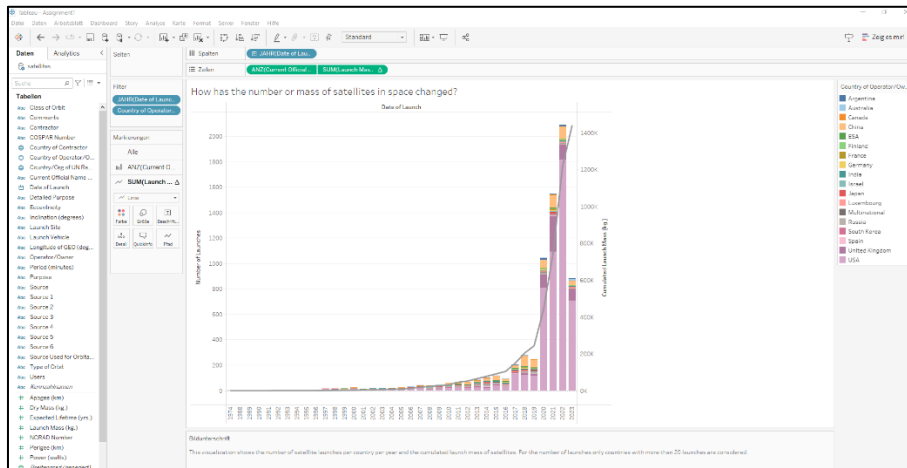


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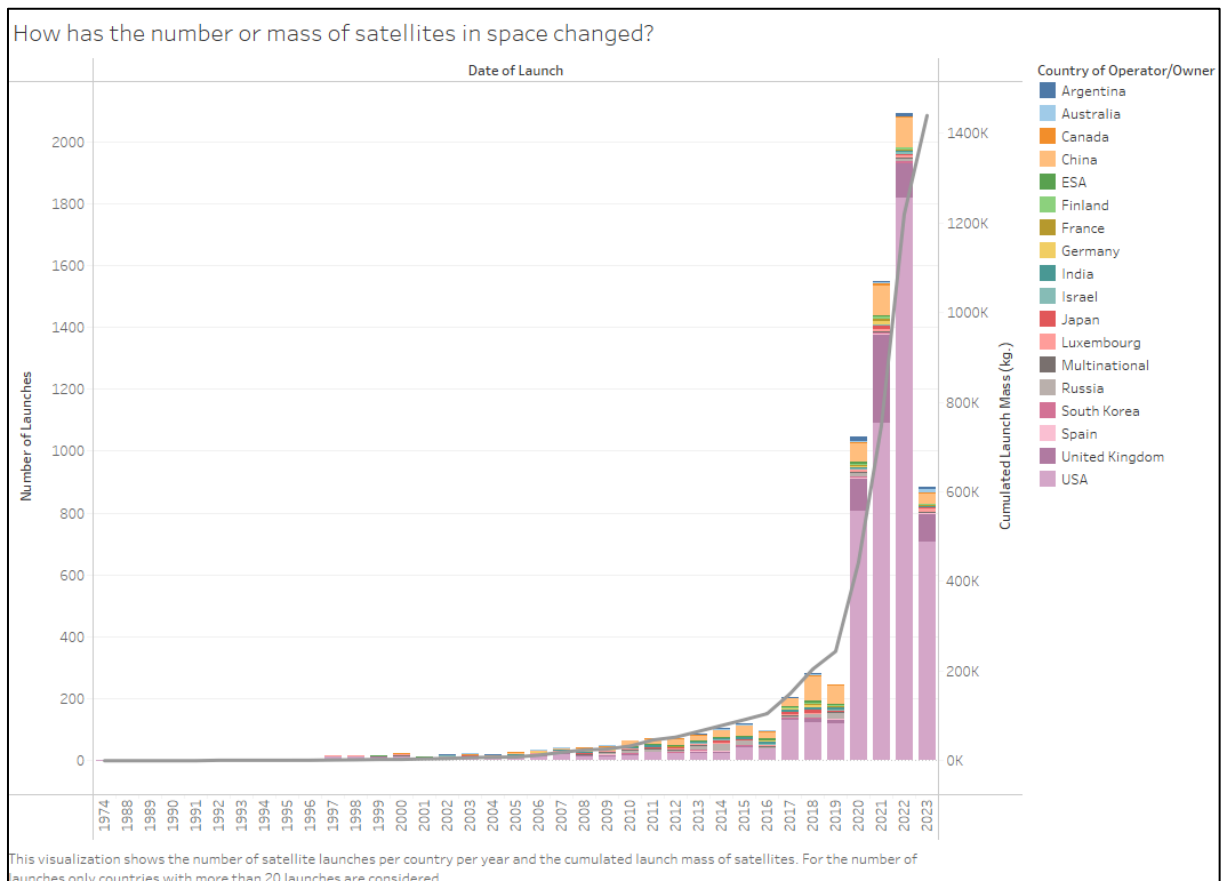
# Overarching question: How sustainable was and will our use of satellites be?

