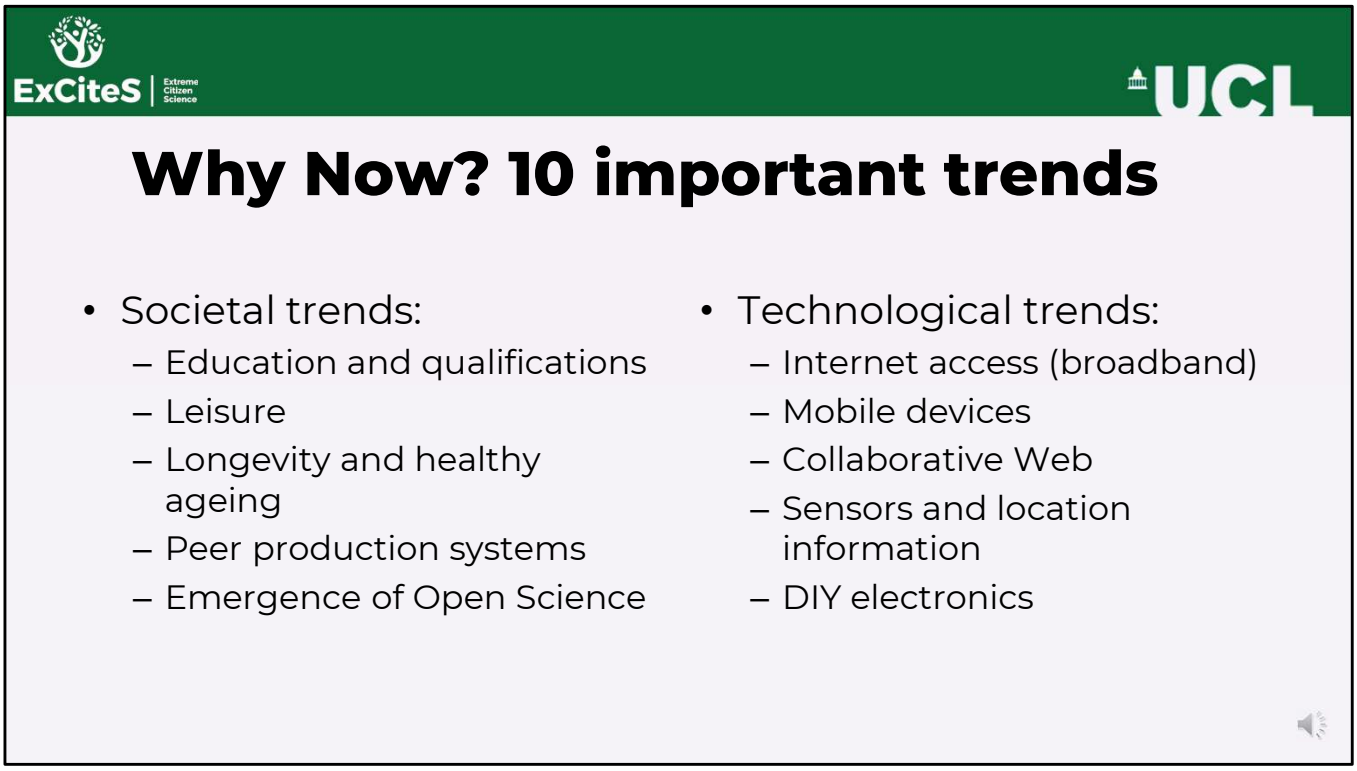

Trends are a valuable way to consider what were the social and technological process that led to the change that we see now. From looking at the range of activities in citizen science, I would like to suggest that the following 10 trends are the most relevant. We will look at 5 trends that are happening in society, and 5 trends that are happening in technology. We look at them in more or less chronological order. Let's start with the first one, the education transition.

