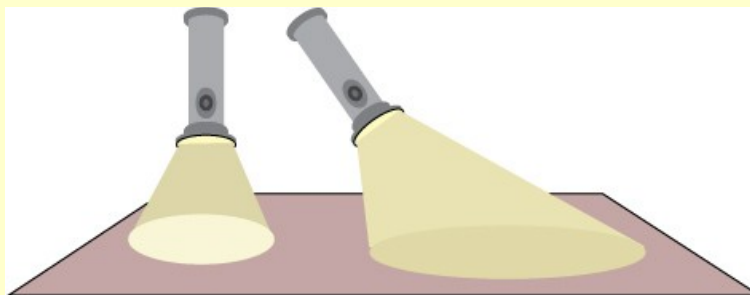
As a result, the temperature on a “hot” summer day in central Russia is usually lower than on any day in central Africa.

In winter, things are even worse. Temperatures can be 100 degrees below the lowest ever recorded in central Africa.



Drawing from NASA

Demonstration: Hold a flashlight about a foot above a table. Shine it directly down. Notice how all the light is concentrated in a fairly small circle.



Now aim the flashlight down at an angle. See how the same amount of light is now spread over a much larger area?

This is exactly how sunlight works. The high sun at the Equator sends a lot of energy to each square foot of the surface. Meanwhile, the low sun over Moscow spreads the energy over a large area. Each square foot of surface therefore gets much less energy.

Here's one effect of the low sun angle. Russia has millions of square miles of forest. This sounds like a lot, but trees need a lot of sunlight to grow fast.

In a sunny, warm place like Alabama, a tree can grow 60 feet tall in 30 years. As a result, you can get a lot of wood from just a dozen 30-year-old Alabama pine trees.

In a cold place like central Russia, trees can grow for a century and still be less than 30 feet tall. It might take hundreds of these little trees to make enough wood to build a house.

What happens if you try to heat the house with a wood-burning stove? It might take hundreds of trees each year to keep the house warm.

This fact leads us directly to the next consequence, about the growing season for food crops.

Consequence #3: The growing season in most of Russia is too short for food crops.

The low angle of the sun is also a big problem for food production. Nearly all of Russia is colder than anywhere in the United States (outside of Alaska).

History fact: During the Cold War, some politicians noted that the Soviet Union had to import millions of tons of food. Then they said: “This proves that the American economic system is superior. With our free-market system, farmers can grow much more food than Soviet farmers are able to grow under Communism.”

Question: Is this a fair statement about the reason for low food production in Russia?

Here are four scientific facts.

- 1) The sun does not rise very high in the sky in Russia.
- 2) A low sun does not provide much energy to warm the ground.
- 3) Temperatures in most of Russia are low, even in summer.
- 4) The growing season for food crops is short.

And here the geographic consequence:

- 5) It is difficult or impossible to grow food in most of Russia.

Southwest of Russia is the country of Ukraine. It has a much better climate for farming than Russia. This area was the main food-producing part of the former Soviet Union. This might be part of why Russian soldiers were invading Ukraine while I was writing this paragraph!

The situation is summarized on the map below. The dots represent land that can be used to grow food. You can “count dots” – Russia has millions of acres that can produce food.

The star, however, shows the latitude of Minneapolis, Minnesota. This city is located at the northern edge of the Corn Belt – the area of really good cropland in the United States. The map clearly shows that all of the cropland in Russia is farther north than Minneapolis. Most of Russia is too cold to grow corn well. As a result, farmers often have to settle for planting a lower-value crop such as wheat, rye, or potatoes. Even then, yields are low. Grain production per acre in Russia is typically less than half of the average in Europe or the United States.



Consequence #4: Transportation is difficult in much of Russia.

In addition to low crop yields, Russian farmers have another huge problem. Many of their fields are located thousands of miles away from the places where people need food.

