The Unprecedented Decade:
A Proposed Solution to Current Global Crises

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Abstract

In response to various reports of ongoing crises throughout the world, this essay has been written with the aim of proposing a radical transition in the way the world currently operates. Through general observation, the case presented below posits that human labour is insufficient to provide the means of modern lifestyles, and that current economic systems are incompatible with a sustainable and decent human lifestyle due to this insufficient productivity. To compensate, mechanised labour has been produced and implemented to offset this insufficiency, but at the cost of the environment and a growing human insolvency. To avoid economic and ecological disaster, this essay posits that human labour must be abandoned and replaced by sustainably powered and automated labour worldwide, simultaneously fulfilling the various global demands freely and obsoleting emissions-intensive mechanised labour. Doing so would eliminate economic contentions that prevent many from attaining a decent quality of life while also addressing the issue of heavily polluting industries.

Introduction

On the 9th of October 2018, the Intergovernmental Panel on Climate Change (IPCC) released a report stating that the world had 12 years to in which to take action to avoid a catastrophic change in global weather systems [1]. The document included a set of proposed "pathways" by which the world could act to combat the adverse effects being caused by man-made emissions. Unsurprisingly, the main suggestion was to lower these emissions by diversifying energy generation, specifically lowering coal to 0% and oil by a significant fraction. In addition to this, the document suggested a range of other changes, such as innovations that can disrupt the energy markets or, in a similar manner, "transform" the aforementioned pathways through technological innovation.

In a similar vein, on the 30th October, the World Wildlife Fund issued a report on the state of natural resources and assets, placing a monetary value on ecological phenomena to the tune of $125 trillion [2]. Additionally, in 2016 Credit Suisse revealed that the richest 1% of the global population owns half of the world's wealth [3]. These reports are all indicative of issues that put the world in a precarious position. Moreover, the solutions to these problems, as some of the authors point out, are so far-reaching as to have no precedent in any society in history, and will have to be all the more extensive given that government investment into fossil fuels is increasing [4].

Despite this stark deadline and bleak global outlook, there are still options available. The IPCC lay out dozens of actions that can be taken to push back the 2030 climate change deadline, there are a number of organisations worldwide dedicated to preserving wildlife and others to ending poverty. These reports and options present good cases and make commendable suggestions of viable solutions. Moreover, a united, coordinated effort is more likely to provide a decent response. The focus of this essay is not these solutions however, and instead proposes a radical strategy to address the aforementioned problems simultaneously. This proposal can potentially supplement, or be supplemented by, the original solutions, but attempts to solve the issues by considering the underlying contentions that led to the crises in the first place.

The Global Crises of the Current Era

In 2017, The Carbon Majors Report detailed how 100 companies were responsible for 71% of carbon emissions [5]. This suggests that inaction and disregard for the environment comes from industrial and/or commercial entities, driven by demand and capital. The current trends of industry, capital and demand have resulted in a range of damaging industrial and commercial practices. To suggest better practices, we must identify the underlying contention behind them and propose an alternative approach that satisfies demand while avoiding economic and environmental damage. However, here we will opt for a more heuristic approach, using general observations to establish a cause of the current global crises, after which we can begin to offer such alternative solutions.

To begin, we observe that the global economy is dependent on labour. We also note that in the case of human labour, the energy expended by the human body is not entirely relevant to the work it completes, nor is it always sufficient to meet demand. Often the payment received for this work does not reflect this expenditure, either underpaying, paying for the work done or overpaying to include other expenses. This payment will hence either not meet the requirements to sustain and/or motivate human labour or will cost the relevant industry more than the completed work physically accomplishes and/or is worth.

The inadequacy of human labour is even more apparent when considering the cost of a modern lifestyle, with access to high quality nutrition, healthcare and commodities. To compensate for inefficient human labour, industrialisation and mechanised labour have been implemented on large scales worldwide. This strategy has improved productivity, but failed to alleviate the original contentions of human inadequacy, as the machines do not directly improve human productivity. Summarily, the use of polluting machinery in supplementing and replacing human labour not only come at the cost of human employability, but also taken a heavy toll on the environment.

Hence it becomes apparent that human labour is incapable of achieving a productivity that can provide a modern quality of life, particularly on an society-wide scale. This fact has not stopped demand for a decent, and in some luxurious, lifestyle, and has resulted in a conflicted global economy that emphasises short-term, concentrated profitability via stagnating wages and large-scale industrialisation while sacrificing long-term, widespread stability in both the economy and the environment. These factors have exasperated the global economy and environment to the point of the current crises and require extreme changes, similar in scale to those suggested by the IPCC.

