15th Hungarian Geographical Contest 2024/25

2nd Round

Written Test

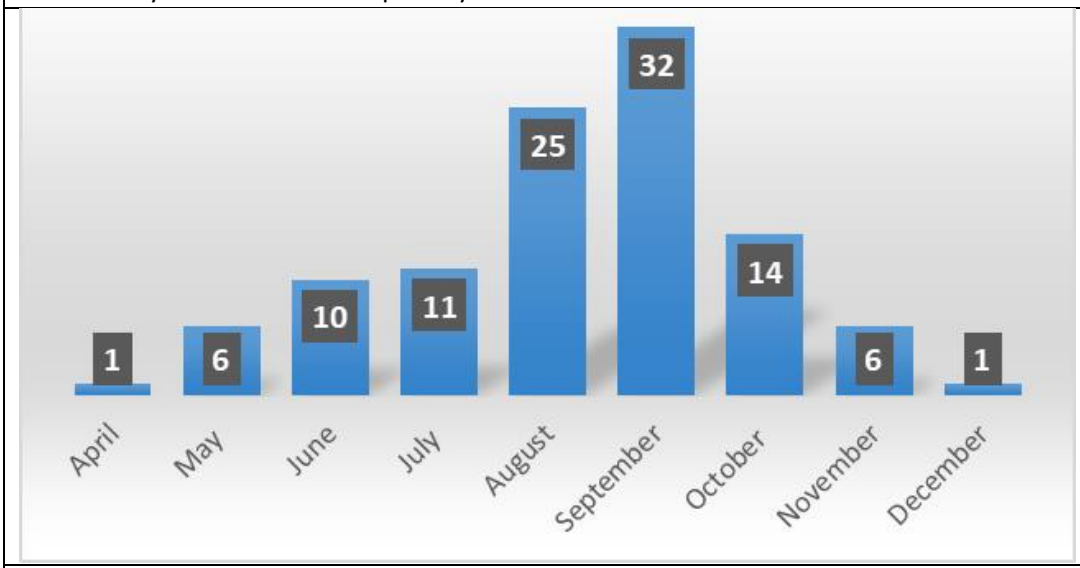
Source Booklet

13 December 2024

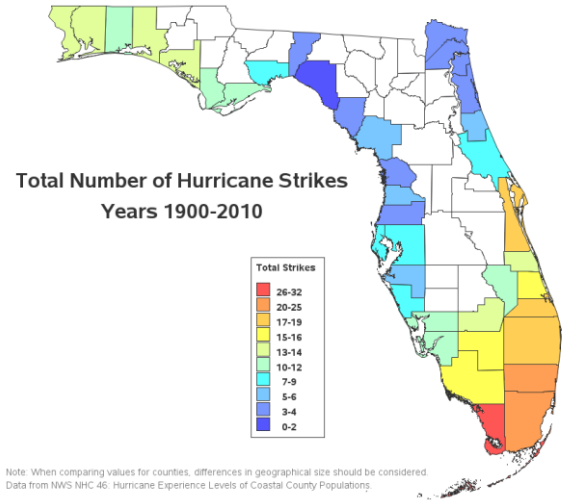
Do NOT open the booklet until told to do so by a supervisor!

Your answer will NOT be marked if you write it in this booklet!

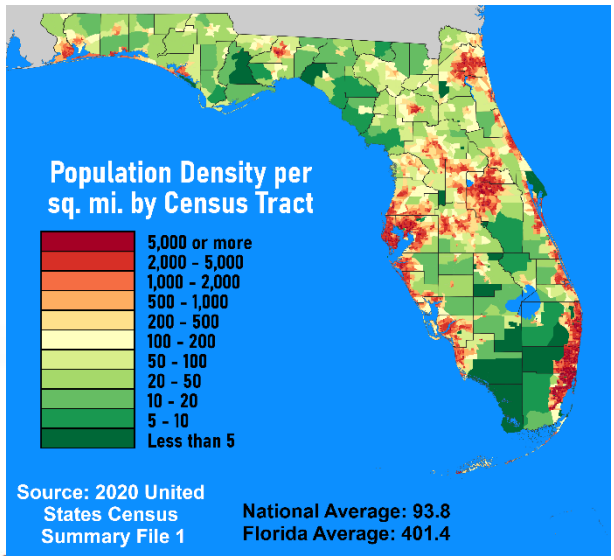
A.4 Monthly distribution of tropical cyclones in Florida



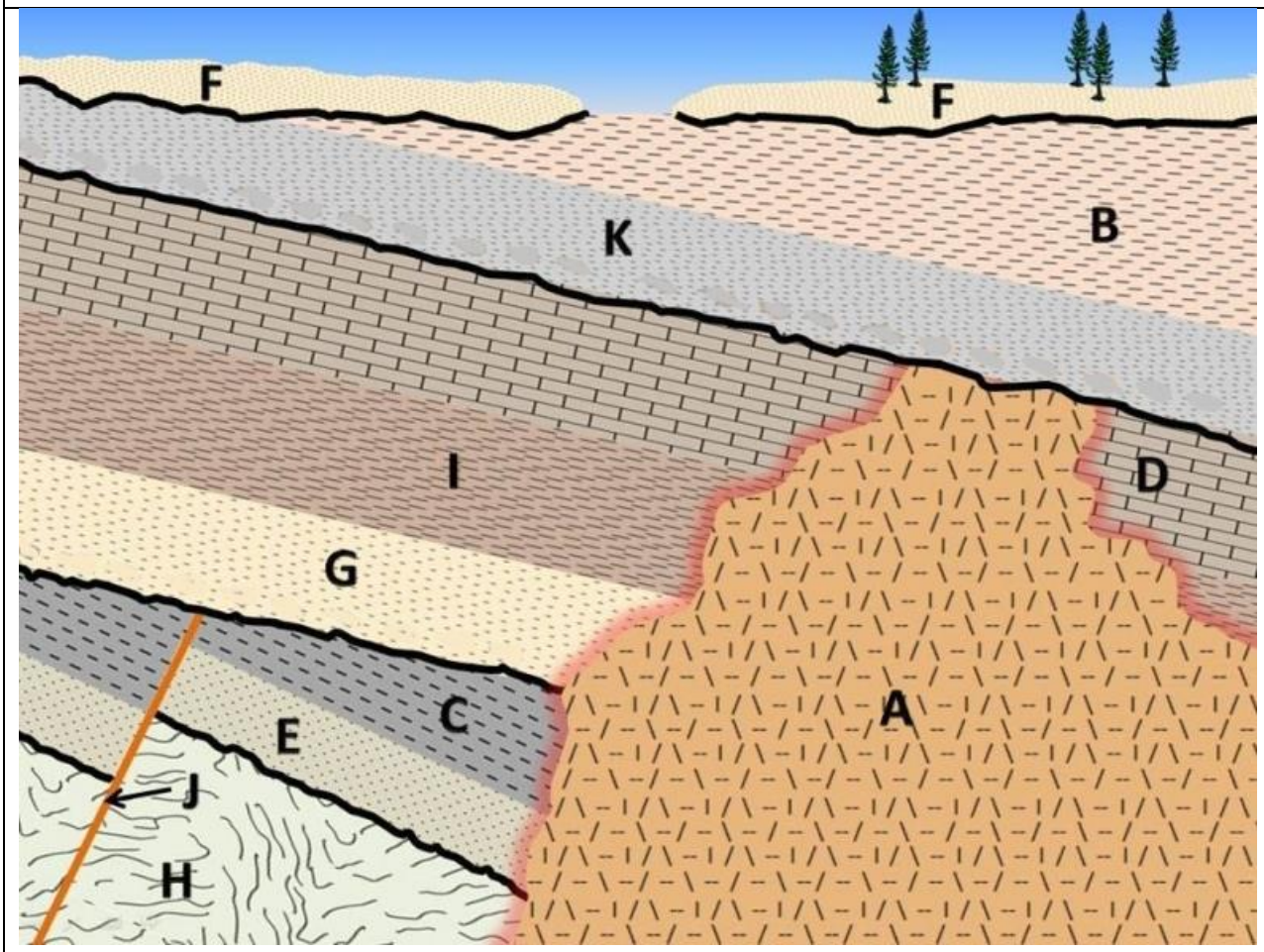
A.5.1. Number of hurricane strikes and hurricane tracks



