



Thinking through geography in times of the COVID-19 pandemic

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Abstract

In 2020 the COVID-19 disease caused by the SARS-CoV-2 coronavirus changed our world drastically. From Wuhan to Bergamo and from New York to Cape Town the immense effects of the pandemic are noticeable: many deaths, an enormous economic decline and many borders closed. Scientists are working hard to find out more about the new virus, especially to get vaccines to stop it. Geography offers knowledge and tools to help to visualize and analyze the diffusion of the virus and its effects on society at different scales. Important questions are how to handle the unwanted guest and how to continue our life in the near future. Do we use the pandemic as a chance to really improve life on planet Earth? And is there a role for geography education in all this? More attention to systems thinking and a more sustainable lifestyle are needed.

Keywords: Corona, COVID-19, Geography Education, Local and Global, System Thinking

1. Geography and questions about COVID-19

“Geography is the study of Earth and its natural and human environments. Geography enables the study of human activities and their interrelationships and interactions with environments from local to global scales” (IGU-CGE, 2016). So geography seems to be appropriate to help to describe and explain the distribution of COVID-19. Many media use geographical tools from simple maps to more complex Geographical Information Systems (GIS) to visualize the distribution of COVID-19

and changes in the distribution of the disease at different scales. Modern GIS technologies provide real-time information to support the global fight against outbreaks and epidemics (Kamel Boulos and Geraghty, 2020). Visualization is helpful but thinking beyond maps is what really matters. To be able to do so geographical knowledge about man, environment and its relationships in and between regions is indispensable.

Many scientists believe that the pandemic started at the end of 2019 at a food market in the Chinese city of Wuhan. By January 24, 2020, the city was placed under quarantine when the

count of death cases was 17. Within two months the Chinese government reported that the outbreak was under control. By April 16, China issued 4500 COVID-19 deaths which was surprisingly low compared with the numbers in other countries. At the moment of writing this contribution, mid-September 2020, the highest number of COVID-19 related deaths is found in the USA, although the highest number per 1,000,000 inhabitants is found in Peru (Table 1). Numbers in Europa have gone down now after a fierce spring outbreak. Italy, Spain and the United Kingdom counted many victims. In the summer of 2020 countries like the US, Brazil, India, Russia and Mexico scored high. In many countries in September 2020 a second wave with many COVID-19 infected persons is going on. However, how the pandemic will develop in the time to come is a big question as a good anti-virus vaccine is not yet available.

As many issues about this new virus are uncertain, it is very difficult to make decisions for the near future. Is it really safer to travel hours and hours by plane close to other people than to travel by bus or train? Even if the air circulation in planes would be better than in other means of transport, it is incomprehensible that flying is safe sitting close together for a long time. Or is the economic argument decisive and is the lobby of the big airlines stronger than that of bus and train companies?

Other big questions refer to other aspects of the new virus. Is it wise to close borders and to order social distancing and home quarantine? The rules are different from one region to the next and so are sanctions to trespassers. Not everybody can work at home and not all governments support those who lose their income by COVID-19. A lockdown can have very negative effects and can cause severe problems, not only economic problems. Even some health problems not related to the new virus increase when medical care for COVID-19 cases consumes almost all available time, energy and means of the health care sector. Not exactly knowing how the new virus operates nor how strictly they should fight the virus, many governments are looking for a middle ground. Nevertheless, the pandemic is affecting society

on planet Earth in all its veins in a way unknown and everywhere in a different way.

The Coronavirus Resource Center of the Center for Systems Science and Engineering (CCSE), at the Johns Hopkins University (<https://coronavirus.jhu.edu/map.html>), offers a really great interactive dashboard with up-to-date data available for download. It offers state, country and global data, maps and news as well as critical trends and even “data in motion” and e-learning modules. However, the data are snapshots of a continuously changing pandemic. In addition, it is good to realize that collecting reliable data is very difficult in most areas, and also done differently in different areas, so the numbers given are indications and no more than that.

