



19th International Geography Olympiad

Bandung, Indonesia

8–14 August 2023

WRITTEN RESPONSE TEST

Question and Answer Booklet

Name: Team:

Student number

1	9				
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Do NOT open the Booklet before instructed to do so by a supervisor.

Instructions for Students

1. Fill in your name, team and iGeo student number on the front page of this Question and Answer Booklet.
2. Fill in your iGeo student number in the boxes on top of the pages in this Booklet.
3. This test consists of 6 sections.
4. The maximum total mark is 90.
The mark for each question is given in the margin at the beginning of the question.
There is a maximum of 15 marks for each section.
5. Answer all questions in the spaces provided in this Booklet in English.
Keep the left margin free for markers.
Please write clearly.
Please use blue (or black) pen, not pencil.
6. Check the backs of pages as questions are printed on both sides of a page.
7. There are blank pages which you can use as additional space for your notes.
Please cross through any notes so that we know they are not part of your answers.
If you use these pages for answers, please label them clearly with the Section and question number (e.g. A1).
8. Where appropriate, please write sentences or phrases not single words.
9. Give only the required number of answers (reasons, examples, etc.).
For instance, if the question asks for 2 reasons and you give more than 2, only the first 2 reasons will be marked.
10. The Resource Booklet contains Figures referred to in this Booklet.
Do not write any of your answers in the Resource Booklet.
11. You may use a calculator during the test.
12. Students not educated in English are allowed to use bilingual dictionaries during the test.
Students must ensure that their bilingual dictionaries do not contain unauthorized material such as study notes and named examples of places etc.
13. Time:
180 minutes for students not educated in English (+10 minutes reading time),
150 minutes for students educated in English (+10 minutes reading time).

Good luck!

Written Response Test

Contributions from: Australia, Belarus, Croatia, Denmark, Indonesia, Poland, Romania and Thailand
Committee Convenor: Ivan Sulc (Croatia)
Director of Tests: Susan Lomas (UK)

Section A: The Aral Sea

Resource Booklet Box A1 provides historical information regarding the Aral Sea region. Resource Booklet Figure A1 shows Central Asia with the location of the Aral Sea. Resource Booklet Figure A2 contains Landsat satellite imagery showing changes of the Aral Sea (1964-2022). Resource Booklet Figure A3 shows changes in Precipitation of the Aral Sea 1955-2015. Resource Booklet Figure A4 shows changes in Salinity of the Aral Sea 1955-2015.

2 m

1. Describe the drainage pattern surrounding the Aral Sea and name any appropriate technical term(s) that apply to this sort of basin.

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3 m

2. Study Resource Booklet Box A1 and Figures A1 and A2. Using the information provided and your geographical understanding, explain three **economic impacts** due to the changing conditions of the Aral Sea.

Impact 1:

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Impact 2:

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Impact 3:

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2 m

3. Study Resource Booklet Figure A3.

Identify two factors responsible for the trend shown in this precipitation graph of the Aral Sea.

Factor 1:

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Factor 2:

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4 m

4. Study Resource Booklet Figure A4.

Explain two **causes** and two **environmental effects** of the trend shown in the salinity graph of the Aral Sea.

Cause 1:

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Cause 2:

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Effect 1:

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Effect 2:

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4 m

5. Study Resource Booklet Box A1 and Resource Booklet Figures A1, A2, A3 and A4.

Explain 4 reasons why solutions for the issues in the Aral Sea region are difficult to implement.

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Section B: Maritime transport

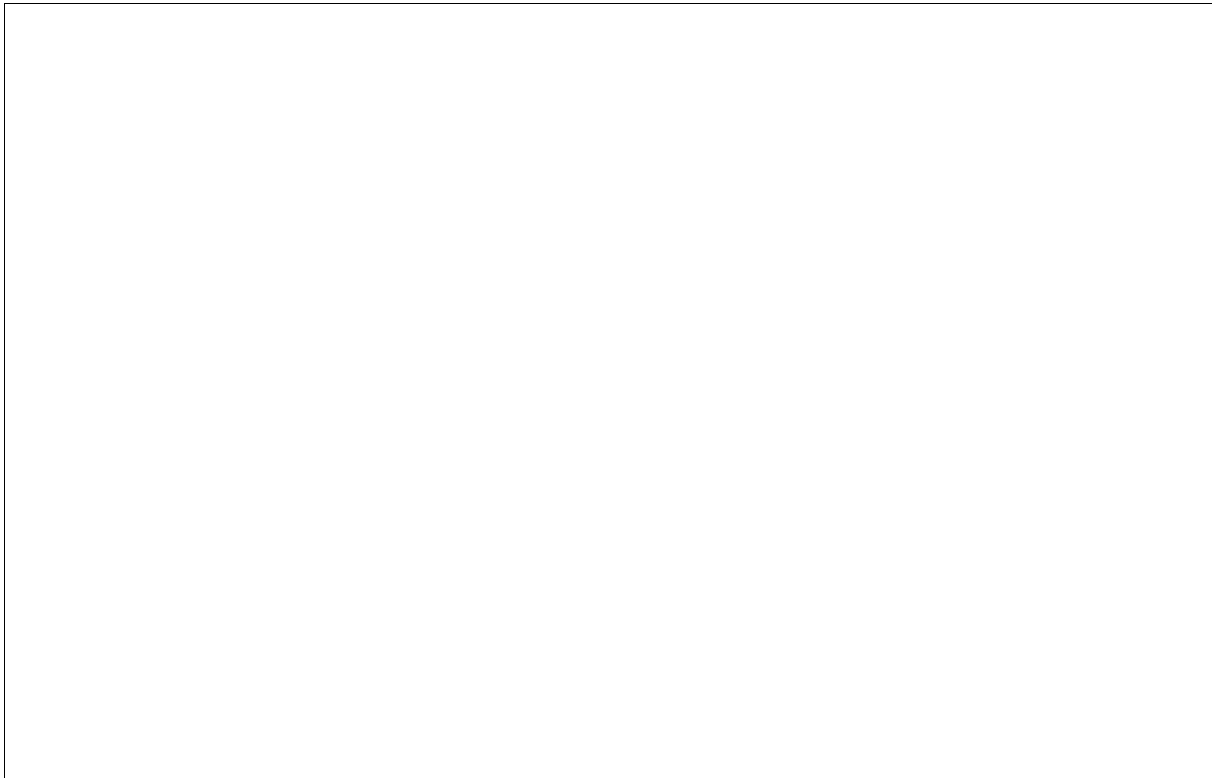
Resource Booklet Table B1 shows the UNCTAD port liner shipping connectivity index (PLSCI) in the first quarter (Q1) of 2006 and fourth quarter (Q4) of 2022 in 50 busiest container ports in the world.

Resource Booklet Figure B1 shows Maritime trade by basic type of cargo by world regions 2006-2021.

Resource Booklet Figure B2 shows the Finnafjord Port Project in Iceland.

5 m

1. Study Resource Booklet Table B1. Use an appropriate data representation method to show the Port Liner Shipping Connectivity Index (PLSCI) in 2006 (Q1) and 2022 (Q4) for the **ten highest ranked container ports in 2022**.



2 m

2. Study the Resource Booklet Table B1 and Figure B1 and your diagram in Question B1. Identify two spatial and/or time-related patterns of international **tanker freight trade** and explain them.

Pattern 1:

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Pattern 2:

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2 m

3. Study Resource Booklet Figure B2.

Using the information provided and your geographical understanding suggest two main reasons for the location of this port in a sparsely populated area outside the major sea transit routes.

Reason 1:

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Reason 2:

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2 m

4. The investment in the Finna fjord Port Project would not have been possible a few decades ago. Specify **two changes** in global economic or environmental conditions that make the investment possible now.

Change 1:

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Change 2:

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4 m

5. Outline the **environmental impacts** of the Finna fjord Port Project. Use at least two positive and two negative environmental impacts.

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Section C: Land use and land cover change in Burkina Faso

Resource Booklet Figure C1 shows land cover change in Burkina Faso in 1975, 2000 and 2013.

2 m

1. Study Resource Booklet Figure C1.

The northern part of Burkina Faso lies in a large region that stretches across Africa from east to west.

a) Name this region.

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b) Identify the main **natural characteristic** of this region that explains the type of land cover in northern Burkina Faso.

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6 m

2. Study Resource Booklet Figure C1.

Describe in detail **three changing patterns** in land cover in Burkina Faso between 1975 and 2013.

Pattern 1:

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Pattern 2:

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Pattern 3:

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1 m

3. Specify the main **reason** for the land cover change in Burkina Faso.

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3 m

4. Outline three **implications** of the land cover change for the ecosystems in Burkina Faso.

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3 m

5. In 2020, more than 50% of Burkina Faso's population suffered from chronic food deficiency. Suggest and explain three **sustainable development projects** that would help reduce food insecurity.

