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Pearson Edexcel
Level 1/Level 2 GCSE (9–1)

Geography B

Paper 3: People and Environment Issues
– Making Geographical Decisions

Thursday 11 June 2020 – Morning

Resource Book

Do not return this Resource Book with the Question Paper.

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For some Figures there is a modified colour and modified black and white diagram. You may use whichever version is easier for you to view. Some diagrams are only in modified colour but you are then provided with a description of the diagram.

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SECTION A

People and the Biosphere

The Issue: Russia's energy future

- **Russia's economy depends on sales of energy to other countries, but its conventional oil and gas resources will start running out soon.**
- **Russia still has plentiful supplies of unconventional fossil fuels, such as shale gas, but these are difficult and expensive to exploit. They are also in ecologically sensitive areas.**
- **One response of Russian energy companies is to make money by developing new oil and gas resources in Africa, South America and Asia.**
- **Given its vast land area, Russia could one day develop wind energy on a large scale.**

Introduction

- **Russia (also called the Russian Federation) is the world's largest country, covering an area of 17 million square kilometres. Its diverse physical environment ranges from Arctic tundra to hot deserts. Russia's taiga (boreal forest) is the Earth's largest forest, bigger even than the Amazon rainforest.**
- **Below Russia's varied ecosystems lie major oil and gas resources. However, some could be hard to develop without new technologies and international cooperation.**
- **Following major political changes in the 1980s, Russia's economy became over-reliant on exports of oil and gas. In turn, many countries now depend on Russia for energy imports, mainly delivered by pipeline.**
- **Russia's recent actions have created global political tensions. In 2014, Russia took control of part of Ukraine, a neighbouring country. To show disapproval, the European Union (EU) and United States (US) introduced barriers to trade (called sanctions) designed to hurt Russia's economy.**
- **One impact of these sanctions is that EU and US energy companies are no longer allowed to help develop Russia's shale gas and other unconventional fossil fuels.**

Figure 1 – Colour (Part 1)

Russia’s biome map and animal biodiversity

Key:

Tundra

Taiga (boreal) forest

Temperate forest

Temperate grassland

Desert

Sea

- A – 80°N

B – 0°

C – 20°E

D – 40°E

E – 60°E

F – 80°E

G – 100°E

H – 120°E

I – 140°E

J – 160°E

K – 180°

L – 60°N

M – 40°N

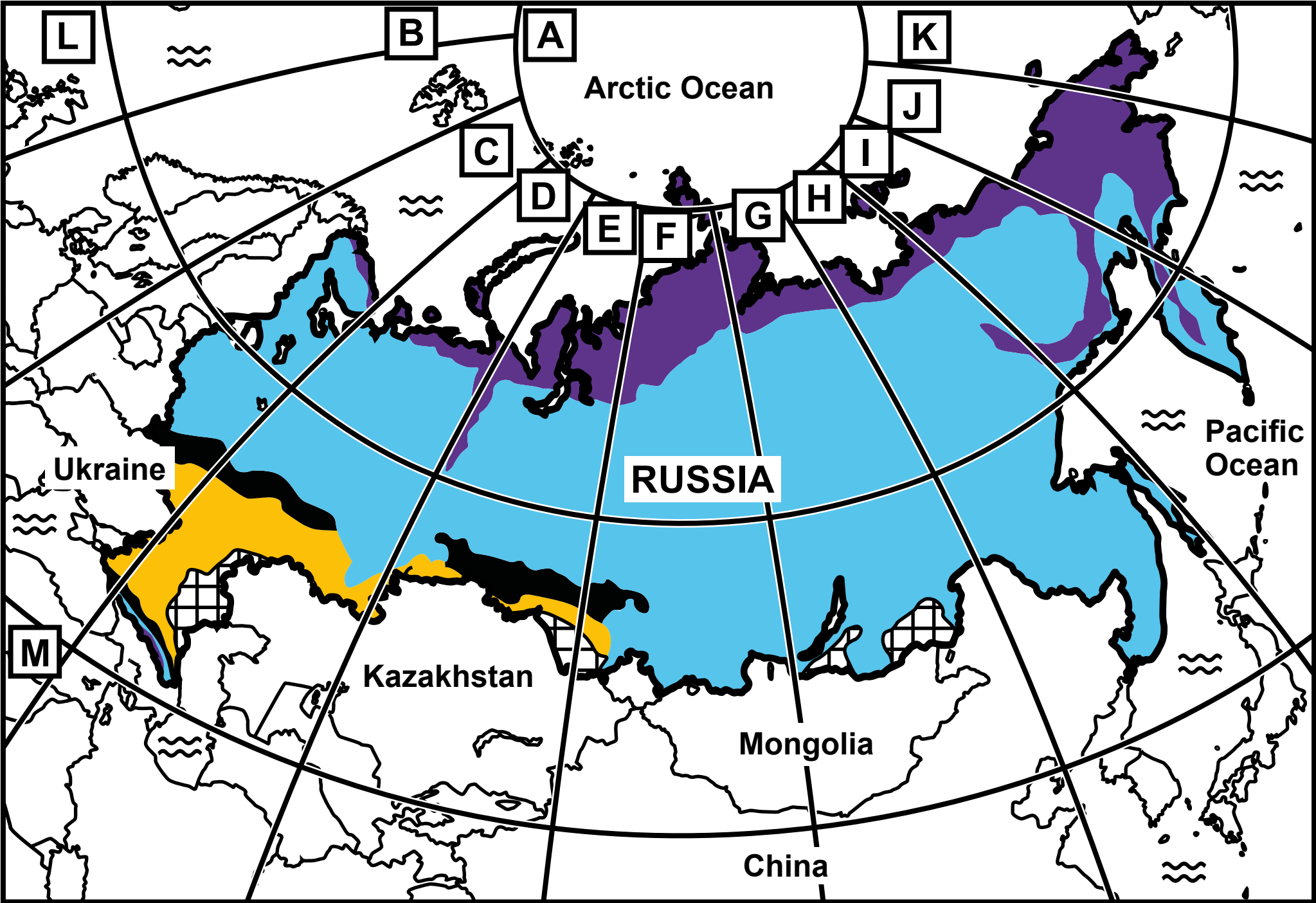
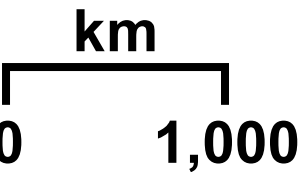








Figure 1 – Colour (Part 2)
Russia's biome map and animal biodiversity

Key:

- | | | |
|---|---|--|
|  Tundra |  Taiga (boreal) forest |  Temperate forest |
|  Temperate grassland |  Desert |  Sea |