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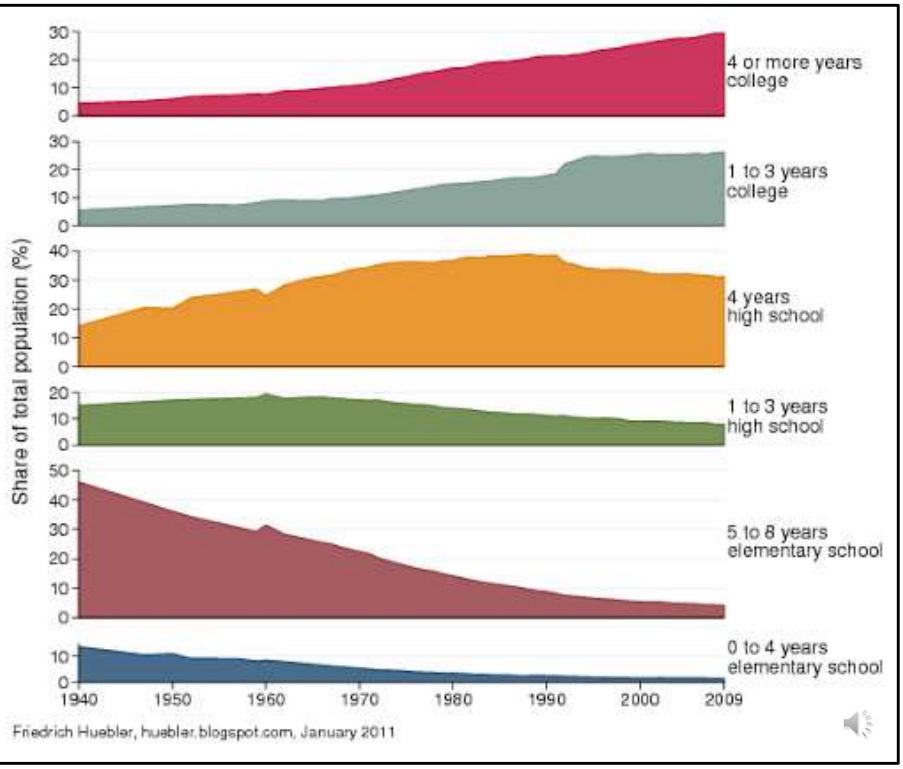
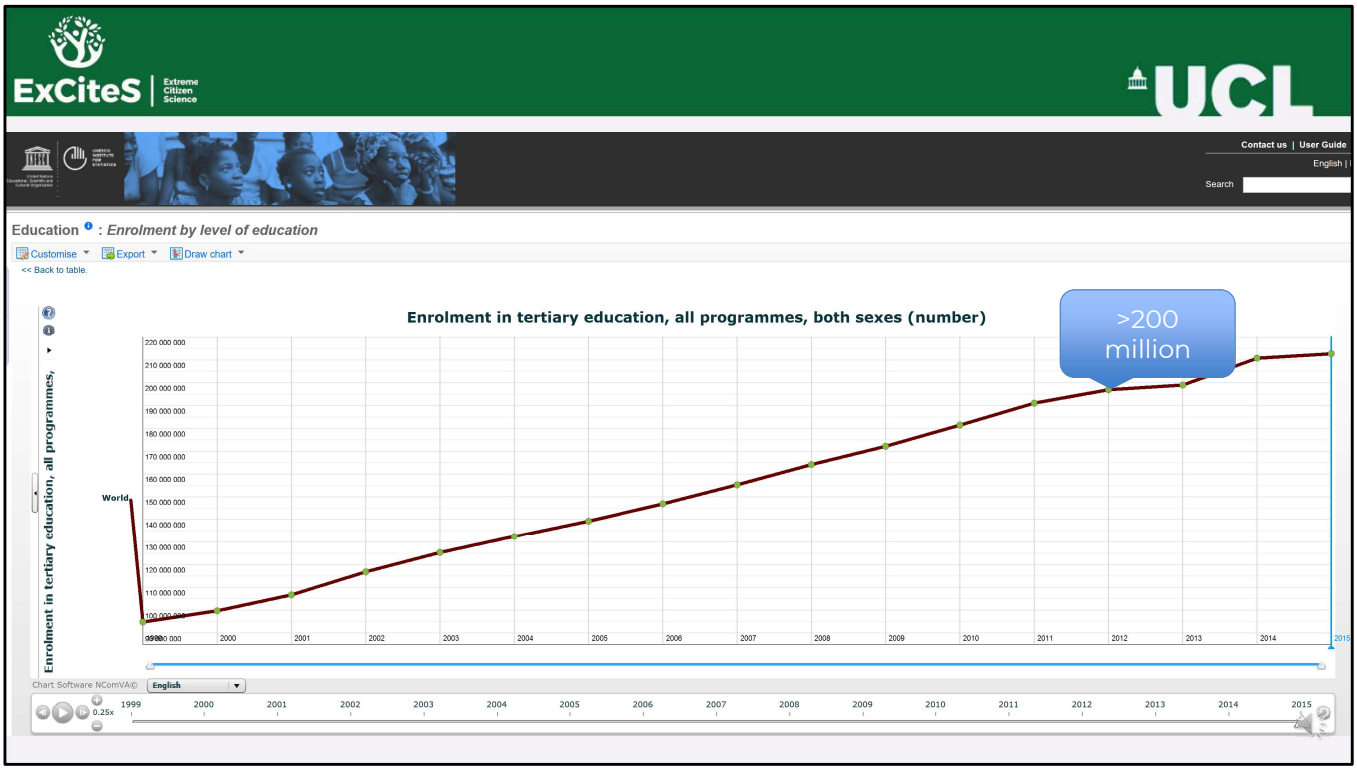
- Years of school completed by population 25+ years 1940-2009 in the USA
- Notice 1960s transition to high schools, and 1990s transition to higher education



