Environmentalism + Capitalism = Happy Growth

Edited by
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and Federico Sampalmieri

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Graphic Design by Martina Raspa

Printer: EURACUS S.r.l.

ISBN: 978-2-39067-016-2

Published by the European Liberal Forum in cooperation with Fondazione Luigi Einaudi Onlus. Co-funded by the European Parliament. The views expressed herein are those of the author(s) alone. These views do not necessarily reflect those of the European Parliament and/or the European Liberal Forum asbl

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EDITOR'S NOTE

Gian Marco Bovenzi

Gian Marco Bovenzi, Attorney, was born in Rome, Italy, in November 1989. He holds a Masters' Degree in Law at the University of Rome "Tor Vergata" (2014), discussing a thesis in compared criminal procedure law. He joined the Erasmus program in Paris at the University of Paris XII (2010/2011), and further achieved a post-graduate Masters' Degree in Forensic Sciences at the University of Rome "La Sapienza" (2018), an LL.M. in American Law at the Syracuse University College of Law (New York, United States, 2019), and a post-graduate Certificate of Advanced Studies in Counterterrorism and National Security at the Institute for Security, Policy and Law (Syracuse, New York).

He worked as an intern at the United Nations Office for Drug Control and Crime Prevention (Wien, 2015) and as a law clerk for the Italian Department of Justice (2016/2017). He currently runs a law firm specialised in criminal law and privacy law.

Global warming. Climate change. Air, water, and soil pollution. Deforestation. Collective health. Animal and wildlife endangerment. And the list could go on.

We refer to all those problems generally associated to the perceived global threats associated with the environment, and the need that the governments and the policy makers throughout the world adopt environmentally-friendly policies.

Within the EU framework, the adoption of the European Green Deal, with the goal of ultimately reaching climate neutrality by 2050, focused even more the attention of the general public and the public debate on the issue. Nevertheless, when speaking about the environment (and environmentalism accordingly) it is essential to bear in mind that the reality is not as simple as it might look like. This meaning, environmental-friendly policies are not necessarily associated with lower consumerism, or a lower growth. On the contrary, a proper liberal economic approach is capable to bring positive environmental outcomes.

In this regard, the present publication presents four contributions, each providing a different point of view on the topic.

The first chapter focuses on the benefits deriving from the adoption of the so-called “highway of the technological innovation” approach in tackling global warming and the climate change. With the words of the authors, such an approach “pursues the idea of decoupling the quantity of resources consumed from the quality of life, establishing a ‘doing more and wasting less’ attitude, in terms of economic growth and impact on the health of our planet”.

The second chapter focuses on a technical aspect of the green transition: the role played by critical raw materials (CRM), an essential component for renewable energy resources in fighting climate change. The author stresses the essential role of the CRMs, and how Europe should adopt specific strategies in order to access them, given the high increase of global demand – and of their cost, accordingly.

The third chapter explores the effect that a higher level of environmentalism and anti-consumerism yields in an economy where consumers possess a heterogeneous willingness to pay both for the environmental and for the hedonic quality of products on sale, demonstrating particularly that when the hedonic and environmental attributes of goods are aligned, a higher level of environmentalism does not necessarily yield a better environmental outcome.

The last chapter raises attention on the relationships between globalisation and environmentalism, specifically analysing direct and indirect ways through which it affects national policies and the consumer behaviour. Moreover, the contribution stresses the links between globalisation and the increased levels of gas emissions, and between globalisation and the proliferation of nationalistic movements in several countries.

Summarising, the “happy growth” deriving from the synthesis of environmentalism and capitalism is achievable through a technical and rational approach fostering growth and refusing the concept of anti-consumerism. In this regard, it is essential not to be driven by a mere emotional pro-environment ideology, and the role played by the media in delivering such message in order to “drive” the public debate in this direction is crucial. Rational information and communication systems are the main drivers to raise awareness among the general public, declining the issue of environmentalism in the proper way.

CHAPTER I

ABSTRACT

This contribution focuses on the possible approaches to fight/challenge Global Warming and Climate Change. While most of the theories supported and promoted by environmentalist associations – that often find space in politicians' programmes – are centred on reducing production to diminish the human impact on Earth's resources, this chapter will highlight the possible benefits of the so-called "Highway of the technological innovation". This approach pursues the idea of decoupling the quantity of resources consumed from the quality of life, establishing a "doing more and wasting less" attitude, in terms of economic growth and impact on the health of our planet. With the help of data and reliable sources in the following paragraphs, it will be exposed how to undertake this new path of environmentalism.

The work is organised as follows: the first section evidences the critical points of the "traditional" environmentalists' approach; in section two the focus will be on the new energy sources; sections three and four will highlight data that explain how innovation would affect productivity such in terms of new techniques and materials, while section five will be centred on the more practical examples of the automotive sector. Section six concludes.

Decoupling will save us from the fallout of the trap of carbon emissions, demography, and prosperity

Patrizia Feletig and Chicco Testa

Decoupling will save us from the fallout of the trap of carbon emissions, demography, and prosperity

Patrizia Feletig and Chicco Testa

Patrizia Feletig is a freelance journalist, whose main activities are interviewing people, writing and researching stories in different fields from technology to corporate, from art to social sciences. She is Advisor of Guarini Institute for Public Affairs John Cabot University, and General Secretary of Associazione InnovaFiducia, a non-profit organisation promoting the building of trustworthy culture and impact investing.

CHAPTER 1

Decoupling will save us from the fallout of the trap of carbon emissions, demography, and prosperity

Patrizia Feletig and Chicco Testa

Introduction

«Change the system, not change the climate» shows some of the activists' banners in Earth Day protest. It is already an economic agenda, long before being an environmental policy intention. The pillars of this pauperism, self-punishing, and anti-industrial vision exploit the catastrophic climate narrative pumped up by media hysteria with some complicity of a scientific community which goes along with it. The just green transition promised by politics, if not a practical impossibility, will be costly and not painless for many. With the technologies currently available, many sacrifices will have to be undertaken to move towards carbon neutrality within 30 years, provided that it is not only a desirable goal, but also one with relevant impact on the rise in global temperatures within 2°C. And nothing in climate science ensures this outcome. Not even the latest report of Ipcc, the UN climate change intergovernmental panel, which states that even if we immediately stop all CO2 emissions, it wouldn't withdraw a single gram of greenhouse gas already stuck in the atmosphere. To stabilise human influences on climate, rather than overdoing with endless sacrifices, we need to focus on innovation, as it has been the case with humanity's great challenges. We have an example of this right now: Covid-19 pandemic will be overcome with vaccines (some of them so revolutionary that our cells become a tailor-made drug factory), not with endless lockdowns.

The just green transition promised by politics, if not a practical impossibility, will be costly and not painless for many

Climate change is a real but contrary to the mainstream narrative, humanity is not heading towards a Sixth mass extinction, a groundless scenario so dear to the current apocalyptic environmentalists. Global warming will be a problem, but a problem that we should fix smartly. Free, open-technology competition alone can lead to immediate, real, global reductions. We should rely on the future and on ourselves, and on our own species. First, by removing from our horizon the doom catastrophism that prevents us from deciding rationally, and makes us chase propaganda solutions and placebos to silent our guilt feelings.

Launch and propagation times of technological innovations are becoming increasingly shorter, and they embed higher rate of sustainability and lower consumption of natural resources. We have access to a set of very powerful technologies that will, within a few decades, profoundly change our production patterns and our social life. The future is already here – it's just not evenly distributed, as the science fiction writer William Gibson put it. A mix of innovations born partly as an improvement of specific production activities and to an even greater extent as an autonomous and continuous development of the information revolution.

Together they could lead us to make a decisive leap in what many consider to be the high road to environmental sustainability: the decoupling of economic growth, improved well-being, and consumption of natural resources. Already today, compared to the pre-industrial era, we consume far fewer natural resources in proportion to the wealth produced. We can go further. Above all, as the title of a successful book by Andrew McAfee states, we can achieve More with Less.

Let's explain it.

The first pilar is called AI, Artificial Intelligence. Which connections with environment? AI represents a huge enhancement of human intelligence capabilities that allows us to see, control, steer and improve realities to which we have been and still are partially blind. And blindness leads to wrong answers, loss of time and above all, waste of resources. The driver is blind to general traffic conditions until a smart GPS makes him see the surrounding conditions: selecting the route that saves him time and petrol. The farmer looks at the sky hoping to grasp the right weather conditions to sow, fertilise, treat, and then harvest. He often makes mistakes wasting time and crops. A company employee needs to commute every day, wasting time, money and generally worsening his carbon footprint; until a high-speed Internet connection allows him smart working from home or anywhere else: today with videoconferencing, tomorrow using holograms. In fact, the second major pilar entwined with the first one, is called IT, Information Technology. The ability to store, process, analyse, and share data and information through computing and networking.

In a broader sense, if the first industrial-technological revolution had to do basically with a larger availability of energy (steam engines, hydropower electricity, oil) which meant a huge input that ramped up and accelerated work capacity, today we are moving steadily towards the knowledge of the deep mechanisms underlying the matter cycle and life processes. Something that gave birth to quantum physics. We know the genetic structure of a plant, an animal, and man. The atomic structure of a material. We can, if necessary, predict and modify it. For example, in a simple laboratory operation, it is possible to mutate a tiny piece of the genetic structure of a plant to let it produce extra vitamin (as in the case of Golden Rice), to resist to a parasite or to require less water. It's not energy but information what is most needed.

Blindness leads to wrong answers, loss of time and above all, waste of resources

The powerful combination of machine learning, big data, comprehension of the deep structures of life and materials, added with the ability to be interconnected (not only between humans, but also human and machine interaction and IoT) at growing higher speeds, deploys boundless horizons for humanity. Until yesterday, we struggled to strengthen our muscles, today we can fully expand our intelligence. But in all these processes, time is a pivotal variable. Some of the technologies that are just around the corner could be accelerated decisively if critical mass was put into place: funding, brains, cooperation. And if prejudices and oppositions were eradicated.

