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► To cite this version:

Jacques Fontanel. Globalized system of market production in crisis. Global warming, rare earths, GAFAM, economic war. Sustainable Economic Development. New ideas, Feb 2021, Genève, Switzerland. hal-03740768

HAL Id: hal-03740768

<https://hal.univ-grenoble-alpes.fr/hal-03740768>

Submitted on 30 Jul 2022

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Globalized system of market production in crisis.
Global warming, rare earths, GAFAM, economic war

Jacques Fontanel

Citizens for a sustainable and peaceful development

Geneva, February 9th, 2021

The globalized system of market production is in a strong crisis. Global warming, rare earths, GAFAM, economic war. Climate change poses a problem for the economic system that fostered the polluting industrial revolutions of coal and oil. Today, the digital economy revolution offers significant hope for reducing pollution and promoting decarbonisation. However, the economic interest struggles of the powerful lobbies of the polluting sectors seem to reduce the potential for transformation of an economic system driven by the search for short-term profit. The major powers want to preserve their economic gains and are undertaking this revolution at a pace that suits them, which is not without conflict, given the urgency of action in the face of the harmful transformations undergone by eco-systems. Furthermore, the GAFAMs, the powerful providers of digital services and instruments, together with their Chinese competitors, have a considerable economic and strategic force that could undermine freedoms and human and citizens' rights. For the production of digital tools, rare earths are likely to pose new problems, those relating to the pollution involved in their production and their relative scarcity compared to the stocks known today. Finally, the economic war threatens the World Trade Organization, with the establishment of international and regional blocks.

Keywords : Digital economy, climate change, GAFAM, Rare Earths, Economic war

National security is not limited to the potential of military conflicts alone. It encompasses issues of citizen security as a whole, such as the potential for food self-sufficiency, the capacity for independence in health matters or the technological potential of the digital economy. Today, the three biggest carbon polluters in the world are the biggest powers, the USA¹, China and Europe. Environmental issues are also essential to human life and could even be at the heart of future inter-state conflicts, given the international nature

¹ A "New Green Deal" was proposed in February 2019 in the US Senate. It would aim to generate 100% of the US's electricity from clean, renewable sources and increase national energy efficiency, particularly in transport and buildings

of pollution and its transmission to neighbouring countries. Global warming² is a global problem that states cannot solve alone. It is therefore necessary to find collective solutions, to radically modify our fossil and consumerist production and consumption processes. However, when it comes to ecology and the environment, borders do not exist and the minor and greedy interests of others can thwart the efforts of some nations. A global industrial plan should be put in place, but no international authority can commit to it without the voluntary agreement of states. To avoid a frightening future, our fossil fuel and consumerist production and consumption processes should be radically changed.

During the Davos Forum, many participants considered that a tax on carbon dioxide emissions is the most effective way to reduce CO₂ emissions and to force private or public economic actors to prefer new energies. Under these conditions, technological innovation in favour of a green economy would be encouraged, by increasing the price of carbon production, provided that an appropriate social policy is implemented at the same time. The discounted energy cost of large-scale solar and wind power³ is lower than that of gas refineries, coal plants or nuclear reactors. Technological progress in decarbonising fossil fuels would be needed to limit the stranded assets of oil or coal reserves. In this context, the economic interest struggles of the powerful lobbies of the polluting sectors seem to reduce the potential for transformation of an economic system driven by the search for short-term profit, all the more so as many economic activities are directly affected by these activities, notably the financial, metallurgical or steel sectors. Despite its obstacles, it is a question of launching a third industrial revolution, abandoning those of coal and oil.

However, today's digital economy presents undeniable risks, regarding its neutrality, data security, cybercrime, cyber terrorism and cyber warfare⁴. Without government intervention, the Internet giants have exceptional economic, political and social power that they could continue to use for commercial, but also other political or ideological purposes⁵.

² According to the IPCC, human activity has caused temperatures to rise by 1 degree Celsius compared to pre-industrial times. However, it seems that if it goes beyond 1.5 degrees, a cascade of unprecedentedly violent climatic events would decimate ecosystems and change human living conditions.

³ The LCOE (Levelized Cost of Energy) assesses the average total cost of building, operating and destroying an energy source, based on its lifetime and the total energy yield over the period.

⁴ Fontanel, J., Corvaisier-Drouart, B. (2014), For a general concept of economic and human security, in *The evolving boundaries of defence : an assessment of recent shifts in defence activities*, (Bellais, R. Ed.), Emerald, Bingley, U.K., 2014.