The first important trend and one that I consider as a critical to citizen science is the growth in higher education. Here is a chart from Friedrich Huebler. Many advanced economies experienced a similar process – notice how in the 1940s, about 55% of the population was still having only primary school education, with no more than 8 years of schooling. By the 1960s, 12 years of education become the norm, and by the 1990s, going to higher education became the norm. This is the trajectory that means that a larger proportion of the population is trained in ways that are linked to scientific methods and approaches, and therefore can participate in scientific and technological projects. We cannot ignore the complexities of funding this transition and how governments and nations are struggling to find a way in which long period of education is available to a large proportion of the population and not to a selected few, but the situation now is that we have a large cohort of people with high education attainment.



We can see it in worldwide statistics that show that over 200m people are in higher education – and the growth in it is faster than population growth.

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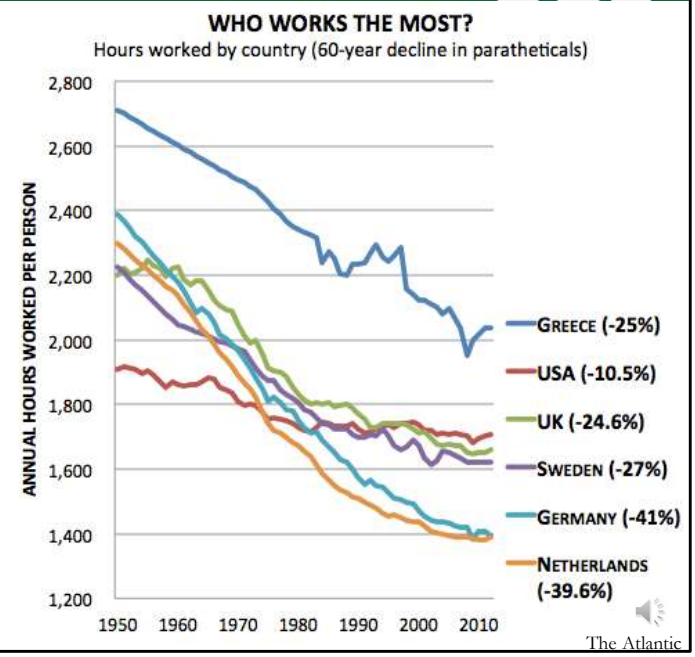
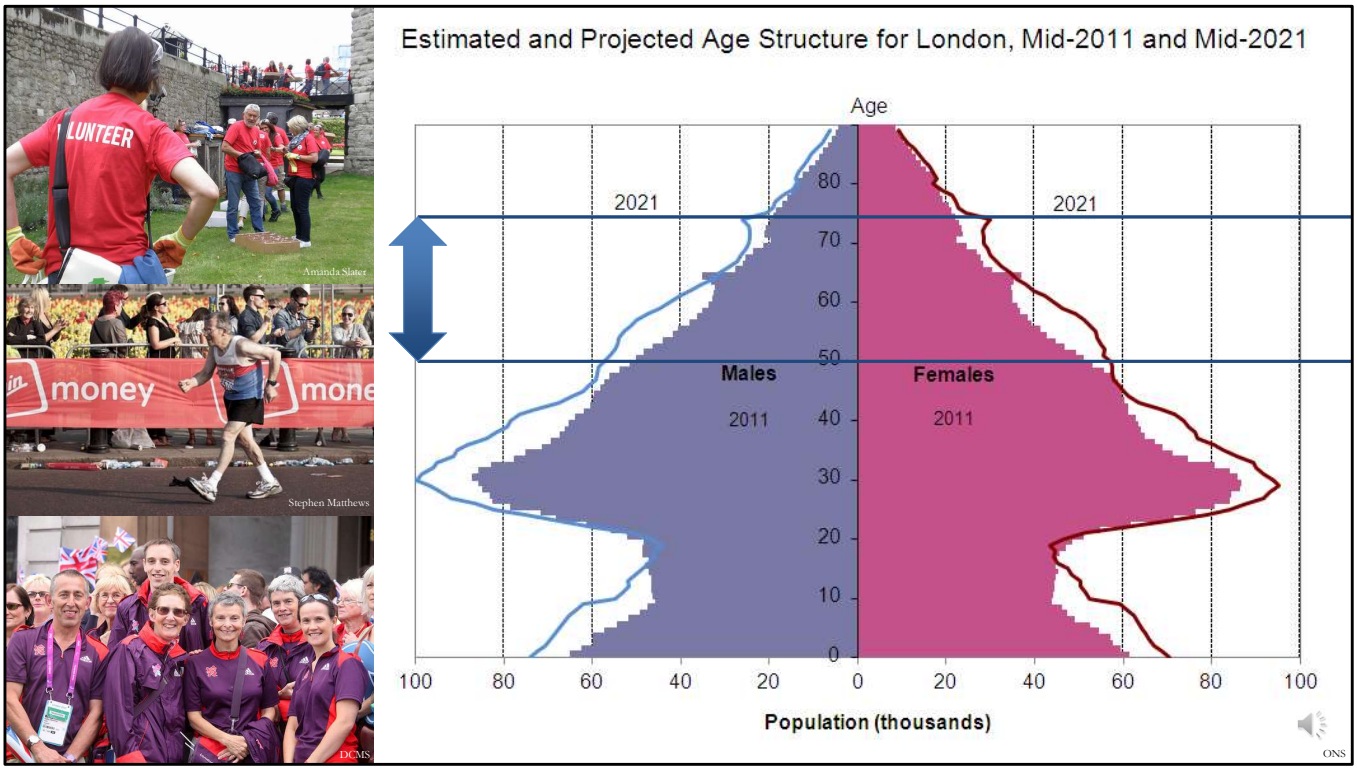
Leisure