Energy: the best is yet to come.

Energy world changes profoundly resulting from factors affecting the entire energy chain: generation, distribution networks and consumption. After a while, renewable sources have become mature technologies overtaking the barrier of costs, which prevented their large diffusion. Today, in many parts of the world, renewables have costs competitive with respect to fossil sources. The necessary investments are therefore affordable and easy to finance. Moreover, they are improving their performance step by step, and the use of new materials (like graphene) could produce further leaps. Similarly, artificial intelligence and information technology are changing the way networks work. Smart grids define energy networks, which evolve from a passive mode of power distribution (from the producer to traders) to direct connection between producer and end-user, optimising network loads, choosing the appropriate energy source and creating a constant data and information interchange between production and consumption. Notwithstanding with the fact that power generation points have multiplied due to the multiplicity of autonomous even small-sized renewable plants.

This contributes to a second possible goal: electrification of larger chunks of energy consumption. Replacing fossil fuels with electricity produced from renewable sources. The main change is related with electric transport, which today is practically only used for trains, undergrounds, tramways, and in a near future will also be deploy for private vehicles BEV. To achieve definitively this goal, we need to make a further leap in battery efficiency. Batteries are the new challenge of electric world. The greater their «density», e.g., their ability to store energy in less space, the greater their penetration capacity. Transport is just one of the possible uses. The other, equally important, is to compensate the intermittency of sun and wind, renewable sources are not continuous and programmable sources, but available according to atmospheric conditions, the season and daylight span. The possibility of storage of the power produced during the "good" hours and use it during the "bad" hours would overcome this limit. It would solve other problems as well. An ideal energy source must meet five requirements: concentration (a lot of energy in a small space), programmability (availability on demand), divisibility (use as much as you need), transportability (use where you need it) and finally, low cost. Another requirement has recently been added to these five classical requirements: sustainability, e.g., lower (or zero) climate-changing emissions. On this last point, renewables are definitely the top but without efficient batteries, fossil fuels remain more desirable. In fact, the share of coal in worldwide electricity production continues to be massive and only marginally reduced. China and the US are funding batteries R&D and have, together with Korea, a market share of around 90%. There is a strong synergy between private investment and state support. Europe, unfortunately with much delay, has finally launched a program for a new generation of batteries. For the time being, as with many other manufactured goods (photovoltaic panels and wind turbines), we are still dependent on imports.

There is a strong synergy between private investment and state support

For a long time, nuclear energy has been perceived as another alternative to fossil fuels. The fuel used (uranium) has a very high energy concentration, incomparable to other fuels, and the production of electricity is free of emissions. Two serious accidents, Chernobyl and Fukushima, have undermined faith in nuclear power, and the increased safety measures required, particularly in Europe and the US, have effectively halted its development in western countries. However, in 2019, six new power stations with a capacity of over 6,000 megawatts went into operation. Since 2010, 57,000 nuclear megawatts have been installed. To put it bluntly, to obtain the same amount of energy from photovoltaics we would need around 380,000 solar megawatts, which would occupy the equivalent of around 500,000 hectares, something like 200,000 football pitches. Another 54 reactors are under construction in various parts of the world.

Major investments are also being made to achieve stricter safety standards, even by changing the design layout. No longer high-powered giant reactors, rather smaller power units, manufactured in series and assembled in factories to reduce costs and equipped with inherent safety systems. In other words, capable of shutting down autonomously in the event of a malfunction. It would be a mistake to turn down a power technology capable of producing huge amounts of electricity with zero emissions. There is also the quest of nuclear fusion, which can multiply electricity generation many times over and reduce risks to practically zero. But this is, honestly, still a long way off.

Finally, there is hydrogen, pivotal in the European Green Deal plan. Hydrogen is not a fuel, but an energy “carrier”, e.g., a container for secondary energy, which must be produced using processes requiring energy. By the general laws of thermodynamics, the energy contained in hydrogen will always be less than the energy used to produce it. But it has the advantage of storing energy, almost as a battery, of being easily transportable and of being able to be produced using solar energy or other renewable sources even in places where there is a large supply of it but a scarce consumption (deserts). It can perform various functions. For example, it can be blended into the gas network, used for transport, or used to generate electricity.

However, all the above concerns mainly electricity production which today accounts for about 20% of our total energy consumption. The rest - transport, heating, many industries - uses fossil fuels. While the production of electricity from renewable sources, if calculated only on the basis of electricity production, has already reached a significant level: over 20%, and continues to grow, when we look at it as a share of total energy consumption (electricity plus fossil fuels), percentages downgrade dramatically. According to the International Energy Agency's figures for 2019, the solar energy contribution does not reach 1%, wind is barely above 1% of total consumption and hydroelectricity, mostly installed in the last century, roughly 3%.

Mobility is a much more complex issue, but once again there is no alternative to innovation. For passenger transportation, as already mentioned, both traditional electric transportation (trains, metro, tramways, etc.) and battery electric vehicle BEV are a viable alternative. The only critical point is the time needed for mass replacement. For freight transport: cargo and trucks, and for air transport, things are more difficult. You need high-powered engines, which cannot be powered by batteries which, if used, would be incompatible in weight and size, at least in the current stage of technology development. Although some experiments are already under way, and hybrid engines - endothermic and electric together - could probably be a satisfactory solution. Then there is always the highway of efficiency. Engine efficiency, design efficiency, improved materials for lighter vehicles. Synthetic fuels, which have the same energy density as traditional fuels, are also being experienced. Hydrogen could also be an excellent fuel.

Similarly, substantial improvements can be made in the use of fossil fuels for heating. High-efficiency electric heat pumps are now current solutions. Side-by-side with the improvement of the energy performance of buildings (thermal coats and window frames) and the widespread application of home automation systems to optimise heating and lighting consumption.

From Pinocchio to MasterChef

Agriculture is another sector where staggering innovations can be introduced contrasting the oversimplified and misleading storytelling circulating. One of the many examples is Oxfam's report on the contribution of food production systems to climate change, which states: «Around the world, farmers are harvesting smaller and smaller crops and needing larger and larger production areas, contributing to higher food prices». However, the situation is quite the opposite. Take a staple food like cereals and look at the figures published by FAO. From 877 million tons in 1961 to 2,801 billion in 2014, a total increase of almost 320% and an average annual growth of 54 tons. How was it achieved? Only to a minor extent by the increase of the cultivated area. Instead, due to an increase in productivity, which rose from 13 quintals per hectare in 1960 to 39 quintals per hectare in 2014. An impressive jump. The best consequences of which, contrary to what Oxfam claims, have been an increase in the availability of food at ever lower prices, which has drastically reduced world hunger. We shifted from the penury described in Pinocchio's tale to TV shows like MasterChef for gourmets.

The world of agriculture is a perfect example of decoupling: the land surface from the output. According to FAO figures, the average area needed to feed one person halved from 1960 to 2006. From 0.45 hectares per person to 0.22 hectares. Thanks to the extension of irrigation systems, the use of tractors, fertilisers and pesticides, and increasingly advanced cultivation techniques - a set of tools called the Green Revolution. According to FAO, between 1960 and 2012, the amount of land allocated to food crops increased by only 12%, while world agricultural productivity grew by 150-200% over the same period. The number of people employed in the agricultural sector has fallen dramatically, Italy passed from 43% of the active population employed in agriculture after World War II to less than 10%, having meanwhile increased total production.

However, agriculture brings in various problems of environmental impact. The extensive use of fertilisers and pesticides employed to boost its output, has over time sedimented, leading to erosion of soil quality and reduction in the biodiversity of farmland.

The wrong way to approach the problem is to oppose traditional agriculture versus organic farming. Leaving aside theories and practices bordering witchcraft, such as biodynamic agriculture, which however finds unjustified attention and disgraceful public funding in Italy. Full moons, ox horns, and mouse skins are part of a paraphernalia made up more of superstition than rational approaches.

> The world of agriculture is a perfect example of decoupling: the land surface from the output

Organic farming, a form of agriculture that tries to limit the use of chemicals without being completely free of them, is an important reality that has carved out a niche of high-end products, both in terms of price and consumer profile. Moreover, it is particularly suited to certain areas of Italy for the production of typical quality crops. However, it is unthinkable to feed seven billion and more people with organic farming. Yields per hectare are much lower, and organic farming has limitation into the staple crops of human nutrition like rice and cereals.

But even vineyards where grapes cultivation produce excellent wines, and contribute to the surplus of balance of payments, require extensive use of in order not to be destroyed by recurrent diseases pesticides (vine farmers result top users).

In fact, we should see modern agriculture as a continuum between traditional and advanced farming where the goal of increasing the quantity and quality of agricultural production and reducing the overall environmental impact are all in one. All studies agree that an examination of high-yield agriculture (soya, maize, cotton) shows a 37% drop in the use of pesticides and a 22% increase in yields. This is the effect of the emerging so-called «precision» agriculture, where once again process and product innovation are entangled with AI and Internet of Things, which are boosting the results. Quoting in full the description made by Antonio Pascale, agronomist and writer: "Imagine a big tv screen, that's your agricultural plot. You see the image, and maybe, on the whole, it looks good to you, yet, at the end of the day, you find surprises: something is wrong (our screen consumes too much, performance slows down when you least expect it, blurring, rippling, etc.)."

Why? To find out, precision farming breaks down the screen into individual pixels, transforms the field into many micro-fields. Every pixel, every square meter of land is mapped (how much nitrogen? phosphorous or potassium? are there aquifers, soil elements that create critical conditions?) both from above (with satellites, drones) and from below (with sensors). In the end, by integrating the data, beautiful coloured maps are produced. If you allow me a narrative analogy, our field becomes a living character with many nuances, different colour and tone intensity. We can see which micro-field is more productive (and understand why), which micro-field is less (and understand why). Here there is already an element of novelty to point out: we are not trying to push production ever higher, but we are trying to get the maximum production potential out of every single pixel.