## 1. How has the number or mass of satellites in space changed?

Screenshot of Tableau:



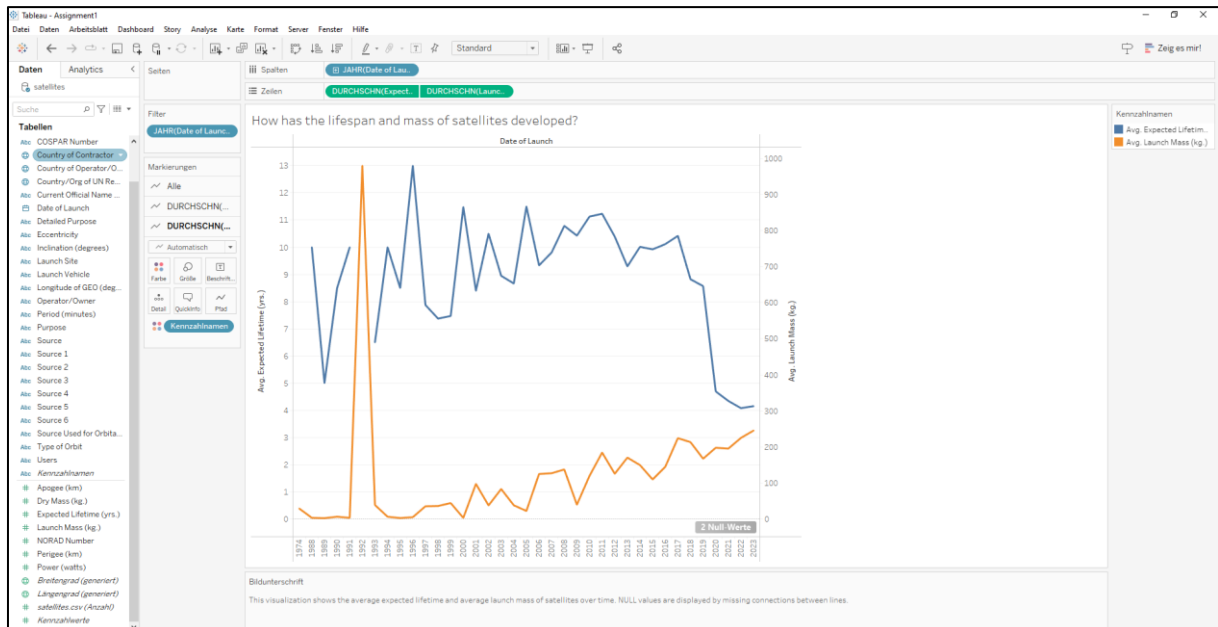
The actual visualization:



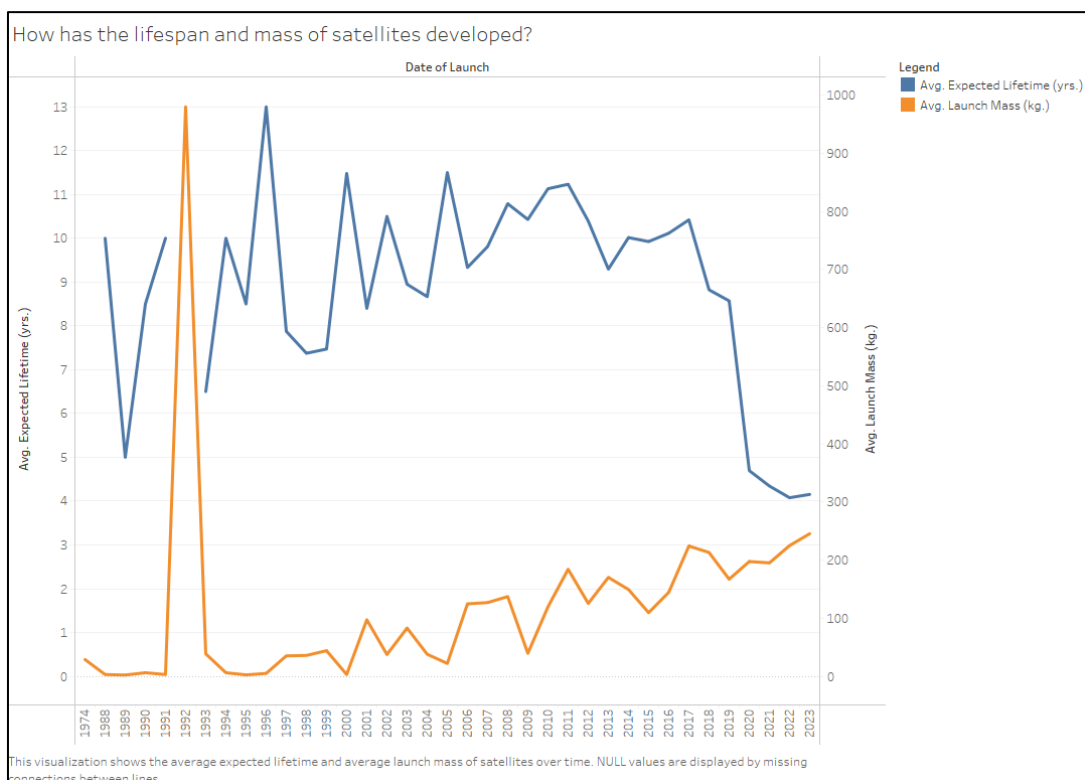
**Caption:** As to be seen in this visualization the number of satellites send to space per year increases exponentially. Even though 2023 has only about 900 recorded launches it is probably due to the fact, that the latest recorded launch in the dataset is from the 15.04.2023. The overall mass of human made objects in space increases also exponentially. This launch behaviour could lead to a fast pollution of space.

## 2. How has the lifespan and mass of satellites developed?

Screenshot of Tableau:



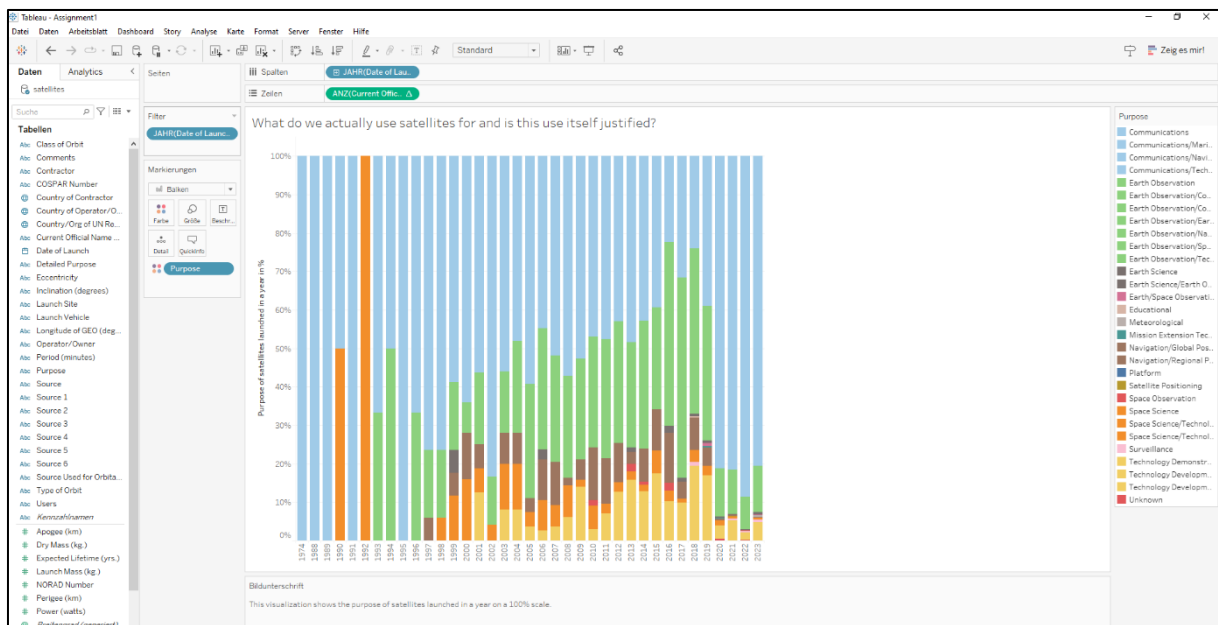
The actual visualization:



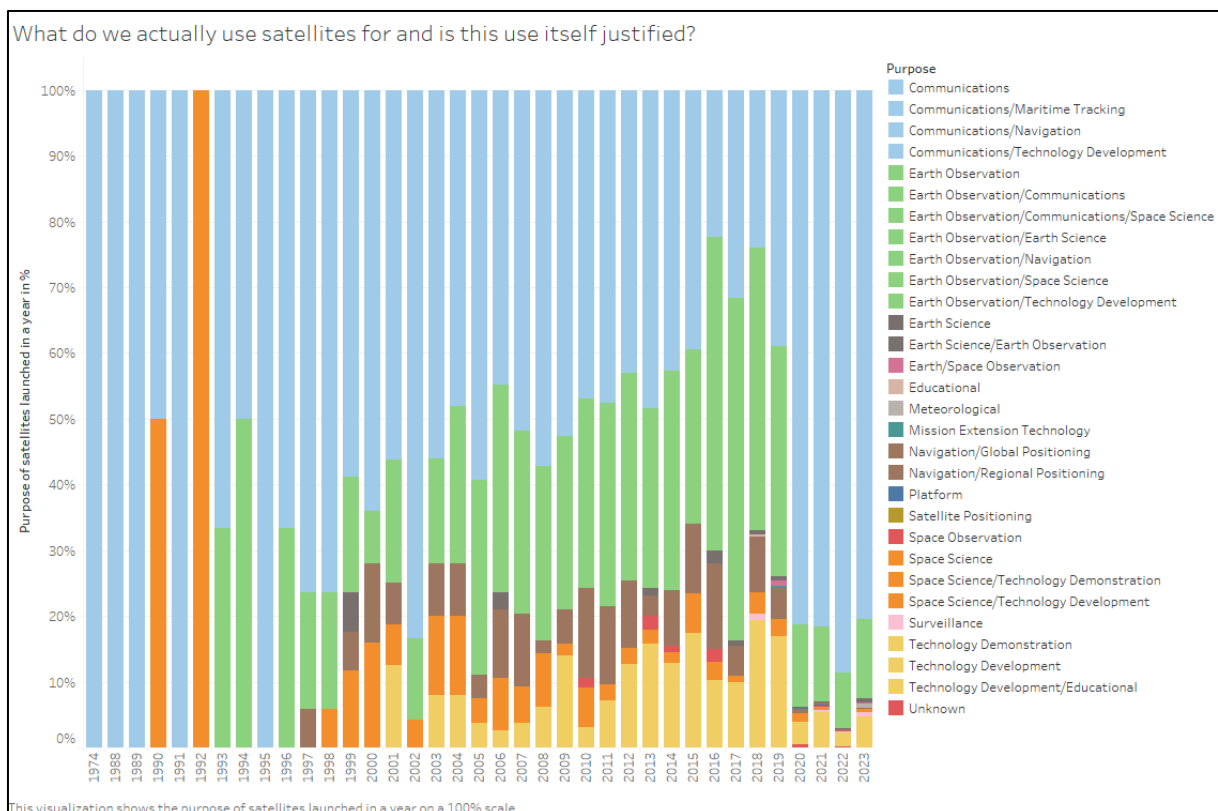
**Caption:** Despite great research advancements in the field of satellites and space transport the overall average life expectancy of a satellite decreases. Also the mass of a single satellite increases steadily. Without proper disposal mechanisms this could lead to a lot of useless junk floating around the earth.