It takes a lot of money to build a long road or railroad. It costs even more in a place where the ground freezes deeply. This is because of a very simple fact: *Water expands when it freezes*. Freezing water can crack building foundations. It can make potholes in roads. It can even break rocks apart.

Old photo of a railroad in a place that has *permafrost*. Freezing water expands and pushes the rails out of line.

Definition: Permafrost is ground that is always frozen below the surface. The top layer often thaws on warm days and then freezes again during cold nights.



Protecting a railroad from frost damage is expensive. Basically, you have to replace all of the soil under the track with sand or crushed rock. Then you have to make sure that water from rain or snow does not stay in the sand and freeze. This is hard to do in any environment. It is especially difficult in a vast swampy plain, like much of Siberia.

Siberia is the northern part of Russia, east of the Ural Mountains. It is a huge area, about as large as the entire United States.

If people want a road or railroad, somebody has to build it. In cold places, however, farming and forestry are not very profitable. There is little money to pay road builders.

This makes a chicken-and-egg cycle of cause and effect:

- Low population makes it hard to build roads or railroads, because there are very few people to help pay for the road.
- Lack of transportation helps keep population low, because it is hard to make a living in a place where it is difficult to travel or to ship products to customers.

Russian rulers have tried to solve this problem. They used government money to build roads and railroads. They also paid people to move to Siberia.

These building projects and payments, however, took money away from other projects. This hurt the rest of the Russian economy.

Problems caused by bad roads and railroads are not just ancient history. They still affect life in Russia today. You already know that some of the world's richest deposits of oil and metals are located in central Russia. Building pipelines and railroads, however, is expensive. Then you have to pay to move products through long pipelines and railroads. As a result, the mines and oil wells are less profitable than they would be if they were closer to customers.

Consequence #5. In the past, people in many parts of Russia lived as nomads in order to gather enough food to survive.

Early humans often moved to get resources. In some places, they still do.

Definition: a **nomad** is someone who does not live in the same place all the time.

Nomadic hunters move to follow animals that migrate from place to place. Nomadic herders move to find new grass after their animals have eaten most of the plants where they are.

1890s photo of reindeer herders near the Arctic Ocean. Do an internet search to see what may have changed in the lives of these people.



Still other nomads move up onto high mountains during the warm summer. When winter comes, they move back down to lower land.

Nomadism was important for thousands of years in Asia. You may have heard of the Huns and Mongols, with leaders like Attila and Genghis Khan. To stop attacks by nomadic armies, many people built protective walls around their cities and fields. One famous example is the Great Wall of China. This wall was built to protect the farming regions of China from the nomads who lived in the cold grasslands to the north.

Question: What can change the balance between nomadic armies and towns?

Answer: One important change was the invention of gunpowder. Guns gave people a better way to defend against attackers who had horses, bows, and arrows. In short, the military success of nomad armies depends on the available technology.

Even in the modern United States, some people still live like nomads. For example, some farmers might plant fields in Kansas or Oklahoma. Then they move north and plant in North Dakota. Still later, they might cross the border and plant in Canada. Later, the farmers repeat the trip to harvest the fields. In this way, they spread their risk. If one area has a drought or hailstorm, they can still make money from their other fields.

Traveling salespeople, doctors, and musicians are other kinds of modern nomad. By moving among several places, they can get enough customers for their company, clinic, or concert.

In short, nomadism is one way to deal with a cold or dry environment. This statement brings us back to the main point. Much of Russia is cold, dry, or both. It is therefore not surprising to find that modern Russia still has many people who live as nomads.

A long history of nomadism can help us understand why Russia had no strong central government until fairly recently. It also helps explain the next consequence in our list.

Consequence #6. Russian rulers often moved people for defensive purposes.**Forced migration was especially common in cold or dry areas.**

In Lincoln, Nebraska, there is a museum about the Volga Deutsch people. These people lived in Germany. They were invited to move to Russia when the Russian czar married a German princess. (Marriages like this were common in the 1600s and 1700s. It was one way for rulers to form alliances between countries.)