Geography does not give solutions for problems like this pandemic but it is useful to get a better view. This contribution focuses on the way geography might help to understand local and global problems in times of pandemic. Firstly, we will pay attention to geographical concepts that might help to understand the distribution of COVID-19. Secondly, we will describe how different approaches from health geography can expand our thinking about societal change. In the last section we look at preparing ourselves for the future and we also mention some challenges for geography education that might help the citizens of tomorrow to be better prepared for big changes.

2. Why geography matters

During spring 2020 schools in The Netherlands were closed because of COVID-19. Many kids did home schooling. Using Skype one of my fifteen-year-old students showed me an early 2020 map with nitrogen dioxide in the Chinese air before and after the outbreak of COVID-19 (Figure 1). She was amazed at the effect of the new virus on air quality.

	Country	COVID-19 Deaths by country	per 1,000,000	COVID-19 Cases by country	per 1,000,000	population 2020
1	USA	193,320	581	6,462,169	19,427	332,639,102
2	Brazil	130,396	616	4,282,164	20,226	211,715,973
3	India	77,472	58	4,659,984	3,514	1,326,093,247
4	Mexico	70,183	546	658,299	5,117	128,649,565
5	United Kingdom	41,712	634	367,590	5,590	65,761,117
6	Italy	35,603	571	286,297	4,588	62,402,659
7	France	30,902	455	402,783	5,937	67,848,156
8	Peru	30,470	955	716,670	22,456	31,914,989
9	Spain	29,747	595	566,326	11,323	50,015,792
10	Iran	23,029	271	399,940	4,709	84,923,314
	Total World	916,919	117	28,551,911	3,654	7,812,831,000

Table 1. Top 10 of COVID-19 related deaths by country and per 1,000,000 inhabitants as well as the number of COVID-19 cases in these countries and per 1,000,000 inhabitants on September 12, 2020.

Source: Johns Hopkins University CCSE dashboard, September 12, 2020.