### 3. What do we actually use satellites for and is this use itself justified?

Screenshot of Tableau:



The actual visualization:



#### 4. How well are the satellites distributed in space?

**Tableau - Assignment**

**Visualisation:** A bar chart titled "How well are the satellites distributed in space?" showing the "Number of Satellites" (Y-axis, 0 to 7000) across different "Class of Orbit" categories (X-axis: Elliptical, GEO, LEO, MEO). The LEO category shows the highest number of satellites, exceeding 6000. The bars are stacked by "Purpose" (Legend on the right): Communications (blue), Earth Observation (green), Earth Science (orange), Educational (brown), Meteorological (dark brown), Navigation/Global Positioning (grey), Navigation/Regional Positioning (light grey), Space Science (pink), Surveillance (red), Technology Demonstration (yellow), and Technology Development (dark grey).

**Visualisation Description:** The chart displays the distribution of satellites by orbit class and purpose. LEO (Low Earth Orbit) is the most populated category, followed by GEO (Geostationary Earth Orbit). Elliptical and MEO (Medium Earth Orbit) have significantly fewer satellites. The purposes are stacked within each orbit class, with Communications being the most common purpose across all orbit classes.

Class of Orbit	Communications	Earth Observation	Earth Science	Educational	Meteorological	Navigation/Global Positioning	Navigation/Regional Positioning	Space Science	Surveillance	Technology Demonstration	Technology Development
Elliptical	~100	~100	~100	~100	~100	~100	~100	~100	~100	~100	~100
GEO	~400	~100	~100	~100	~100	~100	~100	~100	~100	~100	~100
LEO	~4500	~1500	~500	~100	~100	~100	~100	~100	~100	~100	~100
MEO	~100	~100	~100	~100	~100	~100	~100	~100	~100	~100	~100

**Bildunterschrift:**  
This visualization shows the number of satellites in each class of earth orbit.

### How well are the satellites distributed in space?

A stacked bar chart titled 'How well are the satellites distributed in space?'. The y-axis is labeled 'Number of Satellites' and ranges from 0 to 7000 in increments of 500. The x-axis is labeled 'Class of Orbit' and has four categories: Elliptical, GEO, LEO, and MEO. Each bar is stacked by 'Purpose'. The LEO bar is the tallest, reaching approximately 6700 satellites. It is primarily composed of Communications (light blue) and Earth Observation (green). The GEO bar is around 600 satellites, mostly Communications. The MEO bar is around 150 satellites, mostly Navigation/Regional Positioning. The Elliptical bar is very small, around 50 satellites, mostly Technology Development. A legend on the right lists 12 purposes with corresponding color swatches.

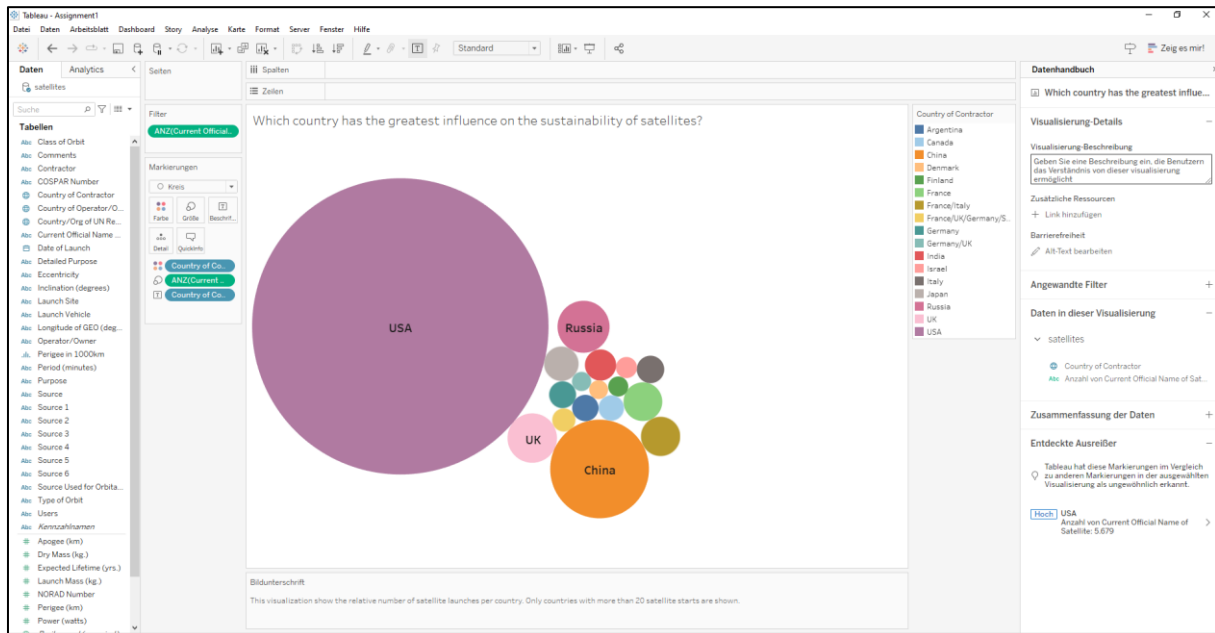
Class of Orbit	Purpose	Number of Satellites (approx.)
Elliptical	Technology Development	40
	Technology Demonstration	10
GEO	Communications	550
	Earth Observation	50
LEO	Communications	5000
	Earth Observation	1200
	Navigation/Regional Positioning	100
	Navigation/Global Positioning	50
	Technology Development	400
MEO	Navigation/Regional Positioning	140
	Navigation/Global Positioning	10