Russian rulers asked the Germans to live between the Russian homeland and the nomads in the grasslands of central Asia. They wanted the German farms and towns to be a *buffer*.

Definition: a **buffer** is a protective area between one area and a different one.

In short, the German settlers were like a front line of defense against attack by nomads.

The Volga Deutsch people are an especially good example of forced migration because of what happened during the World Wars. When German armies invaded Russia, the Russian rulers were afraid the German-speaking people might help the invaders. At first, the Russians passed laws to restrict travel by all German people. Then, they taxed their crops in order to pay for guards to watch them. Later, they took their land and forced the people to move east into Siberia. They killed thousands who resisted.

Many Volga Germans chose to leave Russia, often as illegal migrants. Here is one result: Argentina, Brazil, and the United States each have more than a million Volga Germans. They are the children and grandchildren of people who moved from Russia.

Our goal on this page is not to focus on the history of one group of people. We told the story about the Volga Germans in order to make three points:

1. Rulers in the past often encouraged and sometimes even forced people to migrate.
2. Forced migration was especially common in places that have cold or dry seasons.
3. Forced migrations often cause problems, because the “new land” may not be empty.
Nomads may be using the land, even though they do not have permanent houses.

(Remember, this was one reason for the German-Russian settlements. They were supposed help defend Russia against nomadic people who lived in central Asia.)

In the 20th century, the Soviet government encouraged people to move to distant parts of the Soviet Union. They offered higher pay and other benefits. One goal was to develop resources in distant places. Another goal was to help unify the country.

Then, in the early 1990s, the Soviet Union broke apart. Some Russians moved back home. Many others, however, chose to stay in their new homes. As a result, many countries around Russia have large numbers of Russians living in them. Ukraine has the most – more than 8 million. Kazakhstan has 4 million. Even the tiny countries near the Baltic Sea have some. Latvia has half a million Russians. Estonia has 300,000. Lithuania has 180,000.

The impact, however, may be greater in these three small Baltic countries, because their total populations are lower.

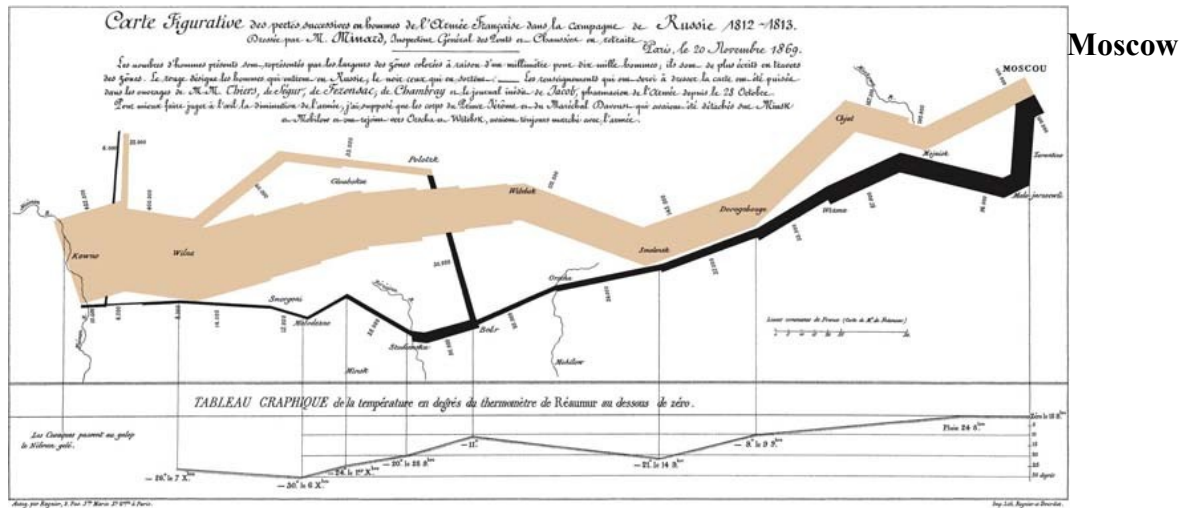
In 2014, Russian soldiers invaded part of the country of Ukraine. They said their purpose was “to protect the Russian people living there.” The rulers of the Baltic countries now worry that Russia might attack them. This is one reason why they asked to join the European Union. These small countries want help from others in case of invasion.