A – 80°N B – 0° C – 20°E D – 40°E E – 60°E
F – 80°E L – 60°N M – 40°N

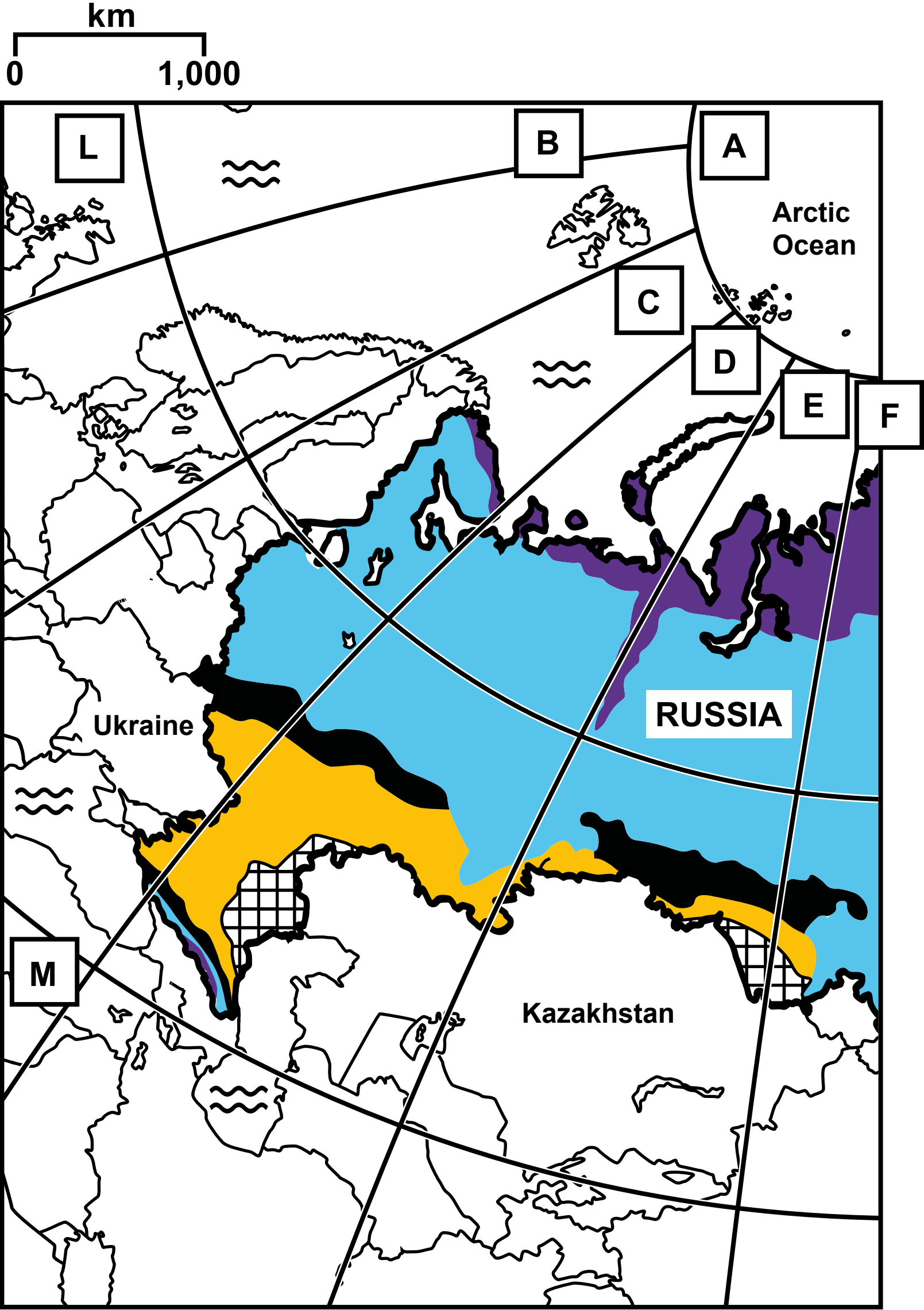








Figure 1 – Colour (Part 3)
Russia's biome map and animal biodiversity

Key:

- | | | |
|---|---|--|
|  Tundra |  Taiga (boreal) forest |  Temperate forest |
|  Temperate grassland |  Desert |  Sea |

G – 100°E H – 120°E I – 140°E J – 160°E K – 180°

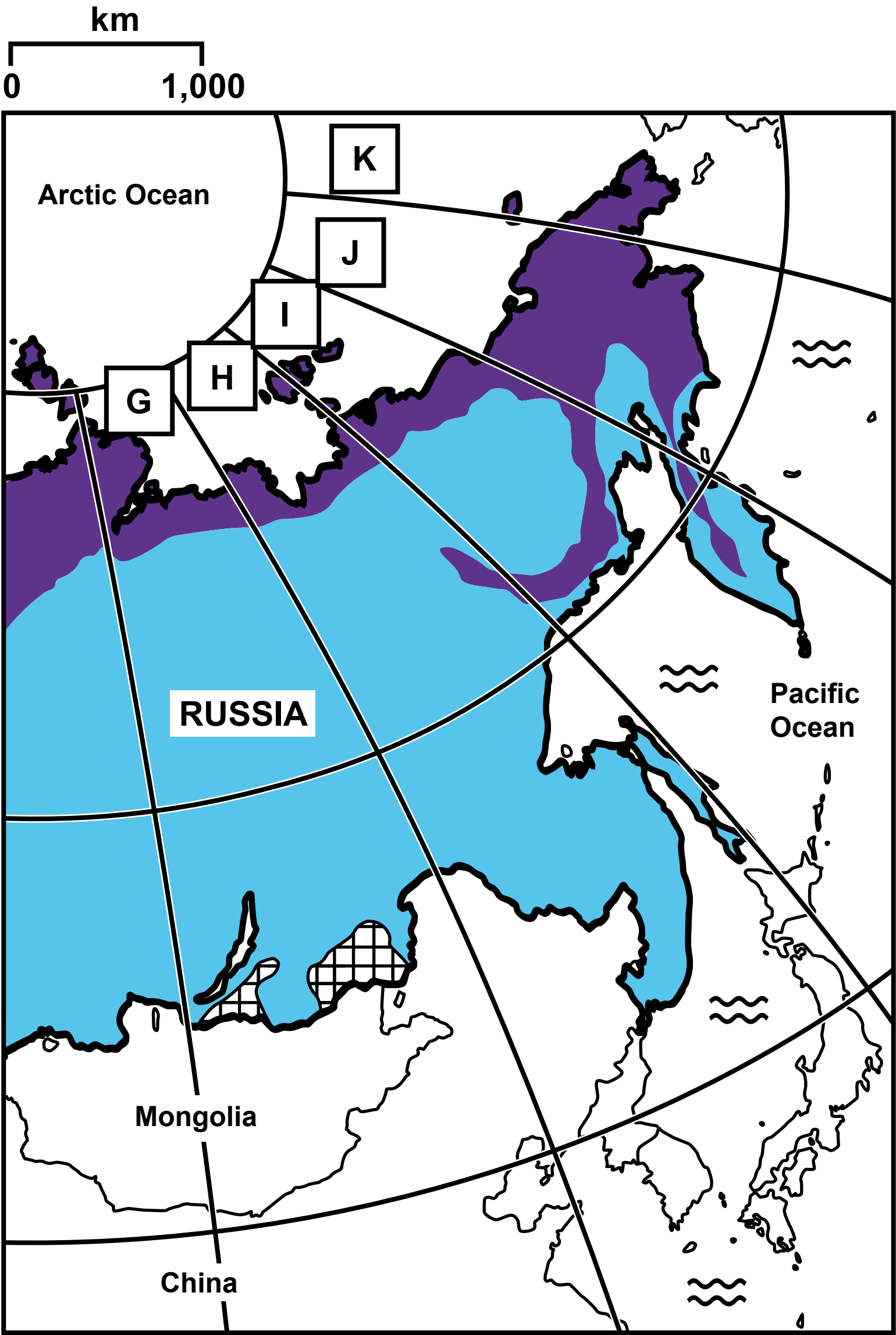





Figure 1 – Black and White (Part 1)


Russia’s biome map and animal biodiversity


Key:


-  Tundra

 Taiga (boreal) forest

 Temperate forest

 Temperate grassland

 Desert

 Sea

A – 80°N

B – 0°

C – 20°E

D – 40°E

E – 60°E

F – 80°E

G – 100°E

H – 120°E

I – 140°E

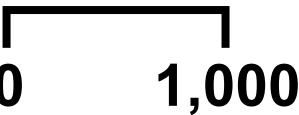
J – 160°E

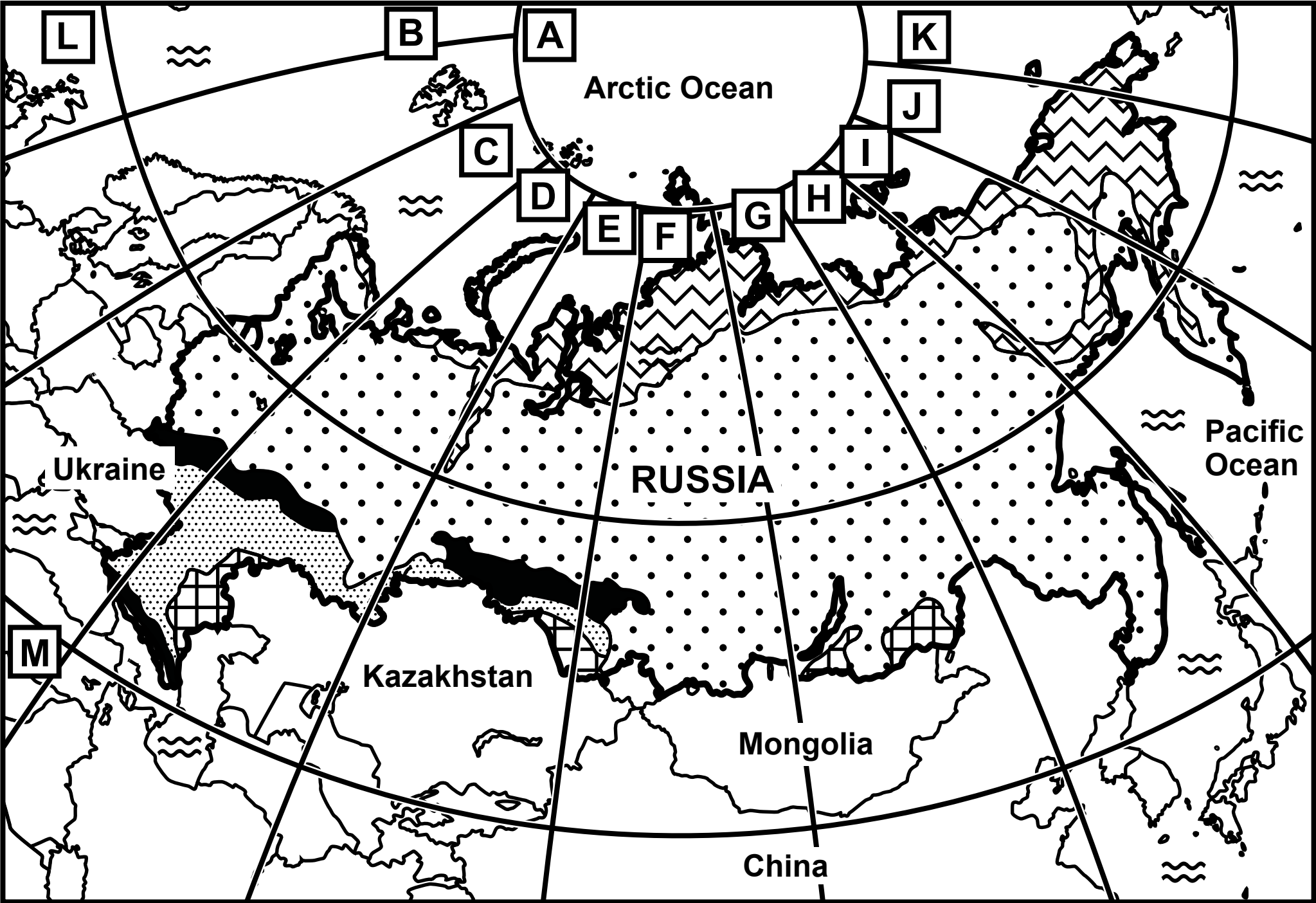
K – 180°

L – 60°N

M – 40°N

km

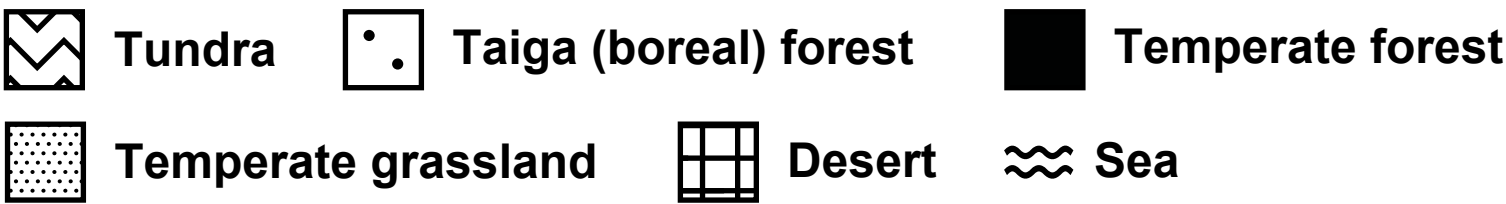




The map displays the geographical distribution of various biomes across Russia and its neighboring countries. The Arctic Ocean is to the north, and the Pacific Ocean is to the east. Neighboring countries shown include Ukraine, Kazakhstan, Mongolia, and China. The map is overlaid with a grid of latitude and longitude lines. Points A through M are marked on the map, corresponding to the coordinates listed in the key. The biomes are represented by different patterns: Tundra (diagonal hatching), Taiga (boreal) forest (central dot), Temperate forest (solid black), Temperate grassland (dotted), and Desert (grid). The map shows a clear latitudinal gradient of biomes, from tundra in the north to desert in the south. The Pacific Ocean is visible on the eastern coast, and the Arctic Ocean is to the north. The map also shows the Black Sea and the Caspian Sea. The word 'RUSSIA' is written in large letters across the center of the map. The word 'Ukraine' is written in the southwest, 'Kazakhstan' in the south, 'Mongolia' in the south, and 'China' in the south. The word 'Arctic Ocean' is written in the north, and 'Pacific Ocean' is written in the east. The word 'Sea' is written in the key. The word 'km' is written above the scale bar. The word '0' and '1,000' are written below the scale bar. The word 'A' through 'M' are written in boxes on the map. The word 'A' is at 80°N, 'B' is at 0°, 'C' is at 20°E, 'D' is at 40°E, 'E' is at 60°E, 'F' is at 80°E, 'G' is at 100°E, 'H' is at 120°E, 'I' is at 140°E, 'J' is at 160°E, 'K' is at 180°, 'L' is at 60°N, and 'M' is at 40°N.

Figure 1 – Black and White (Part 2)
Russia's biome map and animal biodiversity

Key:



A – 80°N B – 0° C – 20°E D – 40°E E – 60°E
F – 80°E L – 60°N M – 40°N

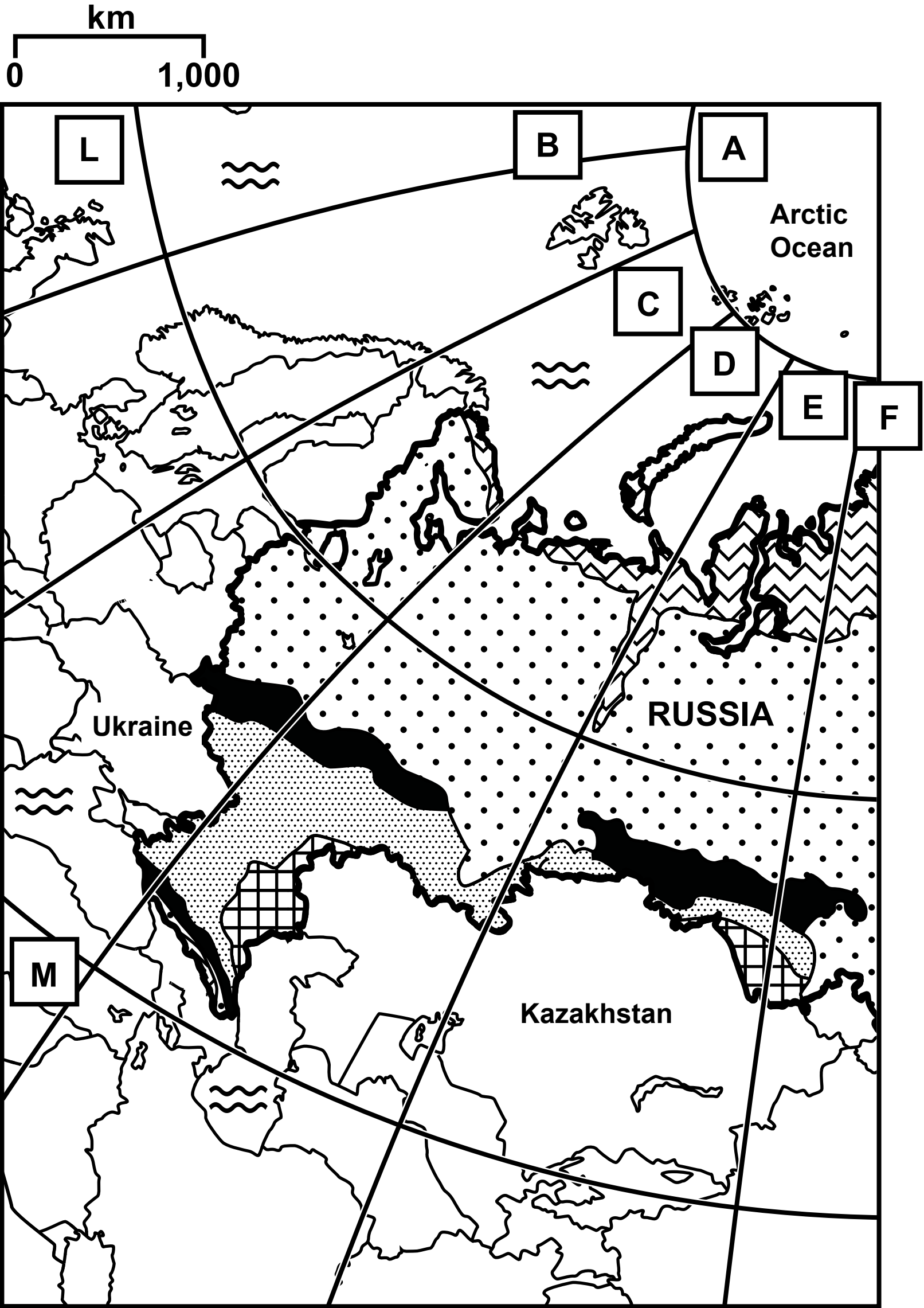








Figure 1 – Black and White (Part 3)
Russia’s biome map and animal biodiversity

Key:

- | | | |
|---|---|--|
|  Tundra |  Taiga (boreal) forest |  Temperate forest |
|  Temperate grassland |  Desert |  Sea |

G – 100°E H – 120°E I – 140°E J – 160°E K – 180°

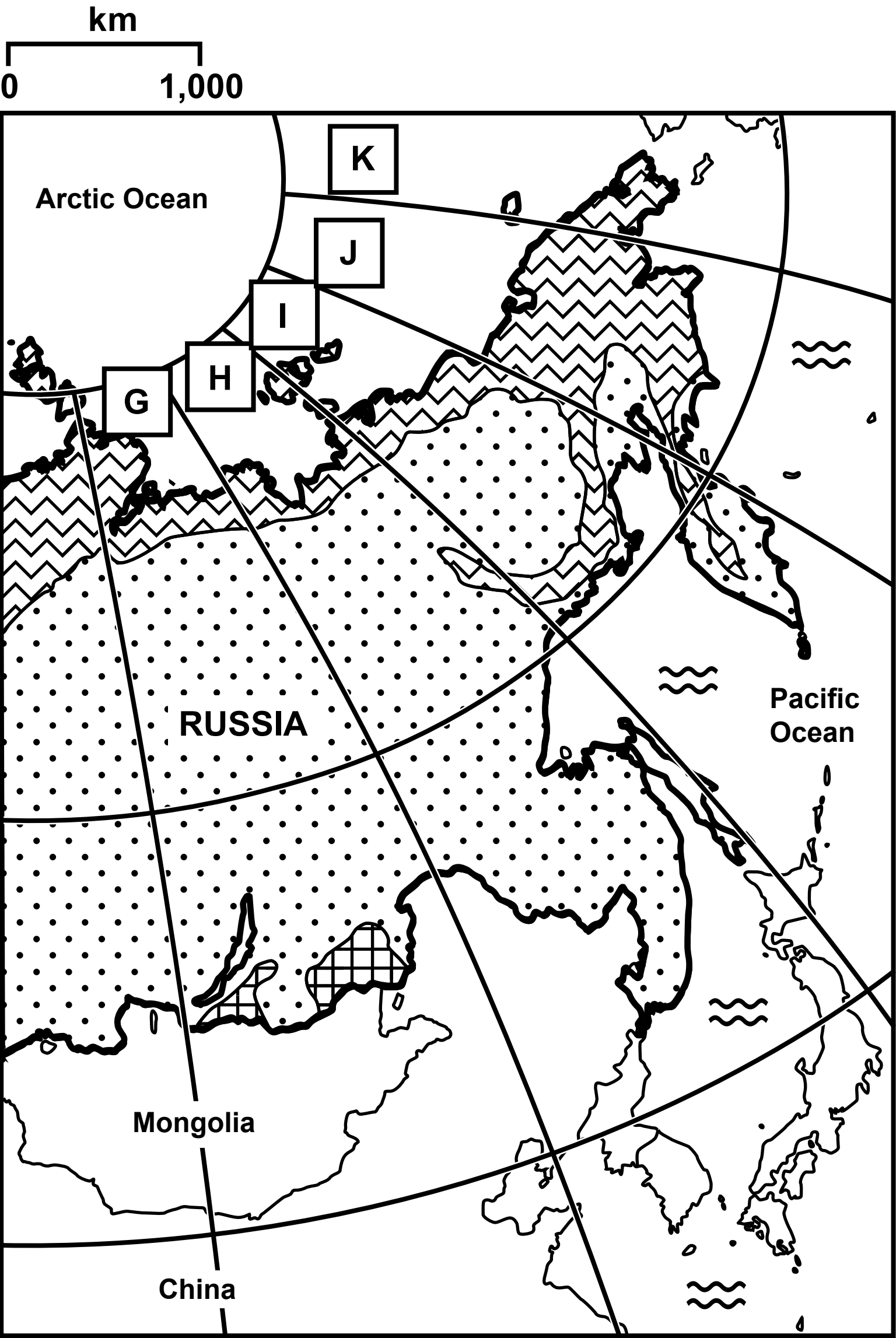


Figure 1 – Table
Russia’s biome map and animal biodiversity

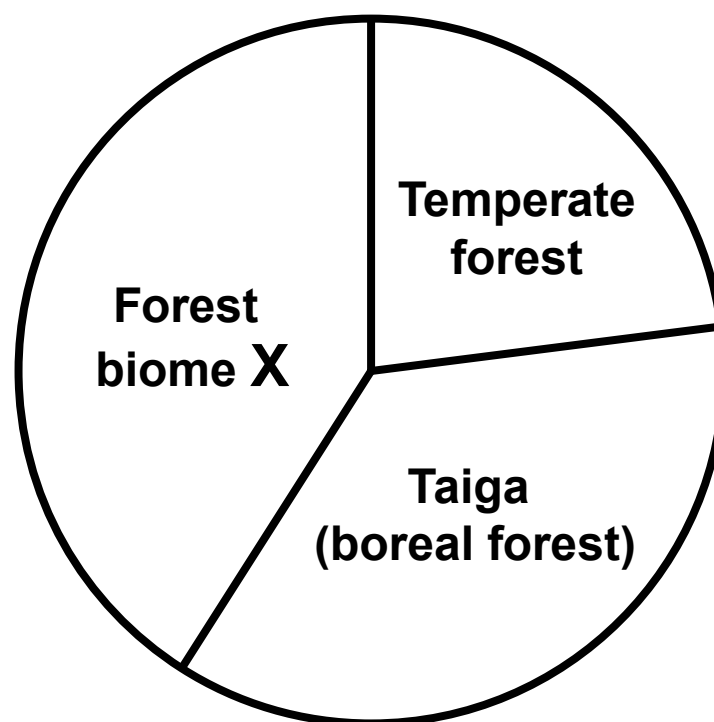
Biome name	Animal biodiversity (approximate number of species)
Tundra	900
Taiga (boreal forest)	1,200
Temperate forest	4,500
Temperate grassland	3,500
Desert	500

SECTION B

Forests Under Threat

Figure 2

Global carbon storage in different biomes



- Globally, around **1,500** billion tonnes of carbon are stored in three biomes.
- The carbon stored worldwide in the taiga (boreal forest) is equivalent to all emissions from human activity in the last **100** years.
- Frozen soil and ground below the taiga (boreal forest) also store greenhouse gases.