Let's say that in our field we produce five tons of cereal per acre. This means that in one place we produce seven, in another four, in another two, in another five, and then these yields will average out to five tons. If we want to increase production, the farmer will choose varieties that aim even higher, say, eight tons, to increase the average in the field (in one place eight, in another five, and so on). But what if instead of looking for higher yields, e.g., always pushing on the accelerator (more input), I try to understand why I am producing less at that specific point (not enough nitrogen? water stagnation? pest attack in progress?). Why is the average below in those spots? Then, I can fix my malfunctioning pixel and modulate the overall picture, e.g., pull-out the productive and qualitative potential from each micro-field to improve the whole cultivated surface.

Second news: with precision farming, I can save money, and a lot of it too. What's the point of putting the same amount of nitrogen in the whole field if the sensors tell there is the right amount of nitrogen in one place? And, to let you understand the preciseness of precision farming, if I realise that in certain sectors of the field the soil is more compact (and therefore less hospitable) due to machines trampling (perhaps the steering angle is too wide), I can make the satellite read the complete map of my field and guide the machine (a seeder, a fertiliser) with millimetric precision so that it doesn't trample on those sectors of the field.

Our field becomes a living character with many nuances, different colour and tone intensity

I can modulate the use of pesticides and intervene only if the attack overcome a critical threshold, saving on costs (and on chemicals). I can set the machines to adapt to the real conditions of the field, which, as we know, are variable and changeable, varying from pixel to pixel, from square meter to square meter. I can use biotechnology (genetic improvement is essential for precision farming) to strengthen the plants so that they can defend themselves better against pathogens and by their own means. All this and other fine things are already possible, to put it in a nutshell: agriculture 4.0 requires an integrated approach.

The bucolic farmer disappears, and the technological farmer is born, capable of collaborating with agronomists, computer scientists and engineers, because each of these professionals works on the proper functioning of its individual pixel, but the pixels must then come together to form the overall image.»

Precision agriculture also requires the use of genetic modification techniques. What farmers used to do over centuries to obtain better and more resistant varieties through cross-breeding, can now be achieved in laboratories by working on the genetic structure of the plant. For example, using CRISPR technology - a kind of cut, copy and paste of small portions of genetic code from which negative functions are removed and replaced with genes that can perform certain functions better as the resistance to a certain parasite. This is a very unobtrusive technique, which does not create any monsters, but simply corrects certain defects. As was done to combat phylloxera - the curse of European vines in the second half of the 19th century - by grafting European vines onto the feet of American vines resistant to this specific parasite. Similarly, it is possible the use of cisgenesis e.g., the transfer of genes from plants of the same species, again with the aim of improving the genetic heritage. Let’s see what one of Italy’s most prestigious wine growers, Angelo Gaja, hero of the exceptional development of the Langhe wines, says: «Let’s break the taboo of GM vines, which will be the salvation of Italian wine. Only by transferring genes from plants of the same species (cisgenesis) can we give great Italian wines a future. If researchers are not authorised to apply the new genetic techniques, our vines have no future. I am aware that cisgenesis is considered a GM technique and genetically modified organisms in the fields appear as blasphemy. But in front of enemies (such as downy mildew, which dries up leaves and bunches of grapes, and powdery mildew, which infects all the green organs of the plant) we cannot stand still. There are those in the cellars who are happy because with the rise in temperature, good quality harvests are more frequent. But there is unfortunately the other side of the coin: heat and dry weather appeal to old and new parasitic diseases. Due to the suffering of vineyards due to long periods of drought, grapes arrive in the cellar too hot, still covered with pesticides that the missing rain has not allowed to wash away. Our nation must allow researchers access to new techniques. The wine world must escape the most crucial danger.... standing still!

Smart Materials

A further chapter of the benefits brought to the environment by technological innovation process encompass the "new materials", resulting from an in-depth knowledge of the structure of matter coupled by the ability to prototype them in the laboratory and then to produce them in the factory.

These are very light materials, stronger than steel, often they result ultra-performing electrical conducting material with insulating capacity and low heat dispersion, therefor with high energy efficiency.

The absolute star appears to be graphite, the abundant and well-known material from which pencils are made. Andrej Gejm and Konstantin Novosëlov, who won the Nobel Prize for this, have succeeded in 'flaking' it (graphite is made up of innumerable overlapping 'sheets') to create a two-dimensional material the thickness of a single atom, called 'graphene'. Spreading one gram of graphene cover a surface area half the size of a football field. As hard as diamond and as flexible as plastic, graphene is hundreds of times stronger than steel. It is biodegradable, waterproof, fireproof, and transparent. According to its discoverers, a sheet of graphene weighing 0.7 milligrams can support a weight of four kilograms being virtually invisible. Its potential applications are endless. In the energy field, it could lead to a new generation of batteries with greater density, a dramatic increase in the efficiency of

The bucolic farmer disappears, and the technological farmer is born photovoltaic panels for electricity production, and exceptional insulation capacity. It could become part of construction materials, improving their strength and endurance. There is a further range of applications from clothing to tyres, as performing shield against heat and cold, to increase strength and durability of the product.

But graphene is just one of several “miracle” new materials with fanciful names. Airloy, micro-latex, Stanene, perovskite nanotubes. Extremely light materials, but very strong and sometimes suited of bearing thousands of times their own weight. Perfect insulators and equally perfect conductors of electricity or information storers and transmitters. The development of composite materials, which perform the same function as steel but are increasingly lighter, is studied since some time and is about to find important applications. In transportation, including aircraft, they considerably reduce weight and thus fuel consumption. According to various experts, a reduction of one kilogram in the weight of an airplane means fuel savings of a few thousand euros a year. Thanks to nanotechnology, e.g. the possibility of designing and engineering new materials starting from their component atoms, this field is rapidly expanding.

The car of the future

Putting all the above features together, imagine if applied to an object of our everyday life, which we learn to know from more than a century, and to which we are tightly bound: the automobile.

Few things have received as much love and gained as much hate. On one hand, cars have given us the freedom. On the other, it brought an equally grand sacrifice. Tens of millions of people have died and been injured, in all its history, traffic congestion and loss of time, cities replanned, and landscape disfigured for the sake of highways and above all, air pollution. Not forgetting petrol wars named after the oil appropriately dubbed “black gold”, the fuel that has powered the world growth of the last century.

The car has been attacked in the harshest ways but has always won. While the various technological revolutions wiped out billions of obsolete objects off our life, cars are here to stay, to multiply at the conquest of the remotest spots of the planet. Having saturated Europe and the Americas, it turned to the East, where it continues, unstoppable, its breakthrough.

On one hand, cars have given us the freedom. On the other, it brought an equally grand sacrifice

It is as if automotive industry had read Darwin's essays on the evolution of species and the survival of the fittest. Because cars have modified themselves over time, producing different variants and incorporating the genes of other technological species: to become stronger and fitter to survive. The vehicle has become more comfortable thanks to air conditioning, hi-fi systems, upholstery, and ergonomic seats. It has become safer, thanks to robust materials, airbags, and seatbelts. And thanks to mobile telephony, it has leapt over what appeared to be a big obstacle: waste of time. Today, many confess that a good traffic jam is the best opportunity to get out of a backlog of calls or chat with friends who may also be stuck in some traffic jam. In recent years it began to incorporate all the gadgets that Internet and other technologies are offering: starting with navigators, which used to guide us the right way, and now also suggest the best way to go, avoiding congestion, detour. From estimations navigator systems save us a few hundred million hours of driving time and much fuel. Next step of car evolution is to fend off the most insidious allegation: pollution, by offering us green electric vehicles. No more arguments will be left to car opponents. But the best is yet to come. Because now car is qualifying for the final evolutionary leap. Connecting artificial intelligence, information technology, the Internet of Things, new super-light materials and the ultra-fast 5G connectivity, all mixed up with a dash of share economy.

Let's enter the new world. First, imagine a car that weighs half as much as current one, but is also stronger thanks to new materials. That has become super-safe thanks to proactive systems that anticipate any kind of obstacle. It is powered by electric batteries rapid recharging with satisfactory mileage autonomy. But above all, you don't need to drive, because thanks to radar, various detectors and navigators, once you've set your route you can relax, read, surf the Internet, watch a movie and even flirt with your partner. You order your destination with your smartphone and the car will drive you autonomously to your destination; then, the car goes autonomously to pick up your children from school or to find a parking slot to recharge. It could be part of a shared fleet, and thus reducing by some factor the large number of cars circulating. On the road? To be honest, most of them are currently parked somewhere, occupying thousands of square km of precious urban land, which could be freed and turned back to collective use.

We can figure out many profound improvements, which can be brought to other areas of human activities with the combination of all the above factors. To make it happen, it is necessary for environmentalism to drop all regressive ideologies and follow the highway of technological innovation. This is the only possible way to achieve the decoupling of the quantity of resources consumed from the quality of life and well-being endeavour we have undertaken but need to accelerate. Unfortunately, however, even among authoritative commentators, is widely spread a die-hard ideology dominated by pessimism and rejection of the stunning potential offered by new technologies.

Optimism and rationality

Environmental policy is full of good intentions, but it should be judged not by them, but by the ability to achieve positive and measurable results. Often the gap between the two is enormous. The objective of a pragmatic and, above all, effective environmental policy aims to minimise the social impact while achieving environment preservation, greenhouse gas reduction, biodiversity protection. In a just eco-transition, the environmental goals shouldn't be pursued at the expenses of well-being of humanity and economic growth. All these objectives can be achieved through a highway, which is at our disposal. Stimulating technological innovation in order that the decoupling of economic growth from the consumption of natural resources becomes permanent and effective. Doing more, wasting less, as mentioned before.