A.5.2. Additional maps about Florida

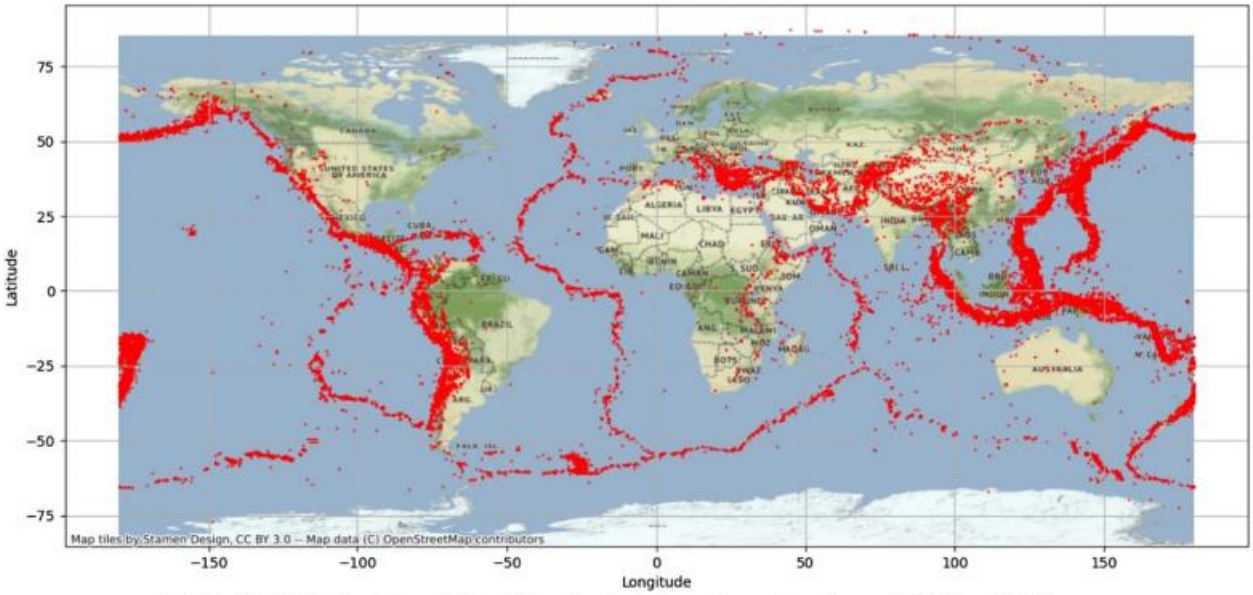


B.1. Theoretical cross section



Source: Coalition for Earth System Educators

2.1. Distribution of eartquakes

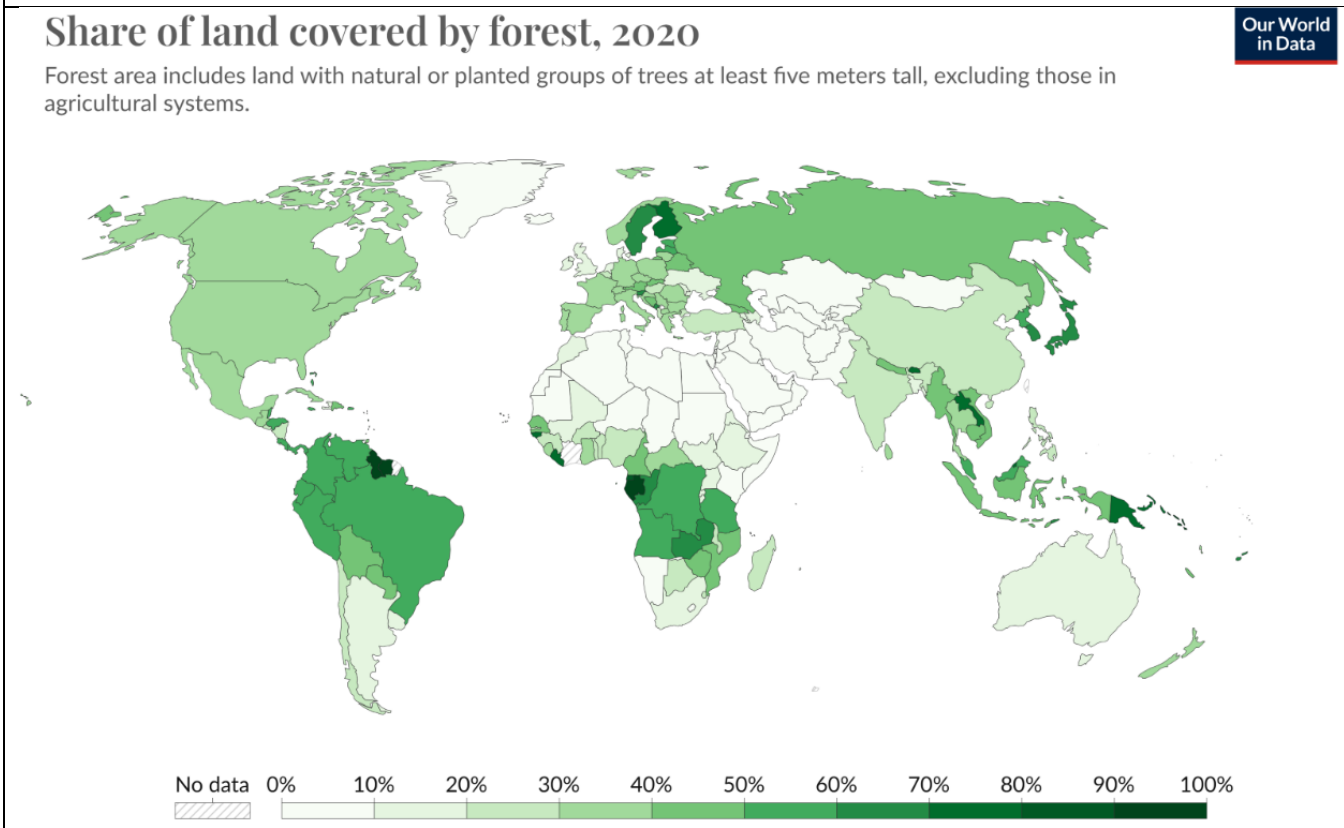


(b) Spatial distribution of significant global earthquakes from 1900 to 2023

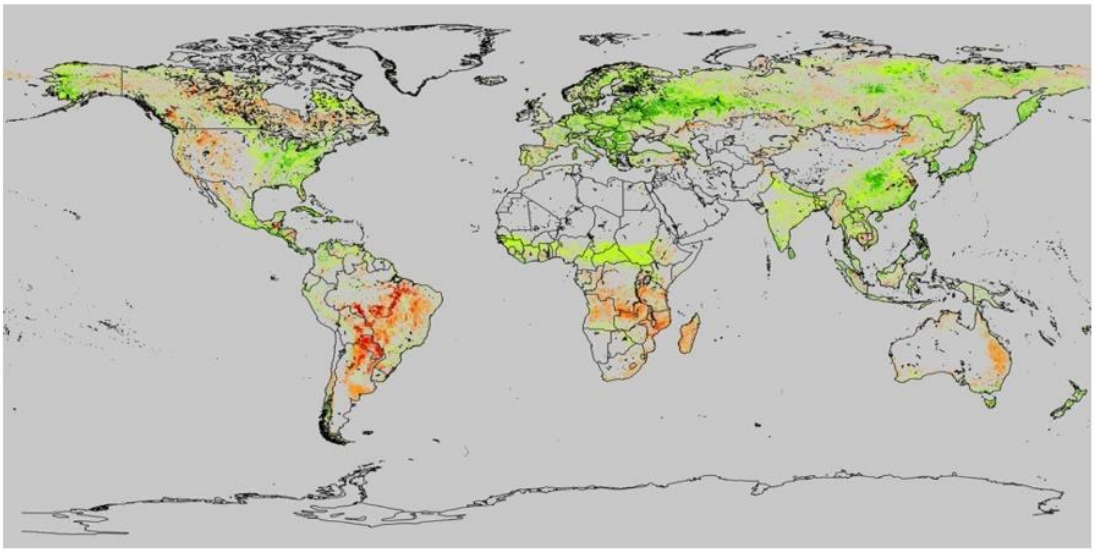
Source: Ibrahim, M., Al-Bander, B. An integrated approach for understanding global earthquake patterns and enhancing seismic risk assessment. *Int. j. inf. tecnol.* **16**, 2001–2014 (2024). https://doi.org/10.1007/s41870-024-01778-1

C. Let them grow!

C.2.1.



C.2.2. Map of global tree loss



Map of global tree loss/tree gain since the early 1980s derived from NASA Landsat and NOAA AVHRR optical imagery, revised by Sassan Saatchi from Song et al., 2016.
NASA/JPL-Caltech/Sassan Saatchi

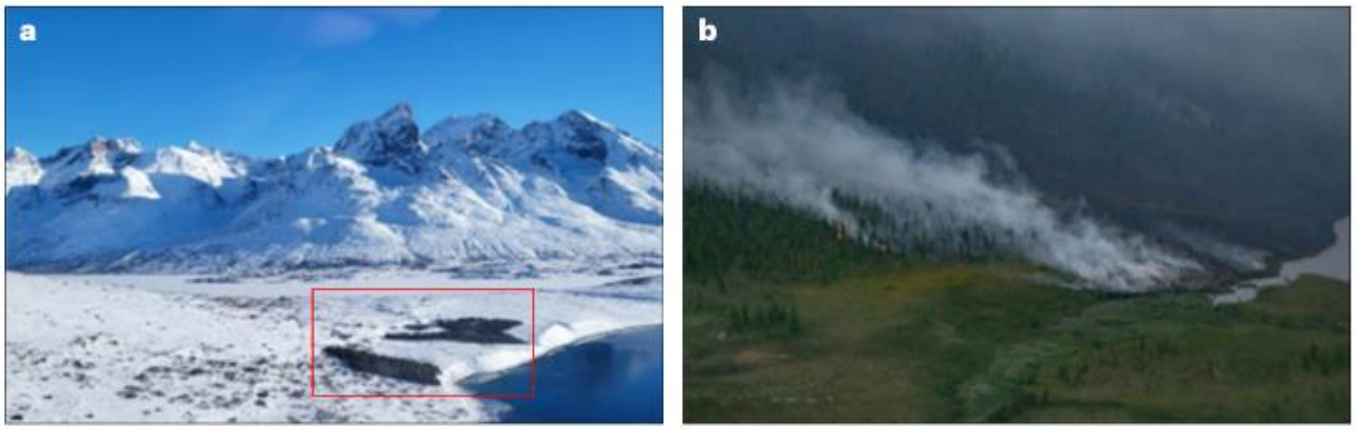
(red indicates net loss of tree cover, green indicates net gain)

C.3.1. "Drawing on the definition used by the Food and Agriculture Organization (FAO) of the United Nations (UN), WRI and the IUCN (among others) define forests as areas that are covered in trees with canopy cover of at least 10% "

C.3.2.

C.3.3. “Senate Bill 48 empowers the State of Alaska to grow our economy by more fully utilizing the state’s forests and tidelands,” said DNR Commissioner John Boyle. “By incentivizing active forest management through carbon offset projects, we can increase the health and productivity of our forests, (...) and create new jobs and opportunities for Alaskans across the state. I’d like to thank Governor Dunleavy and the legislature for recognizing this nascent opportunity and setting a new benchmark for environmental stewardship and responsible resource development.”