Figure 3 – Colour

Conventional and unconventional oil and gas fields in Russia

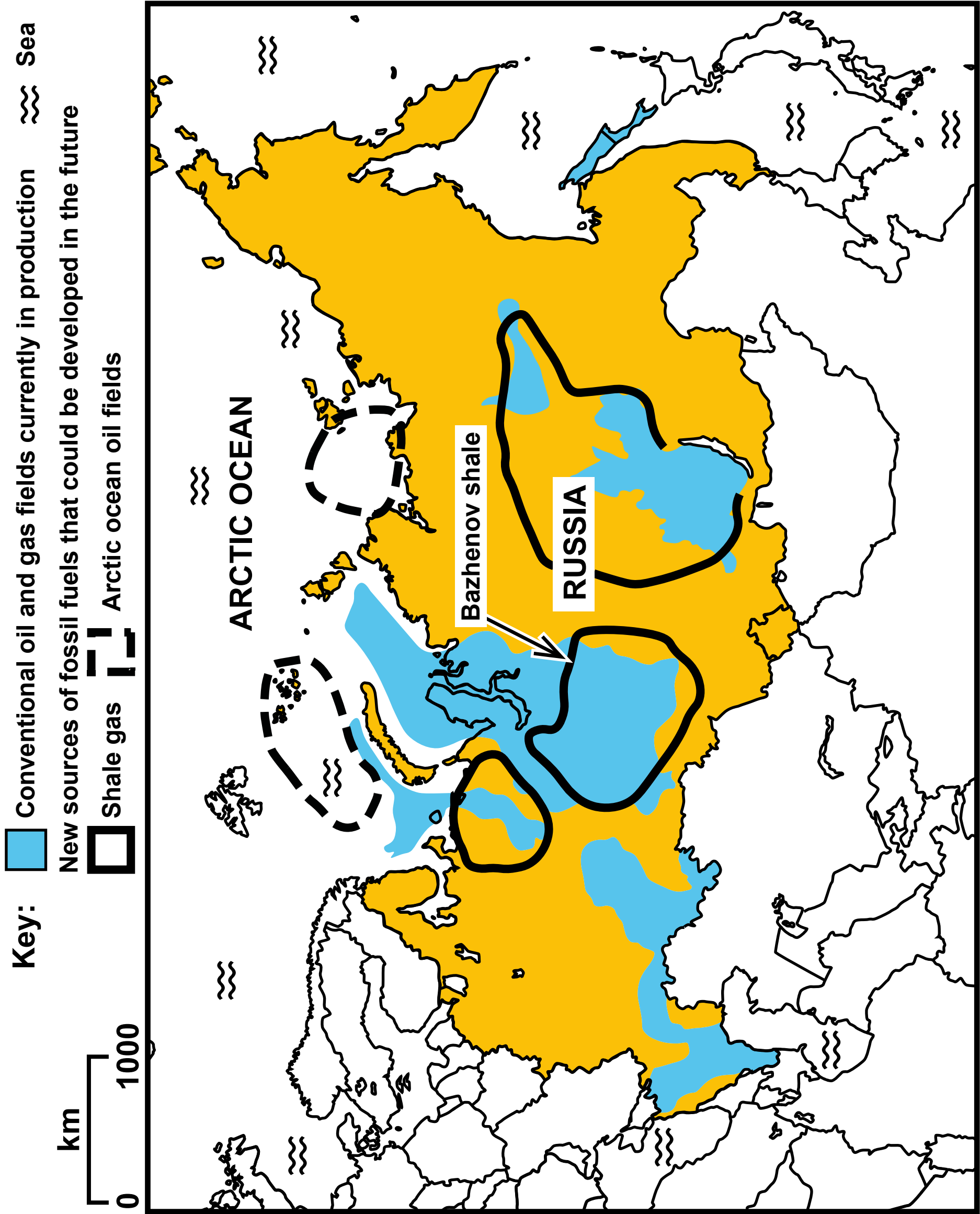


Figure 3 – Black and White
Conventional and unconventional oil and gas fields in Russia

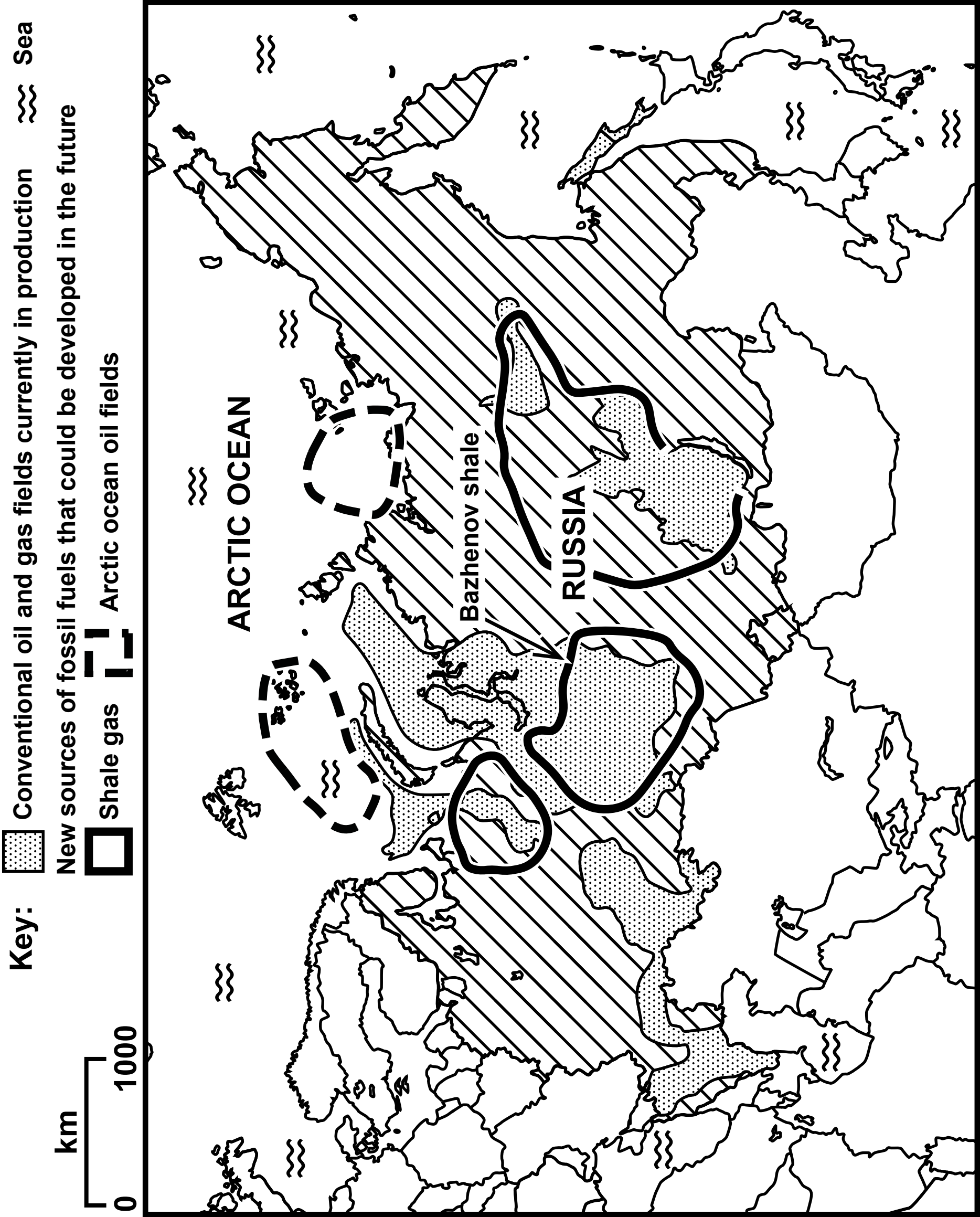


Figure 4



A timeline showing changes in oil prices and Russia's gross domestic product (GDP) per capita, 1997–2017

Key: A = 2000 Vladimir Putin is elected as Russian president

B = 2003 USA-led invasion of Iraq begins – world oil prices are affected

C = 2008 Global financial crisis (GFC) begins – many countries suffer money shortages

D = 2014 Russia takes control of Crimea (part of neighbouring Ukraine)

 Price of a barrel of oil (US\$)  Russia's GDP per capita (US\$)