Environmental goals shouldn't be pursued at the expenses of well-being of humanity and economic growth

It needs to get rid of nostalgia for the past (perceived better than the present), to overcome hatred for modernity, to reject distrust in technological innovation and market economy, and to stop defiance toward large and small companies that stubbornly seek to improve. We should also outpace the opposition between state and market and develop instead fruitful partnerships. Targets, environmental taxes, subsidies, and research programs can be usefully deployed by national governments and international institutions, but innovation becomes viable and available only within a competitive market with the commitment of businesses and entrepreneurs.

For a while in the environmentalism movement two approaches faced each other, becoming recently strongly opposed.

The first approach could be named "nostalgic" - even if sometimes it looks quite "reactionary"- and is longing on good old times. It is essentially an enemy of modernity, to which it blames all the responsibility for environmental damages: high pollution rates and reduced biodiversity. With the addition in recent decades, on a completely different scale, the surge greenhouse gases responsible of climate change.

Environmental awareness began to emerge in the Western society since the mid Sixties. American sociologists defined it as the emergence of post-material needs. Having roughly solved the survival issue and achieved a relative prosperity, the time had come to address the quality of our lives as well. The change was important and in constant rise.

From the 1970s onwards, there has been an acceleration. More stringent legislation has been introduced to contrast pollution, more attention was paid to protecting natural resources, and natural reserves have been established all over the world. In the economies of older industrialisation, including Italy, we assisted to a progressive conversion of traditional industries. By one side, innovative pollutant abatement systems and industrial waste treatment have been adopted; on the other, several productions have been abandoned or outsourced in Asian countries, transforming Italy in a service industry economy with a dominant tertiary sector of activity. This impacted pollution problems although it still existing. In the cities of the industrial triangle (Milan, Genoa, Turin), air quality has improved by 90% since the 1950s. The main sources of pollution have also changed, with a drastic drop in industrial emissions and a consequent increase in the percentage of pollution from traffic, house heating and agriculture; however, with a drastic overall reduction.

Same is happening in China for some years now. The «factory of the world», which has consistently improved its economic situation, created a middle class, encouraged the migration of hundreds of millions of people from the countryside to cities, has dramatically deteriorate urban air quality. Chinese government has switched to pollution mitigation pro-active policies. However, its energy craving is such that coal remains the country main power source, though it is investing a lot in the development of renewable sources, nuclear power, electric cars, and more stringent environmental legislation.

The second approach could be called "neo-technical", using a term invented by one of the first Italian environmentalists, Giorgio Nebbia. It entrusts the hope of a reconciliation between man and the environment thanks to further development of less invasive technologies capable of leading us towards an increasingly dematerialised economy. Once upon a time, we could have defined the two positions as right-wing and left-wing. But the advent of "collective environmentalist" has swiped away with these distinctions, imposing a storytelling full of clichés as lofty as they are ineffective. As supporters of the decoupling philosophy, we are favouring the second approach. The only innovations that are changing the relationship between man and the environment are expected from "technological leaps", which we should push hard to accomplish. Only through them we can make the most efficient use of available resources without wasting them.

We have observed the remarkably improvements, compared to the pre-industrial era, of per capita consumption of natural resources in relation to the economic output and global population. Of course, the overall impact generated by more than seven billion persons has undoubtedly increased. But if we follow the right direction of change, there is no fear for our future. On the contrary. To make this possible, we must also overcome other regressive ideologies struggling against open societies. Globalisation, free market, and cooperation are rejected by frightful citizens and demagogic leaders who are putting up walls and looking for scapegoats as mass distraction tool. The Berlin Wall fall did not end history, instead the progress resulting from the extension of free trade is undeniable. Even an autocratic state like China could resist to this wave, improving citizens living conditions and conquering the status of technological global leader.

If trust, cultural and commercial exchange, cooperation, and the energy of tens of thousands of entrepreneurs with innovation as a guiding star will prevail, there is no reason why pessimism should triumph.

CHAPTER 2

"Competitiveness is how a nation manages the totality of its resources and competencies to increase the prosperity of its people."

Prof. S. Garelli, IMD World Competitiveness Yearbook, 2008

ABSTRACT

This contribution aims to focus on the role played by critical raw materials (CRM) in the path for a green transition. Renewable energy resources are essential in fighting climate change, but they need a large number of raw materials to function. That is why, access to these resources will be a strategic question in the next years. The demand for these CRM has risen rapidly and their cost grew up by more than a hundred percent in the last few years. From a European point of view, the supply of CRMs is critical since the EU imports 75-100% of those materials from non-EU countries. The solution proposed is based on a European responsible domestic production of CRMs. This is not utopian but established on reliable data. The data shows that unexplored mineral deposits of these materials still exist. The combined use of the different skills and expertise among European countries could result in a more self-reliant, and less vulnerable economy to third countries. Furthermore, the European Union could also take the lead in the green-transition process. This paper is structured as follows: the first part is a general introduction to CRMs supply, its importance, the European situation, and the possible solutions. The second part of the paper examines the Hungarian situation. To introduce both, theory and practice, each part is accompanied by a case study.

Towards a sustainable economy with (critical) raw materials

Balazs Ivanics (geologist)

Towards a sustainable economy with (critical) raw materials

Balazs Ivanics (geologist)

Balázs Ivanics grew up in a small town Rétság, Hungary. He studied geology in Budapest, Hungary, and in Freiberg, Germany. Since 2016 he lives in Dresden, Germany, and works as a geotechnical engineer and engineering geologist. His main topics are raw materials, sustainability, hydrogeology, and geotechnics.

CHAPTER 2

Chapter 2

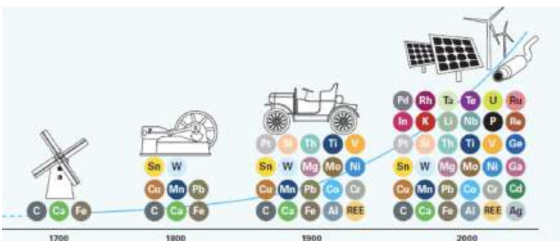
Towards a sustainable economy with (critical) raw materials

Balazs Ivanics (geologist)

Introduction – What are critical raw materials?

Renewable energy resources are receiving increasing attention and have a designated role in the fight against climate change all around the world. But it is less known that these energy resources have huge demand for raw materials (e.g., aluminium, rare earths elements, cobalt, copper, zinc, iron ... etc., see Fig. 1). Many countries have to import these essential materials, which are critical for their economy and make these countries vulnerable to the major exporters.

Fig 1: Materials widely used in energy technologies[1]



1 Volker, Simons, Reller, Ashfield, Rennie, 2014, 'Materials critical to the energy industry — An introduction

These critical raw materials (CRM) form a strong industrial base, producing a broad range of goods and are part of our daily lives. For example, a smartphone might contain up to 50 different kinds of metals like tungsten, all of which contribute to its small size and functionality. Furthermore, raw materials are closely linked to green technologies. They are irreplaceable in solar panels (germanium, indium), wind turbines (iron, copper, aluminium), electric vehicles (gold, lithium) and energy-efficient lighting (LED, gallium)[2]. CRMs are others from country to country and time to time.

One of the biggest exporters (and importers) of raw materials is the People's Republic of China. As a rising superpower, China is reshaping the world and aims to increase its economic, political, strategic, and cultural influence globally. To implement the One Belt One Road (OBOR) initiative, China is investing in foreign countries that have a weaker economy, but at the same time a strategic location or valuable resources[3].

Due to the OBOR initiative, Beijing will have access to further energy resources e.g., in Africa (copper, cobalt, gold), Asia (oil, gas, lead-zinc, iron ore), the Persian Gulf region (oil, gas), South America (copper, gold, lithium) and Australia (iron ore, copper) etc[4]. Furthermore, China explores and mines its ore deposits to reduce the vulnerability of the country too.

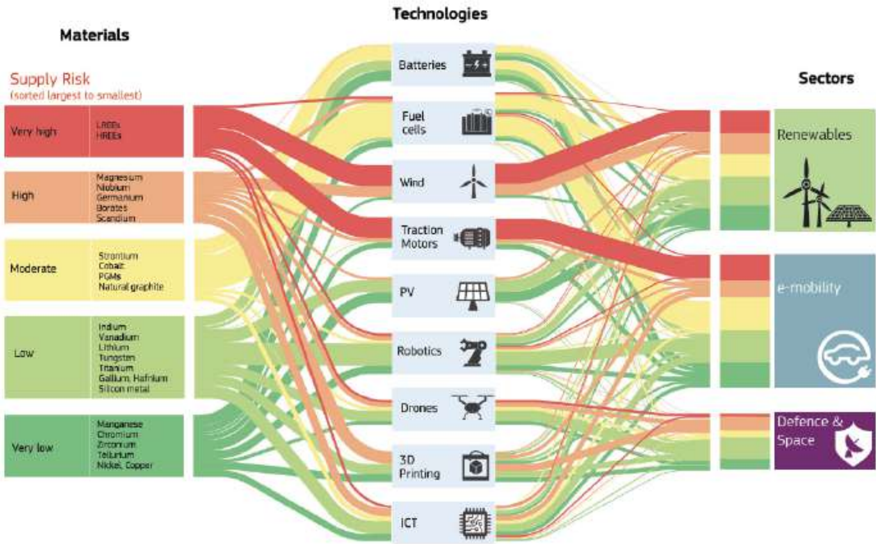
As the Chinese example shows, access to these crucial CRM-resources is a strategic security question. The EU has to aim the same strategy to save its competitiveness and independence and to deliver the clean technologies for the Green New Deal and to supply the different sectors like renewables, e-mobility or defence & space (Fig 2). Achieving resource security requires action to diversify supply from both primary (mining) and secondary (recycling) sources.