C.3.4.



D. The GM Agriculture

D.1. A genetically modified organism (GMO) is an organism whose genome has been engineered in the laboratory in order to favour the expression of desired physiological traits or the generation of desired biological products. In conventional livestock production, crop farming, and even pet breeding, it has long been the practice to breed select individuals of a species to produce offspring with desirable traits. In genetic modification, however, recombinant genetic technologies are employed to produce organisms whose genomes have been precisely altered at the molecular level, usually by including genes from unrelated species of organisms that code for traits that would not be obtained easily through conventional selective breeding. GMOs produced through genetic technologies have become a part of everyday life, entering society through agriculture, medicine, research, and environmental management. However, while GMOs have benefited human society in many ways, some disadvantages exist; therefore, the production of GMOs remains a highly controversial topic in many parts of the world. Genetically modified (GM) foods were first approved for human consumption in the United States in 1994. By 2014–15, about 90% of the corn, cotton, and soybeans planted in the United States were GM. By the end of 2014, GM crops covered nearly 1.8 million square kilometres (695,000 square miles) of land in more than two dozen countries worldwide. The majority of GM crops were grown in the Americas.

Engineered crops can dramatically increase per-area crop yields and, in some cases, reduce the use of chemical insecticides. For example, the application of wide-spectrum insecticides declined in many areas, growing plants, such as potatoes, cotton, and corn, endowed with a gene from the bacterium *Bacillus thuringiensis*, which produces a natural insecticide called Bt toxin. Field studies conducted in India in which Bt cotton was compared with non-Bt cotton demonstrated a 30–80% increase in yield from the GM crop. This increase was attributed to a marked improvement in the GM plants' ability to overcome bollworm infestation, which was otherwise common. Studies of Bt cotton production in Arizona, U.S., demonstrated only small gains in yield—about 5%—with an estimated cost reduction of $25–$65 (USD) per acre owing to decreased pesticide applications. In China, where farmers first gained access to Bt cotton in 1997, the GM crop was initially successful. Farmers who had planted Bt cotton reduced their pesticide use by 50–80% and increased their earnings by as much as 36%. By 2004, however, farmers who had been growing Bt cotton for several years found that the benefits of the crop eroded as populations of secondary insect pests, such as mirids, increased. Farmers once again were forced to spray broad-spectrum pesticides throughout the growing season, such that the average revenue for Bt growers was 8% lower than that of farmers who grew conventional cotton. Meanwhile, Bt resistance had also evolved in field populations of major cotton pests, including the cotton bollworm (*Helicoverpa armigera*) and the pink bollworm (P*ectinophora gossypiella*).

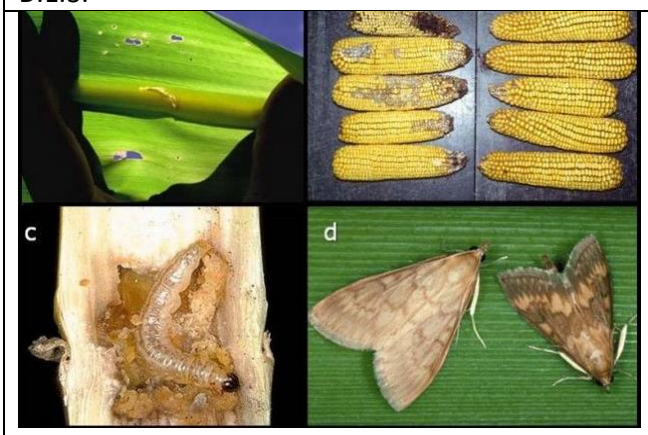
Other GM plants were engineered for resistance to a specific chemical herbicide rather than resistance to a natural predator or pest. Herbicide-resistant crops (HRC) have been available since the mid-1980s; these crops enable effective chemical control of weeds since only the HRC plants can survive in fields treated with the corresponding herbicide. Many HRCs are resistant to glyphosate (Roundup), enabling liberal application of the chemical, which is highly effective against weeds. Such crops have been especially valuable for no-till farming, which helps prevent soil erosion. However, because HRCs encourage increased application of chemicals to the soil rather than decreased application, they remain controversial with regard to their environmental impact. In addition, in order to reduce the risk of selecting herbicide-resistant weeds, farmers must use multiple diverse weed-management strategies.

Another example of a GM crop is golden rice, originally intended for Asia and genetically modified to produce almost 20 times the beta-carotene of previous varieties. Golden rice was created by modifying the rice genome to include a gene from the daffodil *Narcissus pseudonarcissus* that produces an enzyme known as phytoene synthase and a gene from the bacterium *Erwinia uredovora* that produces an enzyme called phytoene desaturase. The introduction of these genes enabled beta-carotene, which is converted to vitamin A in the human liver, to accumulate in the rice endosperm—the edible part of the rice plant—thereby increasing the amount of beta-carotene available for vitamin A synthesis in the body. In 2004, the same researchers who had developed the original golden rice plant improved upon the model, generating golden rice 2, which showed a 23-fold increase in carotenoid production.

https://www.britannica.com/science/genetically-modified-organism

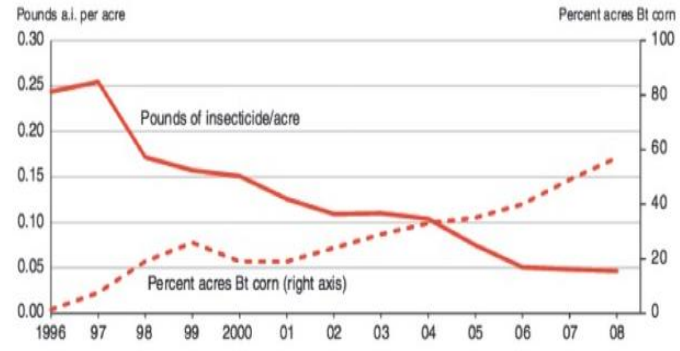
D.1.2. GMOs The number of genetically modified crops and the areas cultivated with them are steadily increasing worldwide. In the EU, only one GM maize is currently cultivated, but many other GMO crops are authorised for food and feed use. However, products derived from or containing GMOs are strictly controlled with zero tolerance for unauthorised GMOs. Authorisation depends on a thorough risk assessment and on the availability of a validated method for detecting, identifying, and quantifying the GMO in food or feed. Biotech companies who wish to bring their product to the market need to submit an application for each GM launch. Part of the application dossier includes a very specific method of detection of each particular GMO. The EU's Joint Research Centre (JRC) is responsible for validating these methods through its European Union Reference Laboratory for GM Food and Feed. The currently used methods rely on certified reference materials (CRM) which are also produced by the JRC. As part of its effort to ensure that the official control laboratories in all EU Member States have the same capacity to detect, identify and quantify GMOs reliably, the JRC not only validates but also develops and optimises GMO testing methods, runs the European Network of GMO Laboratories (ENGL) and organises proficiency testing for control laboratories. https://www.efsa.europa.eu/en/topics/genetically-modified-organisms

D.1.3.

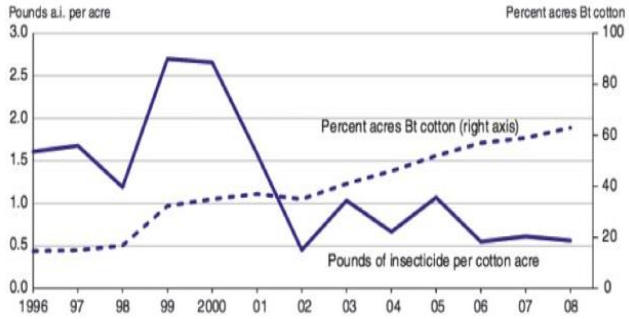


D.1.4.

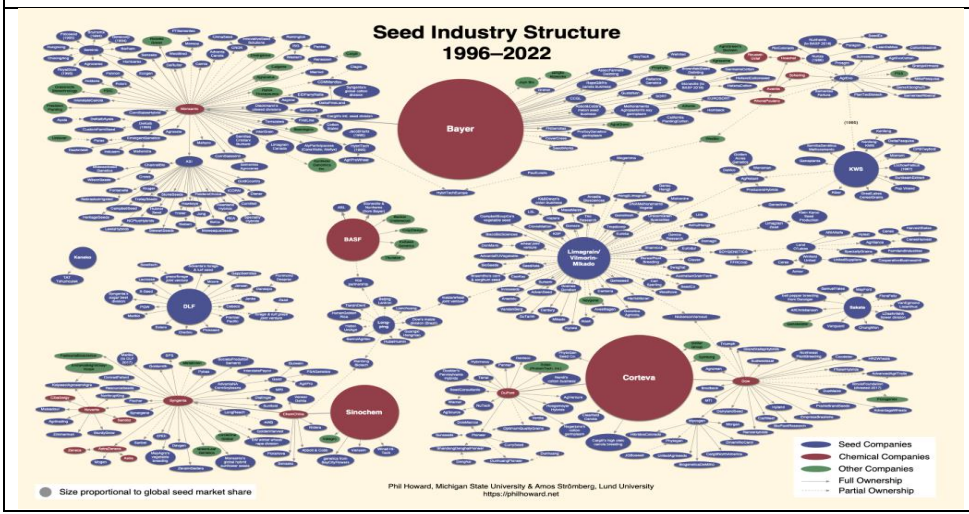
D.1.5.