The value of size as a defense against attack is the next consequence on our list.

Consequence #7. It is hard to attack a country that is huge and cold.

Here is a small copy of one of the most famous maps ever made.

(You can find a bigger copy on the Internet. Use “Minard Map” as keywords.)



The year was 1812. A ruler named Napoleon led a French army to invade Russia.

History comment: 1812 was also a year of war between Britain and the United States. The British were glad that France was busy fighting in Russia in that year. They knew that France would be less willing to help the United States (as they had during the Revolutionary War in 1776-81).

The brown and black lines shows how the French army kept getting smaller as it went to Moscow and back. More than 440,000 French soldiers went into Russia. Less than one quarter of them reached Moscow. Some soldiers were killed in battles. Others died from diseases. Even more died of starvation or froze to death as the weather got colder.

Fewer than 10,000 made it back to France.

It was one of the biggest military disasters in history.

130 years later, Nazi generals learned a different version of the same lesson. They learned that the Russian winter can help defeat even a modern army that has tanks, trucks, and airplanes. The Russians just kept retreating away from the invading German force. The German supply lines were stretched. Front-line troops started to run out of food and fuel. Eventually, they were no longer able to advance. As temperatures dropped, they became less able to fight.

Size and cold climate helped Russia survive invasions by two of the most powerful armies in history. The cost, however, was enormous. In World War II, nearly 11 million Soviet soldiers were killed. About the same number of civilians also died. Meanwhile, the United States lost “only” 418,500 soldiers and 1,700 civilians. In short, the Soviet Union lost nearly 50 times as many people as the United States in World War II.

This loss had a huge impact on the Russian economy. One immediate need was to replace the houses, schools, and factories that were destroyed. Rebuilding was especially hard, because so many working-age men and women had been killed or wounded in the war.

To put this into perspective, imagine that the United States lost every worker in every state from Maine to Florida, . . . and then had to rebuild every city east of the Mississippi River.

Consequence #8. Communist planners found it hard to manage a large, cold country.

It is fairly easy to plan how to make money from fields in central Illinois. Basically, you plant corn or soybeans. The soil in Illinois is fertile and easy to work. As a result, your costs are low, compared to other places. When you harvest your crops, you get an average of 5 tons of corn per acre. The yields are high, because the soil is good and summer is long and hot, with plenty of rain.

Soviet planners had a harder task, because the climate is much colder and drier than Illinois. Corn yields are rarely more than 2 tons per acre. Unfortunately, it takes at least as much effort to prepare land, plant seeds, and control weeds on cold or dry land as on good land.

The same story applies to many other crops. For example, farmers in the Netherlands or France get more than two tons of wheat per acre. By comparison, Russian farmers in southern Siberia are lucky if they get half a ton per acre. Moreover, crops that need a long growing season, such as cotton or rice, simply cannot be grown in most of Russia.

In short, the Soviet economic planners had to deal with five facts:

1. They had to gather information about climate and soil in a very large area.
2. They had to make decisions about where people should live.
3. They had to make decisions about making and shipping fertilizer and farm machinery.
4. They had to make decisions about where and how to build roads and railroads.
5. Yields per acre were likely to be much lower than in other countries.

These facts are linked together. If yields were higher (fact 5), there would be more money to pay for information (Fact 1), labor (Fact 2), supplies (Fact 3), and transportation (Fact 4). In short, the cold winters and vast distances made the job of Communist planners much harder. Planning is easier in a place that has plenty of rain, a long growing season, and good roads!