This visualization shows the number of satellites in each class of earth orbit.

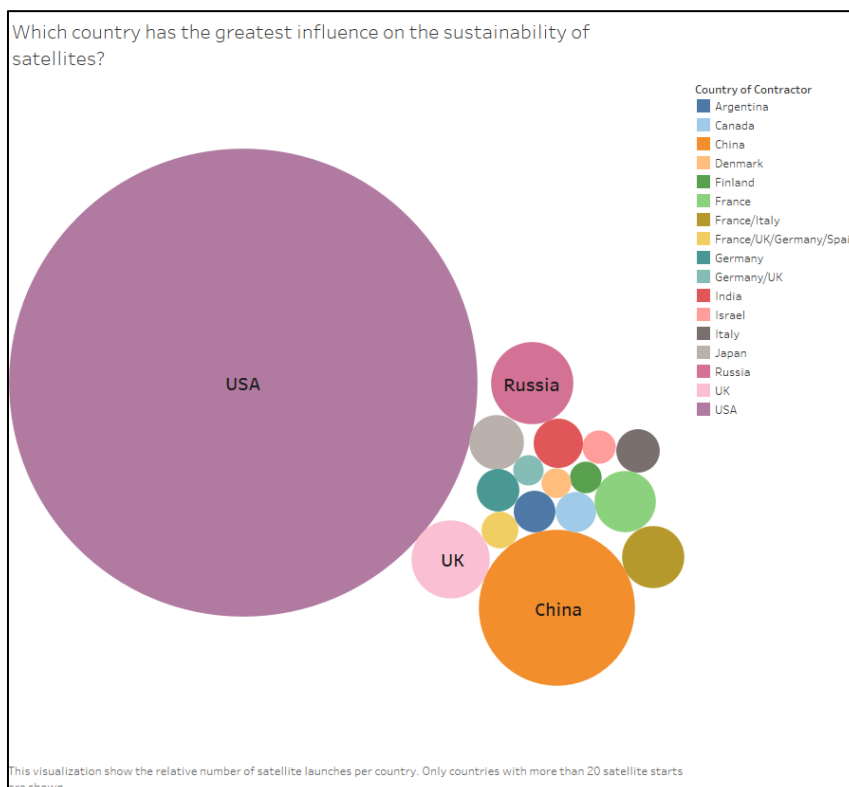
**Caption:** As to be seen in the visualization most of the satellites are in the Lower Earth Orbit (LEO) which is at height of 200 to 2000 km. Therefore, especially with the exponential grow of satellite launches in mind, there could be a huge density issue with a resulting risk of collisions.

## 5. Which country has the greatest influence on the sustainability of satellites?

Screenshot of Tableau:



The actual visualization:



**Caption:** The by far most important country given the amount of satellites contracted are the USA. Even though China, Russia and UK are also important, the amount of satellites they have together is still less than the one of the USA. Therefore the development of a sustainable handling of satellites greatly depends on the USA.