- Across the developed world there have been a marked declined in the number of working hours.
- The 5 days work week only adopted around the world 50 years ago



We need to also consider that people need free time – citizen science falls into the area of "serious leisure". It is done by volunteers in their free time, so patterns of work do make an impact. We now have a very common pattern across the world of 5 days working week, with a very significant reduction of official working time. Of course, this is not true for everyone especially lower down on the earning scale, and not in all life stages, and there is also a gender difference in terms of housework, but the increase in free time open up more time for different activities – including observing nature.



Another important transition that we've seen over the past 20 years is the increase in life longevity. We therefore now have a large group of people – from the people in their 50s to those in 75-80 that are still healthy and active, and want to be engaged in society through work or volunteering. There is a long period of healthy retirement (from about 60-65 to 80)

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Peer Production Systems

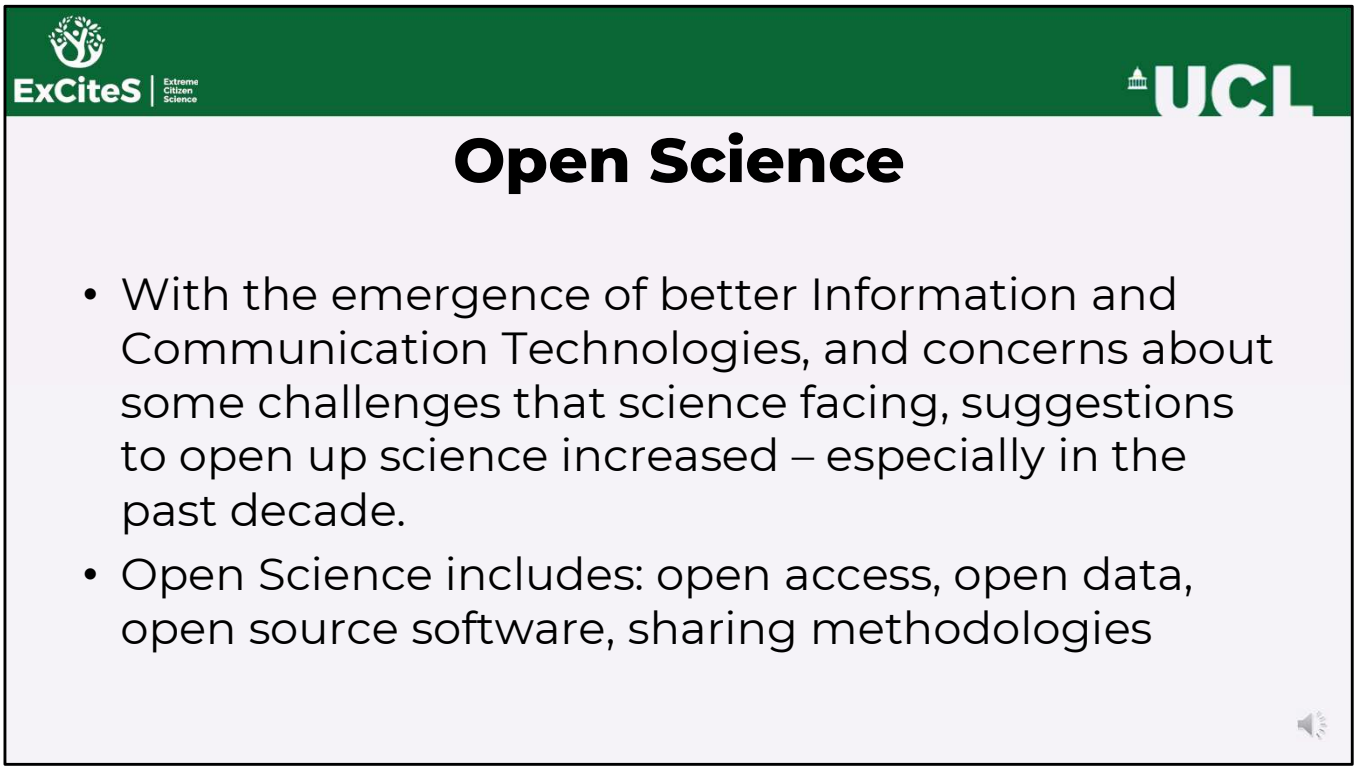
open source initiative

creative commons

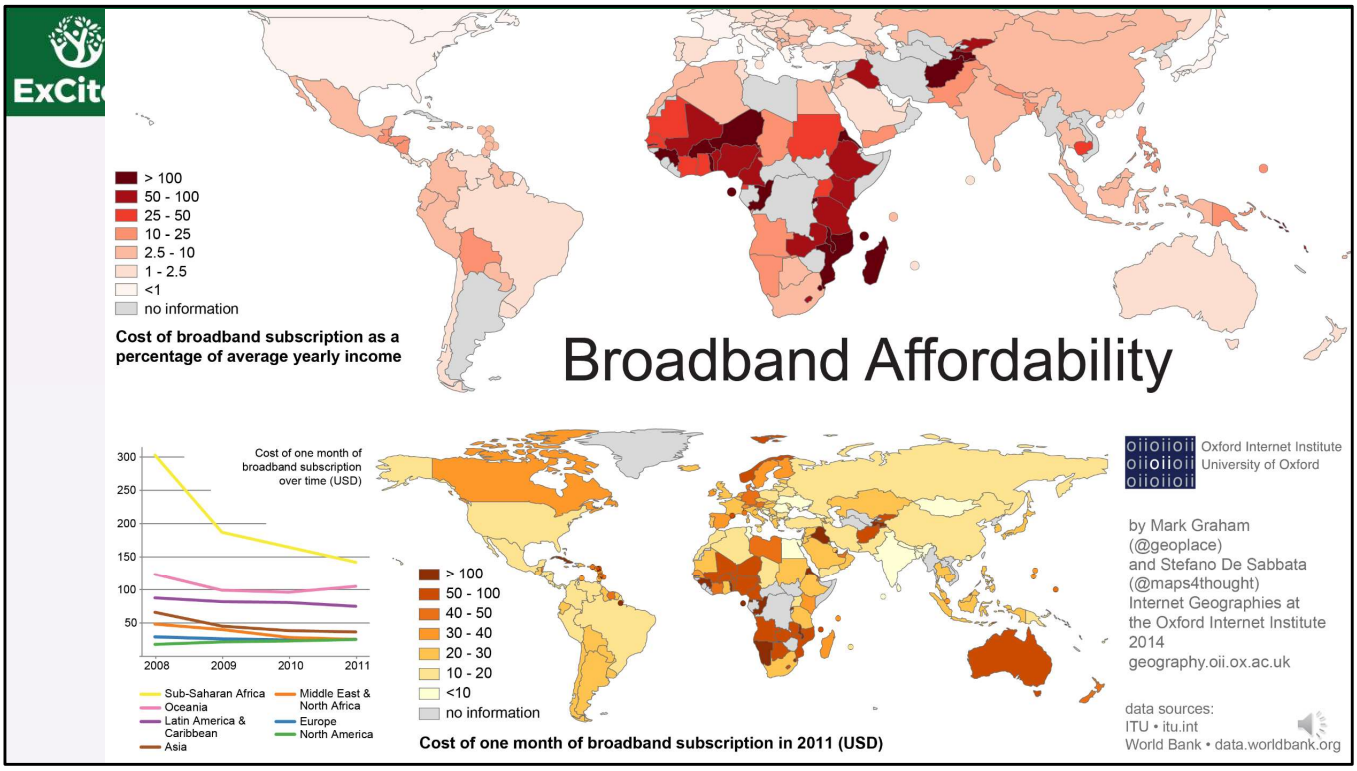
- A socio-technical system that depend on individual action that is self-selected and decentralized, rather than hierarchically assigned (Benkler 2006). It is possible because of the costs of exchanging information are virtually zero.
- They allow many people to collaborate on a common goal – in cases of "commons-based peer production"