Over time, unfortunately, the Soviet government also became more corrupt. Government officials often made plans that rewarded their friends. Ordinary people felt cheated. They refused to work as hard. The economy became less productive, until it eventually collapsed.

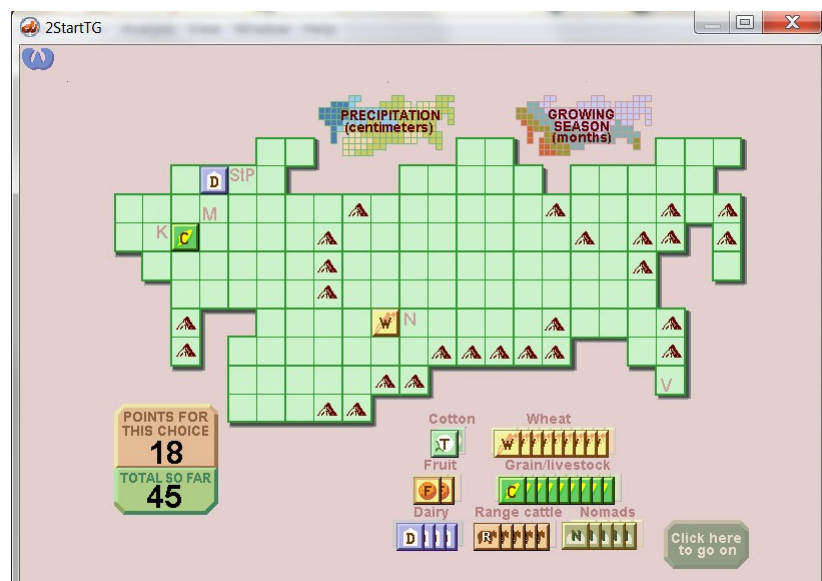
Image from a simulation of Soviet planners trying to decide where to locate different kinds of farms.

The planners just put some dairy farms north of Moscow and received 18 points for that choice.

They had already put wheat farms in southern Siberia and corn farms southwest of Moscow.

They have 45 points so far.

Where would you put the other crops and animals?



Consequence #9. A large country that was formed by conquest is likely to have many ethnic groups. These can be difficult to govern from a capital city that is far away.

Planning in Russia is complicated by another fact – the country was built by conquering other people. As a result, it still has many groups of “non-Russian” people inside its borders. These *ethnic groups* have a variety of different languages and cultures.

Definition: an **ethnic group** is like a very large family – a group of people who have common ancestors, speak the same language, and have the same religion.

In the Soviet era, the government allowed many ethnic groups to manage some of their own affairs. They called these self-governing areas “autonomous ethnic areas.”

(These autonomous areas are shown by diagonal lines on this map).



One result of that policy is a weaker sense of national unity.

In fact, some ethnic groups have tried to break away from Russia. They want to form their own country.

The national government has sometimes responded with force. In an area called Chechnya, for example, the government sent troops to stop a revolt.

You can learn the details of these ethnic revolts in a history book or internet site.

Here, we just want to make a geographic connection between four facts:

1. Transportation and communication are difficult in a large, cold country.
2. This makes it easier for small ethnic groups to keep their own languages, religions, and other customs.
(It's like they can “hide” in a remote part of a huge country.)
3. These people might want more independence from the national government.
4. One possible result is a central government that tries to rule by force.

Putting it all together: Big Russia has a long border with crowded China.

Here is a loaded question. *Can Russia and China get along?*

Consider these six facts – three about Russia and three about China:

Russia Fact 1. Russia has the largest area in the world. It has a lot of natural resources, but not many people to use them.

China Fact 1. China has the largest population in the world, but it is short of resources.

Russia Fact 2. Many parts of Russia have lost population in recent years. Population loss is especially obvious in the cold eastern and northern regions. These are places where people were paid to move during Soviet times.

