

Why I do not believe that people will be richer in the future

An opinion piece by Dr. Dorothea Mayer

Introduction

Our Green Room group has been reading and discussing the book 'Why we disagree about climate change' by Mike Hulme (Hulme, 2009). One of the arguments the book makes is that disagreement about climate change may be rooted in disagreement about the wealth of future generations. Wealth determines how well an individual or a society can cope with the effects of climate change. If a person assumes future generations to be much wealthier than we are today, they may believe that future generations will have more potential to cope with climate change whereas if a person assumes that future generations will be less wealthy, they will believe that future generations will have a lower potential to cope with climate change. This led to an ongoing controversy within our group about how wealthy future generations will be.

I would like to argue that future generations may well be less wealthy than we are today. My reasons for this assumption all stem from a few basic principles: resource scarcity, overpopulation and added stressors due to global environmental change. Today, we can already observe a trend towards resource scarcity which has historically led to price hikes. There is no reason to assume that this resource scarcity will be resolved within the foreseeable future since global consumption is approaching the hard limits of this planet as projected by the Club of Rome (Meadows, Meadows, Randers, & Behrens, 1972). More people having to compete for fewer resources must ultimately lead to increased scarcity and poverty. In addition, global environmental change such as erosion and environmental degradation, increased pollution, sea level rise and severe weather events induced or exacerbated by climate change will add pressures and stressors onto societies which will result in added costs for things such as coastal protection or environmental protection. The funds allocated to such activities then cannot be spent on poverty alleviation.

Definition of terms

Before I can elaborate on my arguments, I need to clarify what I mean by the terms 'people', 'wealth' and 'future'. These terms are often not well defined leading to frequent misunderstandings. For example, when people use the word 'people' more often what they think of primarily is 'people like me'. This is particularly problematic when speaking about wealth since financial situations vary wildly between individuals, families and countries.

When I speak of 'people' I mean the majority of human beings living on Earth now as well as their descendants. The inclusion of the descendants is important since inherited wealth tends to accumulate and chronic poverty can be exacerbated by added stressors. Therefore, I acknowledge that individuals or individual families may become richer, even as the majority of humans becomes poorer.

When I speak of 'wealth', I will focus solely on material wealth, specifically the five basic material human needs of water, food, clothing, shelter and energy. In a world where billionaires are poised to become trillionaires while the poorest families plan foodless days, a hard definition of wealth presents challenges. I will define a person as poor if they are incapable of procuring the five basic human needs while a person at risk of poverty is struggling to procure these basic needs within the context of that person's country. That means that a poor person living in an industrialized nation can

call a larger number of dollars their own than a poor person living in a developing nation, yet still be poor under this definition.

Finally, when I speak of 'future' I focus on the time between the time of writing, 2021, and the end of the 21st century. This covers the first and second generation of people who will feel the effects of climate change.

Resource scarcity reduces people's ability to procure their basic human needs

Any reduction in resource availability will lead to an increase in pricing of these resources, unless some form of government subsidies are implemented. However, even in the case of subsidies, the costs still increase for the average person because governments are tax payer funded. So while the resource itself may become cheaper, taxes may well go up which increases the burden levied on tax payers. Ideally, the rich would pay more taxes, which would not inhibit their ability to procure basic human needs, however, experience shows that the rich overwhelmingly practice 'tax evasion' (stealing from the community). As a result, the ones most heavily burdened by tax increases are middle income individuals and families who are then pushed closer to the precarious state of being at risk of poverty, while those already at risk of poverty will further be impoverished and become poor.

Numerous factors reduce resource availability. In the following, I will look at the five basic resources of water, food, clothing, shelter and energy to analyze why these resources are becoming scarcer and what factors might exacerbate this trend in the future.

Water

Earth only has a finite amount of water on it. Most of that is saltwater, unsuitable for human use. The majority of freshwater is either locked up in glaciers and ice sheets or stored in underground aquifers. Only a minute quantity of freshwater on Earth is contained in surface water and therefore easily accessible to humans. Today, all of these sources of freshwater are in serious decline. Glaciers are melting at record rates while aquifers are being pumped dry faster than they can regenerate, especially in areas important for agriculture (Gleeson, Wada, Bierkens, & van Beek, 2012). Surface water is also disappearing, lakes and rivers are drying up. What is left is often polluted, unsuitable for human use.