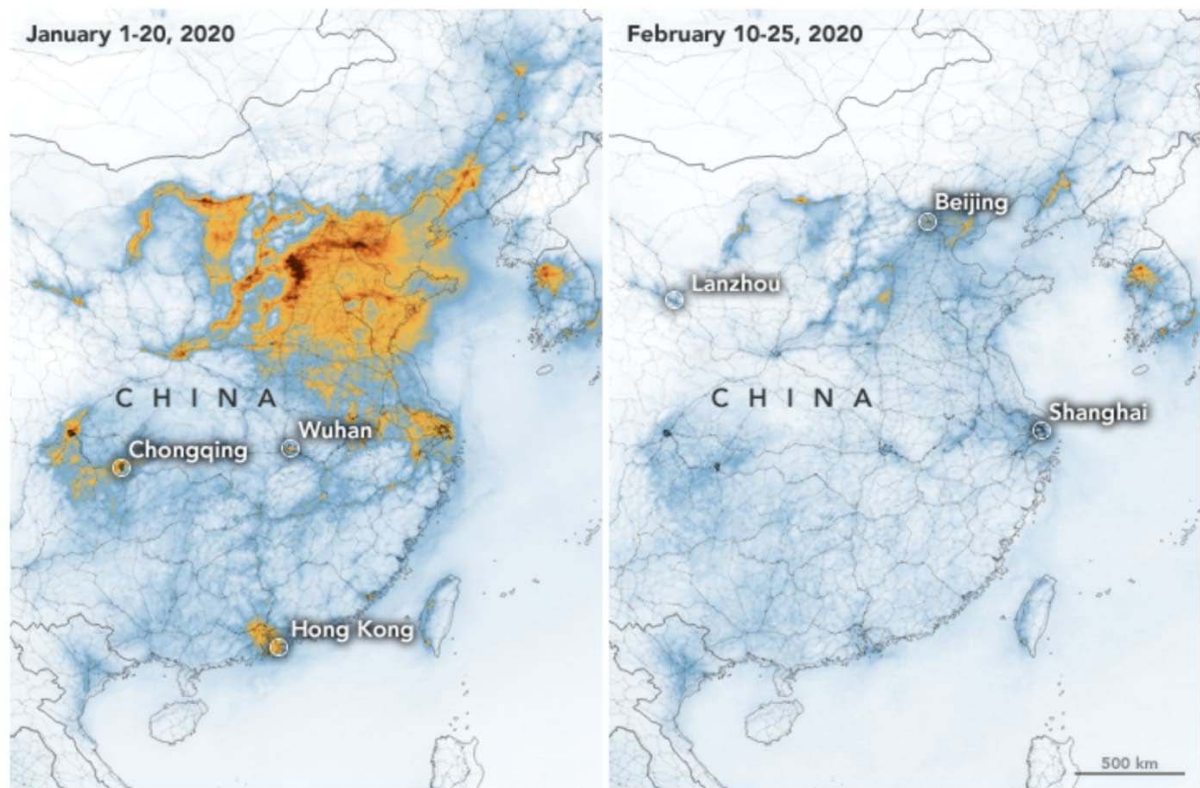


Figure 1. Early 2020 images of nitrogen dioxide in the Chinese air before and after the COVID-19 outbreak. Source: NASA Earth Observatory Centre.

The same spectacular effect of the new virus was visible in other regions like the Po River Valley in Northern Italy and the western part of the Netherlands. Areas with high population density have many activities and a lot of traffic and as a result a huge amount of air pollution. In times of COVID-19 lockdowns this air pollution is much lower.

Results of a research project of the Harvard T.H. Chan School of Public Health showed a link between long-term exposure to fine particulate air pollution and the risk of death from COVID-19. The evidence came from an analysis in 3,000 counties in the United States (Friedman, 2020). Long-term exposure to air pollution increases vulnerability for dying by COVID-19. A similar conclusion has been published in *Environmental Pollution* by Conticini and colleagues. It stated that the high level of pollution in Northern Italy should be considered “an additional co-factor of the high level of lethality recorded in that area” (Conticini et al., 2020).

The question is how these things are linked. Air pollution does not cause COVID-19, but the disease seems to diffuse more easily in low lying densely populated areas with a high output of fine particulates from industry, traffic and intensive livestock farming. In areas with much air pollution many persons will suffer from a weakened long function and will probably be more susceptible to COVID 19.

What we learn from studying the relation between COVID-19 and air quality is that in addition to the characteristics of the actors (age, health and distance to others) and type of activities (industry, agriculture, traffic and recreation) also the geographic characteristics of the area are important. Especially in combination with thermal inversion in a windless valley between hills or mountains air pollution will stay and increase as is often the case in Beijing and the Po River Valley. Therefore, for geographers the natural characteristics of an area are an essential part of the story in addition to human factors. Gatrell (2002, p. 12) uses the term “disease ecology” saying that “the distribution of a disease, particularly an infectious or parasitic disease, cannot be understood without knowing about its

relationships to local and regional ecologies – the interactions between topography, climate, water, soils, plants, and animals”.

As stated at the start of this contribution geography is about man, environment and relationships. Relationships between man and nature within regions but also relationships between people in different areas or regions (van der Schee, 2000). In times of COVID-19 the importance of the geographical key concepts distance and interaction is easy to see. The new virus travelled long distances probably by plane from China to Europe and the rest of the world. Lockdowns and closed borders often came late or too late. Slogans like “keep distance” and “stay home if possible” are well known worldwide today. Not that everyone can and want to obey these advices. In times of COVID-19 using the internet (e.g. online learning, video conferencing) is an alternative for many to bridge distances and stay connected but not for all.

Looking back at more than 6 months of the pandemic we can see some patterns. At the global and national level COVID-19 has stronger footholds in densely populated areas than in remote and sparsely populated areas. Not only the number of people also their age and activities matter. More interaction between people increases the chance of a higher number of COVID-19 cases. Lockdowns that focus on drastically diminishing interaction often stops the increase in casualties. In addition, the characteristics of the area where people live are important. Fresh air and ventilation seem to be important factors not only on the regional but also at a local scale, for instance in retirement homes and schools.