2 Critical Raw Materials Resilience: Charting a Path towards greater Security and Sustainability (European Commission, 2020)

3 Yu, Hong Yu (2017): Motivation behind China's 'One Belt, One Road' Initiatives and Establishment of the Asian Infrastructure Investment Bank. In: Journal of Contemporary China. 26:105, p. 353-368.

4 https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/chinese-foreign-mining-investment-8212-china-s-private-sector-eyes-low-cost-regions-63066809

Fig 2: Semi-quantitative representation of flows of raw materials and their current supply risks to the nine selected technologies and three sectors[5]



This paper aims to draw attention to how to supply the European economy with (critical) raw materials from domestic production and maintain its competitiveness in such a way that it is not dependent on major exporters (like China) and has a minimal impact on the environment.

For this research, English and Hungarian primary and secondary sources were used. The discussion relies on the most relevant and up to date publicly available data.

5 Critical Raw Materials for Strategic Technologies and Sectors in the EU - A Foresight Study, 2020

CRMs and where to find them

Economic importance and supply risk are the two main parameters for the determination of criticality

CRMs of the EU and their location[6]

The European Commission reviews the list of CRMs for the EU every three years. The last review is from 2020. The assessment is based on data from the recent past and shows how criticality of CRMs has evolved over the years. It screened 83 materials and, where possible, looked more closer than in previous assessments where criticality appears in the value chain: extraction and/or processing.

Economic importance and supply risk are the two main parameters for the determination of criticality, and namely:

- Economic importance looks in detail at the geographical location of raw materials;
- Supply risk looks at the country-level concentration of global production of raw materials, EU sourcing, and the governance of supplier countries[7].

The list (see table 1) of CRM provides a factual tool to support EU policy development. It helps to identify investment needs and drive research and innovation in the EU, especially on new mining technologies, substitution and recycling. It is also important for the circular

6 Critical Raw Materials Resilience: Charting a Path towards greater Security and Sustainability (European Commission, 2020)

7 EU methodology uses the Worldwide Governance Indicators (WGI): http://info.worldbank.org/governance/wgi/.

economy[8] to support sustainable and responsible sourcing. EU-Member States and companies can also use it as a reference framework for developing their own specific criticality assessments.

The EU list from 2020 contains 30 materials:

Table 1: Critical raw materials for the European Union (new as compared to 2017 in bold)

Antimony	Hafnium	Phosphorus
Baryte	Heavy Rare Earth Elements	Scandium
Beryllium	Light Rare Earth Elements	Silicon metal
Bismuth	Indium	Tantalum
Borate	Magnesium	Tungsten
Cobalt	Natural Graphite	Vanadium
Coking Coal	Natural Rubber	**Bauxite**
Fluorspar	Niobium	**Lithium**
Gallium	Platinum Group Metals	**Titanium**
Germanium	Phosphate rock	**Strontium**

The biggest problem with the CRM and general with raw materials that the geographical concentration of mineral deposits (Fig. 3), its mining and the supply (Fig. 4) are highly concentrated.

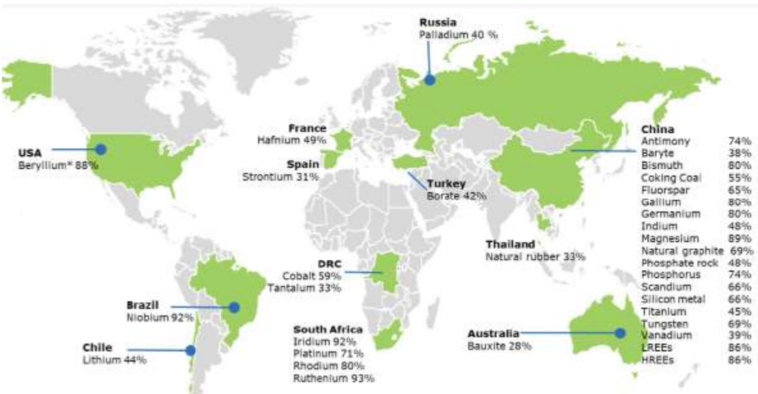


Figure 3 Geographic concentration of CRMs global supplier countries[9]

8 ttps://ec.europa.eu/eurostat/web/circular-economy/indicators/monitoring-framework

9 https://rmis.jrc.ec.europa.eu/?page=why-crms-have-a-supply-risk-8e8af9

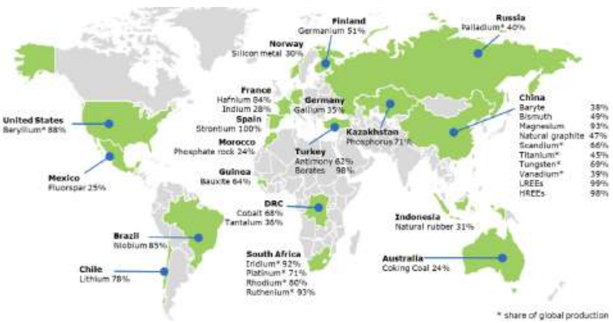
As figure 3 shows, China is the largest miner and supplier of several critical raw materials. Other countries (such as Australia or Chile) are also important global suppliers of specific materials. For instance, Russia (apart from natural gas and crude oil) and South Africa are the largest global suppliers for platinum group metals, and Brazil for niobium.

Looking at the resource management of the EU and the economic connections with relevant international organisations and countries, the map (Fig. 4) shows a slightly different picture than the figure 3. The situation of supply of CRMs is still critical because China is certainly a major supplier of the EU and several other countries represent main shares of the EU supply for specific critical raw materials, such as Brazil (niobium), Chile (lithium) and Mexico (fluorspar).

Further critical examples are the following:

- South Africa provides 71% of the EU's needs for platinum and an even higher share of the platinum group metals iridium, rhodium, and ruthenium;
- Kazakhstan provides 71 % of the EU´s supply of phosphorus;
- the USA provides 88 % of the EU´s supply of beryllium;
- Turkey provides 98% of the EU's supply of borate;
- China provides 98 % of the EU's supply of rare earth elements (17 elements) and 8 other CRMs.

Figure 4 Largest suppliers of CRMs to the EU[8]



As figure 3 and 4 show, most of CRMs come from some non-EU-member countries with low control on governance like China, Kazakhstan, or Democratic Republic of the Congo. These countries have the biggest mineral deposits and production of raw materials. This means a big risk for the EU´s economy and democratic political system to be vulnerable to these countries, because they can use it as pressure in negotiations with the EU to maximise political and economic benefits for themselves.

Figure 5 shows the supply concentration for some raw materials and the governance level of their producing countries. The colour assigned to each country reflects its governance level, based on the Worldwide Governance Indicators (WGI).

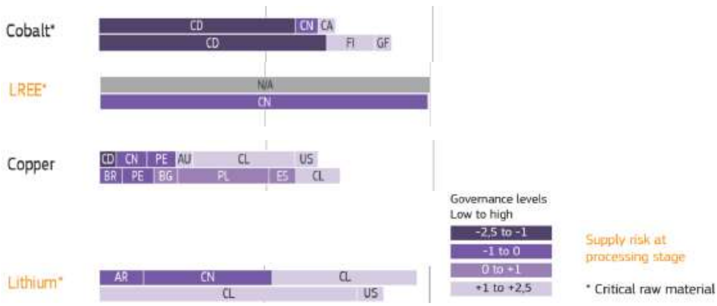


Figure 5 Geographical concentration of global production (upper bar) and supply to the EU-27 (lower bar) and the corresponding governance level in producing countries, average 2012-2016[10]; CD – Congo*, CN – China, CL – Chile, GF – French Guyana, FI – Finland, PL – Poland.

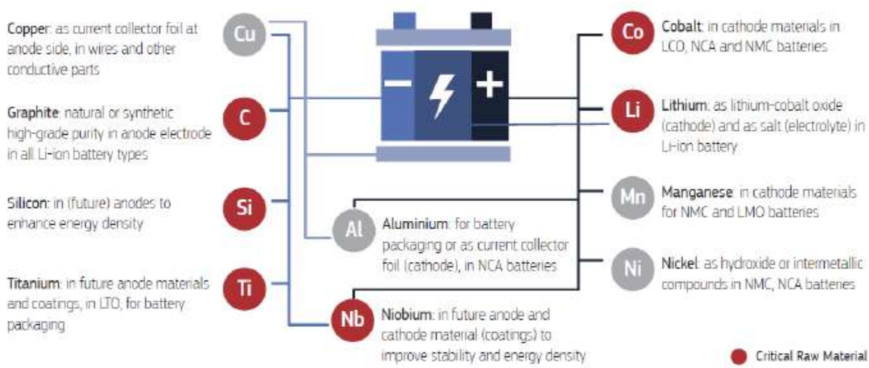
The World Bank[11] projects rapidly increasing demand for metals and minerals with climate-neutrality ambition for 2050. The foresight report of the EU Commission shows the same, for the CRMs of strategic technologies and sectors with outlook to 2030 and 2050.

10 Study on the EU's list of Critical Raw Materials (2020); Final Report

11 World Bank (2017), The Growing Role of Minerals and Metals for a Low Carbon Future * Congos´s WGI is because of the modern slavery and child labour so critical

The most significant example of this is electric storage (Li-ion) batteries, where the rapid rise in demand for relevant metals (see Fig. 5) like copper, graphite, cobalt, aluminium, lithium, iron, lead, manganese and nickel will grow by more than 1000 % (!) by 2050 under a 2°C scenario compared to a “business as usual” scenario.

Figure 6: Raw materials used in batteries



The European Union produces only 1% (!!) of all battery raw materials. 54% of global cobalt mine production comes from the Democratic Republic of the Congo, followed by China (8%) and Canada (6%). Refined cobalt production comes from China (46%) and Finland (13%). Around 90% of global lithium mine output is produced in Chile (40%), Australia (29%) and Argentina (16%).