Pollution is not the only threat for surface and groundwater. Salinization poses an additional risk. Salinization occurs mostly in coastal regions where sea level rise leads to intrusion of saltwater into freshwater reserves. This can occur on the surface, especially in river estuaries as rising tides push further upstream than in the past, or underground as saltwater seeps through the soil, contaminating aquifers.

Contamination is not the only threat for aquifers. As aquifers are pumped dry, the rock layers which used to be supported by water pressure are compressed. This reduces the aquifer's ability to store water and may also decrease water flow into the aquifer. Thus, overuse of aquifers reduces water availability while preventing the replenishing of the aquifer.

Climate change further exacerbates this water scarcity. Rising global temperatures accelerate meltwater runoff from glaciers. Some glaciers have already disappeared while many others are projected to disappear this century. In addition, droughts and heat waves are becoming more frequent. Droughts are periods of reduced rain- or snowfall. During these times, freshwater resources cannot be replenished. Heat waves exacerbate the problem by increasing evaporation, sucking moisture out of plants and soils. This reduces the amount of water that percolates into

deeper soil layers to replenish groundwater supplies and aquifers. During periods of drought, chemical reactions in soils can make them less permeable, thereby reducing the soils' ability to absorb water when it rains. This leads to increased runoff. Thus, even while the land thirsts, precious water is washed into rivers, lakes and from there to the oceans. Less water is retained and therefore available to human consumption.

In the name of 'efficiency' some countries have privatized their water resources, while others are selling or thinking of selling their water resources and the tax payer funded water distribution networks that go with them. Such measures have always resulted in increased prices for the consumers while the infrastructure was left to rust and rot, leading to leakages which in turn led to further shortages and more price hikes. There is no reason to assume that this vicious cycle spawned by corporate greed will be overcome in the future.

Some coastal countries or communities have attempted to alleviate their water scarcity by relying on water desalination technologies. But these technologies are expensive and usually in the hands of private corporations. To incentivize private investments in the infrastructure, the governments often subsidize initial building of water desalination facilities. As soon as these subsidies subside, the same vicious cycle of infrastructure decay and price gouging sets in.

Privatization of water resources grants corporations power over people. If people cannot pay their water bills, their taps are turned off. This forces people to pay the even higher prices for bottled water from stores. Thus the poorest members of society are forced to resort to the most expensive solutions in order to access the most fundamental resource necessary to life.

Food

As omnivores, we humans can consume and digest a variety of foods. Our food can be sourced from the land or from the ocean. We eat plants, animals and fungi. All of these sources of food are currently reaching the limits of their productivity due to various causes such as resource limitations, reduction of total area of arable land or overexploitation and decline.

Land plants, land animals and fungi all derive their primary production from photosynthesis of land plants. Photosynthesis is limited by the availability of certain resources, notably water, nitrogen and phosphorous. While nitrogen is comparatively plentiful, water is becoming increasingly scarce and phosphorous reserves are already severely depleted. Thus plants' ability to grow and produce food will decline as these resources become increasingly scarce.

In addition, heat waves can reduce photosynthetic activity, even in the absence of resource limitations. Enzymes tend to break down under heat stress. In the worst case, photosynthesis can break down entirely. This phenomenon was first observed during the heatwave of 2003 in central Europe.

Land availability and fertility plays an important role for food production. But arable lands are declining worldwide due to combinations of groundwater depletion, pollution, salinization, erosion, land degradation, desertification, infrastructure expansion and sea level rise. Even today, farmers are displaced, forced to abandon the fields which used to nourish them. Farmland is more than just a place to grow crops, it is an investment for farmers. If this investment is lost, the former farmers are forced to buy food to sustain their families. This ultimately exacerbates food scarcity from both ends of the economic chain: it decreases the amount of food produced while increasing the number of people competing for what is left.

Eating habits can exacerbate food scarcity. Meat production requires huge quantities of feed that in turn blocks large swathes of arable land from being used for food production. Converting feed into

meat is accompanied by massive losses of energy and biomass which reduces the overall quantity of food available for humans. In addition in more affluent countries, food can be wasted due either to thoughtlessness, ignorance or even intentional destruction to increase scarcity. Such waste and subsequent price gouging leads to greater strain on the world's poor. In addition, it exacerbates resource depletion and land degradation unnecessarily.