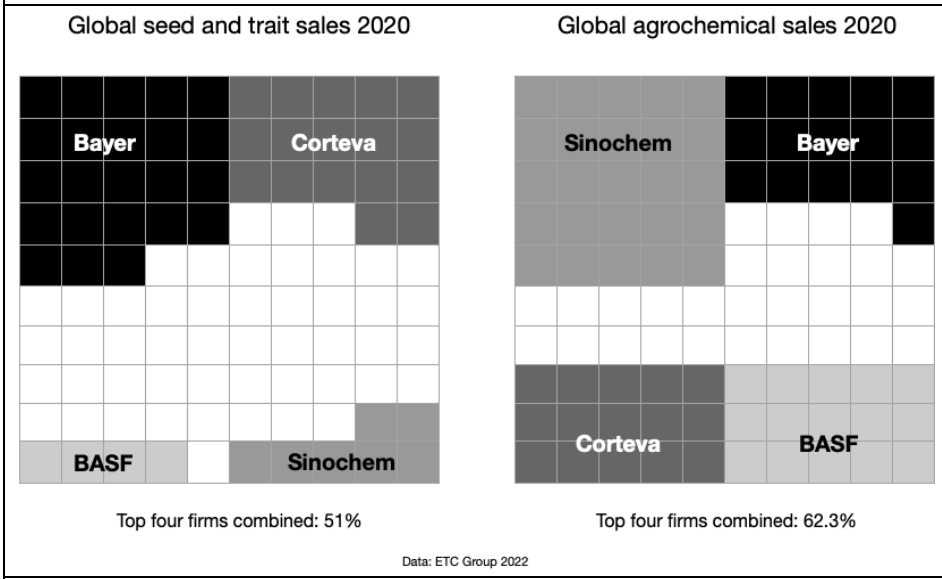
D.1.6.



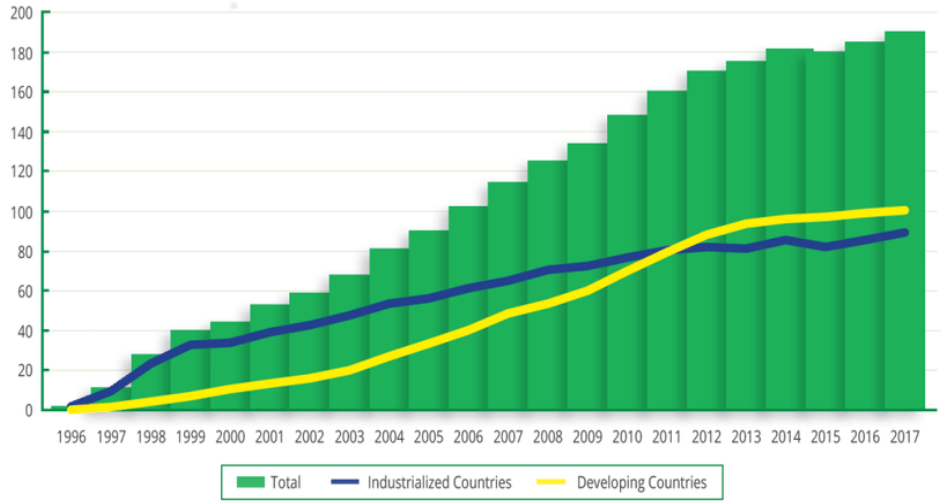
D.2.1.



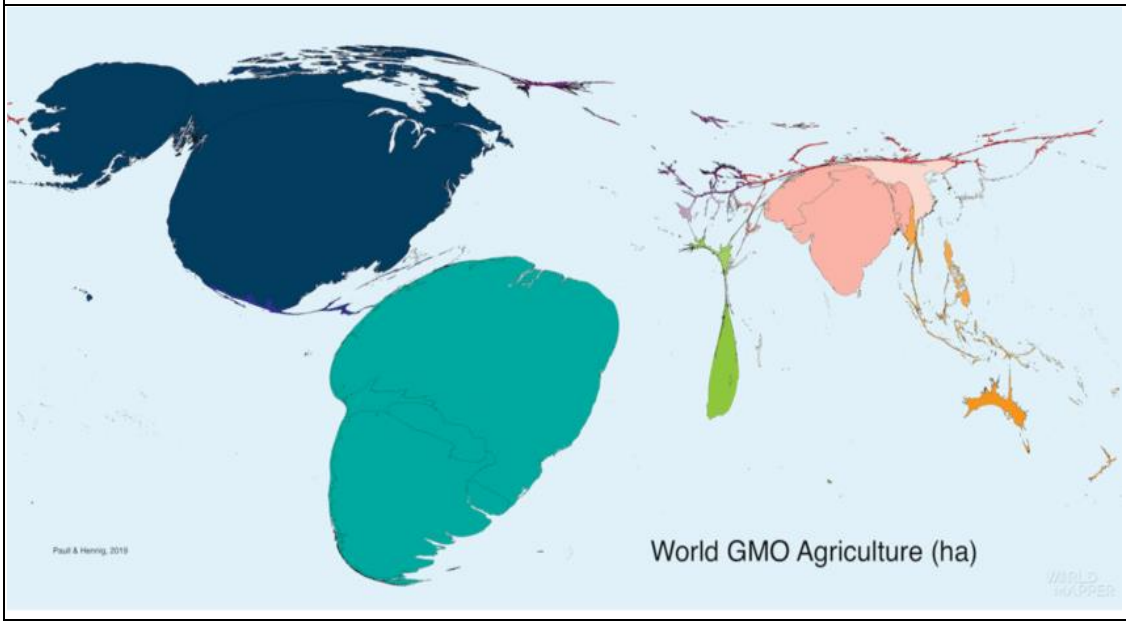
2.2.



2.3. Total global area of GM crops in industrial and developing countries in millions ha (ISAAA, 2017a)

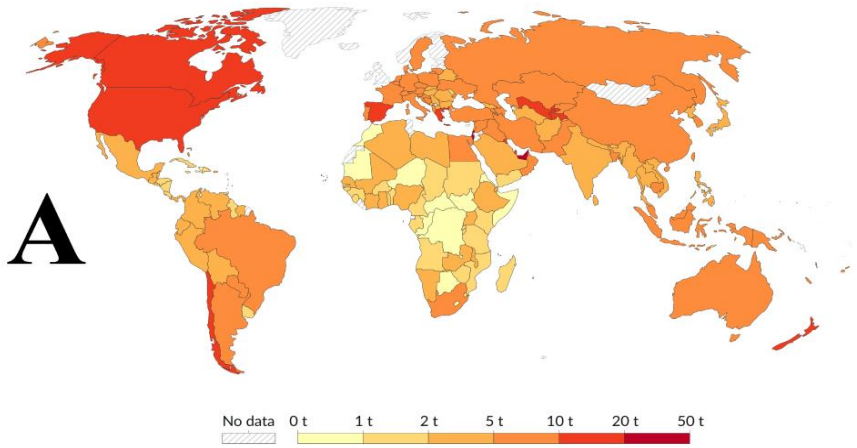


2.4.

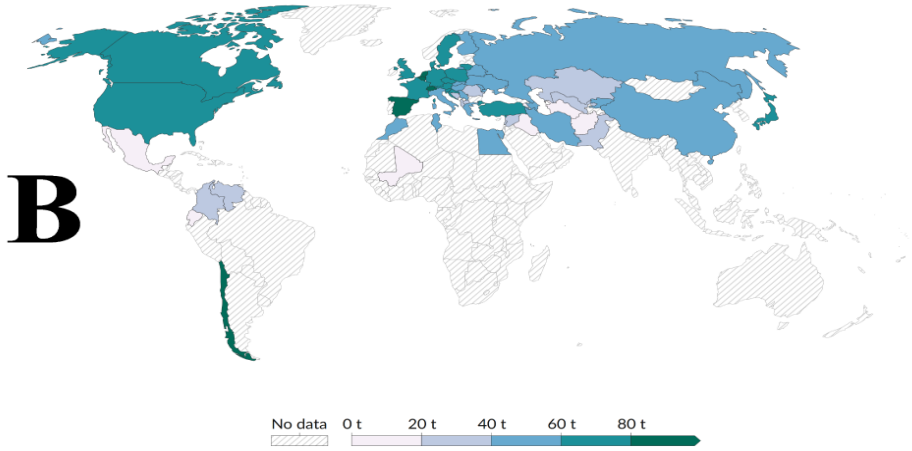


D.3.

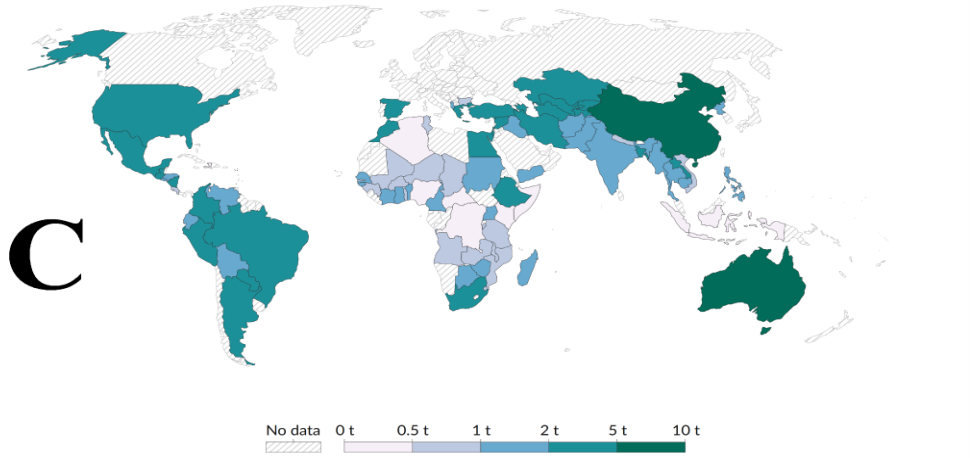
Yields are measured in tonnes per hectare.