⁵ Fontanel, J., Sushcheva, N. (2019), *La puissance des GAFAM : réalités, apports et dangers*, AFRI, Annuaire Français des Relations Internationales, Paris.

Fontanel, J. (2019). *GAFAM, a progress and a danger for civilization*, Financial Architecture; Forced Economic Development in the Context of External Shocks and Internal Inconsistencies, State University of Economy of Saint-Petersbourg (UNECON), Apr 2019, Saint-Petersbourg, Russia

Regulatory bodies at each level of operation must be put in place, controlled by democratically established bodies.

Finally, resources remain scarce, especially the so-called "rare earths" that are so necessary for the development of modern technologies, especially digital ones.

The technological platform of the third industrial revolution and the barriers

In any revolution, a technological platform, consisting of a communication medium (Internet), an energy source (wind and sun) and a means of transport (automated cars) is necessary. The Internet is a powerful communication medium that supports autonomous electric vehicles and renewable electricity. Sensors will link each individual to a global digital network. The IDO (Internet of Things) allows us to connect easily with our work environment, our homes, our business activities, our social relationships and our supply chains. The transaction of services and goods takes place instantaneously, at any time. The marginal cost of goods and services becomes almost zero and profit margins will be very low. In this case, the market can no longer be the dominant instance of choice. Ownership gives way to access; suppliers and users replace buyers and sellers. Smart grids operate continuously, at very low cost, but with continuous traffic. There is a growing demand for collective facilities, from car sharing to co-location. Many activities are non-profit or cooperative, with non-market exchanges, such as Wikipedia, which is completely free to access. This circular economy saves carbon emissions. The sun and wind never send their bill. The collaborative economy will grow.

On the other hand, as a first step, it is necessary to disable and dismantle the blocked infrastructure, to transform the electricity networks (replaced by a high voltage smart grid)⁶, to change the logic of transport, logistics, traffic flows, to renovate buildings (by equipping them with devices capable of capturing renewable energy and storing energy) with the implementation of a smart infrastructure. This could lead to a change in skills, with non-profitable, collective sharing activities. This was the objective of the first creators of the Internet, financed by public funds, which private companies have managed to privatise, at least in part. With IDO, we can hope to improve this productivity, with a resilient and carbon-free circular economy. The first two industrial revolutions improved living conditions on Earth, but even today more than 46% of the world's population survives on \$5.5 a day.

⁶ On average, 86% of the energy of the second industrial revolution was lost in transmission in the US.

The third revolution must be more democratic and egalitarian, given the importance of public services that are almost free, thanks to technological progress in digital technology and renewable energy. The tipping point will also depend on the price of oil and gas, two fuels that still largely dominate the market. However, as in all financial matters, as long as these sectors are making large profits, they will continue to speculate on keeping their businesses. The US (the world's largest producer) and Canada (4th largest) are still exploiting natural gas, with heavy investment. Pipeline investments risk becoming stranded assets in less than a decade. At this rate, there could be \$1 trillion of stranded capital by 2030⁷. In 2018, the World Bank published a report highlighting its concerns about what lies ahead for carbon-rich countries⁸.

The issue is above all the sustainability and stability of such a system compared to the old process which, in any case, leads to natural disasters with considerable costs. However, the cost of the operation will undoubtedly be considerable and the problem is to know who will bear it. The transition arises from the convergence of the infrastructure sectors of the "second industrial revolution", telecommunications, fossil fuels, mobility, logistics and housing stock. The change in technology will completely depreciate the value of existing assets. According to Citygroup, it is expected to lead to the tying up of \$100 trillion in stranded assets, if the Paris Conference target of a 2°C temperature increase on Earth is not exceeded⁹. In this context, given the enormous revenues of carbon energy producers and the power of lobbies that are often directly or indirectly enriched by fossil fuel reserves, we can expect strong reactions from owners to delay a process that, given current knowledge, should eventually be definitively established.