Furthermore, the European Union is between 75% and 100% reliant on imports for most metals[12]. It means that the EU is fully dependent on the major raw materials exporters like China, Russia or the USA.

In the future, the EU has to achieve more strategic autonomy from exporting countries.

12 European Commission, EIP on Raw Materials, Raw Materials Scoreboard 2018.

This by:

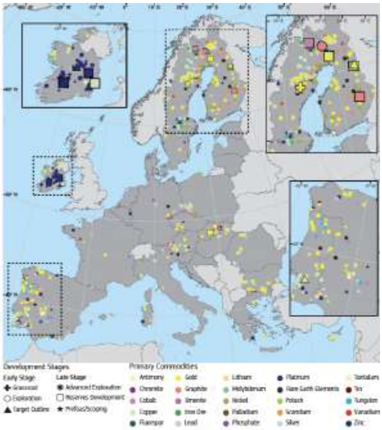
- Diversifying and strengthening global supply chains (resilient value chains),
- Reducing excessive import dependence through enhancing circularity and resource efficiency (recycling) and
- Increasing supply capacity within the EU.

Responsible domestic production of CRMs in the EU - Solution for the vulnerability?

Gaps in EU capacity for extraction, processing and recycling capacities (e.g., for lithium) reflect a lack of resilience and a high dependency on supply from major exporting countries. Certain materials (like lithium) mined in Europe currently have to leave Europe for processing. Technologies, capabilities and skills in refining and metallurgy are critical points in the resilient value chain too. Circularity and the recycling of (critical) raw materials from green technologies is a crucial part of the transition to a climate-neutral economy. Resilient value chains, recycling and substitution or diversified sourcing from third countries can contribute to reduce the supply risk, but they are still not enough. That is why the main focus of this topic is on responsible domestic production in the European Union.

Primary raw materials will continue to play a key role because global demand for CRMs rapidly increases. Member countries of European Union have a long tradition of mining and extractive activities. The EU is well-endowed with aggregates as well as certain base metals such as copper and zinc. Nonetheless the EU is less successful in developing projects to source (critical) raw materials, even though there is significant potential for these (Fig. 7).

Figure 7 Mineral exploration activities in the EU-27



> In the future, the EU has to achieve more strategic autonomy from exporting countries

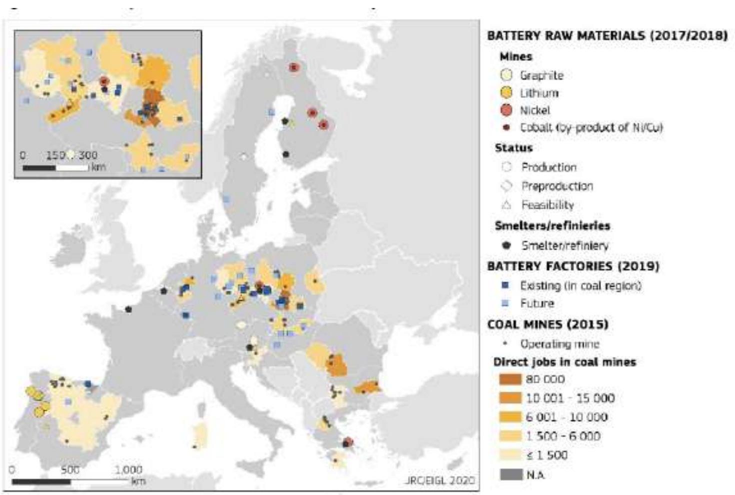
The reasons of lack of successes are multi-faceted:

- Lack of investment in exploration and mining,
- Diverse and lengthy national permitting procedures and
- Low levels of public acceptance.

Looking at the geographical location of CRMs in EU, the development of raw materials such as aluminium, lithium, nickel, cobalt, graphite and manganese etc. provides interesting opportunities. Many EU battery raw material deposits are located in regions (e.g., East Germany or West Poland) that are heavily dependent on coal or carbon-intensive industries and where battery factories are planned (Fig. 8).

Furthermore, much mining wastes are rich in CRMs[13] and can be extracted to build new economic activities on coal-mining sites, improving the environment and the economy. It will help to reduce the socio-economic impact of the transition to climate neutrality in coal and carbon-intensive regions. It can support the economic diversification and renewing of regions including through circular economy investments. Many mining and engineering skills are transferable to the exploitation of metals and minerals, often in the same regions.

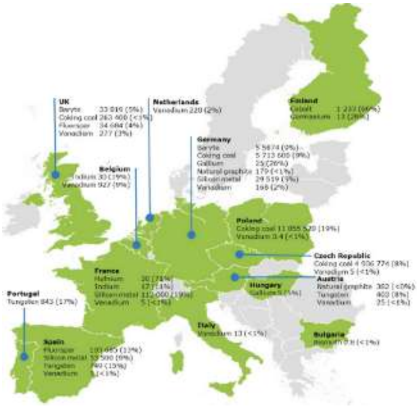
Figure 8 Battery raw material mines, battery factories and coal mines in the EU



Responsible domestic raw materials production can support the secure and sustainable supply to the manufacturing industries, but the EU's mineral potential still remains underexplored. Only some EU-member country (e.g., Germany for gallium or Portugal for tungsten) has significant production in CRMs (see Fig. 9).

13 Recovery of critical and other raw materials from mining waste and landfills https://ec.europa.eu/jrc/en/publication/recovery-critical-and-other-raw-materials-mining-waste-and-landfills

Figure 9: EU production of primary CRMs in tonnes and share of supply to EU in %, average 2010-201412waste



Prices and future demand of raw materials and metals are the main drivers of exploration activities

The future availability of critical raw materials from EU domestic deposits is determined by the success of mineral exploration projects. They involve a series of activities intended to find a viable quantity of minerals that are economically beneficial and technically feasible for extraction. It requires geological knowledge and technological feasibility as well as environmental, political, social, and legal acceptability[14].

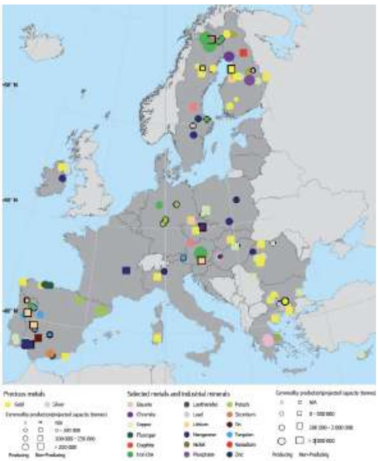
Prices and future demand of raw materials and metals are the main drivers of exploration activities. Investment in a mining project is long-term by nature and requires a large amount of capital. The decision to invest in exploration activity in the EU is also challenged by other important issues such as:

14 European Commission, EIP on Raw Materials, Raw Materials Scoreboard 2021

- Permit and licenses;
- Public acceptance;
- Exploration technologies and mines design;
- Environmental, health and safety issues; and
- The access to relevant knowledge and information on minerals.

The EU's exploration budget in 2019 remained low compared to other world regions. The 2019 exploration budget was mostly allocated to gold (37%), followed by copper (30%), zinc (25%), nickel (8%), and a very small percentage (<1%) to PGM. And these mineral exploration projects remained concentrated in Ireland, Spain, Portugal, Sweden, and Finland. (See Fig. 10, new projects are indicated by circle points (active, producing) and squares (active, non-producing) with a black border line).

Figure 10: Mine production of metal and industrial minerals in the EU



There are still many unexplored / underexplored mineral deposits of (critical) raw materials in the European Union. Mobilising its domestic potential in mining is an essential part of the EU becoming more resilient and developing open strategic autonomy.

Case study from the EU for the responsible domestic production of CRMs – Mittersill, Austria

Nobody would think of Austria as a highly developed mining country with significant production to tungsten. But Austria has one of the most important tungsten mine in the world, with a processing-smelting plant near Mittersill. The mine works according to the highest safety and environmental standards immediately adjacent to the “Hohe Tauern” National Park (Fig. 11).

To preserve natural resources, the firm “Wolfram” has extensive recycling facilities using secondary tungsten raw materials too.

Figure 11: Location of the national park Hohe Tauern“ (green area) and the tungsten mine and smelting plant of Mittersill (red dot)[15]

Transport of the ore from the mine to the plant is done in an environmentally friendly manner by means of a conveyor belt through a tunnel. The plant produces scheelite concentrate, covering an important part of the raw material requirement of the EU and increasing independence the security in the supply chain of tungsten.[16]

The mine produces ca. 500.000 tons ore (0,3 %WO3) per year. The tunnel and transport network is now 60 kilometres long and 500 meters deep and is being constantly expanded.

15 https://hohetauern.at/de/besuchen/ihr-aufenthalt.html

16 https://www.wolfram.at/en/the-company-wolfram/

Except for tungsten, Austria still plays an important role on a world scale for magnesite and talcum too. The Erzberg (ore mountain) is the biggest and most modern mining area in Central Europe and serves as a symbol for the domestic mining industry in Austria[17]. More than 230 people currently are working there and ca. 3 million tons of iron ore can be produced in one year[18].

Following the increasing global demand for lithium and cobalt (for batteries for electric vehicles) new exploration projects have been launched in Austria. And a lithium mining project in Wolfsberg has already become an active mine in 2017[19].

From global to local: unexplored and unused possibilities in Hungary

There is a common opinion in Hungary: the country is poor in raw materials and the domestic mining is dangerous for the nature and hazardous for the mine workers.

This example shows also that public acceptance is the No. 1 business risk for mining of raw materials and metals[20]. Changing public opinion into passive tolerance or active support requires a lot of persistent effort. Public relation campaigns, cultural heritage (mining museums, local heritage ceremonies), transparent dialogues with stakeholders, may help to develop a positive public opinion. The public opinion of mining is in general better in existing or former mining sites.