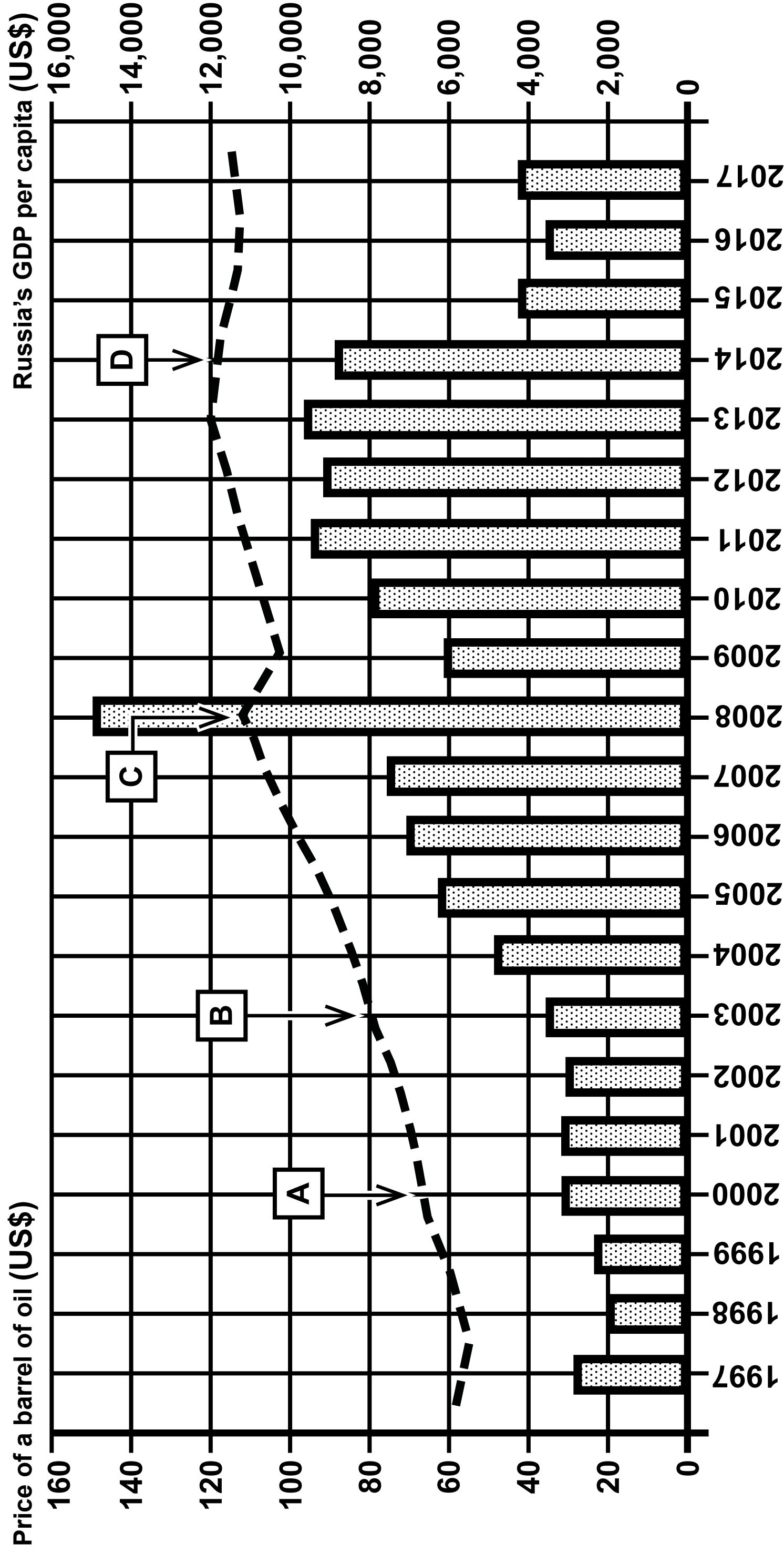


Figure 5**Selected European countries which bought Russian gas, 2017**

Country	% of gas supplied by Russia
Finland	100
Poland	60
Germany	37
Italy	29
Greece	56

Figure 6

Selected news headlines involving Russia, 2014–2018

2014

“RUSSIA TAKES BACK CRIMEA”