No conventional economic theory provides a sufficient answer to these problems either. Capitalism's focus on profitability devalues any labour not in sufficient demand, leading to issues with human error, inefficient labour and disaffection. Communism's philosophy, to provide an equal and sustaining wage to workers regardless of circumstance or productivity, risks economic stagnation and/or collapse from widespread lack of production, whether due to lack of earnings/motivation or caused by widespread inefficiency and losses. Likewise, socialism suffers similar flaws, though also inherits some of capitalism's imperfections. As previously mentioned, the introduction of industrialisation to aid human labour runs into the same issues of pollution and human redundancy as before.

As long as current socio-economics is focused on manipulation and exploitation of labour, emphasising short-term profitability through ever-cheapening labour, while the "affluent" ignore the potential the contentions of mechanised and human labour, the current trends will continue. This will inevitably worsen the quality of life on Earth, and end human civilisation altogether. This "affluent" demographic spans from the wealthy elite and government officials, to the socially and culturally influential, the former being either those with money and manpower, the latter being those able to raise capital and manpower quickly through social/cultural influence.

An Unthinkable Solution

The current crises and their underlying causes are indicative of prioritising capital and demand above environmental and inequality issues, despite clear warnings against inaction. Various institutions have their predictions on the future, but there are three likely eventualities: Revolution, insurrection or extinction. The latter two possibilities will see current civilisation and its benefactors fall either by violent means fostered through social disaffection or by complete civil, economic and ecological collapse respectively. The former is the only solution of the three that can provide the necessary change to preserve the environment and humanity. The world requires an industrial revolution.

To prevent these crises, the supplementation and replacement of human labour with machinery must adopt a sustainable and free approach. Gauging product value by demand or accessibility will encounter the issues of the previous section and result in social upheaval, especially as replacement labour will displace human labourers who will then lack an income, disposable or otherwise. As such, the global economy must abandon unnecessary/trivial human labour and valuations relative to human capability due to its economic incapability, and modify mechanised labour due to its pollution.

To separate it from mechanised labour, this proposed source of production is referred to as automated labour. In this essay, it is defined as self-sufficient, subservient mechanised labour that requires minimal to no maintenance from human labourers and powered through sustainable power sources. In being so, it will require no need for human labour, and itself provide productivity in place of human labour. For this reason, its operation must not include the use of capital. Otherwise the insolvency caused by automated labour will prevent a large majority from partaking of its production, leading to large-scale insurrection.

Currently, there is a great deal of research, prototyping and realisation of purpose-built robots, from agriculture [6][7] to healthcare [8][9] to distribution [10][11]. These robots make for good candidates of automated labour in an this approach, and provide plausibility for the strategy's success. Additionally, the prevalence of automation in modern society suggests that such trends will continue and quicken pace: a survey conducted by Deloitte found that at current rates, industries would be fully and universally automated within the next five years [12]. Arranging these into a sustainable automated global labour force, as proposed in this essay, will remove both pollution and inequality issues from the global economy, providing products to satisfy demand without heavy emissions or contentious socio-economic systems.

The benefactors of this approach will obviously depend on the intended beneficiaries. Regardless of private or public nature, the interest of any group within society will usually be their own interests, though the more conscientious will be concerned for other's participation and welfare. Given the scale of automating an economy, these benefactors will likely need to interact and possibly combine to reach a mutually agreeable arrangement. To this end, the various demands from across society, and even the world, need to be taken into joint consideration and provide the basis of such an arrangement. The scale of constructing an automated economy is monumental enough without having additional delays due to opposition, disagreements and protests. Hence, implementing this approach must consider all demands and ensure they are all satisfied to no one group's detriment. Avoiding further difficulties in implementing an automated economy should suffice in enforcing this ideal and ensuring all parties are heard and accommodated.

The reader is encouraged to consider what options would persuade the various demographics worldwide to abandon their labours in favour of an automated workforce. As mentioned, the most obvious approach, particularly for private concerns, would be an automated set-up that replicates their current lifestyles, made even more appealing by being freely available. This amounts to early retirement for those made redundant or insolvent, the stability and sustainability of this retirement being subject to protest from any who are neglected by the implemented automated system. The sheer scale of this venture would likely require a transitional period, where human labourers are phased out over time in favour of automated labour.