Project 1:

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Project 2:

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Project 3:

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Section D: Innovative and sustainable cities

Innovative and sustainable cities refer to urban areas that incorporate innovative solutions and sustainable practices to enhance the overall quality of life for residents while minimising environmental impact. These cities prioritise the efficient use of resources, integration of technology, and the promotion of social, economic, and environmental well-being.

To achieve innovative and sustainable urban cities, key strategies include sustainable urban transportation and water-sensitive urban design. Sustainable transportation in cities focuses on public transportation networks, active transportation, electric vehicles, and integrated land use planning. Water-sensitive urban design involves incorporating green infrastructure, reusing water, creating wetlands, and mitigating the urban heat island effect.

Resource Booklet Figure D1 shows the number of battery and plug-in hybrid electric vehicles in the world 2012-2021.

Resource Booklet Figure D2 shows a model of design of a water-sensitive urban city.

2 m

1. Study Resource Booklet Figure D1.
Describe **two changes** in the number and structure of electric vehicles in the transport in the world between 2012 and 2021 using **specific evidence**.

Change 1:

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Change 2:

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2 m

2. Study Resource Booklet Figure D1.
Suggest **two reasons** for changes in the use of electric vehicles in transport between 2012 and 2021.

Reason 1:

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Reason 2:

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4 m

3. Discuss the **benefits** and **limitations** of electric vehicle deployment. Your answer should include at least two benefits and two limitations.

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3 m

4. Study Resource Booklet Figure D2.
Explain three **ways** in which the management of the flow of water influences the viability of a city.

Way 1:.....

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Way 2:.....

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Way 3:.....

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4 m

5. Study Resource Booklet Figure D2.

Evaluate the feasibility of implementing strategies to create a water sensitive city when planning or redeveloping urban areas.

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for answers, which are clearly labelled with the Section and question number).

Section E: Shorelines

Resource Booklet Figure E1 shows the Big Sur River mouth and adjacent beaches before and after the 2016–2017 fire–flood events.

Resource Booklet Figure E2 shows the Big Sur River watershed, including the boundaries of the 2016 Soberanes wildfire.

Resource Booklet Figure E3 represents an oblique aerial photo of the Big Sur River mouth and shows a coastal feature.

2 m

1. Study Resource Booklet Figure E1.

Note how the shoreline changes over time. Name four **factors** that influence geomorphological changes in shorelines.

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3 m

2. Study Resource Booklet Figures E1 and E2.

Explain how wildfires can affect the **width** of the sandy beach near the Big Sur River mouth.

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3 m

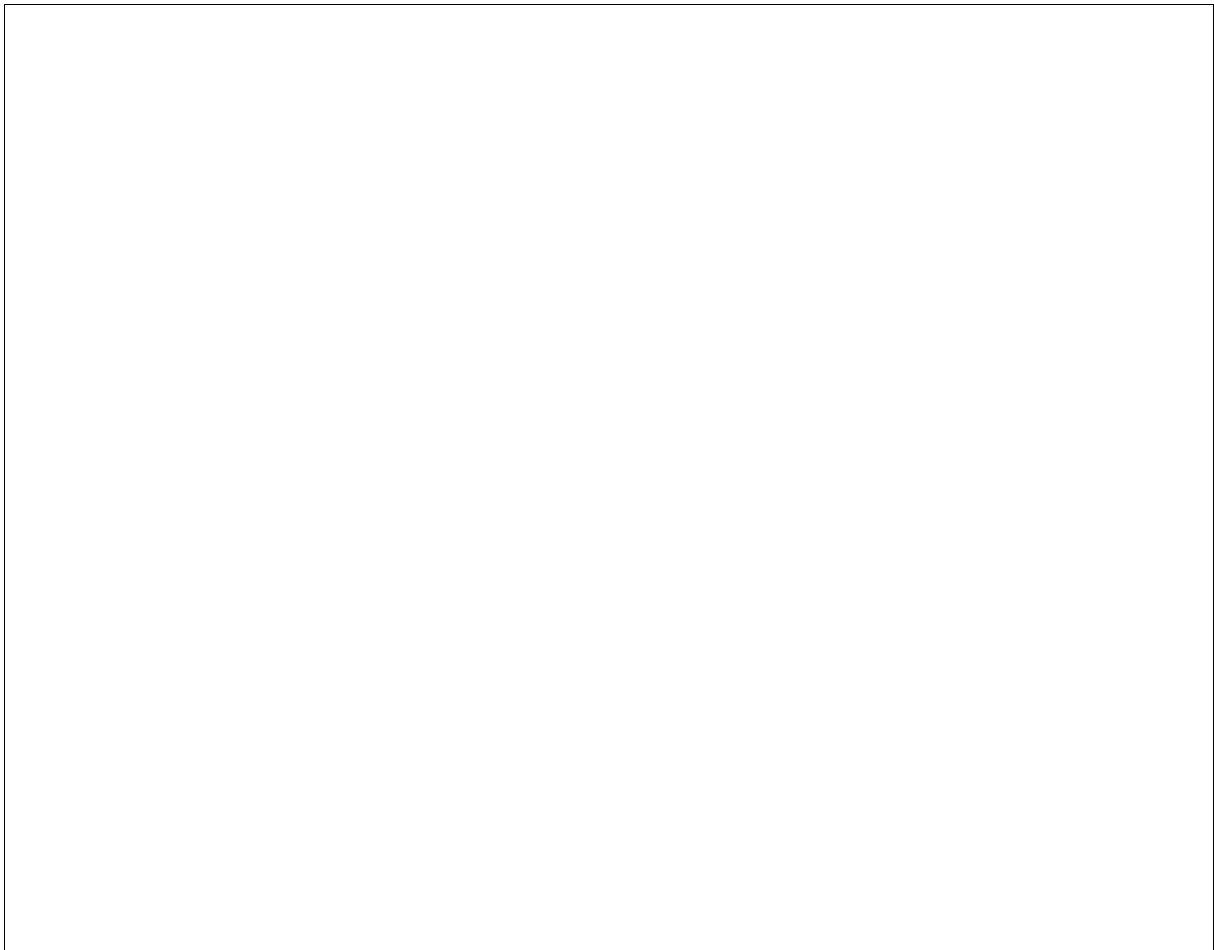
3. Study Resource Booklet Figure E1.

Geologists, engineers, and planners often need to know the rate at which the shoreline moves. This helps them to better define appropriate uses of coastal areas. Use the historical imagery provided to answer the questions 3a and 3b. The scale is the same for both images.

a) Is the beach at point '300 m' eroding or accreting over time?

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b) Estimate the **rate of change** of the shoreline at the point '300 m' to justify your response in part a). Your answer should include the full calculation. The rate must be expressed in metres per month.



1 m

4. Study Resource Booklet Figure E3.

Name the **coastal feature** identified as 'X'.

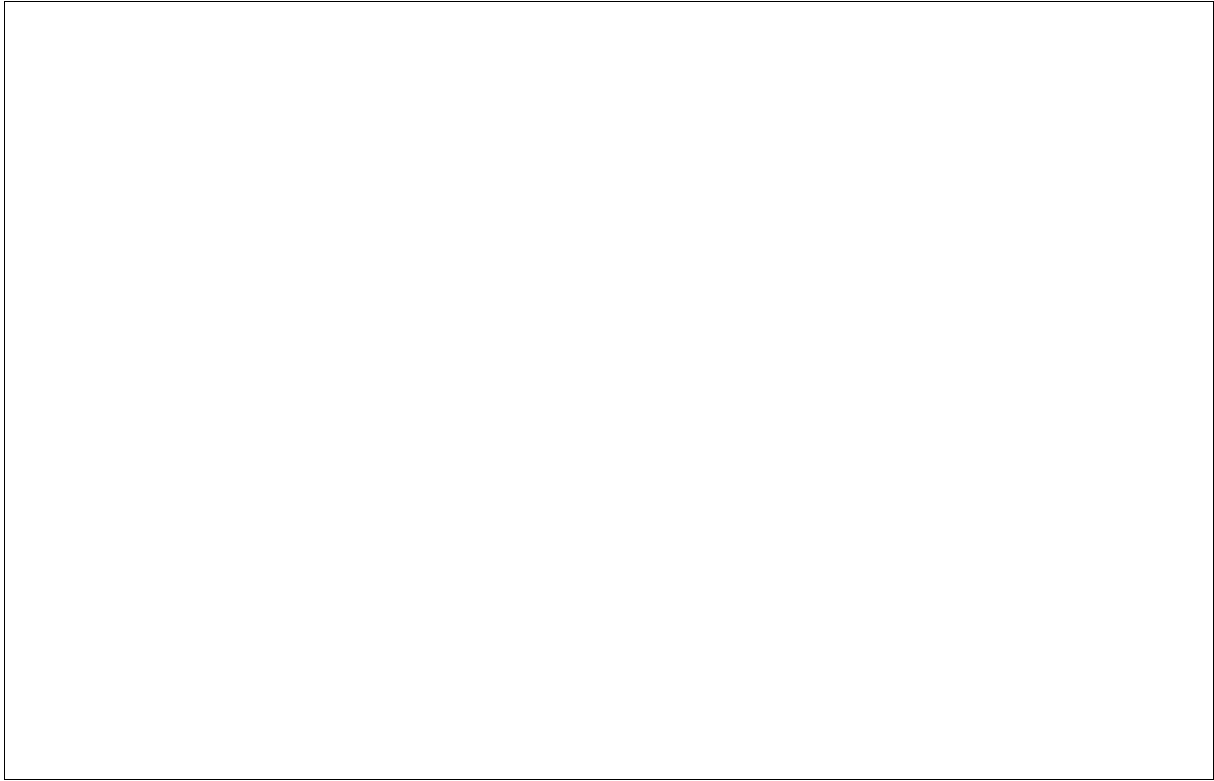
.....