China, the world leader in renewable energy, is now expressing its desire in the thirteenth five-year plan to develop an "ecological civilisation"¹⁰. Green infrastructure offers the same possibilities as fossil fuels, while protecting the Earth from excess carbon production, which is triggering a deadly upheaval of the Earth's climate. This energy internet is one of China's key programmes, and it already employs nearly 4 million people in the renewable energy sector. In the US, companies would like to privatise infrastructure, but it is not possible to hand over the daily lives of

⁷ Dyson, M., Engel, A., Farbes, J. (2018), The Economics of Clean Energy Portfolios : How renewable and Distributed Energy Resources Are Outcompeting and Can Strand Investment in Natural Gas-Fired Génération, Rocky LMounstain Institute, mai 2018. https://www.rmi.org/wp-content/uploads/2018/05/RMI_Rxecutive_Summary_Economics_of_Clean_Energy_Portfolios. Pdf

⁸ Lange, G-M, Wodon, Q., _Carey, K. (2018) The Changing Wealth of Nations 2018 ; Building a Sustainable Future », World Bank, Washington.

⁹ Channel, J. and al (2015) Energy DarwinismII : Why a low Carbon future doent have to cost the Earth, Citi GPS Report.

¹⁰ As part of the 13th Five-Year Plan, the People's Bank of China's strategy is to raise \$1.5 trillion in "green" projects.

citizens to the private sector, without control. Privatisation of all intelligent infrastructures is not conceivable, given the collective responsibilities that the state must assume. For Jacobson (et al) of the University of Berkeley¹¹, the United States can provide for its needs with renewable energy (notably with 57% sun and 38% wind). Buildings need to be renewed on the basis of a smart infrastructure that allows consumers to become active managers of their own electricity. Governments can help with the installation of this equipment, through subsidies or tax reductions, particularly for households and businesses, for residential and industrial premises. In 2007, Europe appeared to be ahead of the US in proposing the 20-20-20 plan. Member States were to increase energy efficiency, reduce greenhouse gas emissions and increase renewable energy production by 20% by 2020, but the results have not matched this proposal. Through the Energy Performance of Buildings Directive, the European Union encourages parties involved in the renovation of buildings to install on-site renewable energy and to create an intelligent energy infrastructure with adequate energy storage, with an energy performance certificate. Without support for this type of operation, the results are almost non-existent. The United Nations Environment Programme (UNEP) has also proposed a new "green deal" to revive the global economy in the wake of the 2008 economic and financial crisis.

The automobile is beginning to convert to the electric system and shared mobility is expected to increase the life span of vehicles by 10 times (more than 800,000 kilometres and double that in 10 years). According to Jeremy Rifkin, autonomous vehicle transport, operating at almost zero marginal cost, powered by solar or wind electricity, should develop in the coming decade. While GDP will fall, household welfare should improve¹². On the other hand, public debt, at least in the short term, should increase due to the new public investments in indispensable infrastructures, concerning ICT, but also real estate, a quasi-blocked asset¹³, to be renovated, which only changes by 2% per year. Buildings will no longer be private, passive and walled-in spaces, but active entities committed to sharing renewable energy.

Finally, we must prepare the workforce for the "green era" and develop intelligent ecological agriculture. Livestock farming is a major contributor to

¹¹ Jacobson, M.Z., Delucchi, M.A., Bauer, Z., Wang, J., Weiner, E., Yachanin, A. (2017), 100% Clean and Renewable Wind, Water and Sunlight All-Sector Energy Roadmaps for 139 Countries in the World, *Joule*, vol. 1, 6 Septembre. <https://doi.org/10.1016/j.joule.2017.07.005>.
Deutch, J. (2017) Decoupling Economic Growth and Carbon Emissions, *Joule*, vol. 1, 6 Septembre. <https://doi.org/10.1016/j.joule.2017.07.005>.

¹² Guilhaudis, J-F., Fontanel, J. (2019), Les effets « pervers » de l'usage du PIB pour la décision politique et les relations internationales. Comment en sortir ?, AFRI, Annuaire Français des Relations Internationales, Paris.

¹³ With investments in insulation, solar panels, micro power plants, charging equipment for electric vehicles and objects and storage technologies.

the production of greenhouse gases and uses 26% of the world's land area. It must be completely rethought in the context of human survival¹⁴. Ecological and organic agriculture is having great difficulty in developing (6.7% in Europe, 0.6% in the USA). We need to rethink the very concept of sustainable food.

International finance is being questioned. Banks believe that climate change threatens a wide range of assets in almost all sectors, but few banks see this as a matter of corporate social responsibility. Pension funds (20% of equity and 40% of US companies' shares), with their highly speculative actions, should start valuing oil companies downwards, but the taste for privatised profits is stronger than the immediate collective interest (the capitalist will sell the rope to hang him, said Lenin). Trade unions and states have ceded control to financial institutions.