Food sourced from the ocean mainly consists of fish. World fish stocks have been in decline for decades, in spite of some countries' efforts to limit catches by enforcing quotas. In addition, pollution has led to accumulation of toxic substances in the food webs of the oceans, making some fish inedible for humans. These trends are likely to continue in the future and could lead to shortages of fish which will in turn impact coastal communities who rely on fisheries both as a source of protein and a pillar of their economies.

Food pricing in different countries can incentivize exports from poorer nations. Some countries, whose populations are dependent on food aid, export food to sustain their economies. Such absurd situations rob the poorest citizens of the means of providing for themselves by increasing food prices to beyond their purchasing power. It also artificially increases the number of people in need of food aid and the funds necessary to address the problem.

Lastly, food production today often involves the application of large numbers of chemicals such as herbicides, pesticides and antibiotics. While some of these substances naturally degrade over time, some accumulate in ecosystems, water and farmland, further limiting these resources. Thus in our attempt at maximizing productivity today, we are poisoning land and water, limiting our abilities to produce food in the future.

Clothing

Clothing can be sourced directly from plant fibers, from animal products such as furs, skins or silks or be woven from synthetic fibers. Plant fibers are subject to all the same limitations as plant-based food. In addition, land used to cultivate fibers cannot be used to cultivate food, thus leading to competition between food and clothing.

Animal skins and furs can either be produced as a by-product of meat production or animals can be reared specifically for the clothing industry. In both cases, land needs to be set aside for animal feed, thus further exacerbating land shortages.

Synthetic fibers are almost exclusively sourced from fossil fuels. They are therefore subject to the limitation of fossil fuel reserves and the competition with energy and plastic production. Some clothes can be produced from recycled plastics but all contribute to plastic pollution, further reducing clean water, air and land supplies.

All types of clothing require large quantities of water to produce. This water is polluted in the process, rendering it unsuitable for human consumption. Thus clothes production increases costs for water purification.

An added difficulty is the recent phenomenon of fast fashion. Those who can afford to wear clothes for very short periods of time before discarding them. In response clothes are designed to be less wear and tear resistant, often fraying after only a few weeks. However, these ephemeral products force those of lesser means to buy new clothes more often than they normally would, thereby exacerbating the financial burden on the poorest citizens.

Shelter

There are two main types of costs involved in procuring shelter: building costs and maintenance costs. Building costs are all costs related to the initial construction of the shelter. Maintenance costs are all costs related to maintaining the shelter in a habitable state.

Building costs depend on availability of building materials. Shelters can be built from renewable resources such as plant (wood, reed, bamboo, thatch) or animal products (leather, bone, dung) or from non-renewable sources (stone, mud, sand, gravel, metals). Renewable resources must be grown or farmed, leading to the same limitations as for clothes and food. Non-renewable resources can be depleted and in some cases already are in severe decline.

A particularly noteworthy example of a non-renewable resource in critical decline is sand. Sand is integral to buildings in the form of cement, concrete and glass. But only water-shaped sand is suitable for construction, the large amounts of wind-shaped sands in desert regions cannot be used. Overexploitation of accessible sand resources increases the rate of coastal erosion and destruction of ecosystems. Sand scarcity will increase building costs in the future. Worse still, once used for construction, sand can rarely be recycled (Bendixen, Best, Hackney, & Iversen, 2019).

People can procure shelter through three different means: by building the shelter themselves, purchasing the shelter, building, apartment or housing unit or by renting it from another owner. Building the shelter limits people to the resources available to them. In the worst case, this can lead to unsanitary or unsafe housing conditions. Purchasing shelter has high immediate costs but lower long-term costs. However, it can indebt people for long periods of time. Renting shelter avoids the high initial investment but at the price of higher long-term costs.

A shelter, no matter whether it is a hut or a castle, is usually a spatially fixed investment (with the exception of mobile shelters, such as tents or house boats). If a natural disaster strikes the area where the shelter is located, odds are that the shelter will be impacted or even destroyed. Frequencies of natural disasters will likely increase as a consequence of climate change and other human activities, thereby increasing the risks that shelters will be lost. This is already the case in many coastal areas where coastal flooding impacts homes and even entire communities. Some communities have already been forced to abandon their homes, while others persevere in increasingly unsanitary conditions. When people are forced to move away permanently they leave behind not only a portion of their lives but also the investments they sank into their condemned homes. These people will be poorer than when they still lived in their ancestral homes.