6 m

5. Study Resource Booklet Figure E3.

Use the information provided and your geographical understanding to answer the questions 5a and 5b.

a) Draw a **sketch** of the geomorphological processes that formed the coastal feature "X".



b) Explain the geomorphological process of the formation of the coastal feature "X" shown in the sketch.

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for answers, which are clearly labelled with the Section and question number).

Section F: Ski tourism

Resource Booklet Figure F1 shows mountain ranges in the world with developed ski tourism.

Resource Booklet Figure F2 shows average annual skier visits 2010-2014 (in million).

Resource Booklet Figure F3 shows influence of innovation in transport on mountain tourism growth.

Resource Booklet Figure F4 shows examples of spatial transformation associated with ski tourism.

4 m

1. Study Resource Booklet Figures F1 and F2.

There are many spectacular mountain ranges in the world, but only a few have developed mass ski tourism. Outline and give reasons for 4 social and/or infrastructural **conditions** that have led to the development of mass ski tourism in the mountains.

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2 m

2. Study Resource Booklet Figures F1 and F2.

Name two main **areas** where ski tourism has developed (use the names of the regions from Figure F1 or similar, not the names of continents or countries). Justify your answer with **statistical data** available in the Resource Booklet.

Area 1:

Area 2:

3 m

3. Study Resource Booklet Figure F3.

Ski tourism in the world has stagnated since the 1980s. Discuss changes in **tourists' travel behaviour** that could be responsible for this stagnation. Your answer should include at least three arguments.

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3 m

4. Study Resource Booklet Figure F4a.

Name the **phenomenon** that can be seen in the photograph. Explain how ski tourism can increase the **hazard** of this phenomenon.

Name of the phenomenon:.....

Explanation:

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3 m

5. Study Resource Booklet Figure F4.

Using the information provided and your geographical understanding explain three **negative environmental impacts** of ski tourism in the mountains.

Impact 1:
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Impact 2:
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Impact 3:
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(you can use it for your notes (please cross them through afterwards) or
for answers, which are clearly labelled with the Section and question number).

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Resource Booklet

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Do NOT write any of your answers in this Booklet.

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Section A: The Aral Sea

- Large scale water diversion projects coupled with drought and high evaporation rates have caused a regional ecological, economic, and health disaster since 1961.
- For over 50 years, rivers feeding the Aral Sea have been diverted to irrigate cotton and rice fields.
- The main body of the sea has lost more than 90 percent of its volume.
- Dust storms from remaining salt flats now contaminate the region.

Box A1: Historical information regarding the Aral Sea region

(<https://eros.usgs.gov/media-gallery/earthshot/aral-sea-kazakhstan-and-uzbekistan>)



Figure A1: Central Asia with the location of the Aral Sea

(<https://www.nationsonline.org/oneworld/map/central-asia-map.htm>)

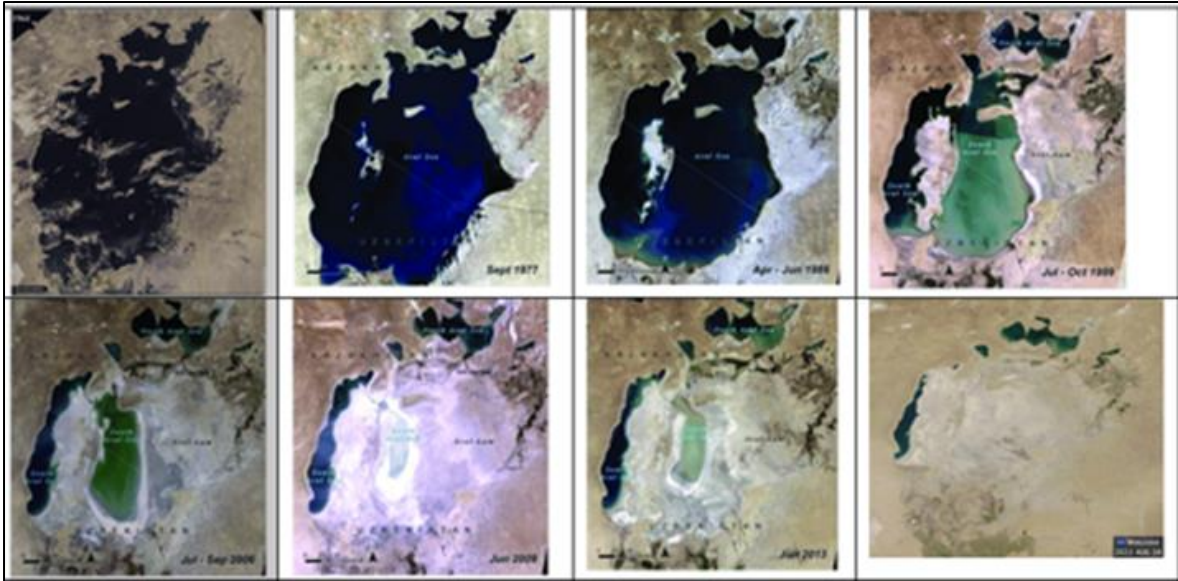


Figure A2: Landsat satellite imagery showing changes of the Aral Sea (1964-2022)

(<https://i.redd.it/former-aral-sea-1964-vs-2022-v0-vyflpv5g3x0a1.jpg?s=92123657c8d8e13f3fa70da989e8b5bd29b3ea75>,
<https://na.unep.net/geas/articleimages/Jan-14-figure-2.png>)

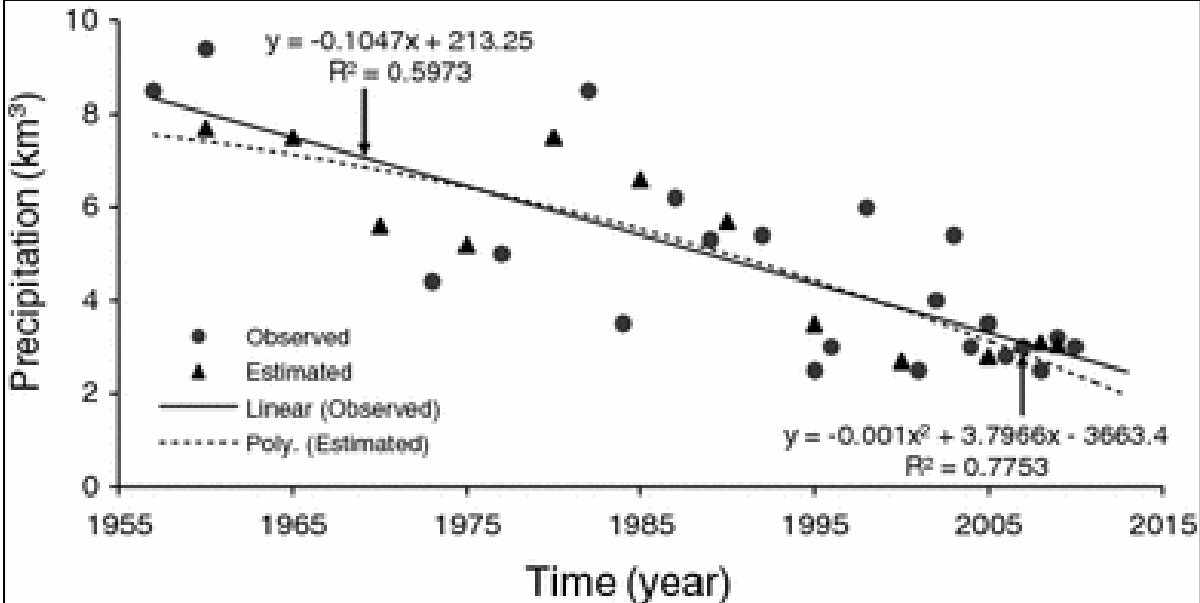


Figure A3: Changes in Precipitation of the Aral Sea 1955-2015

(<https://doi.org/10.1007/s13201-012-0048-z>)