WIKIMEDIA COMMONS

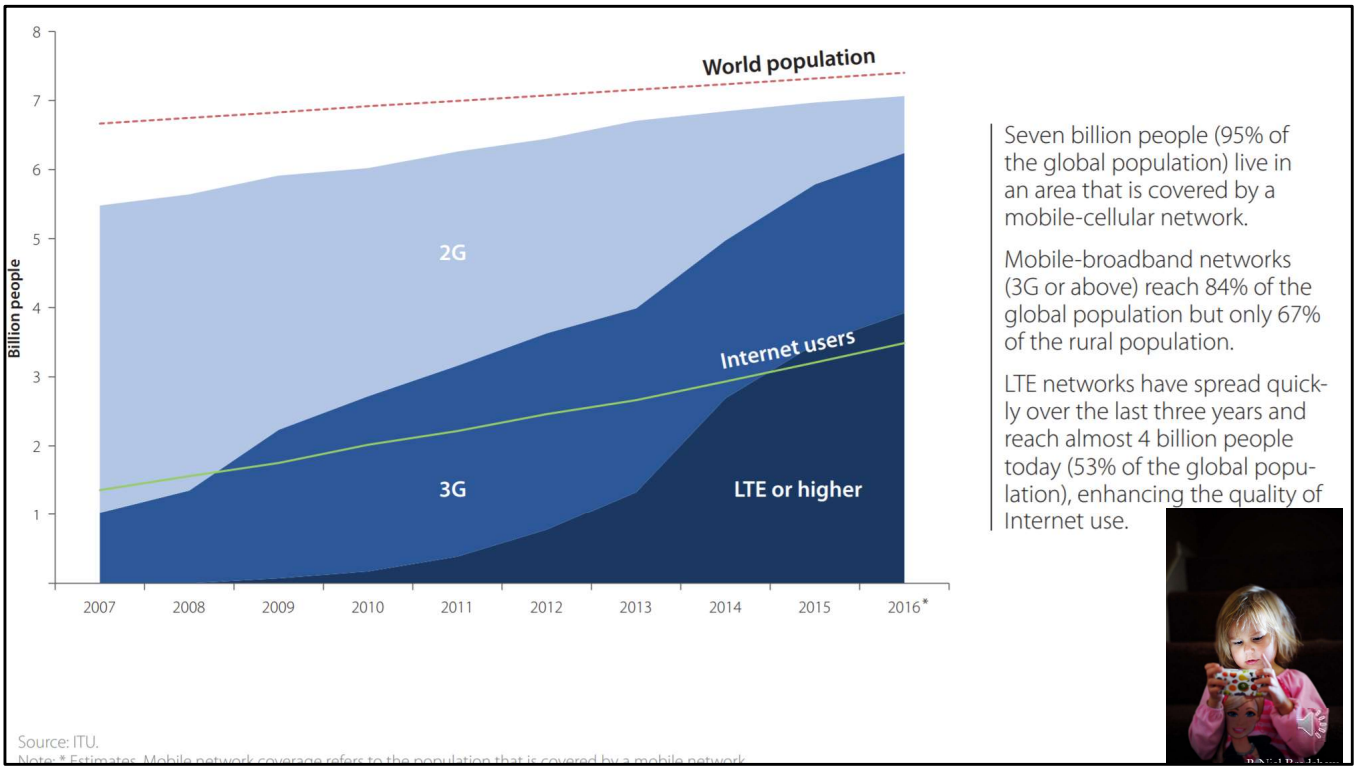
In his book "The Wealth of Network", Yochai Benkler suggested the concept of peer production – a new way for many people to collaborate on tasks in a very distributed way – each person contribute in a way that matches interest and skills, and it all leads to a common outcome. Of particular importance is "commons-based peer production" where people contribute to an open and shared resource that is shared among them and others. The emergence of free shared software in the early days of the internet is an example of such a system, and it has a lot in common with open science.