2016

**“RUSSIA ACCUSED OF USING FACEBOOK TO GET TRUMP ELECTED AS
US PRESIDENT”**

2018

**“RUSSIAN SPIES MAY HAVE CARRIED OUT UK POISON ATTACK IN
SALISBURY”**

Figure 7 – Colour

The new ‘Power of Siberia’ gas pipeline links Russia to China

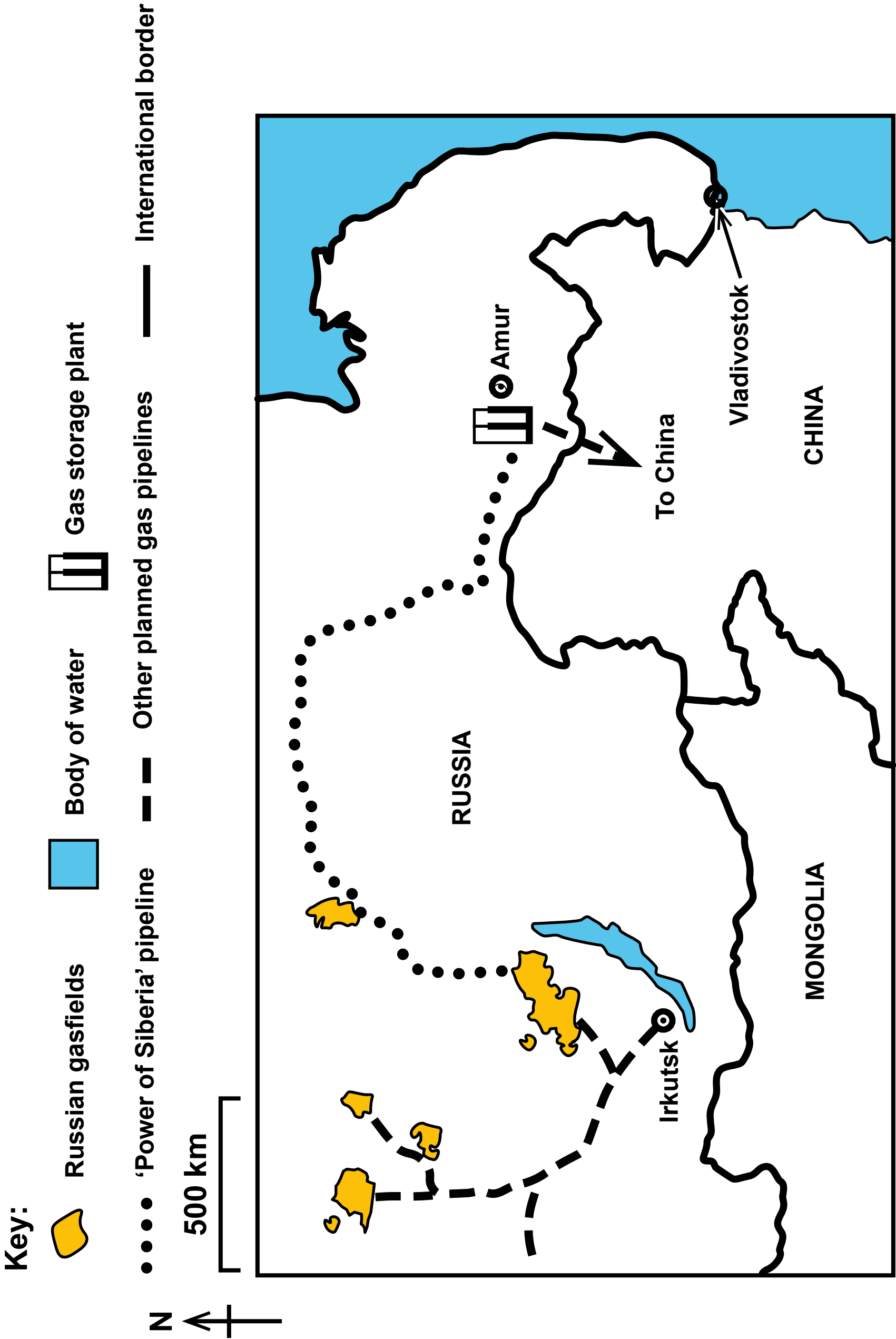


Figure 7 – Black and White

The new ‘Power of Siberia’ gas pipeline links Russia to China

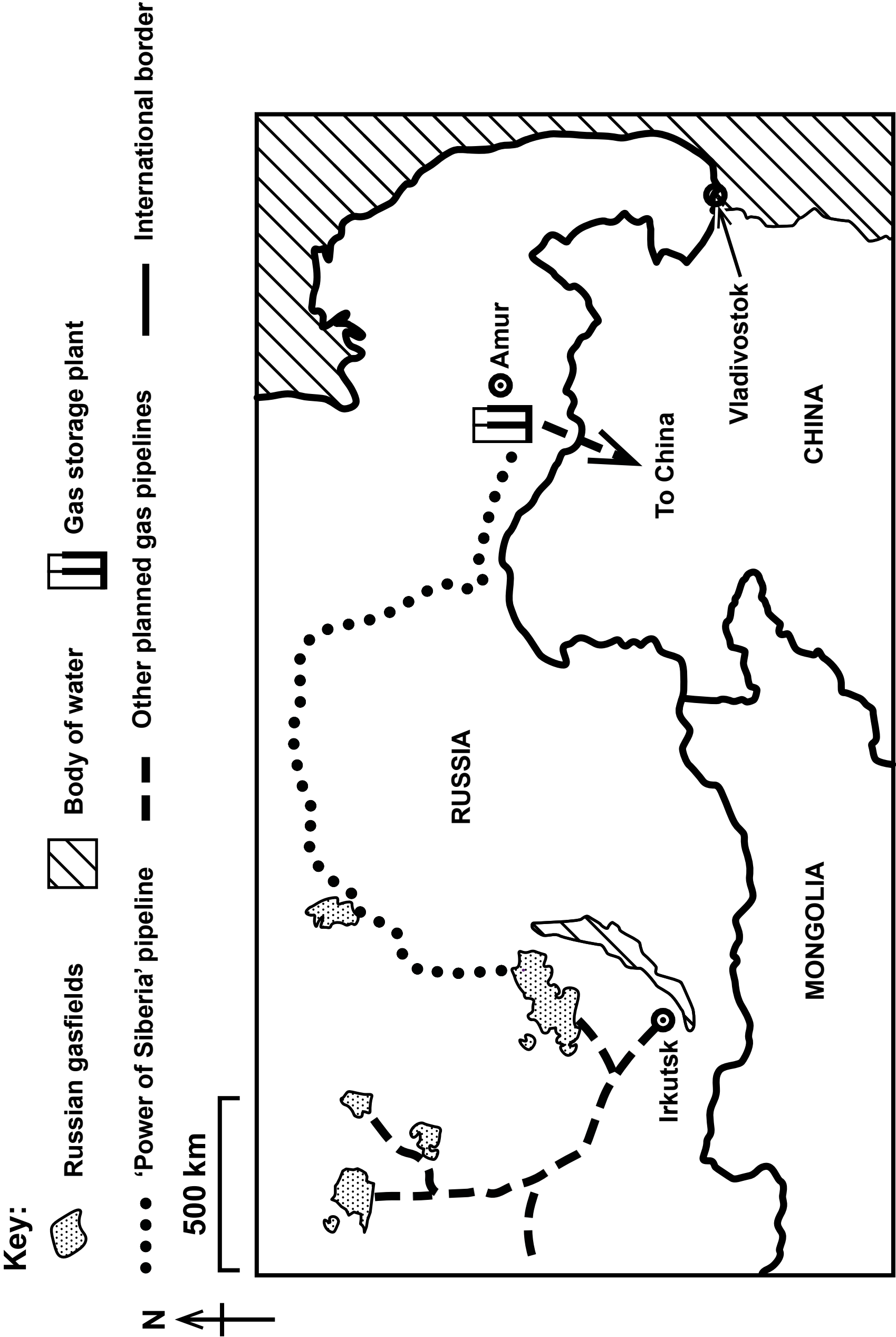


Figure 7 – Information

The new 'Power of Siberia' gas pipeline links Russia to China

- Work started on the 'Power of Siberia' pipeline in **2018**.
- It carries gas from Russian gas fields to China's border.
- The gas is sold to China in a deal worth **US\$400 billion** over **30 years**.
- The pipeline, paid for by Russian energy company Gazprom, is over **4,000 km** long.

Figure 8 – Diagram

Selected countries where Russian energy companies are developing new oil and gas resources

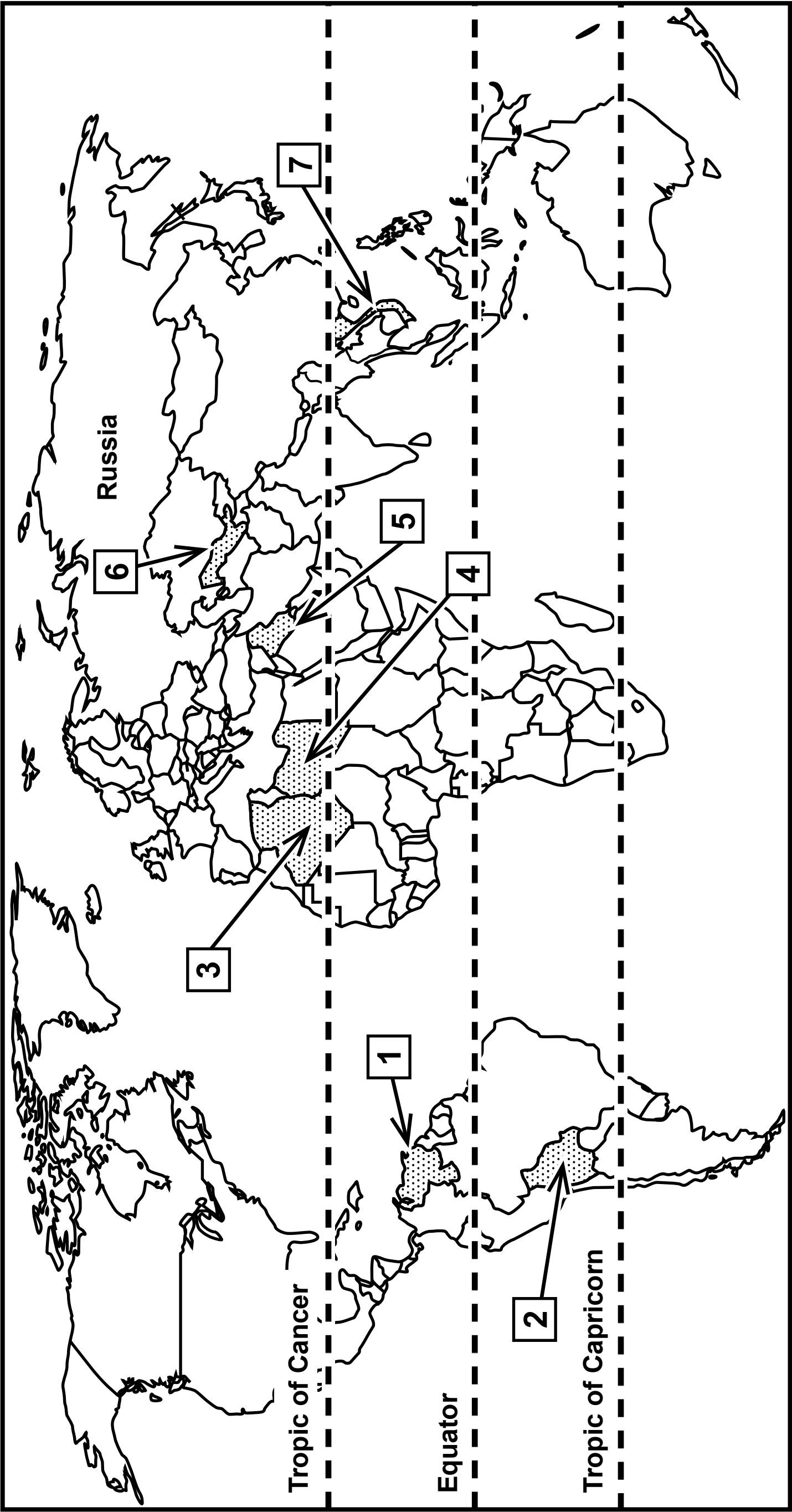


Figure 8 – Information

Selected countries where Russian energy companies are developing new oil and gas resources

	Countries	Natural environments
1	Venezuela	Tropical rainforest and tropical grassland
2	Bolivia	Tropical rainforest and tropical grassland
3	Algeria	Mostly desert
4	Libya	Mostly desert
5	Iraq	Mostly desert
6	Uzbekistan	Mostly desert
7	Vietnam	Tropical rainforest

Figure 9 – Information

Physical and political challenges for energy companies working in Russia, 2019

- **NEED FOR NEW OIL AND GAS SOURCES**

Russia's own oil and gas companies need new sources if they want to maintain their production levels. Conventional sources will be running out by 2030.

- **GEOLOGICAL CHALLENGES**

Russia has shale gas sources including the Bazhenov shale. However, complex geology presents technical problems for Russian energy companies.

- **OFFSHORE DIFFICULTIES**

There are offshore oil reserves along Russia's northern coastline. However, conditions there are difficult.

- **POLITICAL ISSUES**

Russia's energy companies want transnational corporations (TNCs) from other countries to help them develop new oil and gas reserves in Russia. However, TNCs with headquarters in the US, UK and EU countries are no longer allowed to work with Russian companies.