Estimated Feasibility of Global Economic Automation

In 2015, the Massachusetts Institute of Technology's Energy Initiative (MITEI) published a report, the Future of Solar, which examined the use of solar power plants and their use in energy markets, and concluded that solar panels were capable of supplying the world with all the power it demands [13]. There are various concerns in powering the world by solar, ranging from scarcity of materials such as silicon, silver, tellurium, gallium, indium and selenium to balance-of-system (BOS) costs such as installation.

Despite these concerns, the International Energy Agency (IEA) have made estimates on the capacity for solar to provide power in the future, as found in MITEI's report. These projections have been shown to be outpaced by actual solar power implementation, resulting in more solar power generation than expected. From 2006 to 2014, the IEA *World Energy Outlook* showed that solar power generation has been fractionally larger than their estimates. Further to this, prices of solar power systems have also been falling sharply in recent years, improving the viability of solar power.

The scope of the aforementioned paper is large and encompasses a range of data sets and conclusions. For our purposes, we consider the proposal of a global automated economy and break down costs and requirements in a much simpler fashion. To fully automate many of the services and solve many issues of a human driven economy, we first need a sustainable power source, for which we have chosen solar power. Even then, we proceed only with averages and very specific solar conditions. The situation would clearly become more complicated as we examine certain regions more closely and introduce other renewable energy sources, but for now we neglect these factors. To begin, we calculate an estimate for the solar power required to fulfil current global energy consumption. For this, we estimate the amount of solar power available worldwide:

$$\text{Earth's Surface Area} = 501{,}100{,}000\text{km}^2 = 501{,}100{,}000{,}000{,}000\text{m}^2,$$
$$\text{Average Irradiance at sea level on a clear day} = 1000\text{kW/m}^2.$$

Using this irradiance, we can calculate an estimate for the cumulative power incident on a point on Earth's surface over the course of a 12hr period:

$$\text{Approximate Cumulative Power} = 501.1\times10^{12}\text{m}^2\times12\text{hr}\times1000\text{kW/m}^2 \approx 6.12\times10^{18}\text{kWh}.$$

Here we have assumed an average of 12 hrs of daylight per day, when averaging out winter and summer daylight hours. This 12 hour period represents the average duration of solar irradiance for any one point on the Earth's surface. Multiplied by the area of the Earth, we find the total amount of solar irradiance experienced by each metre squared area to be 6.12×10^{18}kWh. Though Moalem states that solar panels are on average capable of an efficiency of 25%, we assume a collection efficiency of 16.5%, the average for lower standards of solar panels at time of writing:

$$\text{Average Total Power Collected} = 16.5\% \text{ of } 6.12{\times}10^{18}\text{kWh} \approx 1.00{\times}10^{18}\text{kWh}.$$

This assumes we cover the Earth with solar panels however. For our purposes, we need the fraction of the surface coverage required to meet current demands. The global energy consumption over the past two decades are given below, supplied by the International Energy Agency (IEA) [14] in kilo tonne of oil equivalent (ktoe) and used to obtain the equivalent kilowatt hour (kWh) values:

Date	1990	1995	2000	2005	2010	2015
Coal (ktoe)	2220183	2207026	2316125	2993746	3652298	3850534
Natural Gas (ktoe)	1663518	1807686	2072073	2359231	2735488	2943686
Nuclear (ktoe)	525520	608098	675467	721706	718829	670298
Hydro (ktoe)	184324	213142	225131	252346	296247	335745
Geothermal, Solar,etc. (ktoe)	36603	42464	60159	70265	110420	204339
Biofuels & Waste (ktoe)	909368	972036	1022197	1096114	1221756	1317216
Primary & Secondary Oil (ktoe)	3233897	3374906	3662923	4000746	4139699	4347259
Total Energy (ktoe)	8773413	9225358	10034075	11494154	12874737	13669077
Total Energy (kWh)	$1.02{\times}10^{14}$	$1.07{\times}10^{14}$	$1.17{\times}10^{14}$	$1.34{\times}10^{14}$	$1.50{\times}10^{14}$	$1.59{\times}10^{14}$
Average Daily Energy (kWh)	$5.59{\times}10^{10}$	$5.88{\times}10^{10}$	$6.39{\times}10^{10}$	$7.32{\times}10^{10}$	$8.20{\times}10^{10}$	$8.71{\times}10^{10}$

Table 1: The global energy consumption data gathered by the IEA, in 5 year intervals over the past 25 years. ©OECD/IEA 2018, World Energy Balances, IEA publishing, modified by HG Haleswood. Licence: www.iea.org/t&c.

