

WS 1 The land area on earth



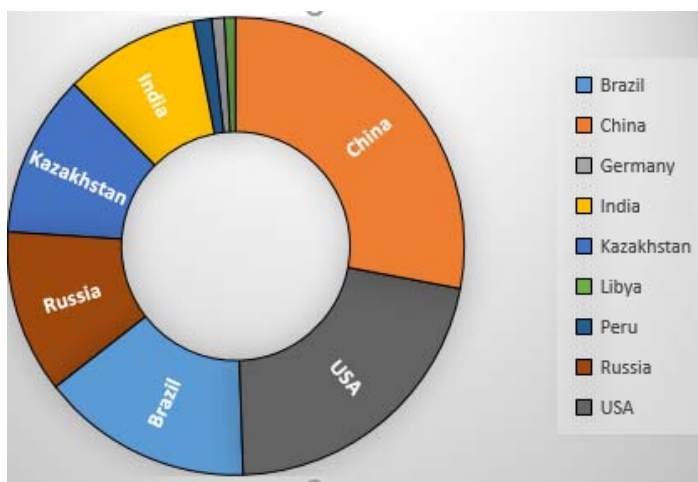
- ✚ 70% of the earth's surface is covered with water.
- ✚ 30% of the earth's surface is land.
- ✚ About half of it is wilderness (ice, mountains, deserts).
- ✚ For us humans, only the other half is suitable for permanent use.
- ✚ The area of use is therefore limited.

There are two different approaches for calculating land consumption. First, based on data from recognized databases, such as FAOSTAT^d and Destatis^e, it is possible to calculate the amount of land actually used for a specific quantity of product in a specific region. Especially when regional or national aspects of land use are to be considered, this type of calculation is advantageous^a.

However, in order to estimate the extent to which humans are using the Earth's available biocapacity and whether current lifestyles can be sustained in the long term, another tool for calculation was first created in 1997 by Mathis Wackernagel and William Rees^c. For this "ecological footprint", the biologically productive area (supply) is compared to the (anthropogenic) demand.

Bioproductive land is divided into different categories. Built-up land, for example, contributes less to the bioproductive area than arable land. Specifically, a distinction is made between harvested land, pasture land, fishing land, forest land, energy land, and developed land for buildings, roads, and railways. For the calculations, each category is assigned an equivalence factor so that real land can be converted into global hectares. The global hectare is a standard unit of area for calculating the relationship between biologically productive land and resource use by humans.

Countries and their agricultural land - a comparison Source: WORLD BANK, 2015



Country	Agricultural Land	as Part of total Area
	km ²	%
Brazil	2,825,890	33.80
China	5,278,330	56.20
Germany	167,310	48.00
India	1,797,210	60.40
Kazakhstan	2,169,920	80.40
Libya	153,500	8.70
Peru	243,306	10.00
Russia	2,177,218	13.30
USA	4,058,625	44.40

However, harvested areas are not equally productive in all countries, The bioproductive areas are first multiplied by the yield factor of the respective country. This conversion allows a globally comparable yield to be determined, which is then multiplied by the equivalence factor^a.

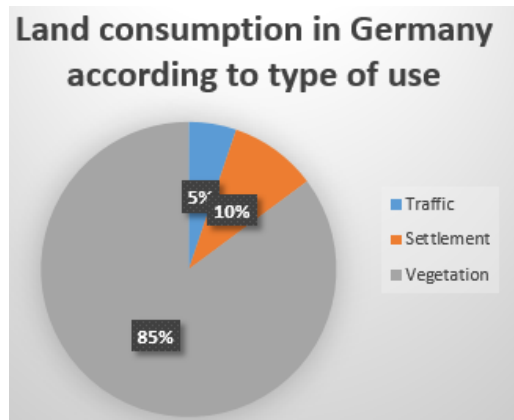
Complex formulas are available to calculate the harvested area of a given product and can be used for this purpose. Here, as with the water footprint, it must be remembered that the calculation for an animal product first requires many individual calculations for the feedstuffs, which are then added up.

WS 2 Characteristic data on land consumption using Germany as an example

Germany is the 4th largest economic power worldwide - only the countries USA, China and Canada produce more effectively.

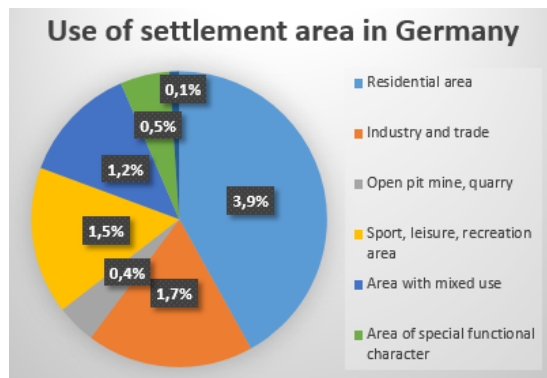
How is the available area of 357,581 km² of Germany distributed?

14.5 % of the area is used for settlements and transport (SuV), 83.3 % (298,000 km²) is vegetation in the broadest sense. 50.6 % of this, in turn, is used for agriculture.



TASKS:

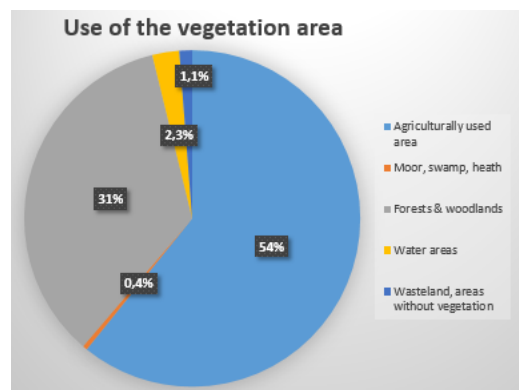
1. Gathers more information. The entry succeeds to the Example well over WIKIPEDIA https://en.wikipedia.org/wiki/Land_use_statistics_by_country
2. Discusses the relationship between vegetation area and sealed area.
3. What is behind the term "Land use plan?"
4. What is the meaning of the terms "metropolitan area" and "Urbanization?"