Figure 9 – Table

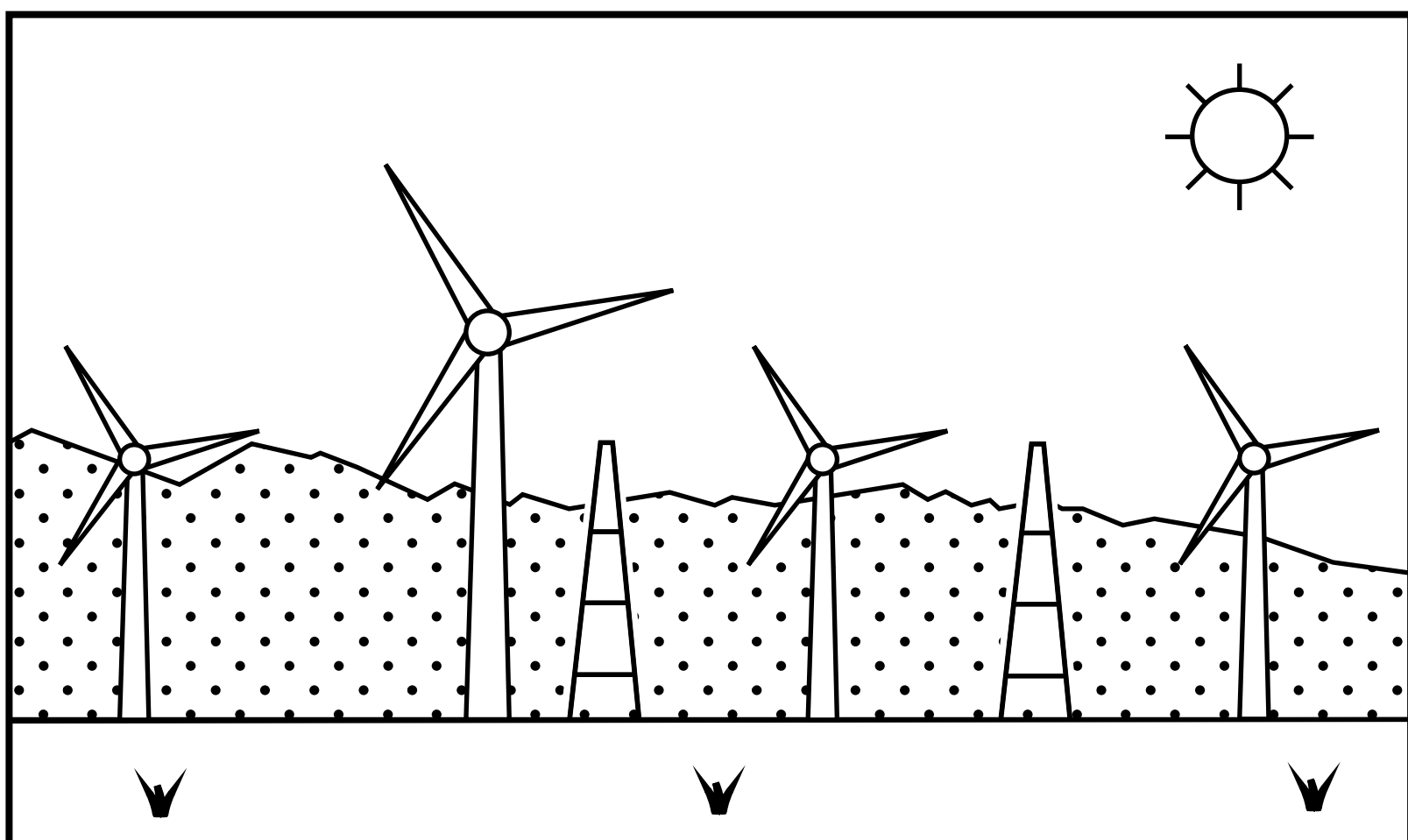
Physical and political challenges for energy companies working in Russia, 2019

Name of TNC	ExxonMobil	Shell	BP
Headquarters	USA	Netherlands (EU)	UK
Cancelled or postponed Russian energy projects	<ul style="list-style-type: none">• Russia’s oil companies hoped Exxon would share its shale gas technology and experience.• Exxon has been exploiting US shale gas for many years.• In 2014, the US government told Exxon to stop working in Russia.	<ul style="list-style-type: none">• In 2010, Shell agreed to work with Gazprom, a Russian oil company.• Together, they hoped to cooperate on a range of shale and offshore projects.• Because of the political situation, some of these plans were put on hold.	<ul style="list-style-type: none">• BP planned to help Russian companies exploit new Arctic Ocean oil reserves.• BP specialises in exploring for oil in deep water with challenging weather conditions.• In 2018, BP said it would abandon some of its Russian plans.

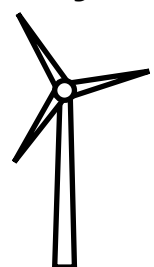
Figure 10 – Diagram 1

The use of wind energy

China has built 100,000 onshore wind turbines in sparsely populated areas such as the Gobi Desert.



Key:



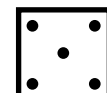
Wind turbines



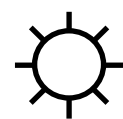
Vegetation



Mast



Mountains

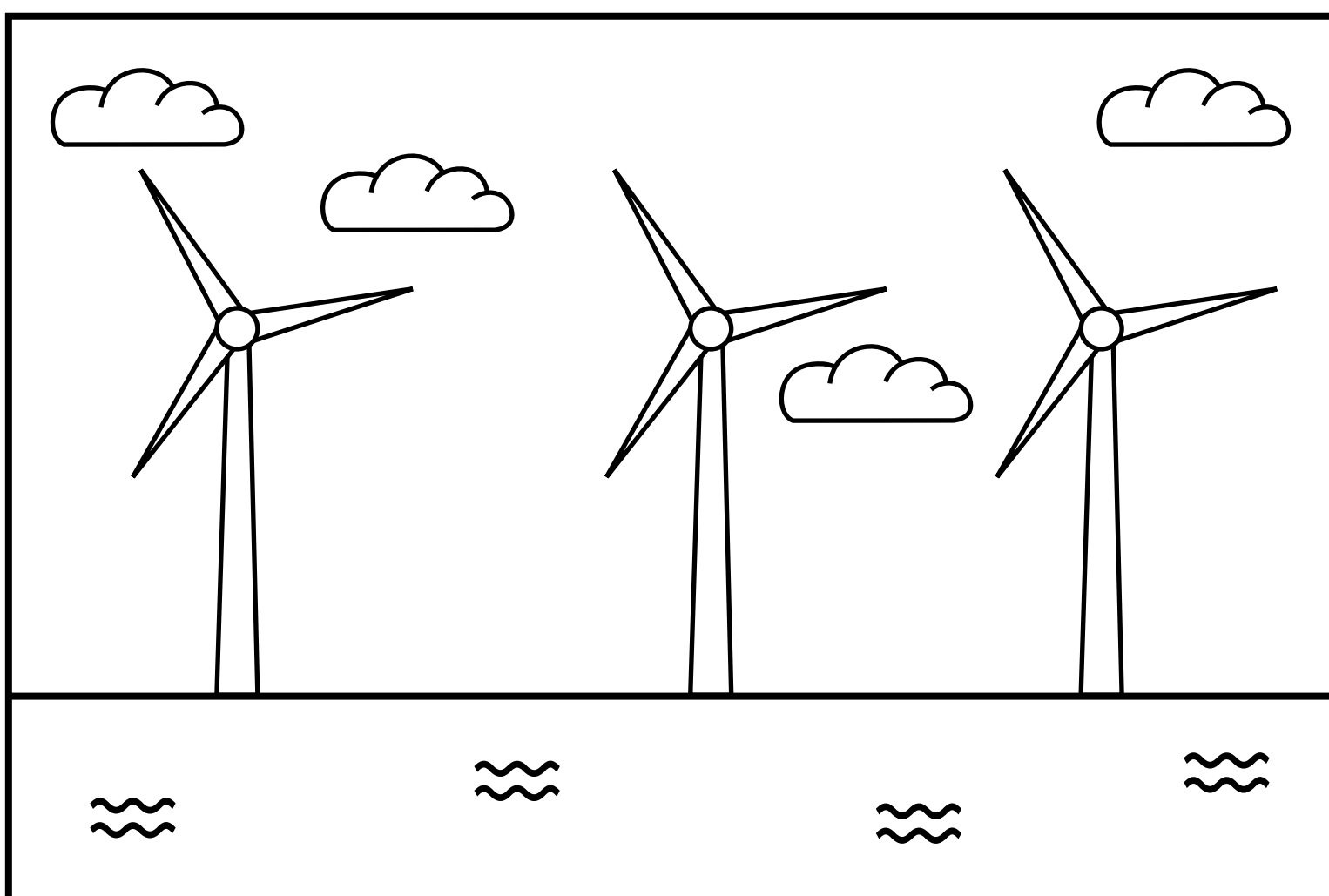


Sun

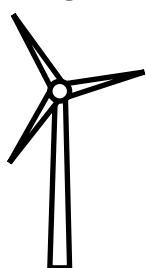
Figure 10 – Diagram 2

The use of wind energy

There are around 2,000 offshore wind turbines in shallow waters along the UK's coastline.



Key:



Wind turbines



Sea



Clouds

Figure 10 – Information

The use of wind energy

Wind energy used by selected countries, 2017

Country	Land area (thousand km ²)	Wind energy as a % of all energy used	Energy output of existing wind turbines (gigawatts)
Germany	357	12	56
UK	242	7	20
China	9,597	4	190
Russia	17,098	<1	2

- Wind energy use has helped some EU countries to reduce their carbon emissions in line with government targets.
- In theory, much of the world's energy needs could be met using wind power. Only a fraction of this potential is currently used.
- In Russia, up to 9,000 gigawatts of wind energy is potentially available. However, millions of new wind turbines would be needed.
- A wind turbine costs around £100,000. Also, new power networks are needed to transmit the electricity to where it is needed. However, costs will fall as the technology improves.

Figure 3 adapted from: <https://medium.com/@Oillywood/russia-turns-to-new-friends-from-china-and-the-middle-east-bf0002384565>

Figure 5 adapted from: © Sergii Pal/123rf

Figure 7 adapted from: <https://ig.ft.com/gazprom-pipeline-power-of-siberia/>

Figure 10 images from: © Feng Wei Photography/Getty Images and © Simon Belcher/Alamy Stock Photo