With this background material topic, our goal is to draw attention to the fact that, just as Europe, Hungary has significant deposits of raw materials (e.g., copper, zinc, lead, manganese, and precious metals etc.) too, which can be extracted economically and responsible. Domestic

17 https://www.geologie.ac.at/

18 https://www.abenteuer-erzberg.at/cms/aktiver-erzabbau-am-erzberg/?lang=en&fbclid=IwAR3tJ9IOoyaq9sTFD_gc0MiDDe8ICdHWxaGPFyr5w99kqZxoW3kKFjejMbk

19 https://europeanlithium.com/wolfsberg-lithiumprojekt/

20 https://www.ey.com/en_gl/mining-metals/10-business-risks-facing-mining-and-metals

sourcing is very important for the European and Hungarian economies also because of the availability of critical raw materials in suitable quantities and quality[21].

Changing public opinion into passive tolerance or active support requires a lot of persistent effort

Hungary is significantly behind other nations in the exploration of raw material resources and with the development of exploitation and technologies of production. Its reason is not the lack of raw materials but, the public acceptant of mining and behind that the political reality.

The last major raw material exploration projects took place in the 1970-80s for the self-sufficient of the Hungarian ´socialist economy´. These rock/ore samples have been analysed only in part, while the data and data storage devices of that period are rapidly becoming obsolete.

The table 2 shows the known raw material deposits of Hungary.

raw material (ore)	extraction in 2018 [kt]	geological deposit in 2019 [kt]
bauxite	4,2	123.955
copper	0	781.170
iron	0	43.151
lead-zink	0	90.775
manganese	0	78.868
precious metals	0	36.588
uranium	0	31.483

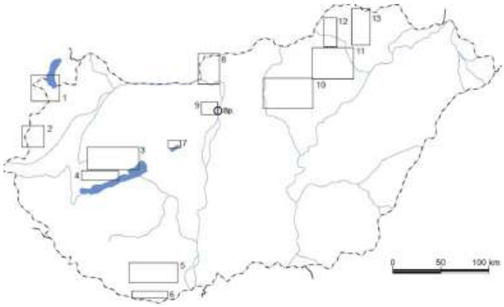
Table 2 Known raw material data of Hungary (2019)[22]

21 János Földessy: Basic research of the strategic raw materials in Hungary (2014)

22 https://mbfsz.gov.hu

Although CRMs were not specially investigated at that time, archive core samples and analysis data are still in repositories and available for study. Many of these CRM elements were either directly explored or mentioned in connection with other explorations and extractive industrial technologies in Hungary (Fig. 11). Some of them have previous commercial production records (e.g., Ga, Ge, fluorite), or have been prospected as a target mineral resource (graphite). Other elements (Be, Co, In, Mg, PGEs, REEs, Sb) have been identified through previous explorations. Some of them are rarely or never mentioned in Hungarian mineralogical and geochemical publications and exploration reports. And there are some new investigations for the CRMs and base metals from the last 10 years too.

Fig. 11 The major raw material deposit areas of Hungary21. 1: Sopron, 2: K szeg, 3: Bakony, 4: Balatonfelvidék, 5: Mecsek, 6: Villány, 7: Velence, 8: Börzsöny, 9: Budai, 10: Mátra, 11: Bükk, 12: Rudabánya, Szendr , Aggtelek, 13: Tokaj



From geological point of view, these are the most important raw material areas of Hungary:

- Mátra (Recsk/Gyöngyösoroszi): copper, lead, zinc, gold, silver, rare earth elements, antimony, indium, PGMs, cobalt
- Rudabanyai-Szendröi-hegyseg: strontium, baryte, antimony, graphite, gold, iron, rare earth elements, PGMs
- Börzsöny: tungsten, indium, gold, silver, rare earth elements, cobalt, gallium
- Transdanubian Range: bauxite, manganese, rare earth elements, tungsten, fluorite, cobalt

- Mecsek: rare earth elements, germanium, magnesium, gallium[23]

From 30 CRMs of the EU almost all of them are located in Hungary but its exploration level is inadequate for the realisation of economical exploitation.

The EU is extremely vulnerable in terms of CRMs, but Hungary is much more so compared to the EU, since it depends on imports for the majority of its supply. This situation is made even less favourable by the fact that demand for these materials from developing nations is growing, making it more difficult to obtain materials on the market.

The basis for good government actions can be found in the attitude of market stakeholders towards raw materials and related resources, infrastructure, as well as in the continuation and development of a modern geological institutional system.

The Hungarian Mining and Geological Service (MBFSZ) maintains the country's mineral resource register. Hungary's "Mineral Resources Utilization and Inventory Management Action Plan" was made in 2013[24]. The Action Plan (2013) determined the potential and importance of raw materials for the national economy. The survey is as follows:

The basis for good government actions can be found in the attitude of market stakeholders towards raw materials and related resources

23 http://asvanykincs.hu/

24 https://2010-2014.kormany.hu/download/c/6a/c0000/%C3%81CsT_02%2012.pdf

- coal,
- hydrocarbons,
- uranium and
- rare earth elements (REE).

The Hungarian Government approved the Action Plan in 2018[25] without mentioning the importance of potential ore deposits (copper, lead-zinc, gold…etc see table 2) for the green technology.

The Hungarian Action Plan (2013) with national importance in coal, hydrocarbons and uranium is based on obsolete raw material ideology. That is why the Action Plan has to be revised in the future. In the new Action Plan, the potential (critical) raw materials for the renewable technology have to get the main part, taking into account economic and green policy principles.

Responsible domestic mining – solution for an economical and a social recovery of a "rust belt" area? – Case study: Recsk, Hungary

Why is Recsk so important for (critical) raw materials?

The case study below will demonstrate the importance and potential of this topic in re-forming our society and economy towards sustainability. In the focus of this chapter lies a traditional mining town located in Northern Hungary, called Recsk. (Fig. 12). Copper mining brought the district Recsk to life in the late 1840s. The second boom of mining activities came in the early 1900s, when gold-rich pyrite ore bodies were found near Recsk (Lahóca-hegy). Before the depletion of the explored ores of the Lahóca-mine, further geological exploration has started in the 1960s, usually with drilling till 1000-1200 m deep. In 1967, valuable copper, zinc, lead, gold, and molybdenum ore were found in

25 https://calamites.hu/hu/2019/06/24/a-kormany-1345-2018-vii-26-korm-hatarozata/

the drilling cores[26].

In 1970 started the mine I (900 m deep) and in 1974 the mine II (1200 m deep), two of the largest works in the history of Hungarian mining. Despite the good research results, the development of underground ore production was not realised. Since 1979 the gold and copper supply and prices were running low enough that the still active open pit mine shuttered[27]. This was the first slap to this district.

Figure 12 Location of the mining area Recsk in Northern Hungary[28]

The second slap was when the North-Hungarian region's traditional specialisation structure (mining, metallurgy, and chemical industry) has collapsed due to change of political and economic system (1990-91) and the expansion of foreign investors' activities[29].

Nowadays, Recsk and its neighbourhood, such as Salgótarján, Bátonyterenye, Pásztó, Ozd and Miskolc, have the highest unemployment rate, the lowest average salary and GDP per capita in

26 Pal-Molnar, Biro: Szilard asvanyni nyersanyagok Magyarorszagon, 2013

27 https://www.recsk.hu/?module=news&action=show&nid=173780

28 http://magyarorszag.terkepek.net/magyarorszag-terkep.jpg

29 https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/region/magyarorszag/alfold-es-eszak/eszak-magyarorszag

Hungary[30].

Another raw material (gold) exploration was conducted between 1991 and 1997, which was stopped due to a large-scale decline in world gold prices, despite feasibility studies. The financial crisis in 2008/2009 affected negative the raw material market too. By 2010 started economic recovery, and it made raw materials more expensive than before. An environmental investigation was carried out in 2016 for the concession of the mining area Recsk II[31].

But the public is not aware of the fact that Hungary´s most economically important non-ferrous and noble metal ore deposit is Recsk. This belongs to the largest ore deposits in Europe. According to the ore data base of the National Mineral Resources Register (Országos Ásványvagyon Nyilvántartás), the geological reserves of:

- copper ore is about 780 million tons (!),
- lead - zinc ores is about 85 million tons (!) and
- gold ore is about 35,5 tons (!).

Furthermore, there are also some other raw materials, like rare earth elements, antimony, indium, PGMs, cobalt or molybdenum as by-products. This ore deposit consists of 2 mining area: Recsk I. and Recsk II.

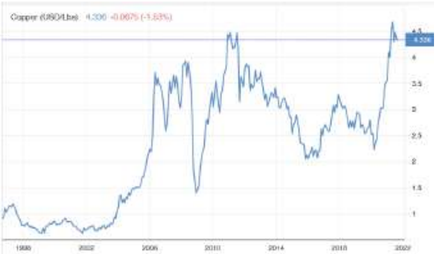
As with any raw material, the limit of workability of non-ferrous and precious metal ores in addition to quantity and quality, the other important factor is the world market price. The figure 13 clearly shows that from the late 1980s to the early 2000s, copper price was very low ($0.5-1.50 / pound Cu). From then on, it rose steeply and after some swings (2008/2009), it didn't stop to the value of $ 4.5 until 2011. Currently (September 2021), after a low point in 2015, 1 pound of

30 www.ksh.hu

31 https://mbfsz.gov.hu/sites/default/files/file/2018/03/14/recsk_vizsgalati_jelentes.pdf

copper costs $ 4.3 again.