Socially responsible investment (SRI) is going to be at the centre of the economic and financial concerns of economic actors. Today, the principle should be that of Benjamin Franklin: Doing Well by Doing Good. The boundary between productive and commercial practices and morally and socially correct financial performance must be removed. Younger generations are interested in SRI and infrastructure modernisation. Today, fossil fuels have had their day; we should no longer invest in them. We need a smart national grid that feeds the flow of green electricity, but many elements will be completely decentralised such as solar panels, wind power, charging stations, electric vehicles, implemented through tax credits. However, this third industrial revolution has two main dangers: the weight of GAFAMs and scarce earth.

The GAFAMs

ICTs (telecommunications, Internet, data centres) are major consumers of energy. If left unchecked, this emission of greenhouse gases could represent 14% of total emissions in 2040. However, this estimate does not include the manufacture of these electrical products, their short lifespan¹⁵ due to double planned obsolescence (change of more efficient devices and reduced use of the same device over time), or the extraction of rare earths, nor the storage of waste. ICT infrastructure is very electricity intensive (70% of the total ICT carbon footprint). Moreover, the GAFAMs

¹⁴ According to Rifkin, with 1.4 billion cows emitting methane, a gas 25 times more potent than CO₂ for its warming potential, and nitrous oxide in their excrement, with a warming potential 288 times that of carbon dioxide, the question arises as to the value of livestock farming to the future of humanity. Beef requires 20 times more land and generates 20 times more greenhouse gases than vegetables per unit of protein consumed. It is also a cause of deforestation, which means that fewer trees absorb the gas emissions.

¹⁵ The energy consumed to manufacture these appliances accounts for 85-95% of their annual lifetime carbon footprint.

seem to want to reinvest in this sector, Google uses 100% renewable energy in its data centres in green energy and Microsoft wants to achieve this result in 2023 (50% is already used on the basis of renewable energy). The GAFAMs want to secure their data centres and control their energy networks, particularly in the face of the risks of natural disasters and cyber attacks.

Initially, the Internet was a public good, managed by the state technocracy of the American military-industrial complex and fed by university research. At the end of the 20th century, the GAFAMs (Google, Apple, Facebook, Amazon, Microsoft) benefited from the process of commodification of the Internet. Today, the financial, technological, economic and security power of GAFAM over modern society is immense, perhaps excessive. The massive use of the Internet has allowed the emergence of a digital economy with increasing returns, drastically reduced transaction costs, permanent processes of financial concentration and active support for deregulation, thus favouring vertical and horizontal integration operations¹⁶.

The GAFAMs are developing technologies that are changing the way we think. Today, their power is of concern and is being criticised for, among other things, their commercial use of normally private information, their patent-protected application of domineering technology, their lobbying to avoid anti-trust laws, their use of financial speculation, their penchant for tax trading and optimisation in tax havens, and the creation of a society of control and surveillance of consumers and citizens.

Google cannot be allowed to settle in public governance, even if it proposes the creation of smart cities (Toronto). Controlled by private interests, the sources of profit are gigantic. However, the decisions of these private interests raise many questions concerning human rights, individual freedom and the democratic control of these monopolistic oligopolies. Google's proposed Smart City for Privacy in Toronto would have turned the city into a Smart City for Surveillance. Only local governments can initiate equivalent procedures. In this context, Lander Germany is better equipped than Jacobin France.

GAFAM are companies that do business first. Therefore, despite their public denials, they have little regard for the protection of democratic societies and do not feel responsible for the societal consequences of their actions. These commercial monopolies will not change on their own without a political will to regulate their activities.

¹⁶ Fontanel, J. (2016), *Paradis fiscaux, Etats filous, La fuite organisée des impôts vers les pays complices*. L'Harmattan, Paris,

Fontanel, J., Sushcheva, N. (2019), *La puissance des GAFAM : réalités, apports et dangers*, AFRI, Annuaire Français des Relations Internationales, Paris.