Data source: USDA National Agricultural Statistics Service (NASS) (2024); Food and Agriculture Organization of the United Nations (2023)
OurWorldinData.org/crop-yields | CC BY



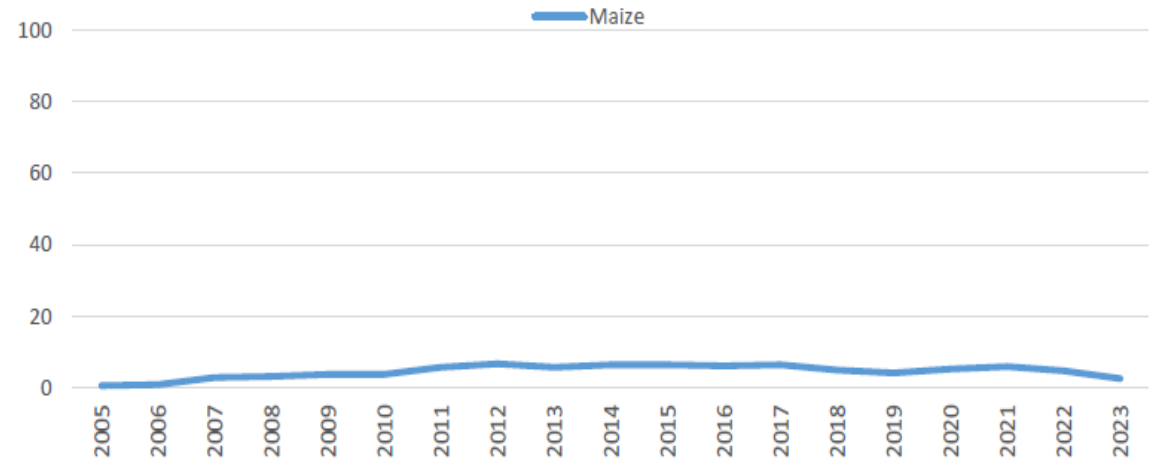
Data source: Food and Agriculture Organization of the United Nations (2023); Brassley (2000) OurWorldinData.org/crop-yields | CC BY



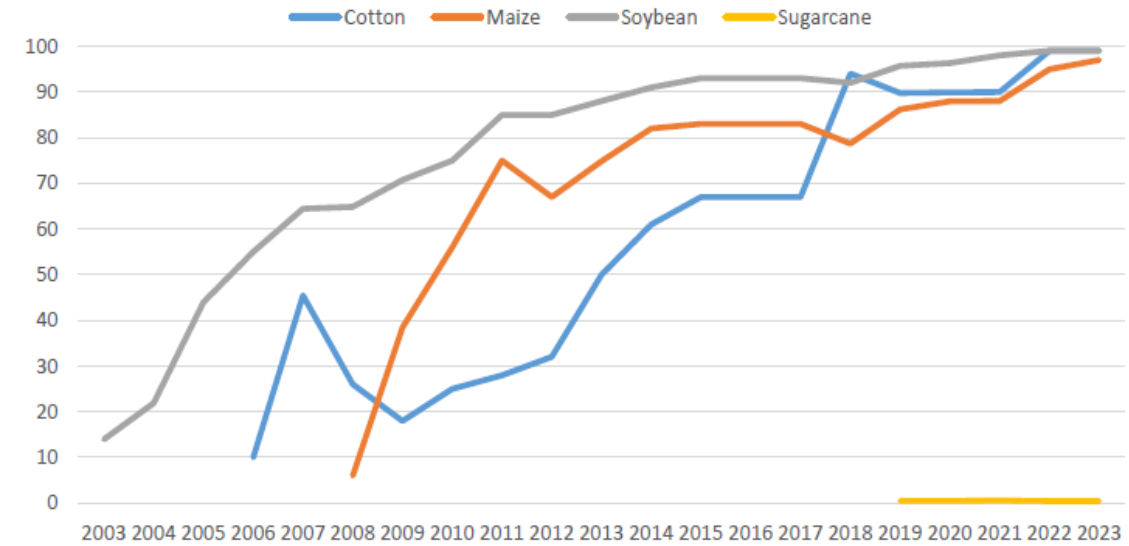
Data source: Food and Agriculture Organization of the United Nations (2023) OurWorldinData.org/crop-yields | CC BY

D.4. Share of GMO-corps of the total production in the country's agricultural output

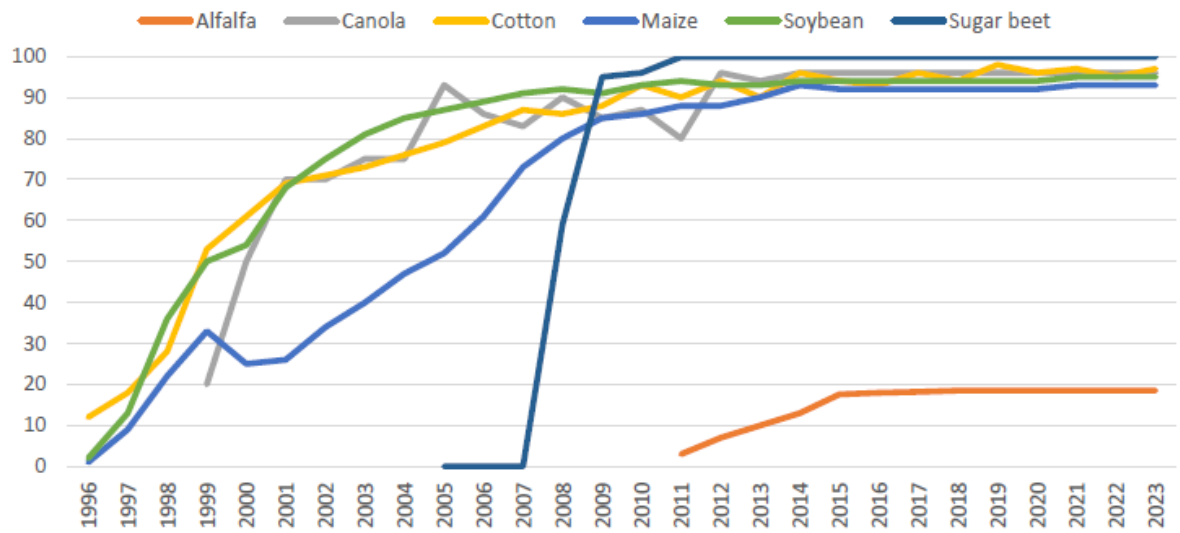
A



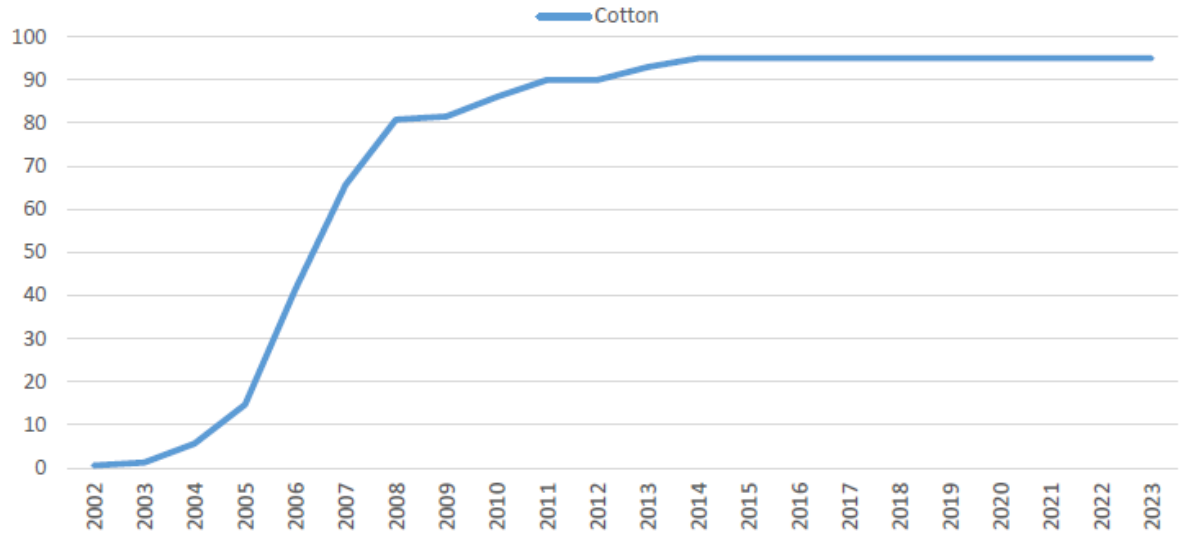
B



C



D


Cotton
100
90
80
70
60
50
40
30
20
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0
2002
2003
2004
2005
2006
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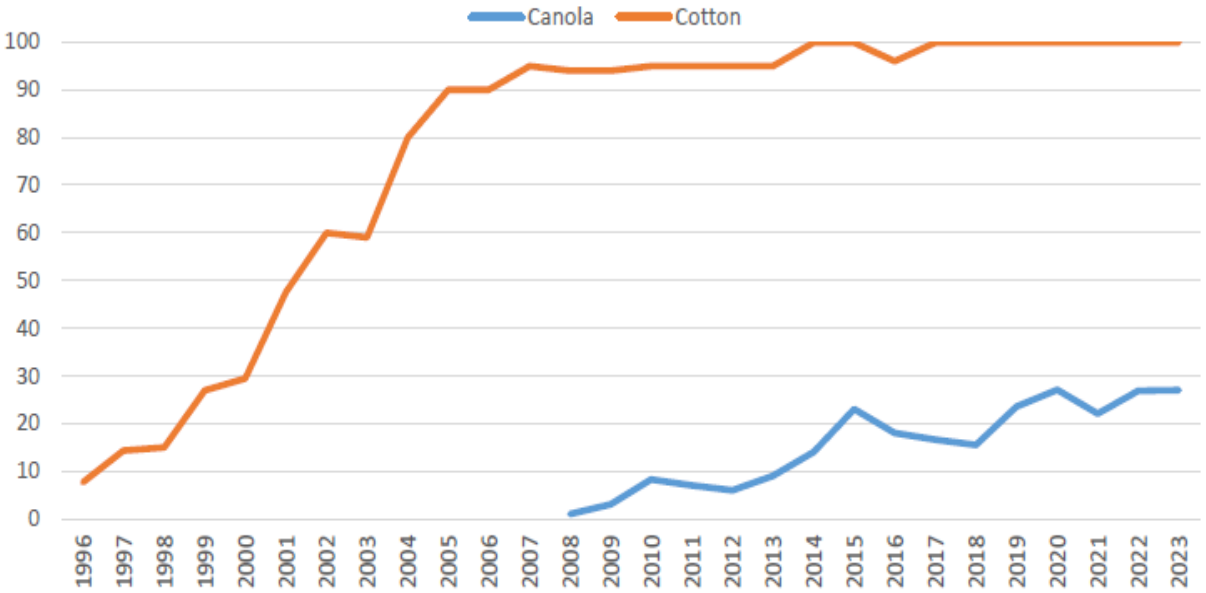
2020
2021
2022
2023