The fraction of surface coverage required can then be found by the ratio of current daily demand (or most recent demand, such as the 2015 data) to solar power incident on the Earth in a 12 hr day. This ratio can be multiplied by the Earth's surface to obtain the required solar panel coverage:

$$\text{Coverage Factor}{=}8.71 \times 10^{10}\text{kW}/1.00 \times 10^{18}\text{kW} \approx 8.71 \times 10^{-8}$$
$$\text{Total Coverage Required}{=}8.71 \times 10^{-8} \times 510.1 \times 10^{12}\text{m}^2 = 44429710\text{m}^2 \approx 44.42\text{km}^2$$

This figure is approximately a magnitude of 10 less than the numbers presented by Moalem. This is likely due to the above solar irradiance of a 1000kW, which is the average on a clear day at sea. Any irradiance below 1000kW yet above 100kW will increase the required area by a multiple of 10. Thus, the required coverage ranges from approximately 40km^2 to 400km^2. Here we consider the worst case scenario, requiring 400km^2. The upper cost of solar panels were found to be £3000 for 8m^2 (from a commercial source [15]), which is £375 per square meter. At time of writing this is around \$480 per square metre, which scales to \$480$\times 10^6$ (\$480 million) per square kilometre. As these prices were found from a commercial source, the BOS costs are considered to be inclusive of this final cost.

Multiplying this by 400km^2 gives a total cost of \$192$\times 10^9$ (\$192 billion) to collect enough solar power to fulfil the energy consumption of the world on an average day between 2010 and 2015. Currently, the global GDP amounts to \$75 trillion, which is approximately 390 times larger, while the GDP of America is $19 trillion, which is almost 100 times larger. The world could hence satisfy its current energy demand through solar power at a fraction of its current GDP, though there would be some issues with countries whose personal GDP did not cover their percentage of the cost. This would cover all energy costs of mechanised labour supplemental to human efforts and lives within the current global economy.

However this calculation only covers the global energy consumption from 2010 to 2015 in terms of generation of electricity, which only covers mechanised labour. To observe the feasibility of our proposed transition to an automated economy, we need to consider how much solar power will be needed to automate human labour. Obviously, a transition of this sort and scale will be international in nature and subject to relevant issues, but to estimate an provisional cost we assume full compliance and cooperation. We also assume that the affluent have enough wealth and influence to automate their lifestyles, removing any cause for them to protest, and that human labour is largely abandoned in favour of sustainably automating the world.

The calculation for energy required to automate human labour is particularly complex, due to the diverse natures of human industry and robotic faculties. Automating human labour varies depending on the work, and the automated labour may require AI, mechanical faculties or both. To that end, the amount of energy required to do that work will clearly also vary. Furthermore, there are a vast range of labour roles, from management to knowledge bases to more trivial, manual labour, as well as interaction of these faculties. This difference in labour ultimately affects the power needed to perform said labour, making an average power value across all industries difficult to obtain.

Moreover, human labour includes all the faculties of the human body, relevant or not. Acquiring a minimum energy for automating human labour is difficult for that reason, as it requires separating the energy expended by human labour from the likes of basal metabolic rate and other irrelevant bodily energy expenditures. As we are already dealing with estimates, and for argument's and simplicity's sake, we will assume that the average energy expended on labour across all human industries is 1W h per labourer per hour and with an average of 8 work hours in a day, giving 8W h per human labourer a day.

We will also assume that automated labour, in the form of industrial robots, on average consume 1kWh per hour per robot and with an average of 12 work hours in a day. Though these robots could be kept working indefinitely, their work days are capped in consideration of their solar power supply, which we stated above as being capable of power generation for 12 hours each day. Thus, our robots yield 12kWh per robotic labourer a day. This 4 hour difference in work day hours, and the difference in work energy expenditure between 1W h and 1kWh, will lower the number of robots required to replace human labour. Additionally, unlike human labour, which requires a constant salary, robots will only need a single one-time cost. After that, their labour is limited only by availability of materials, maintenance and power supply.