Use of settlement area in Germany	
9.4 % of the total area	
Residential area	3.9
Industry and trade	1.7
Open pit mine, quarry	0.4
Sport, leisure, recreation area	1.5
Area with mixed use	1.2
Area of special functional character	0.5
Cemetery	0.1



Use of traffic area in Germany	
5.1 % of the total area	
Road traffic	2.5
Way	1.9
Place	0.1
Rail traffic	0.3
Air traffic	0.1
Shipping traffic	0.05



Use of the vegetation area	
83.3 % of the total area	
Agriculturally used area	54
Moor, swamp, heath	0.4
Forests & woodlands	31
Water areas	2.3
Wasteland, areas without vegetation	1.1

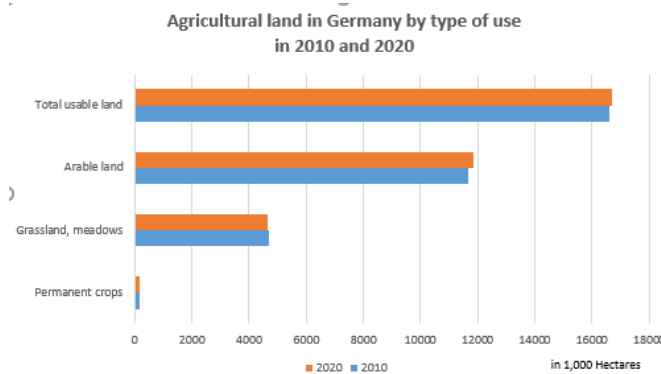
WS 3 Group discussion / expert round / group puzzle

Available vegetation area accounts for 83.3% of the total area in Germany. But only slightly more than half of it can be used for arable farming and pasture. 31% of the area is forested, only 2.3% is water bodies and rivers. 1.1% is wasteland, i.e. land without vegetation. There are hardly any moors, swamps and heaths.

TASKS:

1. Describes the geological and climatic growing conditions.
2. How is the water supply for fields and pastures secured?
3. Are fertilizers and/or pesticides used?

What is produced on the farmland in Germany? Crops such as wheat, rapeseed, sugar beet, potatoes or various vegetables are grown on arable land. Permanent grassland, including meadows and pastures, accounts for 28.5 percent of agricultural land. The rest is devoted to the cultivation of fruit, vines and other permanent crops. Discuss the growing conditions of field crops. Uses the website of the German Farmers' Association <https://www.bauernverband.de/themendossiers/ackerbau/themendossier/ackerbau-in-deutschland> and the ProPlanta information portal <https://www.proplanta.de/>.

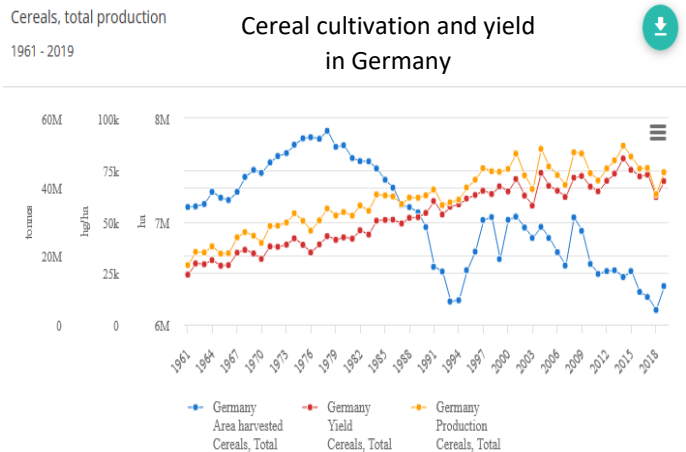


Agricultural land in Germany by type of use in 2010 and 2020 (in 1.000 Hectares)		
	2010	2020
Total usable land	16614.4	16704
Arable land	11690.3	11846.7
Grassland, meadows	4724	4654.7
Permanent crops	198.1	198.8

Although the agricultural area under cultivation in Germany has been steadily decreasing since 1990, an increase in yield is recorded in the FAO 2018. How does this succeed? What measures are German farmers taking? Make guesses and find explanations.

TASKS:

- Based on WS 1 + 2, discuss the numbers in the table.
- Prepares group findings in a presentation.
- Investigate the land use of your home country.



Sources:

^a Giljum et al. 2007: Scientific investigation and evaluation of the "Ecological Footprint" indicator,
^b Federal Environment Agency Research Report 363 011 35, ISSN 1862-4804, UBA Footprint_Final_Report_070222_SG.doc (uba.de), p.59 [10.06.21].
^c Wackernagel & Rees 1997: Wackernagel, M., Rees, W., Unser ökologischer Fußabdruck, 1997, Springer Basel AG.
^d FAOSTAT <https://www.fao.org/faostat/en/#country/79>
^e destatis 2019a: Land use of food commodities 2010 - 2017 - Federal Statistical Office (destatis.de) [01.07.21].
 destatis 2019b: Land use of food commodities of animal origin 2010 - 2017 - Federal Statistical Office (destatis.de) [10.06.21].
<https://de.statista.com/statistik/daten/studie/183734/umfrage/landwirtschaftliche-nutzflaeche-in-deutschland-2010/>