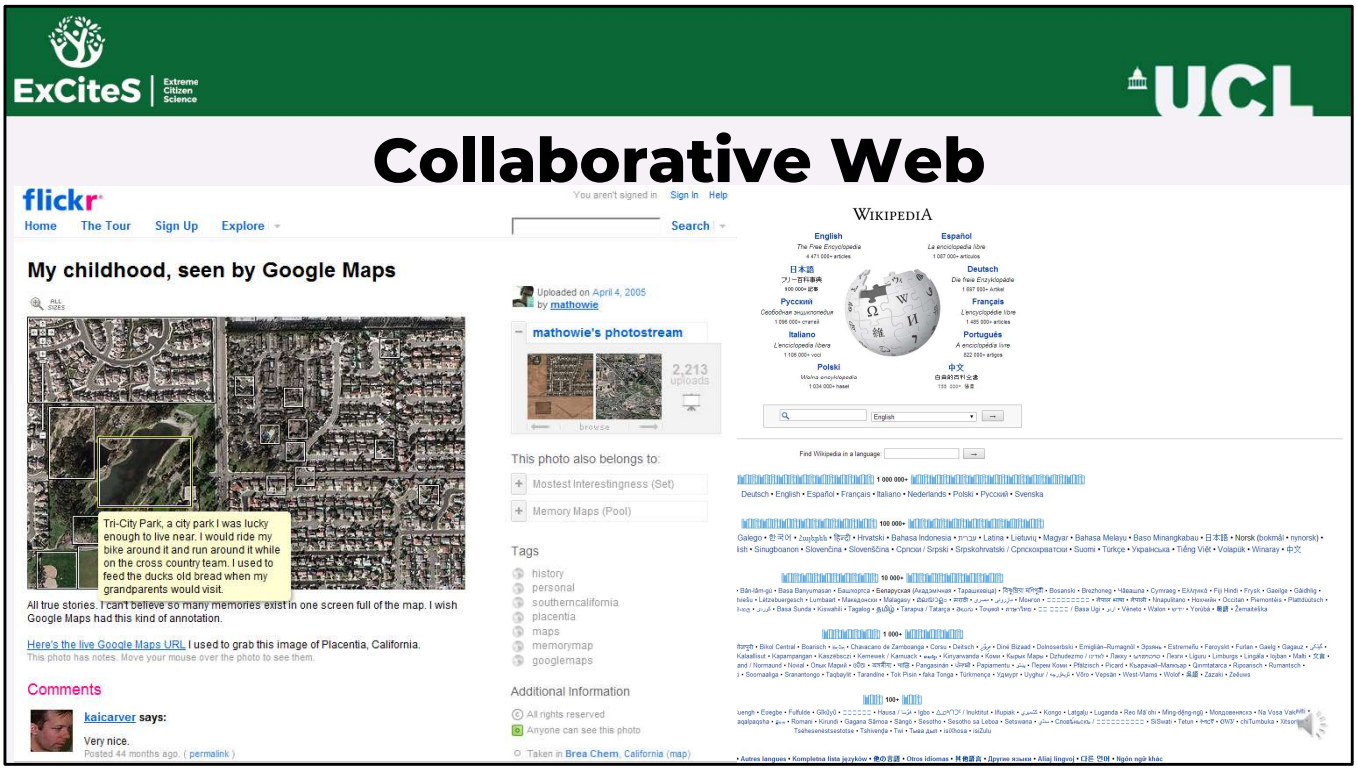
This is a trend that is linked to technology, but is also based on societal aspects. The open science movement has grown from the dissatisfaction of the way information and data are shared among scientists, and an emphasis in the 1980s and 1990s on commercial and market-based approaches to the results of scientific research. The movement, which mostly concerns scientists but now also include policymakers and a small group within the public emphasis that because science is mostly publicly funded, it should be shared openly with anyone who needs the information. The open science movement includes calls for sharing the papers and publications from scientists for free, providing access to data and code that is used to process it etc.