The current global employment to population ratio is currently 58.5% [16], meaning 4.44 billion of the 7.6 billion people on Earth are currently employed. Using these figures, our solar power plants must be sufficient to supply 35.52 billion W h, or equivalently 35.52 million kWh. Looking back at the IEA's global energy demands in Table 1, the daily global energy demands on average from 2010 to 2015 was 87.1 billion kWh. Adding this to our estimated energy expended by human labour gives a total of 87.135 billion kWh. The addition of human labour expenditure is thus considered barely a factor in power expended by the global economy.

More pertinent to this calculation is the cost and power consumption of the replacement automated labour. On average, an industrial robot costs anywhere from $50,000 to $80,000. To obtain a number for the automated "population" required to replace human labour, we take the ratio of work energy expenditure:

$$\frac{8\mathrm{W\,h}}{12\mathrm{kWh}} = \frac{2}{3 \times 10^3}$$

Multiplying this by the current employed population will yield the number of robots required to replace human labourers:

$$\text{Number of Replacement Robots} = \frac{2}{3} \times 10^{-3} \times 4.44 \text{ billion} = 2.96 \text{ million}$$

Thus, the replacement robots will require funds between \$148 and \$238 billion. Our grand upper total to automate the global economy is thus \$325.1 billion. However, this figure represents an overestimate, given that not every job will require an industrial robot to fulfil it.

As initially stated, there are many other considerations ignored in this approach, such as international, private and public responses and interactions, as well as the inclusion of other renewable energy sources and the specifics of implementing an automated economy. Additionally, these estimates have not considered the rising energy demand from developing countries, as well as from potentially increasing population. Finally, while we have considered the power required to replace human labour, we have no factored into this calculation the power requirements for self-sustaining automated labour manufacture and maintenance (robots that build and maintain other robots).

Summarily, the above estimates show that global automation via solar power is hypothetically viable. The current worldwide industrial and human energy expenditures could be supplied by a sufficiently large enough solar panelled area, at a fraction of the cost of the global GDP. Additionally, as the final costs are calculated by considering global population, the cost required for any particular country can be found by calculating said country's population as a percentage of global population and multiplying by the final cost presented above.

Consequences & Considerations of an Automated Economy

The previous sections consider a fully automated global economy, and observe that the scale of such a system would require a transitional period where the automated labour is itself produced and implemented. This would require a provisional labour market to produce the replacement automated labourers, most likely a mix of human, mechanised and potentially automated labourers. Navigating this period could be contentious, affected by industries' and individuals' assessments of the risks associated with the proposed automated economy. The conclusion of these risk assessments would give a clearer indication of how to proceed.

We assume these risk assessments will be conservative and cautious. Despite stable early retirement, a salvageable environment and a more cohesive social climate being appealing motivations, they lack the comforting assurance of capital. Additionally, the differing industries are likely to automate at different rates, resulting in some sectors requiring human labour for longer, for which capital is likely to considered useful and so remain in demand. As such, we also assume that capital will be retained as a societal mechanism during the transition. While automation is considered preferable and superior to human labour, here we note that currently unautomated industries tend to have no alternative to said human labour. This unfortunately entrenches these industries in the contentions presented in the previous sections, and makes transitioning to an automated economy difficult as a result, particularly with regards to capital.

Despite this, the transition can be stabilized to a degree. With some industries automated, earnings can be proportionally scaled with the decrease in living costs. This should allow industries to employ more labourers, which in turn are dedicated to automating the industry they enter. The approach of "reskilling" labourers has already been considered recently by the Economic World Forum, providing not only precedent for the strategy, but potential guidelines [17]. Generally however, this strategy runs the risk of wealth consolidation within certain demographics. If owners/shareholders appropriate the extra capital from decreased wages instead of using it to expand their labour force, this strategy will obviously fail. Conversely, if excess capital successfully expands the remaining human industries' labour force, the new recruits will have varying and redundant expertise, lessening their utility. Likely they would most useful as brute labour power, allowing established/experienced workers the freedom to automate their industry.

A more glaring issue in this transition is the problem of sourcing enough production and expertise to facilitate economic automation. While industrialisation and automation has already lead to many industries implementing mechanised labour, much of this labour still requires human oversight to operate properly, and not all of it produces what may be required for economic automation. Replacing human awareness with computational oversight and/or artificial intelligence will be challenging, especially if specialist expertise is insufficient to automate the majority of industries. There are similar issues of "brain drain" for actually designing automated labour efficient enough to replace human labour. Hence the transition strategy must be carefully considered, with the allocation of capital and specialist expertise evaluated for both potential pitfalls and optimal efficiency. Rather than distribute specialists across various industries, it may be more productive to focus them on certain industries at a time, particularly if there is a lack of "brain power" and production available.