E


Canola
Cotton
100
90
80
70
60
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20
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1996
1997
1998
1999
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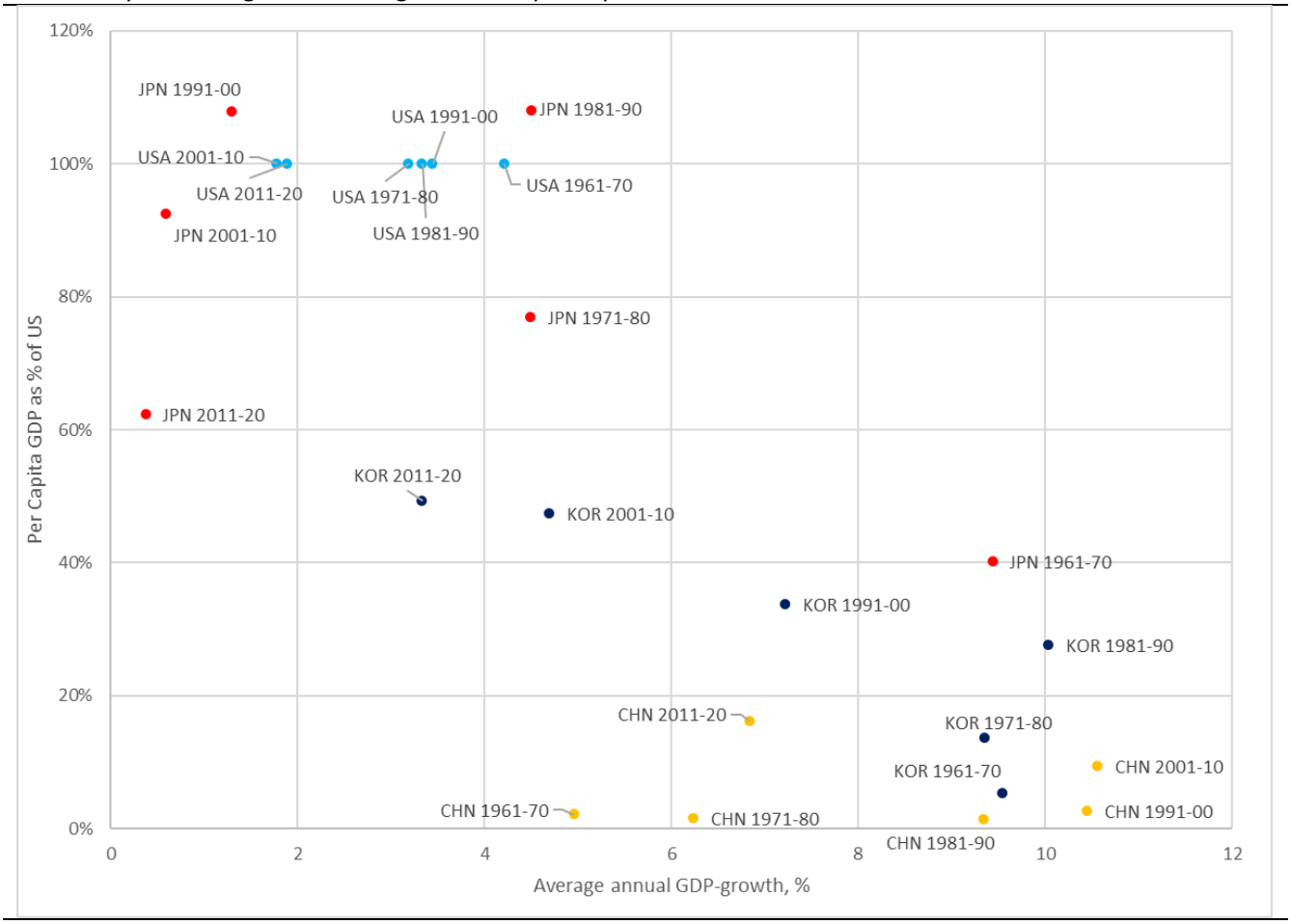
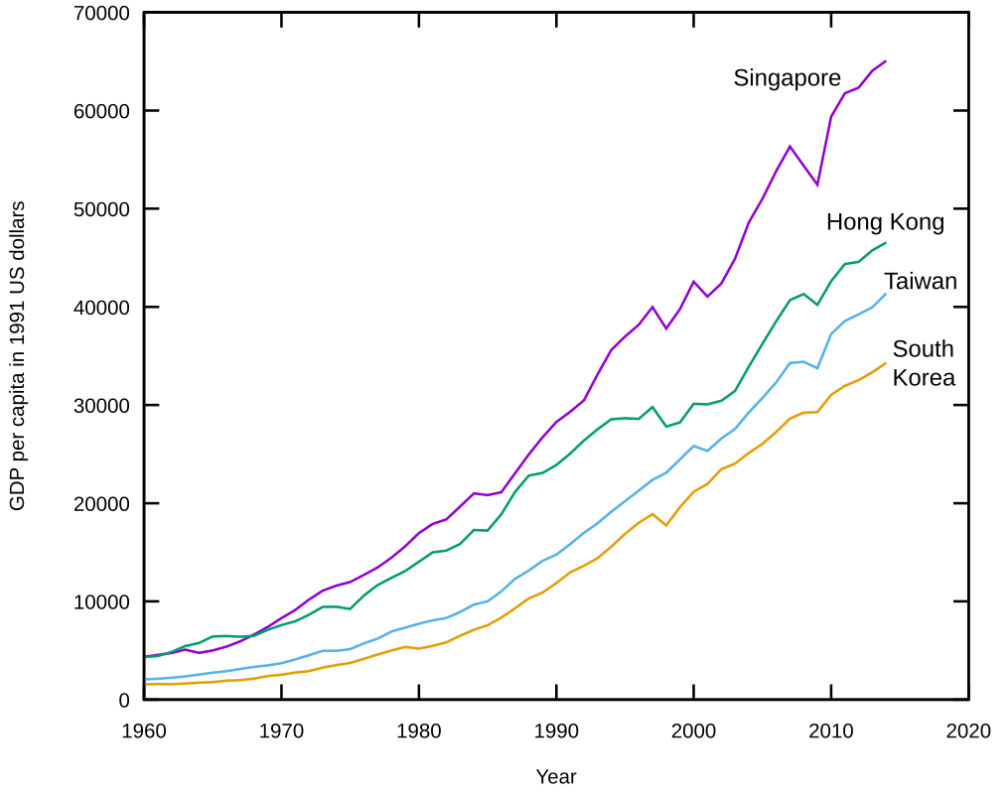
2023

E. Beyond the K-pop

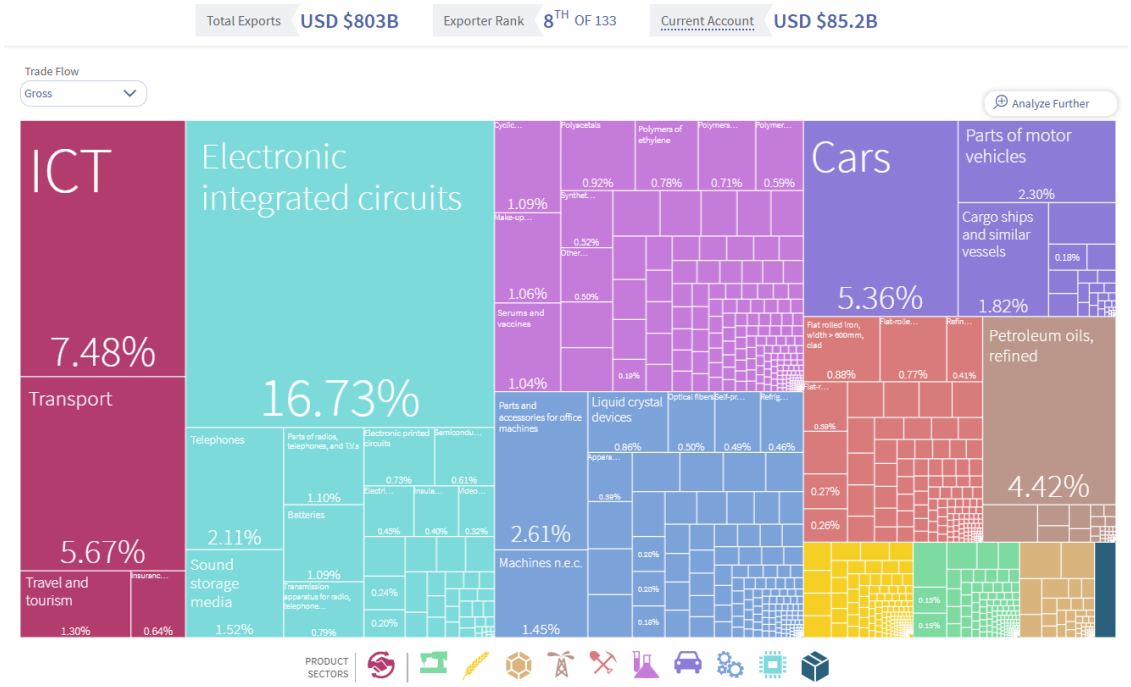
E.1.1. 10-year average economic growth and per capita GDP of selected countries