Co-ordination in fighting the pandemic is far away. Nations, regions and even cities have their own way to fight the virus, which makes the world map more than it was before a mosaic. Geographers study this mosaic, the Earth as a whole as well as its parts. Every place is unique and different. What we see at each scale from local to global is different. That is important because the corona data of a country as a whole can be very different from the data for a specific city or region in that country.

Summarizing briefly, the geographical way of thinking is about actors and activities in areas at different levels from local to global. This way of thinking can help to analyse big problems like climate change, water management, food supplies, urbanisation and migration as well as the diffusion and distribution of pandemics like COVID-19.

3. Looking for explanations

In his book *Geographies of Health*, Gatrell (2002, pp. 25-49) presents different research approaches to explain the distribution of diseases. These approaches are also useful to explain what happens in times of COVID-19.

Firstly, positivist approaches that use the methods of natural science search for statistical regularities, spatial patterns and associations in health data. An example are studies using lots of quantitative data and statistics about correlations to show that patients with obesity seem to be at an increased risk of exacerbations from viral respiratory infections. Lighter et al. (2020) report that obesity in patients younger than 60 is a risk factor for COVID-19 hospital admission.

Secondly, interactionist approaches that wish to emphasize the subjective experience of health and illness. This is less readily measured and quantified. In-depth interviews are used by interactionist researchers to get a better understanding of how people live. The understanding of health related behaviour is often central in these qualitative studies.

Thirdly, structuralist approaches that use theories of inequality, oppression and class conflict. Poverty is an important cause of ill-health and poor people often cannot afford medical care or medical insurance. In our capitalist world the impact of the COVID-19 outbreak has seriously affected the poor whose food security is at a low level. It is clear that billions of people across the world will run into poverty as a result of the ongoing halt of economic activities (Ranasinghe et al., 2020).

In most media we see a lot of information about the new virus that can be roughly classified as positivist or interactionist. In addition to a deluge of corona data in tables,

graphs and maps, we see many in-depth interviews with COVID-19 victims and with people affected by the social and economic effects of a lockdown. In general, there is less attention in the media to structuralist approaches.

As geography looks at the local level as well as the global level, it is good to have an open eye for positivist, interactionist and structuralist approaches and to use a mix method strategy of quantitative and qualitative research. From structuralist publications we can learn that the more global level of power and policy should be added to the more local oriented actor – activity – area triplet. Every region and nation has its own powerful network of entrepreneurs and politicians that act together in often not transparent ways that seem to be different and elusive every time. The “game of the boys and their toys” is heavily determined by economic and political interests and coloured by cultural, social, historical and geographical characteristics of the area and society it is about. Unfortunately, the externalities of this game for non-players, have-nots and planet Earth are often not reflected on. Fighting inequality and injustice, however, should be high on the agenda of our local and global society, see also the United Nations Sustainable Development Goals.

At the moment of writing this contribution it is possible to explain in general terms why the number of persons hit by COVID-19 is higher in some regions than in others. However, fine tuning is very difficult. Understanding how things work in times of COVID-19 is extra difficult as inconvenient truths are not always accepted and social media with fake news and shouting people are not very helpful to get the picture clear. Even more frustrating is that many COVID-19 issues have been presented in a clumsy, unclear way or have even been concealed. Some examples from the Netherlands may help to illustrate this. Firstly, as long as there were not enough face masks available, the official Dutch policy was that face masks were not necessary, while in other countries they were compulsory. Secondly, keeping distance from other people in public spaces like shopping areas is prescribed but often cannot be maintained due to a lack of police officers. A third example concerns Royal Dutch Airlines (KLM), a big

partly state-owned company that got billions of state aid after the COVID-19 outbreak. No public accountability was given for the generous government support while at the same time many small companies and parts of the cultural sector were much less fortunate or got nothing at all. Air traffic was given inexplicably preferential treatment. Those who expected strict rules for air travellers were disappointed. After the virus had passed its peak, air traffic from Amsterdam Schiphol Airport was quickly started up again, but without strict safety measures. This resulted in new incoming travellers infected with the disease. Last but not least, the Dutch National Institute for Public Health and the Environment got messages from the Dutch Ministry of Health what to report and what not (Hofs, 2020). So, confusion and annoyance everywhere. This affected people's confidence in the government as popularity polls showed.