To this end, we also note that in MITEI's Future of Solar report, [13], they consider the production of certain materials required to facilitate building solar power plants. Economic automation is no different. The various materials required to construct the automated labour for an automated economy need to be sufficient to supply enough labourers to offset current emissions, including production of sustainable power sources. As stated previously, insolvents from these industries require a solution to their redundancy, which will either place them in a new industry or place them in retirement providing automation can sufficiently provide for them. These constraining factors will shape the necessary strategy to avoid social upheaval, and so determine the priority and speed of automating human industry, subject to availability of specialist expertise.

Assuming an appropriate strategy and sufficient production are found, we now consider how an automated economy needs to be servile and satisfy demand in practice. This quality will avoid insurrection motivated by poverty/inequality/insolvency. This requires complete disintegration of capital from the automated industries, to provide freely for the insolvent and/or contribute to human labour forces or obviously risk insurrection. Forgoing the specifics of social policy for now, we also note that automated industries require a metric to measure demand and how much is required to satisfy it.

In current economic understanding, there are not many well-known or intuitive means of measuring the amount of physical work done to arrive at a product. The closest concept would be embodied energy, which is used in the construction industry. This concept values materials based on the energy required to produce them. This would provide the automated economy with a better yardstick than capital with which to measure the requirements for sourcing and manufacturing products to satisfy demand.

In application, the use of embodied energy can be simplified to basic physics. The final value would be the mass of a product's components multiplied by their acceleration during transit, then multiplied by the total distance travelled. For the sake of simplicity, we take the acceleration to be from rest to the maximum velocity attained during transit. Dividing this by the time taken to transit in seconds then provides the work done in Watts, providing a measure of power required to transport the materials and a measure of demand on solar power. There are further grounds for considering the entropy of the materials, especially when combining them, though this also increases the computational and power requirements of the automation.

Eventually however, automating the global economy concludes with removal of all human labour and capital from industries that do not essentially require them. Industries requiring sentience and self-awareness, with qualities such as creativity and critical thinking, are likely to remain human industries, especially where we do not/cannot trust artificial intelligence. However, at that point, automation should be so pervasive that it subsidizes earnings to the point where they are negligible or unnecessary. In such a cases, it is more likely that human labour markets are then entirely driven by personal interest while carrying no real economic consequence/responsibility. Obviously if any industry is found to be impossible to automate, it will have to retain human labour, which can be a serious problem. Drastic changes and/or crises can lead to pressuring human labour under terms it finds disagreeable, risking further social upheaval, particularly if there is no adequate return for exhaustive and exasperating work.

There also remains the issue of sourcing and eventual recycling of materials. While acquisition of raw materials can be implemented within the transition period, lower demand for or sources of raw material will lower automated labour efforts to source said material. These considerations must also take in account the production and/or transportation limitations of local, national or international automated labour markets, monitoring population distributions and immigration to ensure materials are handled to adequately meet demand.

So far we have assumed full global compliance, but various countries worldwide are privy to supplies of scarce materials and/or commodity supplies. While the devaluation and removal of capital from certain industries and production lines may lower the value on various products, scarce materials and/or commodities will always carry a high value, or at least competing demands. Compliance with global automated economy will be impaired by some countries' possession of these rare resources, and they are unlikely to supply them without an equal or greater return. This obstacle may be overcome through a mutually beneficial trade agreement of materials scarce in their own countries, but it remains subject to a number of concerns, both geopolitical and cultural in nature.

Additionally, this kind of international cooperation and coordination, and even general interaction, could prove difficult when considering automation of politics, especially if countries opt for AI governance. While this automation will need to be servile, its subservience can show how difficult politics can be, particularly when constituents demand certain actions but expect certain other consequences. Factor into this interaction on an international level, an AI governance becomes even more difficult. These problems can be seen even at the national and local levels, with conduction of military and law enforcement agencies, especially when that conduct is automated. Political and judicial automation are thus the most likely to be contentious and incite social, if not global, upheaval. Their solution will be non-trivial, but a workable strategy is likely to remove much, if not all, contention from these arenas.

Having observed the contentions inherent to transitioning to an automated economy, and even the contentions of said economy, it is clear that there is no full-proof solution to the current global crises. However, given the more stable, sustainable and productive nature of an automated economy, implementing such an approach would be far more conducive to providing and securing the environment and a higher quality of life for much of the world, including avoiding widespread social upheaval capable of universally worsening the quality of life worldwide.