China Fact 2. China's economy is expanding rapidly. This creates a demand for more energy and mineral resources. It also creates a demand for land – for farms, for factories, even just to live on.

Russia Fact 3. Russia still has one of the world's strongest armed forces. It has spy satellites, nuclear bombs, drones, and other modern weapons.

China Fact 3. China is catching up, especially in hi-tech research and manufacturing.

Now add one more fact: The long border between Russia and China goes through a large, cold desert. This is some of the emptiest land in the world. Most of the border area has fewer than 5 people per square mile.

Another fact: Two other large countries are located in the mostly empty area between Russia and China. Those two countries – Mongolia and Kazakhstan – have some of the lowest population densities in the world.

Definition: **Population density** is the number of people in a unit of area, like a square mile. It is the big idea in the chapter about China

All of these facts are the context for a big problem:

Size and cold climate may make it hard for Russia to remain a major exporter of oil and natural gas to places like China.

As noted earlier, Russia has some of the largest deposits of oil and natural gas in the world. Unfortunately, Russia is also huge and cold. As a result, Russian people use a lot of energy for transportation and heating. They use much more energy *per person* than the world average. Their use of energy is likely to increase if their population or economy grows. If that happens, they will have even less oil or gas to export.

This can affect people in places like China, Japan, or Europe. These people should not assume that Russia will always be willing to export large amounts of oil and natural gas. The people of Russia might decide to keep their resources. They might figure that the resources are more valuable if used to run new railroads, heat new buildings, operate new factories, and run other parts of their economy.

If the Russians do that, however, people in places like China will have to look somewhere else to get the resources they need to run their economy.

Summary – how can the big idea about size help us understand Russia?

Ultimate cause: Land near the Arctic Circle is cold. It is much closer to the North Pole than to the Equator. Few people want to live in this cold land. As a result, many cold areas became part of large countries that have population centers in warmer places.

(Canada, for example, is almost the same size as the United States, but it has only one tenth as many people. Most Canadians live near the southern border of the country. Northern Canada is cold and has very few people.)

Big idea: Size is important, because large areas can have many natural resources, but they also have high costs of transportation and communication.

Study area: Russia is a good place to study the effects of size.
It is by far the largest country in the world.

Consequence #1: Large size usually means plenty of mineral resources.
Russia “earns” hundreds of billions of dollars every year
by selling oil, gas, and metals to people in other countries.

Consequence #2: Most of Russia does not get enough sunlight for rapid tree growth.

Consequence #3: The growing season in most of Russia is too short for food crops.

Consequence #4: Transportation is difficult in much of Russia. Distances are great.
Low temperatures and frozen ground add to the cost of building and
maintaining roads, railroads, pipelines, even airports.

Consequence #5: In the past, and even today, people in many parts of Russia live as
nomads. Nomadism is one way to gather enough resources to survive.

Consequence #6: Russian rulers often moved people for defensive or economic purposes.
Forced migration to cold or dry areas was especially common.

Consequence #7: Russia’s size and climate helped defend it against invasions by enemies.

Consequence #8: The Communist planners in Moscow had trouble planning the use
of land in such a large country.

Consequence #9: A large country built by conquest is likely to have many ethnic
minorities and regional groups. These may be difficult to govern
from a distant capital city.

Putting it all together:

This chapter used Russia as a “laboratory” to analyze some consequences of large size. This huge country has always been difficult to govern, because distances are great and transportation is expensive. Transport costs and harsh climate also make it hard to make money in distant places. Poverty makes it less likely that these distant areas would be successful as independent countries.

These geographic facts will continue to be important for people in the United States, because Russia is still a large country with a lot of resources. It will continue to have an impact on the worldwide availability and use of oil, natural gas, and many other key resources. Moreover, China, the country with the largest population, has a very long border with Russia, the country with the largest area and the most resources. This long border could be a focus for international disputes in the future.