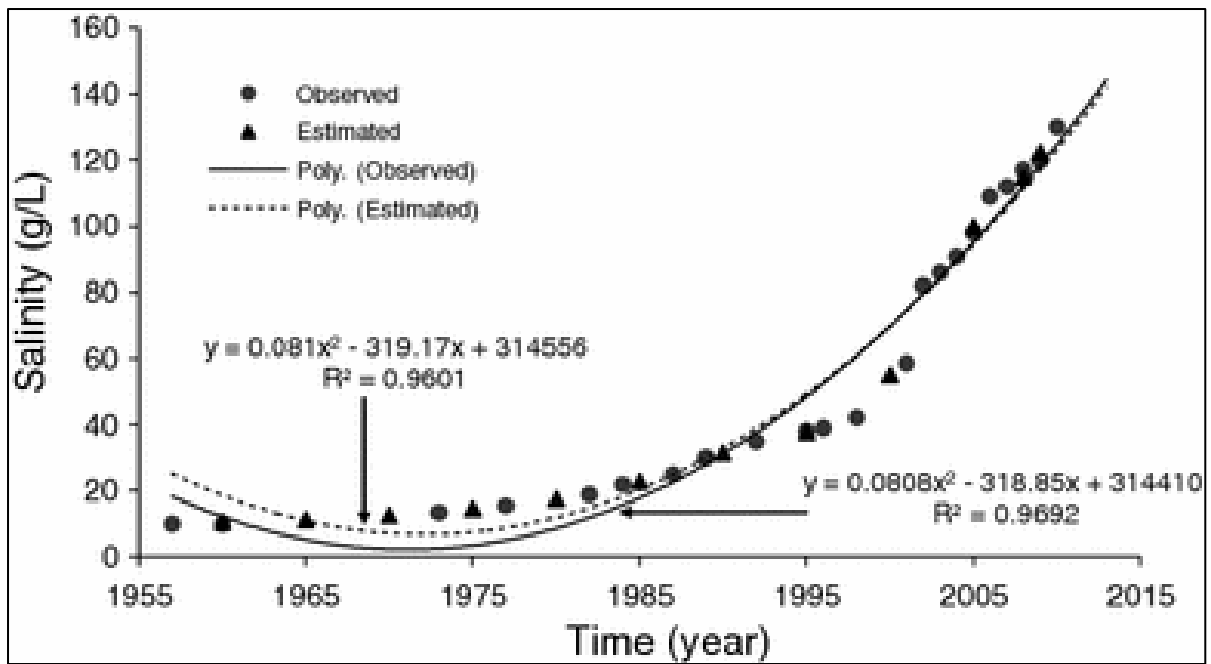


Figure A4: Changes in Salinity of the Aral Sea 1955-2015

(<https://doi.org/10.1007/s13201-012-0048-z>)

Section B: Maritime transport

Table B1. United Nations Conference on Trade and Development (UNCTAD) port liner shipping connectivity index (PLSCI)* in the first quarter (Q1) of 2006 and fourth quarter (Q4) of 2022 in 50 busiest container ports in the world

(<https://unctadstat.unctad.org/EN/>)

No	Port	Index (PLSCI)		No	Port	Index (PLSCI)	
		Q1 2006	Q4 2022			Q1 2006	Q4 2022
1	Shanghai	80.4	147.7	26	Le Havre	45.0	64.2
2	Ningbo	55.0	133.8	27	Dalian	38.6	63.9
3	Singapore	96.6	127.9	28	Kwangyang	31.9	61.9
4	Pusan	77.9	124.3	29	Piraeus	28.8	61.3
5	Qingdao	48.1	104.7	30	Bremerhaven	47.6	60.0
6	Rotterdam	76.4	94.9	31	Port Said	39.4	59.7
7	Hong Kong	100.0	92.8	32	Khalifa	n.d.	57.8
8	Port Klang	60.2	92.5	33	Gioia Tauro	28.8	57.5
9	Antwerp	74.7	90.7	34	New York/New Jersey	34.9	56.3
10	Shekou	36.3	90.7	35	Taipei	n.d.	55.9
11	Kaohsiung	59.8	85.9	36	Felixstowe	44.0	55.5
12	Xiamen	42.7	85.5	37	Jakarta	31.5	55.0
13	Yantian	46.4	84.2	38	Ambarli	14.0	54.9
14	Nansha	16.1	84.1	39	Sines	10.8	54.6
15	Hamburg	73.4	78.3	40	Mundra	15.6	54.0
16	Jebel Ali	37.4	77.6	41	Kobe	51.1	53.5
17	Laem Chabang	33.9	76.1	42	Vung Tau	n.d.	53.4
18	Colombo	33.5	73.9	43	Jeddah	36.8	53.3
19	Tanjung Pelepas	33.0	72.4	44	London Gateway	n.d.	52.8
20	Xingang	39.2	70.5	45	Nhava Sheva	33.3	52.8
21	Valencia	41.9	70.4	46	King Abdullah	n.d.	52.7
22	Tanger Med	n.d.	69.2	47	Haiphong	10.4	52.5
23	Yokohama	55.9	69.9	48	Zeebrugge	27.7	52.4
24	Algeciras	30.1	68.5	49	Savannah	31.9	52.2
25	Barcelona	37.3	66.8	50	Tokyo	43.9	51.2

*Port liner shipping connectivity index (PLSCI) is a measure of connectivity to maritime shipping and a measure of trade facilitation in container ports and countries. A port with a higher connectivity is assigned a higher value.

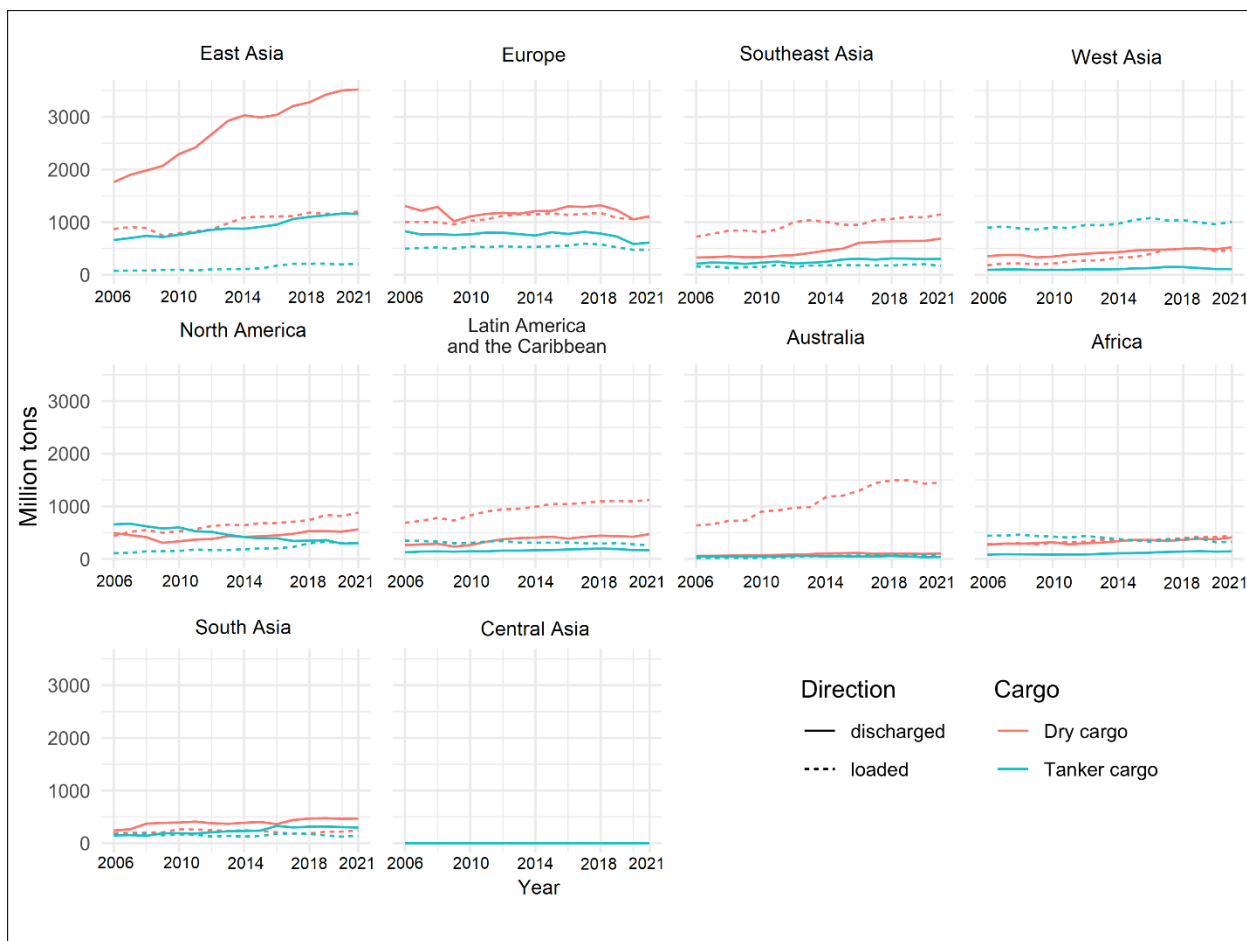


Figure B1. Maritime trade by basic type of cargo by world regions 2006-2021 (tanker cargo – oil, liquid fuels, chemicals; dry cargo – all other cargo)

(<https://unctadstat.unctad.org/EN/> (elaborated))



WELCOME TO THE FINNAFJORD PORT PROJECT

The Finna fjord (Icelandic: Finna fjörður) Port Project (FFPP) in North-East Iceland shall become a truly "green" port harnessing the abundant resources of Iceland's cheap renewable energy. The facility is also a new landmark deep sea port in the North Atlantic ocean for transshipment sailing the Northeast Passage or „Northern Searoute" capturing the Asia-Europe route.