We see different strategies in different countries and an overview of critical factors and good practices is difficult to make until the virus has disappeared. The crucial question here is what determines our behaviour in times of COVID-19. Fair and consistent information about interventions in everyday life and their consequences is important, but also adequate medical support is a top priority if we want to keep the pandemic under control.

4. Geography education and pandemics

Of course, COVID-19 does not only have negative consequences. Information technology and home delivery is booming more than before. The pandemic also has some positive effects on worldwide energy consumption and it dampens CO₂ emissions. Part of these effects might be permanent. However, although the energy transition is going on (Figure 2), COVID-19 buys little time to reach the Paris climate goals.

However it may be, the pandemic offers opportunities to revise our way of life. Already before the pandemic Morgan (2015) wrote an interesting paper that contains a review of some debates within Anglo-American geography about the shape of the world to come. Morgan advises us to juxtapose Harvey's (2010; 2014) structuralist accounts and Gibson-Graham et

al.'s (2013) post-structuralist account and find a way to balance these perspectives to get an idea about social change in our capitalist world. According to Morgan structuralists are focusing on "political and economic forces that limit the range of possible futures" while post-structuralist "stress the open-ness of possible and preferred futures by positioning that human and physical geographies are being constantly 'made' through human and natural processes". Gibson-Graham et al. focus more on the importance of local initiatives for societal change than Harvey does. Morgan thinks that looking at the separations and connections between structuralists and post-structuralists is helpful in our search for societal change and in any attempt to provide a futures perspective to geographical teaching and learning.

Many geographers argue that the local and the global are interwoven. In arguments about probable, possible and preferred futures scale is a very important geographical concept. In 2016 Werlen organized the International Year of Global Understanding (IYGU) under the auspices of the International Geographical Union. The IYGU (Werlen, 2015, p. 107) aims "to raise awareness of the global embeddedness of everyday life; that is awareness of inextricable links between local action and global phenomena". The IYGU wants to achieve these goals by empowering bottom-up movements that take sustainability in account when making decisions, by promoting global sustainability and by highlighting that territorial conflicts are not a solution for global challenges.

What the COVID19 pandemic teaches us once more is that globalization entails vulnerability, inequality and dependence. It would be wise in the near future to work hard to realize a healthy, sustainable and just society. Perhaps it is best to organize it in small units focusing on sustainable food, water, housing and energy management for all inhabitants. More than 500 years ago Thomas More already described his utopia. A vision is a good thing to start with, but giving it hands and feet is not easy. However, if we look at many modern initiatives for instance in recycling, energy transition, local and global co-operation there is hope for a more sustainable society on planet Earth. As Tyner and Rice (2020) state: "A

meaningful life is only possible within a form of social organization that provides opportunities for the flourishing of all people, not some at the cost of others – that is, one that fosters meaningful life by making empathy its top priority. Such a society sees no dilemma between saving lives and saving a way-of-life. Indeed, unlike today’s corona-economists, it sees these as one-and-the-same”. This can be a passable road to realize a preferred future for many.

Can geography education help the citizens of tomorrow to think about sustainable development goals and societal change? During the first wave of the COVID-19 outbreak Kidman and Chang (2020) have been asking questions about how well we are preparing children as tomorrow’s citizens. They state that education in times of crisis should “teach children how to identify risk and manage crisis within the social contexts of their society” and help them “to interpret accurately the information they come into contact with”. From a short review of papers in *International Research in Geographical and Environmental Education* relating to the teaching of risk, disasters, and/or crisis management, Kidman and Chang summarize that both the natural and human processes need to be considered and that “students would be interested in studying topics around extreme natural events when taught via pedagogies involving inquiry-based practices (critical, practical and action oriented)”. In the same line other authors like Pauw mention an important task for geography in schools: “With future issues being highly complex, dynamic, appearing on different scales and often involving both human and natural aspects, geography offers a highly appropriate fundamental conceptual framework for an understanding of these issues” (Pauw, 2015, p. 319).