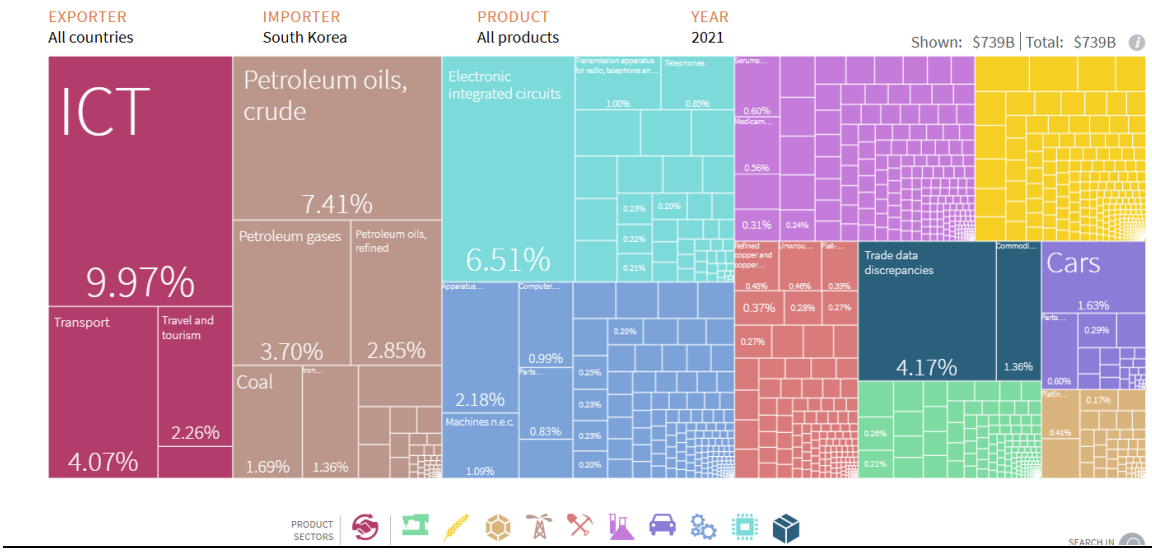
E.1.2. Per capita GDP growth of the Tiger economies