The Transhumanist Appeal

Even if more rigorous calculations were done and show global economic automation to be more beneficial than not, it is likely that more appealing arguments would be needed to justify the risk to current generations. This is especially true of older generations whose concerns only consider the immediate future. Mobilizing maximal global effort clearly requires a future worth saving, particularly futures that offer maximal benefits for large and immediate investment.

To provide this motivation, we look to Transhumanism and the many innovations it intends to provide. The most appealing of these breakthroughs is increased longevity [18], as well as anti-aging and age reversal treatments [19]. It also offers a wide range of more exceptional products such as body modifications, spanning a range of augmentations from 3D printed replacement organs [20] to bionic eyes [21]. In fact, DARPA has already seen success in memory prosthetics that restore and improve short term memory [22]. Speculatively, these same modifications would advance even further given a stable, cohesive society, especially over the course of an extended life. Such advancements would lead to restored or improved motor function and bodily autonomy with enhanced prosthetics or via gene therapy and genetic engineering.

Of course, longer, more luxurious lifespans need stability to lower the risks of interruption and even termination. Supplies and resources, and with them social and civil cohesion, are required in order to live comfortably and without the risk of subversion. We have already considered the state of affairs that can lead to these issues and their solution, an automated economy. As such, the motivation for and means of automated economy go comfortably hand-in-hand, such that an extended lifetime will require an automated economy, or otherwise be reserved for the affluent, which will incite protest and resistance due to both their privileged longevity and the fact that they have sequestered it from others. And as automation can so easily replace human labour, there appears no real justification to continue using human labour forces and no reason to prevent them accessing the same longevity either, providing it is sustainably automated.

Returning to the point at hand, Transhumanist principles offer many intriguing technological advances and the promise of further innovations in the future, including such experiences as space exploration and extraterrestrial colonies, breakthroughs in entertainment and recreation, gene therapy, physiological enhancements and so on. Furthermore, the prevalence of cosmetic surgery suggests that Transhumanist sentiments could be fostered within the mainstream. Indeed, there have already been reports of, admittedly unsavoury, methods of age-reversal [23], suggesting that Transhumanist means of increased lifespan would not be dismissed outright.

Conclusion

In conclusion, we have summarised the global economy in a axiomatic fashion, condensing the current crises as the result of the following contentions:

- Human labour lacks the productivity to sustain a healthy, modern lifestyle without concessions from their industry and/or society.
- Mechanised labour is used to supplement and replace human labour, to the detriment of the environment.

These two points are considered foundational causes of the current crises throughout the world. The inadequacy of human labour and the pollution of compensating mechanised labour have resulted in trade, class and military wars throughout the world in attempts to ensure as high a quality of life as possible to the perpetrators. To fix these issues, this essay has suggested a major overhaul of the global labour markets, replacing human labour with sustainably powered robotics in markets that do not require human labour, freeing many necessities and commodities from capital requirements while simultaneously removing the need for fossil fuels. Failure to do so will result in either environmental disaster or violent social upheaval.

Given the amateur nature of this essay, this proposal has not been rigorously researched, trialled or simulated and so lacks proper validation. A number of alternative solutions may be viable, but under conventional economic theory that demands human labour, these solutions will continue to suffer the above contentions. Additionally, this essay has avoided overly examining policy and politics, in an attempt to provide a general approach that may be tailored to fit countries according to their need and cultures. Given the dire state of much of the world and its worsening circumstances, the author suggests that current action against global crises make joint efforts to investigate the aspects of this approach related to their causes. If rigorously shown to be successful/beneficial, clearly it would provide crucial counsel to the relevant policy makers and a genuine, effective response to the aforementioned crises.

Regardless of approach, the world has just over 10 years to make widespread and unparalleled changes to address the mounting crises. In conclusion, to survive, we must undertake the most unprecedented decade.