The Finna fjord area is located in North-East Iceland. Leewards to the prevailing winds and waves, the Finna fjord Port can draw on the cheap and green geothermal and hydroelectric power of Iceland to process natural resources.

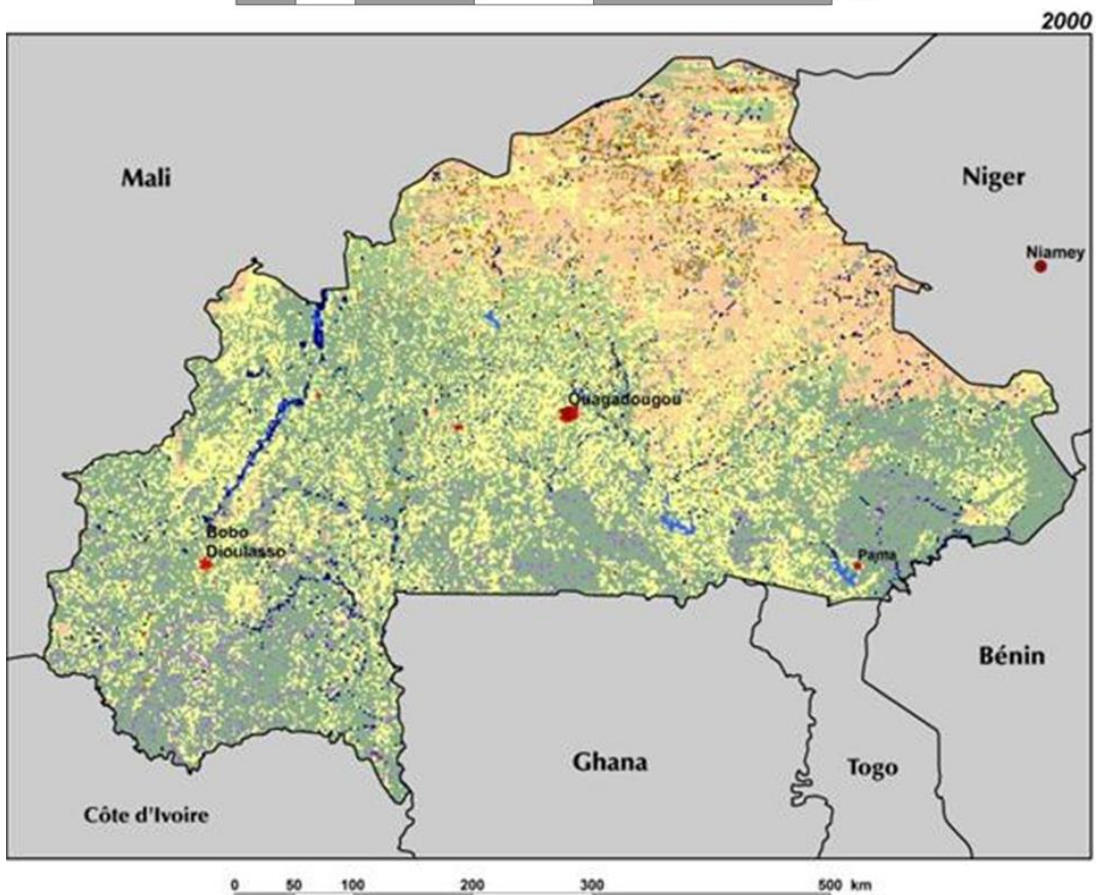
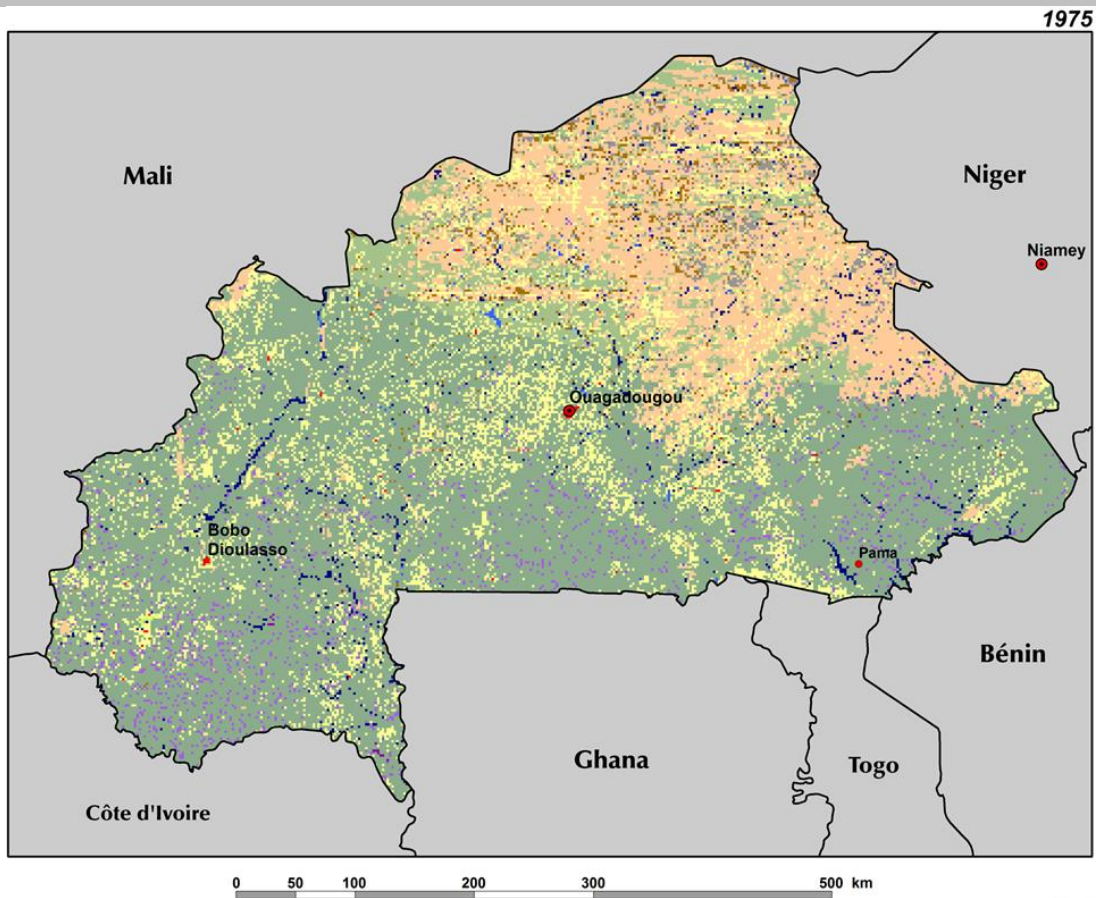
Key uses can include:

- Production of hydrogen or other emission-free future fuels
- Desalination of water
- Consolidation and processing facility for raw material from mines in the Arctic region for export to North America or Europe.
- Application of energy-intensive Agribusiness

The Finna fjord Port provides an ideal business location for all sorts of offshore activities close to the Dreki Area. Due to its location on the "great circle" distance from North America to Asia and Europe, there is room for an international freight airport serving the local fish industry.