Rare earths

Rare earths¹⁷ are characterised by their exceptional properties, which are necessary for "green tech"; in particular, they enable the production of clean electricity and are essential for new information and communication technologies. However, they are often expensive and their extraction, which often causes pollution, is difficult in the context of a separation operation with the abundant materials in the earth's crust that cover them. Small quantities are produced each year, in territories that are both small in number and sparsely urbanised, under difficult social conditions. Finally, China is the producer of two-thirds of the mineral resources essential to the modern economy. It pays a price for this¹⁸, but economic development takes precedence over any negative external effects. The thirst for power and the race to catch up economically is leading China to the greatest excesses, especially in the less touristy regions. The demand for germanium, tantalum, palladium, scandium and cobalt will accelerate in the coming years. Consumption of the main metals is growing at a rate of 3% per year, which will quickly lead to increased scarcity, higher prices, reduced environmental constraints and cross-conflicts between firms and states. It even raises the question of economic and military power. The violence of the high-tech boom, combined with the accompanying scarcity of metals, raises the question of the "sustainability" of "green" development and the balance of power between the superpowers. Some metals could quickly become endangered, such as vanadium, terbium, europium, neodymium, titanium, indium, dysprosium and cobalt¹⁹. The shortage of metals is an obstacle to the so-called green revolution. Waste will have to be reprocessed, but for the time being the cost of reprocessing is not yet profitable for many rare earths.

The idea that digital technology can help us reduce energy costs is an assumption. Certainly, the digital economy can a priori design smart electricity grids that can optimise expenditure, depending on the permanence and intermittency of energy sources. It also reduces the carbon impact of human activities, with the third industrial revolution proposed by Rifkin²⁰. Dematerialisation leads to teleworking and data storage, which reduces energy expenditure.

¹⁷ Guillaume Pitron (2019), *La guerre des métaux*, LLL, Les liens qui libèrent.

¹⁸ 80% of underground wells in the "Middle Kingdom" are unfit for consumption according to European health standards.

¹⁹ Marscheider-Weidemann, F., Langkau, S., Hummen, T., Erdmann, L., Tercero Espinoza, L. (2016), *Raw materials for Emerging Technologies 2016*, German Mineral Resources Agency (DERA), March.

²⁰ Rifkin, Jeremy (2019), *Le New Deal Vert Mondial. Pourquoi la civilisation fossile va s'effondrer d'ici 2028. Le plan économique pour sauver la vie sur Terre*, Editions « Les Liens qui libèrent ».

Fontanel, J. (2020), *Le New Deal Vert, la troisième révolution industrielle ? Une analyse de la pensée de Jeremy Rifkin*, Pax Economica, Grenoble

However, this picture remains incomplete. This reflection works "ceteris paribus", all other things being equal. Upstream, new rarities are appearing that are likely to create 'bottlenecks', which will inevitably lead to an increase in the price of raw materials and to a slowing down, or even a partial halt, to the widespread application of new technologies. Rare earths" are the first supplies concerned. The digital industry uses metals (22% mercury, but also silver, gold, lead, etc.). A single chip weighing two grams requires the disposal of 1,000 times more material²¹.

The idea, often mentioned, of exporting polluting industries to poor countries, then materialised in China, under the direction of an authoritarian state, which was not very concerned about environmental constraints at the time, and was in the process of regaining its economic power. The European REACH regulation also protects European citizens by requiring the development of good ecological practices. Under these conditions, industrialists are in collusion, buying cheaply, having a cheap workforce and little regard for working conditions. Consumers have not taken any action to discourage this movement, which is dangerous for their safety. As long as pollution does not affect them, polluting importers from distant lands can easily dominate the markets.

China, because of its reserves, its protection policy and its ability to attract companies in the sector, can become master of the geo-economic game, with all the dangers that such a position could have for world peace and the maintenance of today's international institutions²². In 2020, the conflict with Huawei highlights the violence of the relationship for global technological power. The US is at risk of losing Chinese supplies of rare earths. Will Washington announce the reopening of the mines to limit Chinese imports, especially Mountain Pass? It needs to strengthen the resistance of the supply chains for the basic products needed by the US army, but also for dual production. The Americans are thinking of introducing a "Buy American Clause" in military contracts. Faced with the threat of a Chinese embargo, it was eventually planned to develop the production of vital materials, without any significant achievement by 2020. The Pentagon is questioning whether malicious viruses are being planted on Chinese imports to prevent the equipment from functioning properly. Even today, the F-35 carries rare earths from China in its cockpit. The economic war could soon take on a worrying aspect in the event of a conflict between the two great powers²³.

²¹ Flipo, F., Dobré, Lichot, M. (2013), La face cachée du numérique. L'impact environnemental des nouvelles technologies, L'Echappée.

²² Fontanel, J. (2016), La sécurité économique et sociétale: pour une conceptualisation humanistes multidimensionnelle, PSEI, Paix et Sécurité Européenne et Internationale.

²³ President USA (2017), Presidential Executive Order on Assessing and Strengthening the manufacturing and defense industrial base and supply chain resiliency of the United States, White House, 21 July.