References

[1] Intergovernmental Panel on Climte Change. **Global Warming of 1.5°CC**. 2018, October 9. Retrieved from http://www.ipcc.ch/report/sr15/

[2] World Wildlife Fund. **Living Planet Report 2018: Aiming Higher**. 2018, October 30. Retrieved from https://wwf.panda.org/knowledge_hub/all_publications/living_planet_report_2018/

[3] Credit Suisse Research Institute. **Global Wealth Report 2016**. 2016, November. Retrieved from http://publications.credit-suisse.com/index.cfm/publikationen-shop/research-institute/global-wealth-report-2016-en/

[4] International Energy Agency. **World Energy Investment Report 2018**. Retrieved from https://www.iea.org/wei2018/

[5] Griffin, P. **The Carbon Majors Database: CDP Carbon Majors Report 2017**. 2018, July. Retrieved from https://www.theguardian.com/sustainable-business/2017/jul/10/100-fossil-fuel-companies-investors-responsible-71-global-emissions-cdp-study-climate-change

[6] Noguchi N. **Agricultural Vehicle Robot** Journal of Robotics and Mechatronics. 2018; 30(2): 165-172. (https://doi.org/10.20965/jrm.2018.p0165).

[7] Sujon MDI, Nasir R, Habib MMI, Nomaan MI, Baidya J, Islam MR. **Agribot: Arduino Controlled Autonomous Multi-Purpose Farm Machinery Robot for Small to Medium Scale Cultivation**. 2018 International Conference on Intelligent Autonomous Systems (ICoIAS), Singapore. 2018; 155-159. Retrieved from https://www.emeraldinsight.com/doi/pdfplus/10.1108/IR-09-2014-0396

[8] Morales ER. Patent Number: *US9358682B2*. Retrieved from https://patents.google.com/patent/US9358682B2/en

[9] Lohmeier S. Patent Number: *US20160120611A1*. Retrieved from https://patents.google.com/patent/US20160120611A1/en

[10] Gussu TW, Lin CY. **Autonomous Flyer Delivery Robot**. Information and Communication Technology for Development for Africa. 2018; 203-208.

[11] Peterson K et al. Patent Number: *US20180300676A1*. Retrieved from https://patents.google.com/patent/US20180300676A1/en

[12] Deloitte LLP. **Deloitte Global RPA Survey**. 2018. Retrieved from https://www2.deloitte.com/bg/en/pages/technology/articles/deloitte-global-rpa-survey-2018.html.

[13] Massachusetts Institute of Technology Energy Initiative. **The Future of Solar Energy**. 2015. Retrieved from http://energy.mit.edu/research/future-solar-energy/

[14] International Energy Agency. **Total Primary Energy Supply (TPES) by source**. 2018. Retrieved from https://www.iea.org/statistics/?country=WORLD&year=2016&category=Key%20indicators&indic

[15] The Eco Experts. **Solar Panel Cost: How Much Do Solar Panels Cost to Install in 2018?** Retrieved from https://www.theecoexperts.co.uk/solar-panels/cost

[16] International Labour Organization, ILOSTAT database. Data retrieved in September 2018. Retrieved from https://data.worldbank.org/indicator/SL.EMP.TOTL.SP.ZS

[17] World Economic Forum, Boston Consulting Group. **Towards a Reskilling Revolution: Industry-Led Action for the Future of Work**. 2019, January 22. Retrieved from https://www.weforum.org/whitepapers/towards-a-reskilling-revolution-industry-led-action-for-the-future-of-work

[18] Xu M et al. **Senolytics improve physical function and increase lifespan in old age**. Nature Medicine. 2018; 24: 12461256.(https://doi.org/10.1038/s41591-018-0092-9).

[19] Latorre E, Torregrossa R, Wood ME, Whiteman M, Harries LW. **Mitochondria-targeted hydrogen sulfide attenuates endothelial senescence by selective induction of splicing factors HNRNPD and SRSF2**. Aging (Albany NY). 2018; 10:1666-1681. (https://doi.org/10.18632/aging.101500).

[20] Vijayavenkataraman S, Yan WC, Lu WF, Wang CH, Fuh JYH. **3D bioprinting of tissues and organs for regenerative medicine**. Advanced Drug Delivery Reviews. 2018; 132:296-332. (https://doi.org/10.1016/j.addr.2018.07.004).

[21] Blanckaert J et al. Patent Number: *US10123869B2*. Retrieved from https://patents.google.com/patent/US10123869B2/en

[22] Hampson RE et al. **Developing a hippocampal neural prosthetic to facilitate human memory encoding and recall**. 2018 Journal of Neural Engineering. 2018; 15:036014. (http://stacks.iop.org/1741-2552/15/i=3/a=036014).

[23] Irving D. **Young bloodmagic or medicine?** 2018, March 16. Retrieved from https://medicalxpress.com/news/2018-03-young-bloodmagic-medicine.html