Figure B2. Finna fjord Port Project in Iceland
(<https://bremen-ports.de/finnafjord/>)

Section C: Land use and land cover change in Burkina Faso



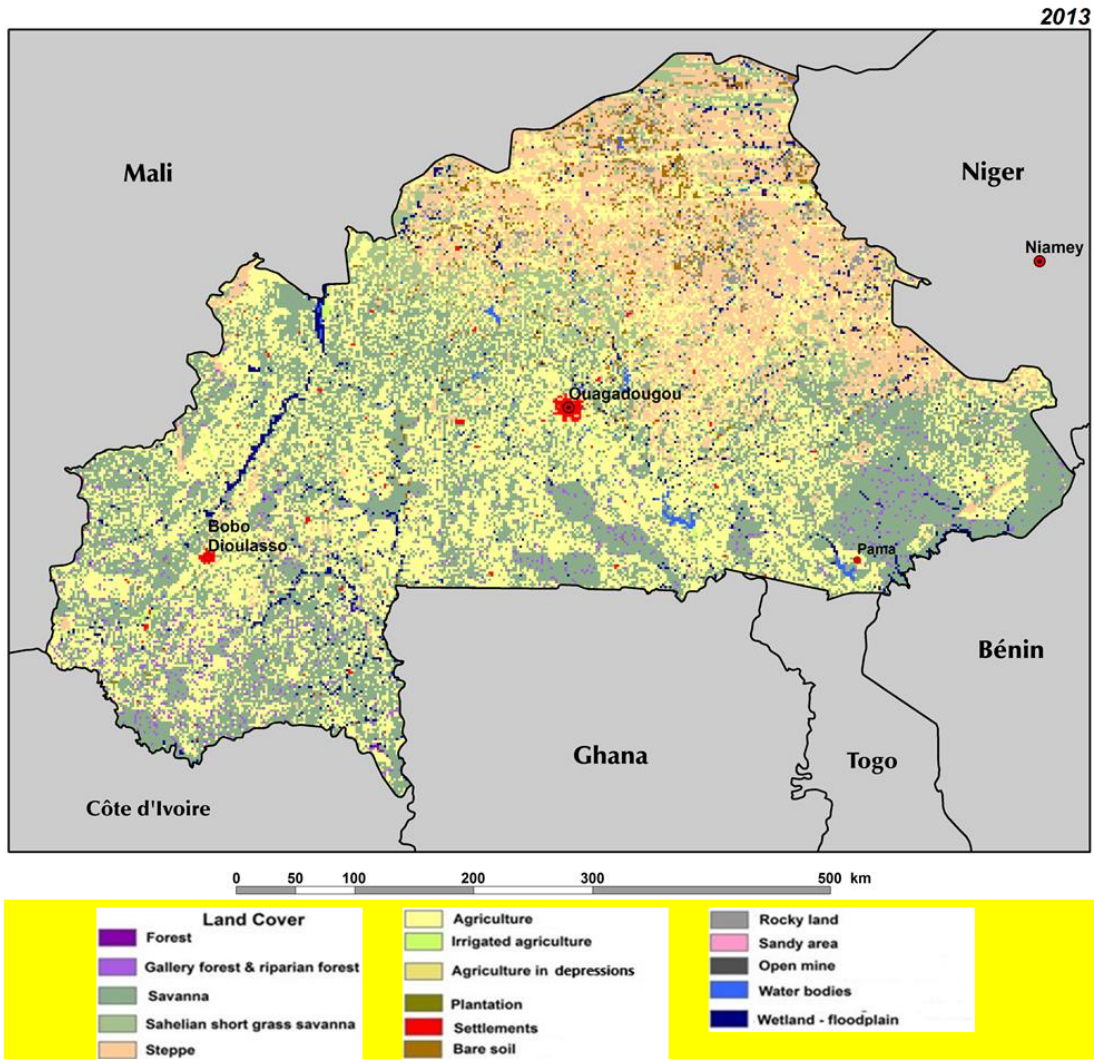


Figure C1. Land cover change in Burkina Faso in 1975, 2000 and 2013

(https://www.researchgate.net/figure/Land-Use-and-Land-Cover-classification-for-the-years-1975-2000-and-2013_fig3_350995189)

Section D: Innovative and sustainable cities

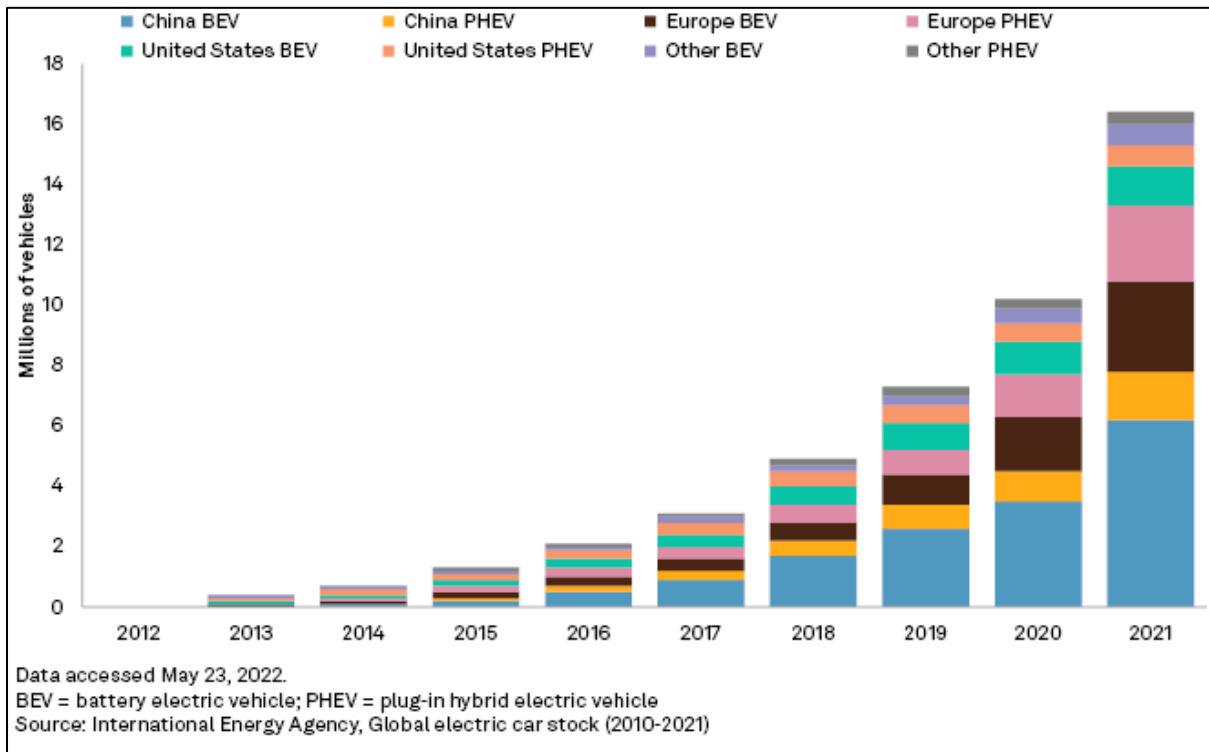


Figure D1. Number of battery and plug-in hybrid electric vehicles in the world 2012-2021

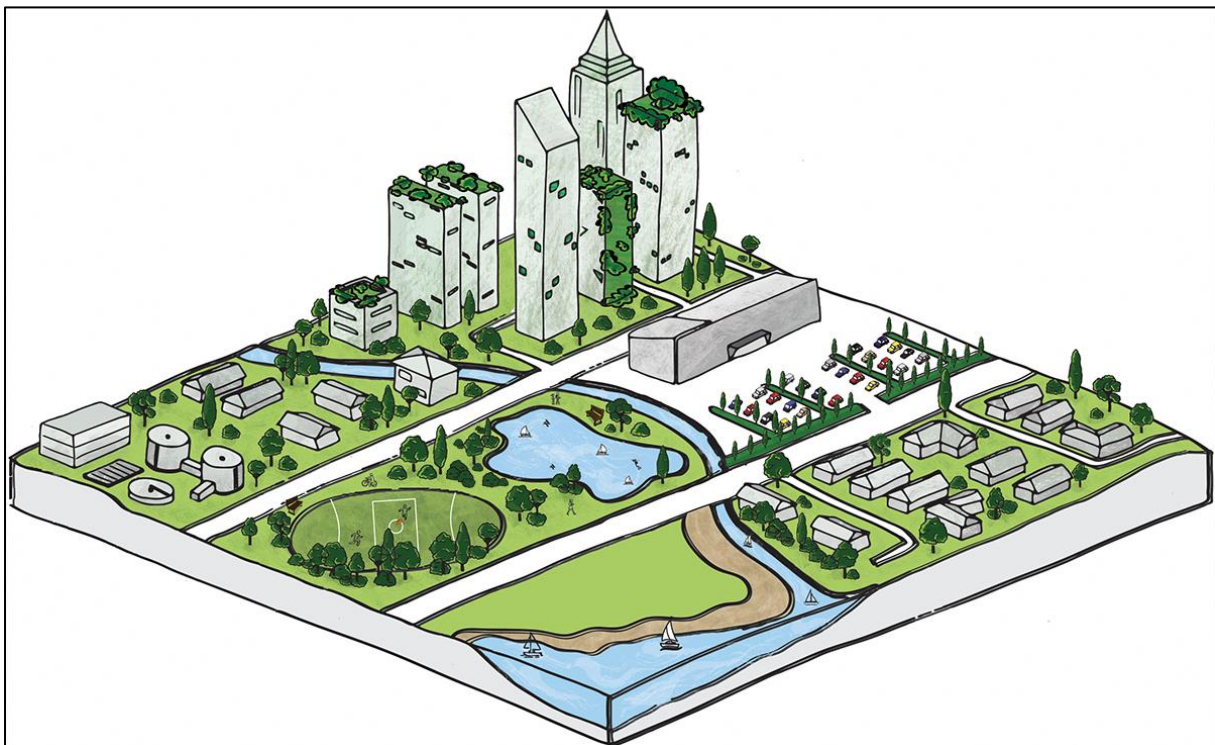


Figure D2. A model of design of a water-sensitive urban city

(<https://watersensitivecities.org.au/solutions/case-studies/>)