Today, the US is setting its own policy of independence by engaging in a process of reducing vulnerabilities of "critical" minerals, developing recycling technologies, analysing alternative possibilities (and their costs), prioritising access to these metals through exchange with allies and partners, initiating exploration of available domestic resources, implementing recommendations to streamline permitting and lease review processes, and providing financial incentives to increase the discovery, production and domestic refining of critical minerals. Strategies to strengthen and support supply chains for these materials are needed to avoid vulnerability to disruption. It will even be possible to change laws and rules according to the urgency of specific demand²⁴.

Economic war

Threatened by the enlargement of NATO and by the accession of former friendly countries to the European Union, Russia has engaged in a "special operation" against Ukraine, with a view to keeping this country in its zone of influence. For Vladimir Putin, Ukraine is part of the greater Russia, the two entities have a common destiny under the responsibility of Moscow. The military action, which did not deserve the name of war, had to be conducted quickly to remedy this accident of history and the domination of the United States and its satellite the European Union. The military fighting has shown the resistance of the Ukrainian people, but also the will of Russia to fulfill its objectives at any cost despite the expansion of economic, social and military sanctions decided against it, mainly by the Western powers. The conflict affects the interests of all the countries of the world, with sanctions on the Russian monetary and financial system, on the available international infrastructures, on the interrupted exercise for Russia of the "Most Favored Nation clause", on the Russian sales of gas and oil to European countries, on the exports of cereals which will be reduced both by the acts of war which limit the production and the maritime blockade in front of Odessa which prevents their routing. In the longer term, economic globalization and the monetary and financial system dominated by the United States could be seriously challenged.

In 2018, Donald Trump had scolded the Europeans for their energy dependence on Russia. This admonition had been put in the bag of excessive and uncontrolled statements of the American President. The partial boycott of this essential source of energy inevitably leads to a surge in prices due to the new rarities, which does not only have positive effects in democracies due to the future discontent of the voting public. Today, sanctions must take into account the interests of countries that suffer the consequences of their dependence on Russia.

²⁴ USGS (2018), Interior Releases 2018's Final List of 35 Minerals Deemed Critical to National Security and the Economy., USGS (Ministère de l'Intérieur), mai 2018

However, with the sanctions decided following the annexation of Crimea, Russia and Belarus are today the most sanctioned countries in the world, much more than North Korea. The European Union and the United States have coordinated their sanctions, and international organizations, such as the World Bank, the OECD or the EBRD, have given their support.

Immediately we can mention the exclusion of Russia from the Council of Europe and the revocation by Western countries of the Most Favored Nation clause, which threatens all Russian exports with high tariffs and imports with a potential quasi-boycott situation. Secondly, financial measures have been taken to undermine Russia's financial infrastructure. All economic actors are partially subject to heightened vigilance in their business dealings with Russia, in view of the measures that would be taken against them in international markets if a link to the SWIFT financial system were to be investigated by the relevant US authorities. The "D'Amato-Kennedy" and "Helms-Burton" laws allow the White House to condemn companies that do not respect the embargoes and sanctions decided by the United States, in particular by excluding them from the international financial system and from the entire American market. On the other hand, Russia has a gas and oil sector that is vital for the country, accounting for 20% of GDP, more than 50% of the value of its exports and half of the state budget. The European Union was, even after the sanctions against Moscow for the annexation of Crimea, the first supplier and customer of Russia. In this context, foreign investment is rapidly becoming scarce and dual-use products for both the civilian and military sectors, such as electronic materials, computers and navigation systems, are banned from being imported into Russia.

For Europe, it is also a question of reducing imports of oil and gas products, suspending all important economic projects in partnership (such as the North Stream II gas pipeline), freezing financial infrastructures, sanctioning Russian political and military figures directly or indirectly responsible for the invasion of Ukraine and applying sectoral sanctions that are particularly damaging to Russia's economic development. It is also forbidden to export high-tech goods to Russia and to import critical raw materials and materials. Partnerships with Russian economic actors become very high-risk operations. The results of economic warfare depend fundamentally on the relative importance of scarcities in the countries concerned. The effect of an embargo on a beauty product does not have the same effect as that on gas or oil, products that are essential to the economic functioning of a system that would nevertheless like to do without them, without being able to do so for at least fifteen years. The absence of rare earths also leads to the transformation of existing technologies, but it takes time to determine the technologies adapted to this type of production.