COVID-19 is not a natural event, but a pandemic that can be used to teach students about the vulnerability and dependencies in our complex world. For students, COVID-19 can mean online schooling, cancelled holidays,

parents losing income or getting much more work because they work in booming sectors of the economy like health care, law enforcement and IT. Starting from their own experiences students should be challenged in geography lessons to construct concept maps or scale models of the causes and effects of COVID-19 in a region. Systems thinking can be helpful. Cox et al. (2019, p. 50) point to the importance of treating relations in an explicit way in the classroom and to visualize the relations in a system using concept maps or computer simulations. Students should learn that changes in a part of the system might affect the whole system. The well-known set of geographical questions in a system thinking inquiry can be helpful: what is where? why there? with what effects? can it be done differently? is that preferable?

This set of geographical questions can be used analysing the occurrence of COVID-19 as well as other changes in people’s lives and livelihoods. As the meaning of the word geography promises, geography in schools can and should take the lead in looking at the world and to understand the world. Geography should work together with other disciplines given the multidisciplinary nature of big contemporary issues like climate change, migration and pandemics (Pauw, 2015, p. 319). Schools are not needed to help students learn facts and opinions. Smartphones deliver that kind of info every minute. What students go to school for is to learn conceptual frameworks to get an understanding of how the world works. Young and Lambert (2014) speak about “powerful knowledge”, conceptual knowledge grounded in a discipline, dynamic and reliable.

The smartphone generation needs it not to get lost in the chaos of today and to be better prepared to find roads to better futures. Powerful geographical knowledge about local and global systems is fascinating and necessary stuff to learn about. Without it tomorrow’s citizens will get lost.



Figure 2. Wind turbines at the Yangtze River Estuary near Shanghai. Source: Joop van der Schee (2016).

A critical reflection is necessary here. Changing the content of geography education and the way of teaching is far from easy. In many countries all over the world geography education does not have a strong position and is taught in a traditional way. In addition, many geography teachers did not learn to realise challenging inquiry learning about complex issues in our fast changing world. However, although the impact of pandemics, climate change and the internet revolution is difficult to grasp, teaching and learning about these modern complex world issues is what we need. Only if teachers bottom up make steps together, exchange good practices and get support from national and international institutes and organizations can we expect that students in the near future will learn geography in a more meaningful way.

This does not alter the fact that we need building blocks. We have to realise that system thinking and inquiry learning in geography are not possible without a good set of basic world knowledge. An option is to start with classroom talks about what we see on thematic maps and in simple web atlases. So doing we may help students to get a better understanding of life on planet Earth. As Kerski (2013) stated “maps help us investigate the ‘whys of where’ the essence of scientific and geographic inquiry. [...]. They explain far more than simply ‘what is where’. They are keys to uncovering the reasons for the location, interaction, and changes occurring over, on, and under our planet’s surface, and in addition, in social, cultural, and political networks that often cannot be seen or touched”. Dangermond and Pesaresi (2018) describe the power of using GIS in education citing Goodchild who said that: “GIS can tell us a lot about the world that is valuable and useful.

But only a user who is always thinking critically can filter what is valuable and useful from what may be dangerous and misleading. Always question!”.

So we need qualified geography teachers who teach students to look beyond maps and to ask critical questions about our complex and fast changing world. In the case of COVID-19, about locations, distance, air quality, food supply, diseases, economic interests and short term politics. Such education will not prevent pandemics, but it will make new generations more critical of the vulnerability and dependencies of the systems we live in and raise awareness of the choices we face on planet Earth.

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