Section E: Shorelines

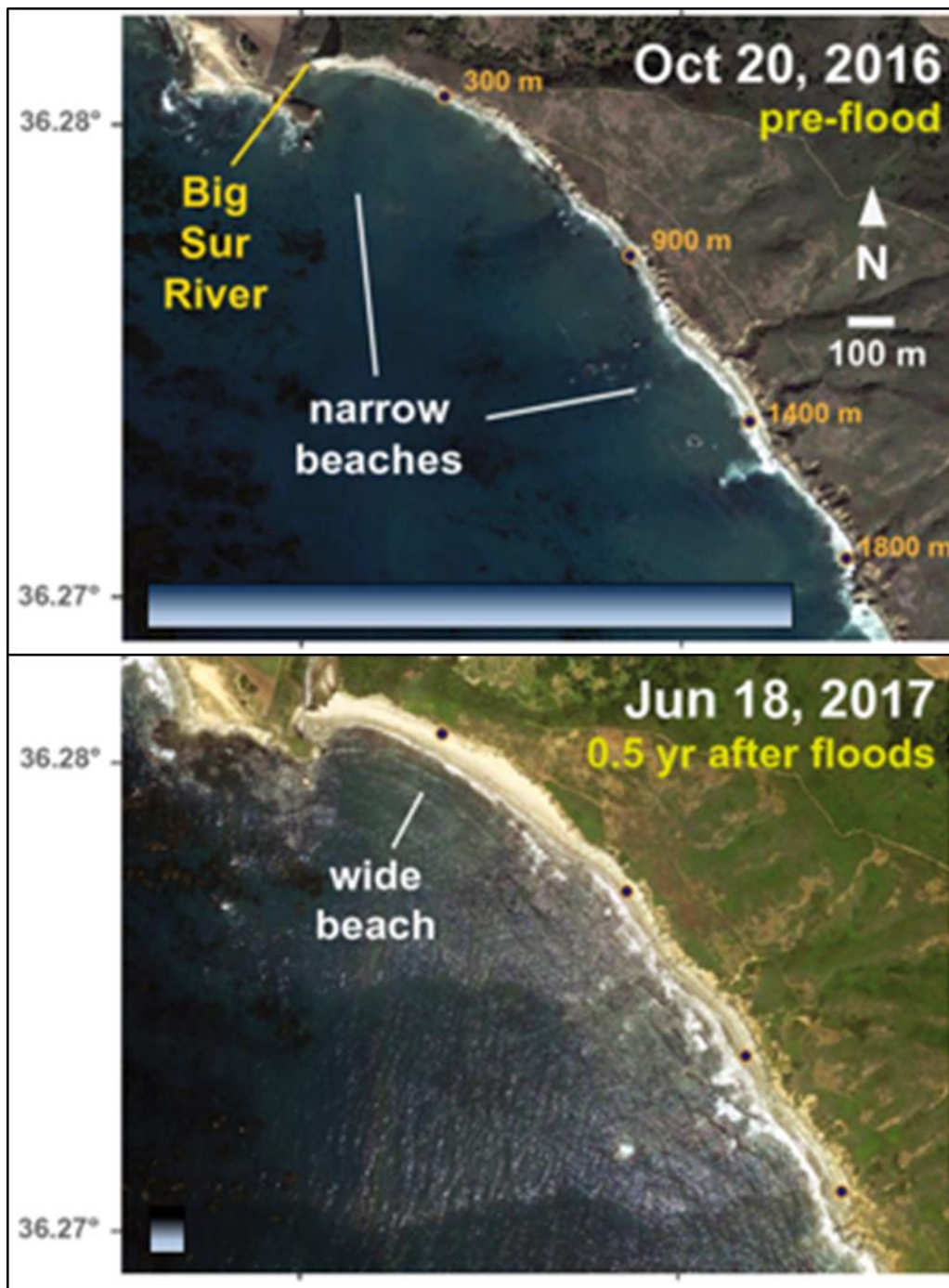


Figure E1. Big Sur River mouth and adjacent beaches before and after the 2016–2017 fire–flood events. The approximate location of the widest beach is highlighted by text in each image.

(https://www.researchgate.net/figure/Imagery-of-the-Big-Sur-River-mouth-and-adjacent-beaches-a-before-and-b-d-after-the_fig4_359121165)

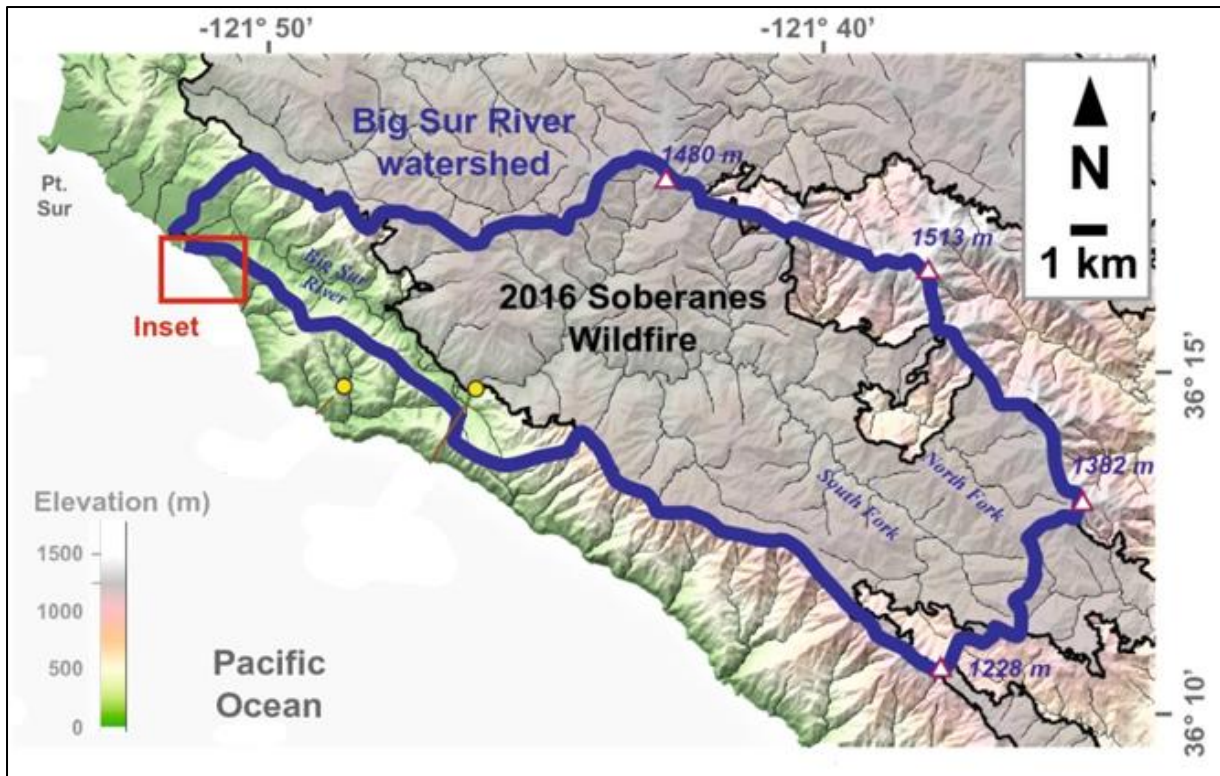


Figure E2. Big Sur River watershed, including the boundaries of the 2016 Soberanes wildfire. “Inset” in the figure shows the location of the images in Figure 1.

(https://www.researchgate.net/figure/Imagery-of-the-Big-Sur-River-mouth-and-adjacent-beaches-a-before-and-b-d-after-the_fig4_359121165)



Figure E3. Oblique aerial photo of the Big Sur River mouth and a coastal feature

(https://www.researchgate.net/figure/Imagery-of-the-Big-Sur-River-mouth-and-adjacent-beaches-a-before-and-b-d-after-the_fig4_359121165)