Conclusions

Dominated by liberal ideas, economic globalization²⁵ led people to believe that the interdependence of states was a factor of peace. However, power relations become more apparent when a country becomes dependent on products necessary for its own development. Mercantilist reasoning reminds us that the future of a country also depends on its ability to resist the power relations that states that do not share its values want to impose on it by force in the supply of goods and services essential to its survival. The clash of civilisations is not always a fable, when a country that recommends itself to communism asks for openness to international competition²⁶.

Significant progress has yet to be made. Without human action, the evolution of the planet will become uncontrollable because no technology on a global scale is capable of protecting humanity from this situation. However, the aversion to loss is greater than the aversion to gain. Those who have power do not want to risk losing it either. Man has established institutions that could improve his condition, but they have now become obstacles to his own liberation. We must think as a species. But in the long run, we will all be dead. And the long term is increasingly in the short term.

Bibliography

Brunat, E., Fontanel, J. (2015), L'économie de la Russie, les grands défis à relever *Annuaire Français des Relations Internationales*.

Brunat, E. Fontanel, J. (2018), La Russie de retour comme puissance militaire ? *Annuaire Français des Relations Internationales*, Vol 19.

Brunat E., Fontanel, J. (2021), La science économique comme idéologie. La science de gestion comme viatique de l'actionnaire, *Marchés et organisation*.

Channell, J. and al (2015) *Energy Darwinism II : Why a low Carbon future doesn't have to cost the Earth*, Citi GPS Report. 122 p.

Chatterji, M. (1993), Note sur les techniques d'analyse applicables à l'économie de la paix, in "Economistes de la paix (J. Fontanel, Ed.), Presses Universitaires de Grenoble.

Chatterji, M., Fontanel, J., Hattori, A. (1996), Arms spending, development and security, Ashing Publishing House, New Delhi, 430p.

City of New York (2019), Community Development Block Grant Disaster Discovery « *Impact of Hurricane Sandy*, New York, <http://nyc.gov/html/onenyc/downloads/pdf/publications/OneNYC.pdf>

Coulomb, F., Bensahel, L., Fontanel, J. (2005), The concepts of economic war and economic conflicts in a global market economy. *Arms, War, and Terrorism in the Global Economy Today : Economic Analyses and Civilian Alternatives*, 13, LIT Verlag,

Coulomb, F., Fontanel, J. (2006) Mondialisation économique, guerre économique et souveraineté nationale, in « La question politique en économie internationale » (Pierre Berthaud & Gérard Kébabdjian, La Découverte, Paris.

Deutch, J. (2017), Decoupling Economic Growth and Carbon Emissions, *Joule*, vol. 1, 6 Septembre. <https://doi.org/10.1016/j.joule.2017.07.005>.

²⁵ Fontanel, J., (2005) *La globalisation en analyse. Géoéconomie et stratégie des acteurs*, L'Harmattan, Paris

²⁶ Fontanel, J., Arrow, K., Klein, L., Sen, A. (2003), *Civilisations, globalisation et guerre*, Presses Universitaires de Grenoble, Grenoble

Dews, F. (2016), 9 Things You Should Know About the Carbon Tax
<http://www.brookings.edu/blogs/brookings-now/posts/2016/05/9-things-you-should-know-about-a-carbon-tax>

Dyson, M., Engel, A., Farbes, J. (2018), *The Economics of Clean Energy Portfolios: How renewable and Distributed Energy Resources Are Outcompeting and Can Strand Investment in Natural Gas-Fueled Generation*, Rocky Mountain Institute, mai 2018.
<https://rmi.org/insight/the-economics-of-clean-energy-portfolios/>

GIEC, Groupe d'experts intergouvernemental sur l'évolution du climat, GIEC (2018), Résumé à l'intention des décideurs, in « *Global Warning of 1.5°C ; An IPCC Special Report*, Organisation météorologique mondiale, Genève, <https://www.ipce.ch/sr15/>)

Flipo, F., Dobré, Lichot, M. (2013), *La face cachée du numérique. L'impact environnemental des nouvelles technologies*, L'Echappée. 128 p.

Fontanel, J., Gaidar, Y. (1998), *L'avenir de l'économie russe*, Presses Universitaires de Grenoble

Fontanel, J., Arrow, K., Klein, L., Sen, A. (2003), *Civilisations, globalisation et guerre*, Presses Universitaires de Grenoble, Grenoble, 127 p.

Fontanel, J., (2005) *La globalisation en analyse. Géoeconomie et stratégie des acteurs*, L'Harmattan, Paris, 627 pages.