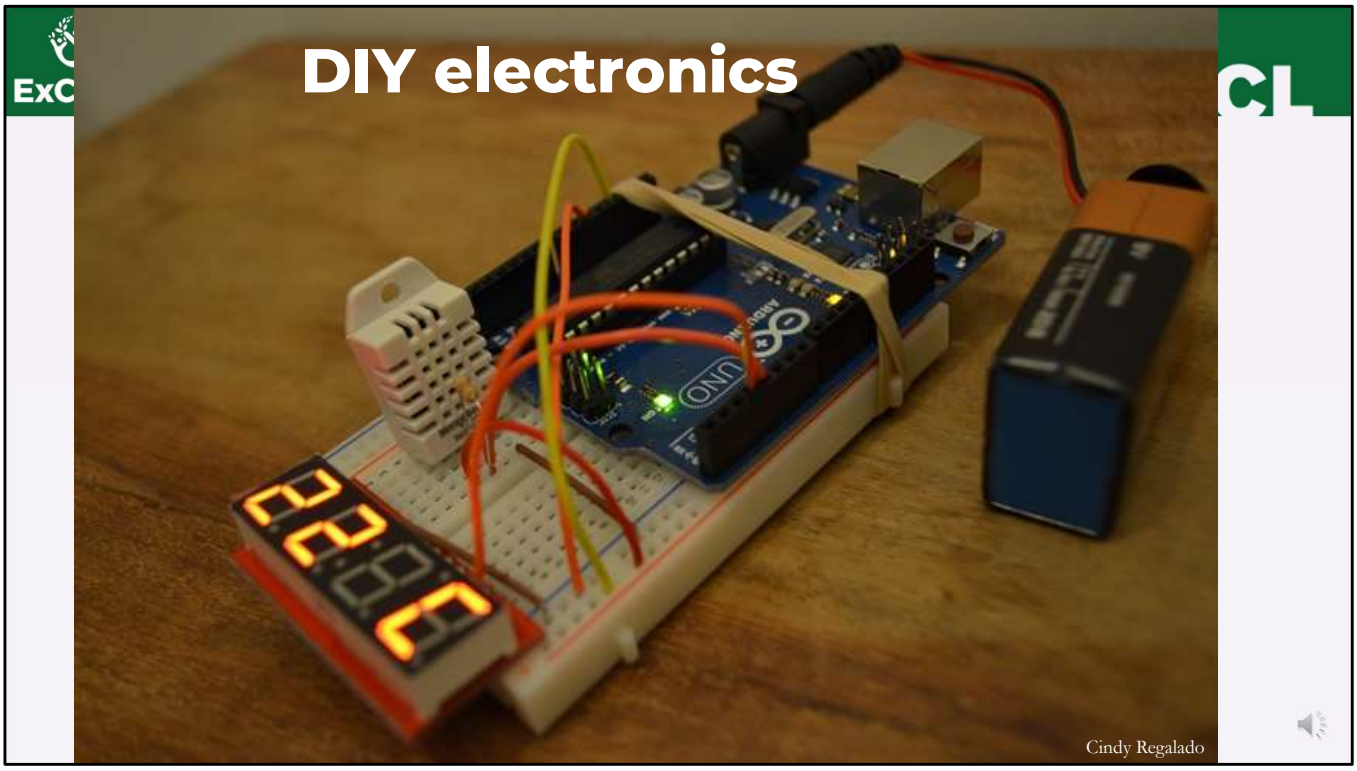
Now we can look at the technological aspects that enabled citizen science. As with the last two socio-technical trends, we can see the technical-social impact of increased connectivity. This is a map from Mark Graham, from the Oxford Internet Institute, which shows the costs of broadband internet subscription. You can see that in many parts of the world, the costs of accessing the internet are very low. We can also see an aspect that is called "Digital Divide" in which parts of the world have cheap and easy access to information, while for others it is expensive. There are further obstacles in terms of access to devices, knowledge of language to access different services, etc.



About 10 years ago, the first effective smartphone was introduced – the iPhone – and very quickly more devices appeared to support internet use in mobile devices. We can also see that a growing part of the world – 84% of the world population, are living in an area that is covered by a mobile broadband network. The importance of broadband is that if you send information from sensors, a picture, or a video, the amount of data is much more than what can be sent in an SMS or narrow network. This is impacting what we can share.



The technical side of peer-production system is the emergence of the collaborative web about 15 years ago – with the increase in access to broadband, it became possible for people to share information on websites. In April 2005, Flickr added the ability to annotate photos by marking rectangular areas on them. The designers created this functionality probably to allow the system users to annotate photos by indicating names of those who appear in the photograph or note specific features. However, one of the users of Flickr, Matt Haughey, who also blogs (thus, is among the few who are actively contributing to online systems), realised that he could take a screenshot of satellite imagery of the area in which he grew up in Google Maps, upload the image to Flickr (somewhat disregarding copyright issues) and use the annotation tools to mark specific locations on the image, attaching to them personal memories such as: 'My first girlfriend lived here ("Lisa"). I met her the summer between 7th and 8th grade when she moved in. We never kissed, and when school started I ignored her because she was in 7th and I was in 8th. I was an ass.'. He was quickly followed by other Flickr users and there were over 650 memory maps on Flickr within a short period.



Finally, with the advancement of ideas about open source, and open science, new forms of open hardware started to emerge – for example, Arduino and Raspberry Pi, which allowed people to start creating their own sensing devices, 3D printers, and other technical and scientific instruments. The set of trends – societal and technical, influence the practice of citizen science, and you will be able to spot many of them in the different examples that we will cover.