Section F: Ski tourism

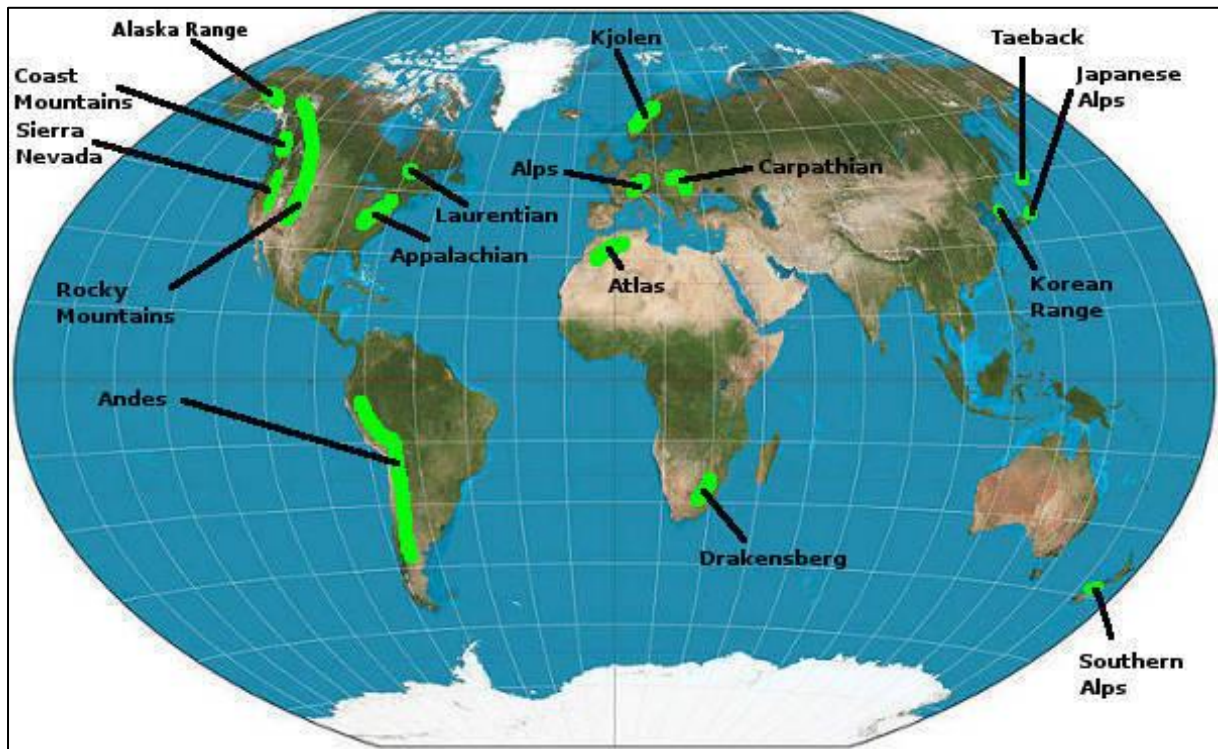


Figure F1. Mountain ranges in the world with developed ski tourism

(<http://www.mountainyahoos.com/SkiResorts/>)

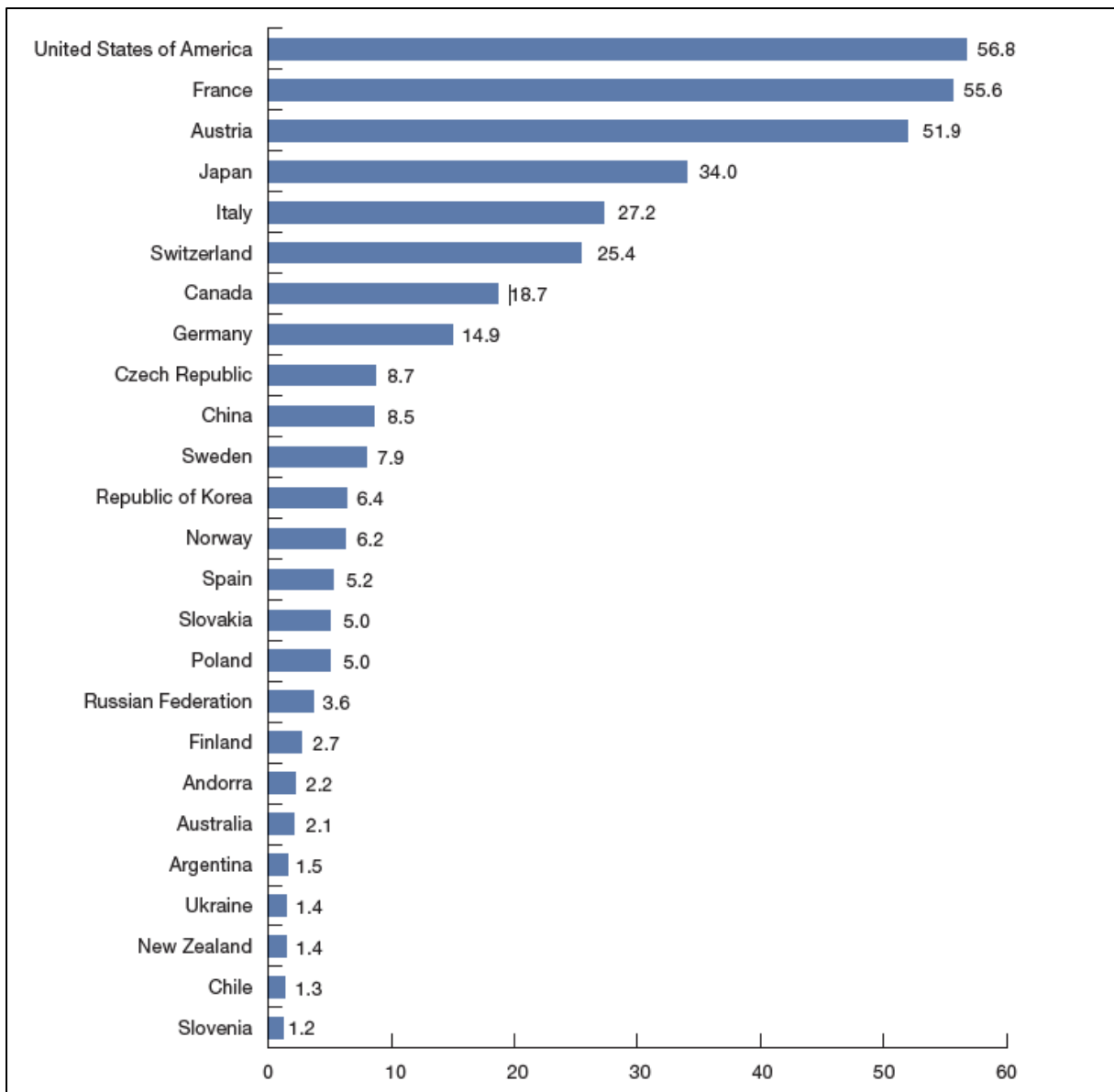


Figure F2. Average annual skier visits 2010-2014 (in million)

(<https://www.e-unwto.org/doi/epdf/10.18111/9789284420261.1>)

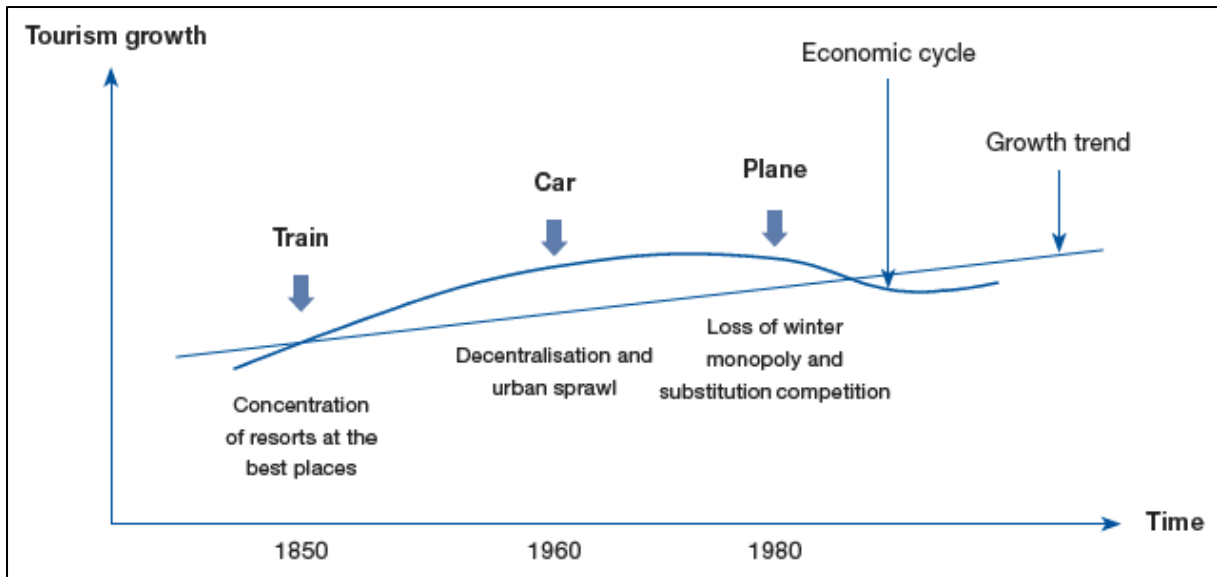


Figure F3. Influence of innovation in transport on mountain tourism growth

(<https://www.e-unwto.org/doi/epdf/10.18111/9789284420261.1>)



Figure F4. Examples of spatial transformation associated with ski tourism

(<https://unofficialnetworks.com/2013/04/09/insane-wingsuit-flight-aiguille-du-midi-bridge/>,
https://www.researchgate.net/publication/311788786_Zum_Management_der_Biodiversitat_von_Tourismus-und_Wintersportgebieten_in_einer_Ara_des_globalen_Wandels)

end ■