Fontanel, J. (2007) Questions d'éthique : guerre, démocratie, économie, éducation, marketing, sport, genre, Editions l'Harmattan, Paris. 191p.

Fontanel, J., Henriques, A. (2007), *A Globalização em Análise: Geoeconomia e Estratégia dos Actores* Instituto Piageto, Lisboa. 2007. 641p.

Fontanel, J., Chatterji, M. (2008), *War, Peace and Security, Contributions to Conflict Management, Peace Economics, and Development*, Volume 6, London, Emerald

Fontanel, J., Corvaisier-Drouart, B. (2014), For a general concept of economic and human security, in *The evolving boundaries of defence : an assessment of récent shifts in defence activities*, (Bellais, R. Ed.), Emerald, Bingley, U.K., 2014.

Fontanel, J. (2016), *Paradis fiscaux, Etats filous. La fuite organise des impôts vers les pays complices.*, L'Harmattan, Paris,

Fontanel, J., Sushcheva, N. (2019), La puissance des GAFAM : réalités, apports et dangers, *AFRI, Annuaire Français des Relations Internationales*, Paris. 49p.

Fontanel, J. (2019). GAFAM, a progress and a danger for civilization, in *Financial Architecture; Forced Economic Development in the Context of External Shocks and Internal Inconsistencies*, State University of Economy of Saint-Petersbourg (UNECON), Apr 2019,

Fontanel, J. (2019), Différends, conflits et guerres économiques. PSEI, Unice, 2019, n° 11 - <http://revel.unice.fr/psei/index.html>.

Guilhaudis, J-F., Fontanel, J. (2019), Les effets pervers de l'usage du PIB pour la décision politique et les relations internationales. Comment en sortir ? *Annuaire Français des Relations Internationales, AFRI 2019*. hal-02017498. 25 p.

Guilhaudis, J-F. Fontanel, J. (2021) Les " terres rares " et autres matériaux critiques et stratégiques, au coeur des conflits de demain ?. Paix et sécurité européenne et internationale, université Côte d'Azur.

Jacobson, M.Z., Delucci, M.A., Bauer, Z., Wang, J., Weiner, E., Yachanin, A. (2017), 100% Clean and Renewable Wind, Water and Sunlight. All-Sector Energy Roadmaps for 139 Countries in the World, *Joule*, vol. 1, 6 Septembre.
<https://doi.org/10.1016/j.joule.2017.07.005>.

Lange, G-M, Wodon, Q., _Carey, K. (2018) *The Changing Wealth of Nations 2018 ; Building a Sustainable Future* », World Bank, Washington. 222p.

Marscheider-Weidemeian, F., Langkau, S., Hummen, T., Erdmann, L., Tercero Espinoza, L. (2016), *Raw materials for Emerging Technologies 2016*, German Mineral Resources Agency (DERA), March. 14 pages.

Matteudi, E., Fontanel, J. (2015), L'action de l'OMC et de la CNUCED favorise-t-elle la réduction de la pauvreté dans le monde? AFRI, *Annuaire Français des Relations Internationales*, Paris

Pearce, F. (2016), Can We Reduce CO2 Emissions and Grow the Global Economy? *Yale Environment 360 Analysis*, April,1,

Pitron, G. (2019), *La guerre des métaux*, LLL, Les liens qui Libèrent. 315 p.

President USA (2017), *Presidential Executive Order on Assessing and Strengthening the manufacturing and defense industrial base and supply chain resiliency of the United States*, <https://www.federalregister.gov/documents/2017/07/26/2017-15860/assessing-and-strengthening-the-manufacturing-and-defense-industrial-base-and-supply-chain> White House, 21 July.

Rifkin, J., Barber, R. (1978), *The North Will Rise Again; Pensions, Politics and Power in the 1980s*, Beacon Press. 279p.

Rifkin, Jeremy (2019), *Le New Deal Vert Mondial. Pourquoi la civilisation fossile va s'effondrer d'ici 2028. Le plan économique pour sauver la vie sur Terre*, Editions « Les Liens qui libèrent ». 304 p.

Saez, E., Zucman, G. (2020), *Le triomphe de l'injustice. Richesse, évasion fiscale et démocratie*, Le Seuil. Paris. 304 p.

USGS (2018), *Interior Releases 2018's Final List of 35 Minerals Deemed Critical to National Security and the Economy*, USGS, may 2018. <https://www.usgs.gov/news/interior-releases-2018-s-final-list-35-minerals-deemed-critical-us-national-security-and>