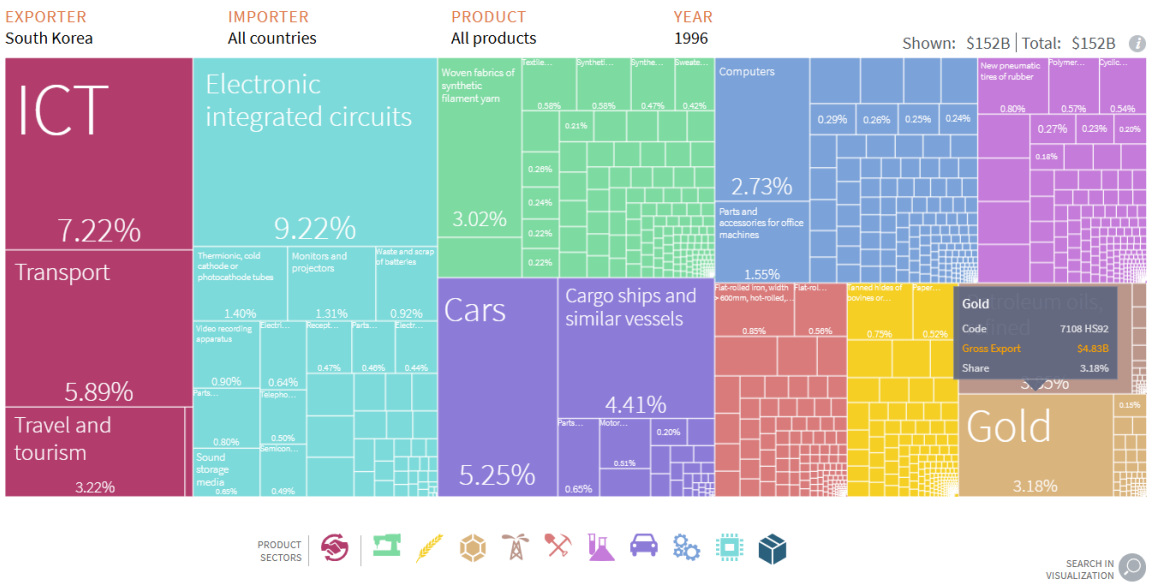
E.2.1. Export of South Korea, 2021



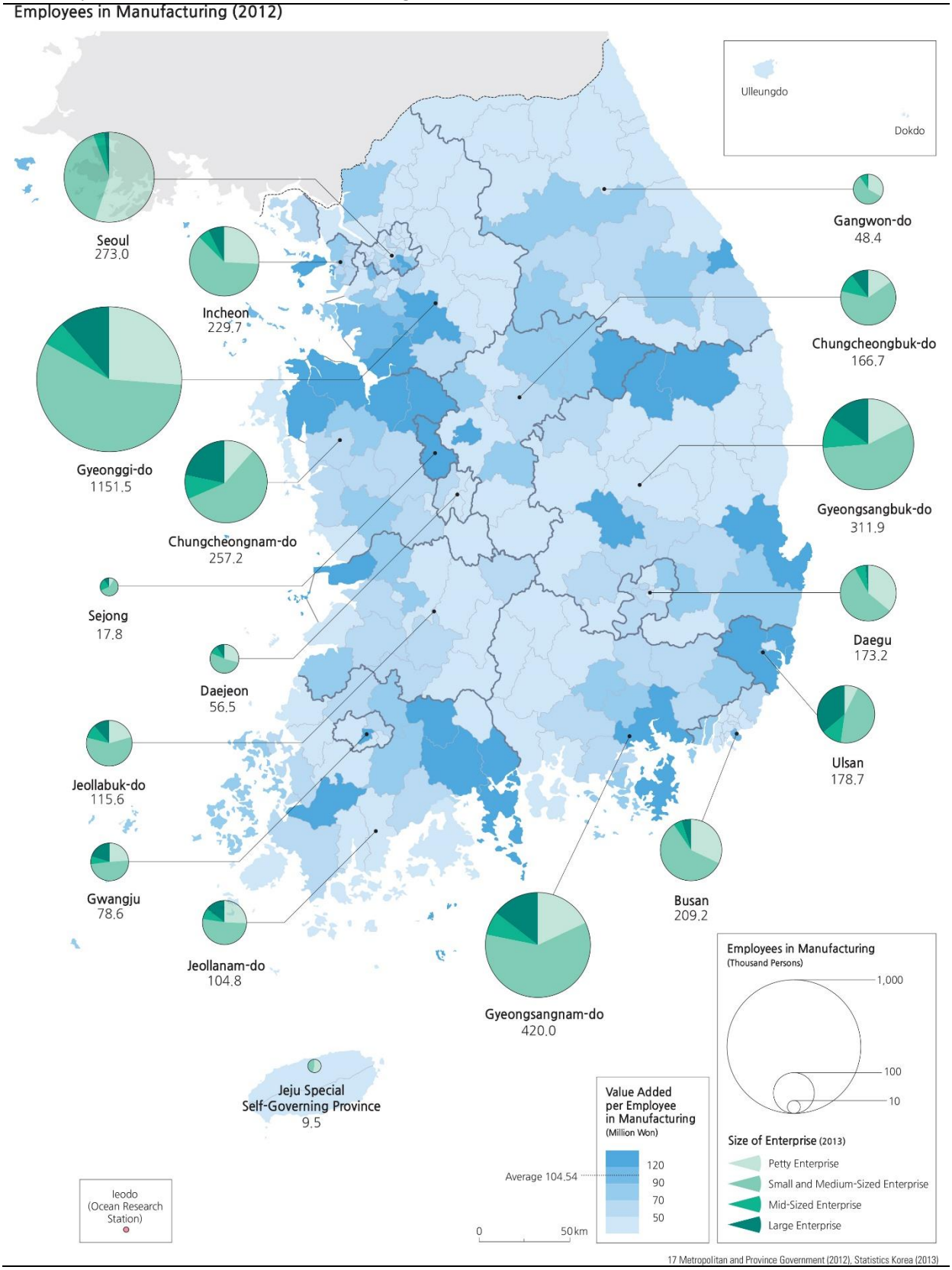
E.2.2. Import of South Korea, 2021



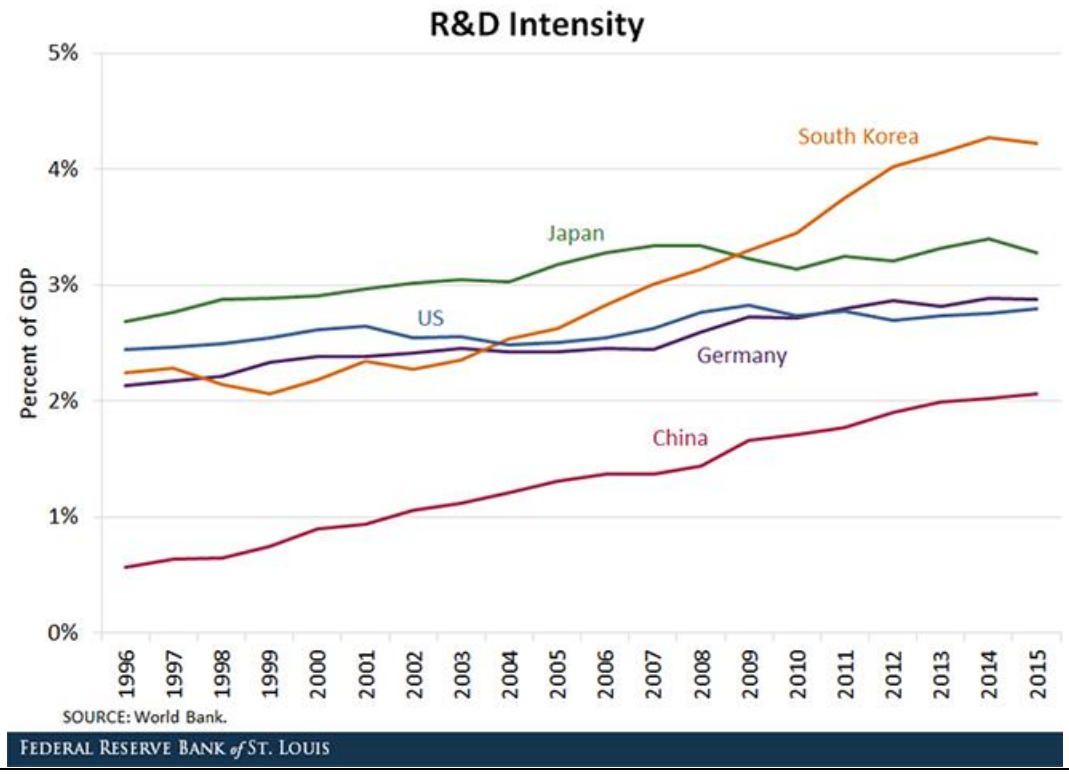
E.2.2. Export of South Korea, 1996



E.2.3. Spatial structure of the manufacturing sector in South Korea



E.3.1. Research and development expenditures of selected countries

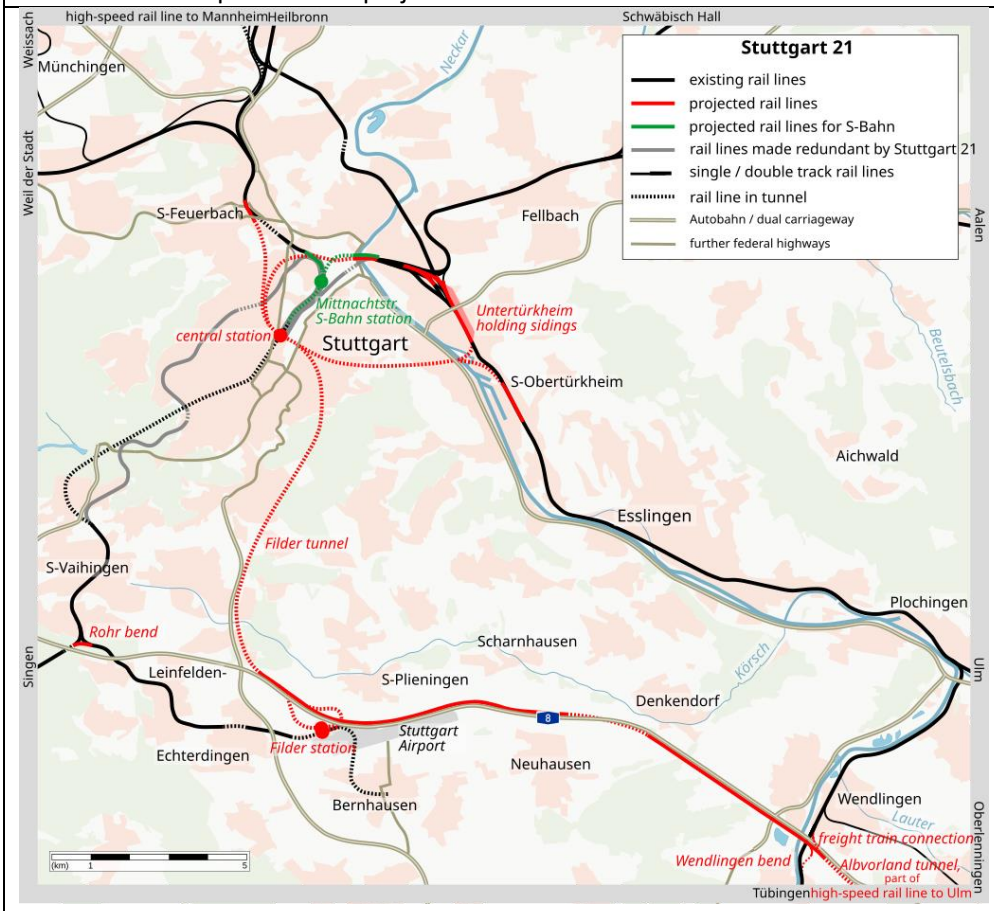


E.3.2. The most innovative economies worldwide

Source: From Statista, based on Bloomberg data

F. Stuttgart 21

F.1. Overlook map about the project's main investments



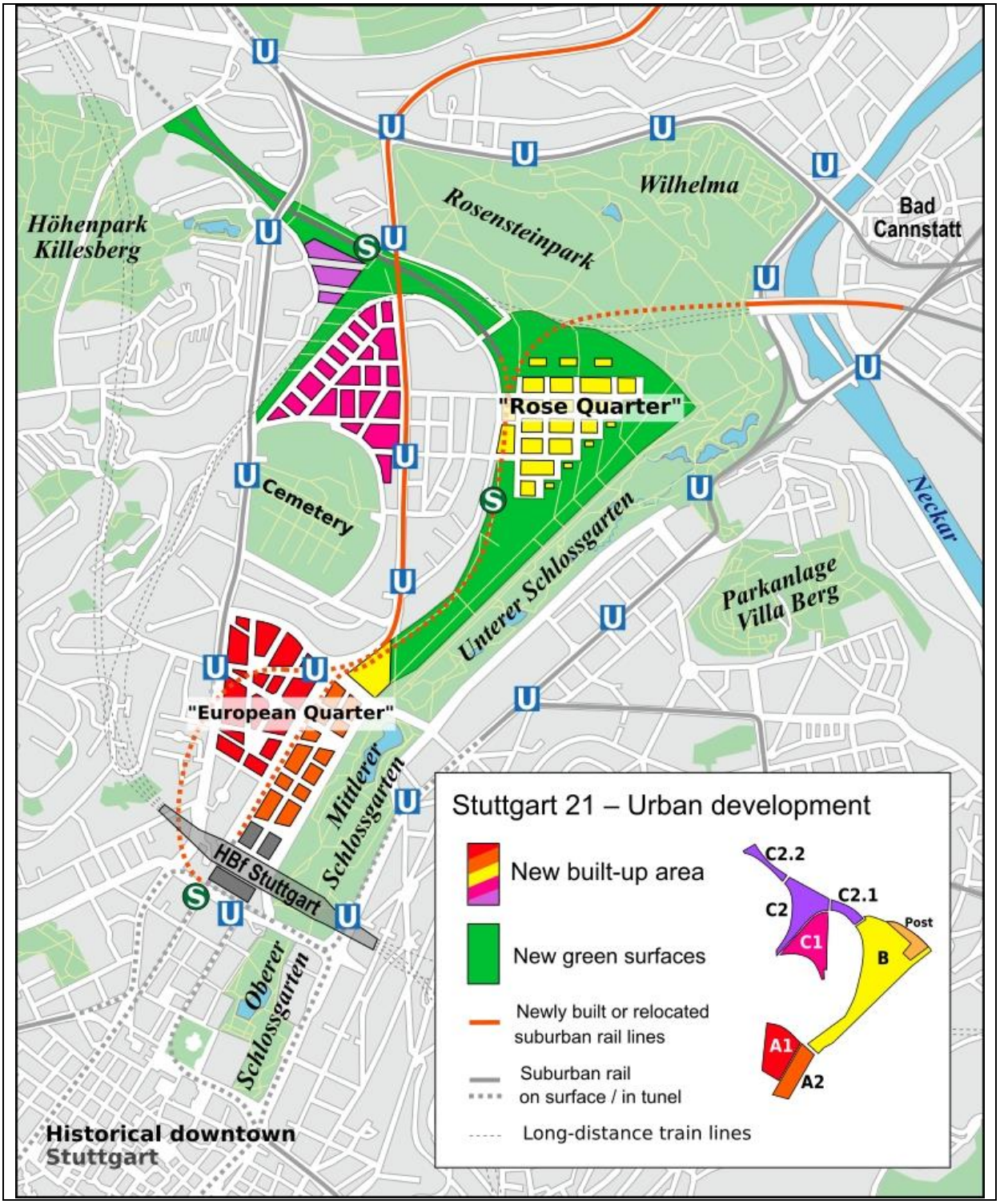
F.3. Rail tunnels under construction in downtown of Stuttgart

F.4. Conceptual plan of the new railway station

F.5. The new design of the station and the old structures

F.6. Overlook map of the development zones

F.7. Development zones and new railway lines


Höhenpark Killesberg
Rosensteinpark
Wilhelma
Bad Cannstatt
"Rose Quarter"
Cemetery
Unterer Schlossgarten
Neckar
Parkanlage Villa Berg
"European Quarter"
Mittlerer Schlossgarten
HBf Stuttgart
Oberer Schlossgarten
Historical downtown Stuttgart
Stuttgart 21 – Urban development
New built-up area
New green surfaces
Newly built or relocated suburban rail lines
Suburban rail on surface / in tunel
Long-distance train lines
C2.2
C2.1
C2
C1
Post
B
A1
A2