Losing a house or apartment that was rented may seem less of a burden, but every housing unit lost increases the pressure on remaining housing units. Since demand continuously outstrips supply, price hikes ensue. So a family that was driven from their rented home by an extreme event, not only lost a large portion of their possessions (which need to be replaced) but may be faced with higher costs to rent a new home. The more families must spend just to keep a roof over their heads, the lower their purchasing power and quality of life will be.

For many families shelter constitutes the single biggest financial burden. Any increases in pricing will increase the burden on people. In the past, we have already seen a housing crisis that led to increased homelessness spawned by people being unable to pay their mortgages. As more people lose their homes they are forced to compete for ever scarcer low-income housing. To make matters worse, many cities report buildings are being left empty, because owners refuse to rent them out (Glaeser, Huang, Ma, & Shleifer, 2017). Thus, slums grow while good housing remains vacant.

Even if in the future a global housing crisis were to bring down prices for shelter on a global scale, it is unlikely to benefit the poorest individuals, or even the middle class. A housing crisis typically drives

the poorest from their homes while the middle class lose part of the financial resources they invested in their homes since their properties would then be worth less than when they were purchased.

Energy

Humans today need two main types of energy: heat and electricity. Of these, heat is the more important of the two, since loss of heat can lead to sickness and death. But for most people, electricity is just as important since it enables accessing information, thereby contributing to raise people's skill levels and opportunities. But regardless of which type of energy we look at, more people need more of it even as our modern lifestyles demand more energy per person.

Energy is sourced from three primary sources: fossil fuels, nuclear fuels and renewables. Fossil fuels such as oil and natural gas are already in decline, all easily accessible reserves either are already in decline or are being exploited to maximum. Efforts to access more resources are bought at ever increasing costs for more expensive technologies. The only fossil fuel we have left in abundance is coal, the dirtiest, most polluting kind of fossil fuel. Crucially the costs for environmental damages and health risks are not priced into the net purchasing price for fossil fuels. But these costs add medical bills to already burdened families. The rise in chronic respiratory illnesses such as asthma is attributed to increased air pollution.

Nuclear energy is currently being touted as cheap and safe. But historically, nuclear energy has been neither safe nor cheap. Government subsidies mask the true costs, burdening the tax payers with both the initial costs of constructing the power plants and the incalculable long-term storage costs while rich private shareholders make off with the profits. In addition, nuclear accidents increase cancer rates and can block large swathes of arable land for an indeterminate amount of time, such as the exclusion zone around the once thriving city of Chernobyl. And just like with fossil fuels, environmental and health care costs are not priced into the energy bill.

Renewables mainly come from solar, wind, water and biomass. Biomass requires land to grow resulting in all the same problems as for clothes. Land-use for biomass production has already spawned the food versus fuel debate, due to the ethical problems involved. Water power requires the construction of dams, which can severely impact downriver communities as well as the entire river ecosystem. Dams also trap sediments that then are not washed into estuaries to replenish the natural barriers against sea level rise. Thus, even as beaches are being robbed of their sand for construction purposes, they are prevented from regenerating by dams, often themselves built from concrete.

Wind and solar energy also require land and resources. Their main issue, however, is intermittency. They cannot produce energy continuously because they are dependent on the weather. Therefore, they require additional infrastructure such as energy storage units in order to guarantee a stable energy supply. Building this additional infrastructure on a global scale will cost large sums of money, a burden that clever companies will no doubt levy on the tax payers.

Conclusion

My analysis of the five key resources necessary to a life in dignity shows that all these resources are either, currently being overexploited, severely stressed or not available in sufficient quantities for everyone. Costs for all basic needs will continue to rise, as scarcities become more apparent. The poor in many countries are already suffering the consequences of these effects.

Current trends are likely to continue, exacerbating scarcities of key resources, increasing their costs and burdening the poor. The higher the costs become, the more people will slide into poverty. This trend will be exacerbated by feed-back loops, such as soil degradation enticing farmers to clear more

land to sustain themselves which leads to more soil degradation, by cascading events such as aquifer depletion leading to land subsidence leading to property loss, and by climate change fueled extreme events that can wipe out people's livelihoods in a short span of time. Therefore, many people are likely to be poorer in the future.

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