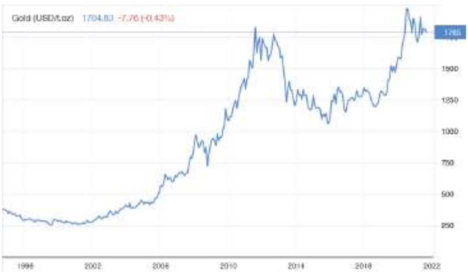
Figure 13 Copper price development, 1997 - 2022[32]



The limit of workability of non-ferrous and precious metal ores in addition to quantity and quality

Projected the same for gold, the price of 1 t.oz ounce ((GB, US) = 31,10348 g) of gold is currently at its peak.

Figure 14 Gold price development, 1996 - 2022[33]



According to some estimates[34], the price of copper must be at least above $ 1,3 / pound and gold above $ 400 / t.oz to be profitable in order for the Recsk mine. Currently, copper

32 https://tradingeconomics.com/commodity/copper
33 https://tradingeconomics.com/commodity/gold
34 Gagyi Palffy: A recski ercelöfordulas, mint potencialis banyaszati lehetöseg, 2002

costs $ 4,33 / pound and gold costs $ 1780 / t.oz(!).

This means that Recsk and its environs have the economic potential of an entire copper and precious metal exploration and of production industry. The value of the raw material resources in Recsk counts 25-30 billion euro.

Importance of domestic sourcing for the society

Hungary is planning to be carbon neutral by 2050. One of many steps is the shutting down of the lignite based Matra Power Plant (Visonta) till 2025 and closing the open pit lignite mines (Bükkabrany, Visonta) approximately 20 km from Recsk. Thousands of workers would be affected by the closure of the mines and the power plant. It would be a catastrophe for this region, which already has the highest unemployment rate in Hungary.

The closure of the Matra power plant cannot happen without creation of other jobs in this region. One possibility to save this region from recession could be the reopening of underground or open pit mining sites in Recsk with a smelter plant for different metals. In this way many of the mining and engineering skills would be transferable to the exploitation of other raw materials (lignite à copper) and many working places could be saved and created new.

As the example of Mittersill (Austria) shows that the responsible domestic raw material production can at once save a region from recession and recover it; furthermore, it can improve the secure and sustainable supply to the manufacturing industries.

Austria is not the only country with significant mining activities. Some other enviably clean and rich countries such as Sweden, Finland or Canada have mining areas with responsible sourcing and decent working conditions.

Mining can positively contribute to poverty reduction if payments of royalties and taxes from industries are invested in socioeconomic development. This potential impact should not be underestimated: Artisanal mining alone provides a source of livelihood for more than 42 million people worldwide.

It means, Recsk and its neighbourhood could be the clear winner of the “European Green New Deal” when considering todays significance of demand, domestic sourcing, and supply of (critical) raw materials for the European industry and economy.

If the EU wants to save its competitive-ness and deliver modern, clean technologies for industry, it has to achieve resource security and diversify the supply from different resources

Conclusion and summary

This short study aims to build awareness of the critical role of raw materials for the European Union. The import of these essential materials makes EU economic system very vulnerable to the exporter countries. Resilient value chains of CRMs reduce the supply risk and mean the safety for the production of the future green technologies and equipment.

Many countries (like China, USA, or Japan) have already started building accesses to the raw material resources in Africa or in South America. Besides export, they are exploring and mining their ore deposits also to reduce the export vulnerability of the country. If the EU wants to save its competitiveness and deliver modern, clean technologies for industry, it has to achieve resource security and diversify the supply from different resources.

Mineral exploration is a key component of strategy of the European Union for increasing the domestic supply of primary raw materials because global demand is rising rapidly. In the EU, there is significant potential in developing mining project for responsible domestic sourcing. But only some EU member country have significant production in CRMs.

One of these countries is Austria. It has one of the most important tungsten mine in the world with a processing and smelting plant immediately adjacent to the National Park "Hohe Tauern". Austria is a good example for the responsible, domestic, and environmentally friendly mining.

A good example how public acceptance can influence mining explorations and domestic sourcing is Hungary. The country has important raw material deposits like copper, bauxite, gold, gallium, graphite, and rare earth elements. But Hungary is significantly behind other nations in the exploration and mining of raw material resources.

One of the most important ore deposits is Recsk in Hungary. The geological reserves of copper, lead, zinc, and gold belongs to the largest ore deposits in Europe. Furthermore, there are also some other raw materials, such as rare earth elements, antimony, indium, cobalt, PGMs... as a by-product. These important critical elements for the industry have very high prices in the world market. It means Recsk and its environs have the economic potential of an entire copper and precious metal exploration and at the production industry.

Recsk is located in Northern Hungary, in one of the poorest districts in the country. By (re)opening the mining activities, the raw material production could save the region from further recession and could improve the secure and sustainable supply to the domestic manufacturing industries too. It means, Recsk and its neighbourhood could be the clear winner of the "European Green New Deal" when considering todays significance of demand, domestic sourcing, and supply of (critical) raw materials for the European industry and economy.

CHAPTER 3

"A protester disrupted a Louis Vuitton fashion show in Paris on Tuesday by walking down the catwalk with a banner condemning the impact of excessive consumption on the environment. Carrying a sign reading "overconsumption = extinction", the woman representing Amis de la Terre France, Youth for Climate and Extinction Rebellion marched down the same path as the models, causing a stir in the audience, a Reuters witness said."

(Reuters, Paris, October 5, 2021)

ABSTRACT

In this note we briefly explore the effect that a higher level of environmentalism and anti-consumerism yields in an economy where consumers possess a heterogeneous willingness to pay both for the environmental and for the hedonic quality of products on sale. We show that the alignment or misalignment of product attributes does ultimately play a crucial role in shaping the effect that environmental and anti-consumeristic ideologies yield on environment quality. In particular, when the hedonic and environmental attributes are misaligned, a higher supply of environmentalism (resp. anti-consumerism) yields the expected positive result on the environment. In contrast, when the hedonic and environmental attributes of goods are aligned, as occurring to a greater extent in recent years, a higher level of environmentalism (resp. anti-consumerism) does not necessarily yield a better environmental outcome.

Are Environmentalism and Anticonsumerism Environmentally Friendly?

Marco A. Marini and Giovanni Maccarrone

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CHAPTER 3

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Are Environmentalism and Anti-consumerism Environmentally Friendly?

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Introduction

Increasing protests are mounting against the uncontrolled hedonistic consumerism usually associated with the exploitation of natural resources, a seemingly recurrent characteristic of our economic era. As well known, while the term hedonism descends from ancient Greeks' well-known tradition[1] which also played an important role in Jeremy Bentham's (1789) utilitarianism (often referred to as quantitative hedonism) and in more recent studies of consumerism in mass capitalism as for instance in the theory of conspicuous consumption developed by Thorstein Veblen (1899)[2], anti-consumerism and

1 It should not be forgotten that the classical Epicureanism (Epicurus c. 341 — c. 270 BC) is quite different from the modern notion of hedonism or consumerism, and was conceived mostly as a state of tranquillity and freedom from fear and absence of bodily pain rather than search of fulfilment of earthly desires and ostentatious consumption of luxury goods as in its more recent acceptions.

environmentalism (or green consumerism) are more recent and less investigated phenomena.

For the scope of this note, we will use these terms, environmentalism, consumerism (and its antithesis anti-consumerism) as follows. We will refer to environmentalism as any doctrine advocating sustainable consumption and production of goods and services in a given society[3]. In contrast, we will mean by consumerism the tendency of people to evaluate as of primary importance the hedonic quality of products they consume, for instance in reason of their brand- and/or status-symbolism (e.g., Miles, 1998, Stearns, 2006). On the opposite, anti-consumerism can be safely conceived as any doctrine that places a stigma on a hedonically too high (compared to the average) level of consumption. There exists a wide literature on the evolution of environmental values in modern societies that, together with the behaviour of consumers and firms, has been constantly evolving over time[4].

Anti-consumerism can be safely conceived as any doctrine that places a stigma on a hedonically too high (compared to the average) level of consumption

For our current scope, it can be observed that every product necessarily embeds a set of hedonic as well as of environmental attributes. The first refers to the characteristics that, for instance, distinguish a top (luxury) quality product (say a Ferrari) from a low quality (basic) product (say a utilitarian Fiat) in the

2 The term consumerism is usually attributed to John Bugas, the number two of Ford Motor Company who introduced this term in a public speech in 1955.

3 See, for instance, Kahn, (2007) and Glaeser, (2014)

4 For an extended survey on the evolution of environmental values see, for instance, Dietz et al. (2005)

perception of consumers. In contrast, the second refers to the ecological footprint associated with a given product, as for instance its environmental sustainability in terms of CO2 emissions or other well-accepted environmental indicators. Therefore, the overall level of quality of a product ultimately depends upon a mix of hedonic and environmental attributes usually decided strategically (under a few technical and economic constraints) by firms which, in turn, usually do their best to match consumers' preferences. With this in mind, we can basically distinguish two cases. The first one is when the firms supplying the green products (denoted G) are also those providing the high-quality product, whereas those producing lower environmentally-friendly (or brown) products (denoted B) are also the ones selling the low-quality product. In other terms, in this case, the hedonic and environmental attributes of goods on sale are aligned and the hedonic and environmental quality of green products necessarily dominates that of brown ones. In the second case, the attributes are misaligned and the hedonic attributes of B exceed that of G, although the latter is environmentally superior. In the latter case, two further subcases may arise. The first occurs when even though the hedonic attributes of B are higher than those of G, they are not strong enough to offset its environmental disadvantage and, hence, the overall quality of good G as perceived by consumers is higher than that of good B. The second subcase occurs when the hedonic attributes of B overcome those of G to such an extent to be considered unanimously by consumers the top-quality product.

Note that whereas for several decades the environmental and hedonic attributes of products on sale have not been in sync, with the environmental advantages in most cases coming at the expense of high performances,[5] more recently firms have started to align the hedonic and the environmental attributes of goods, with firms devoting much more attention to the environmental features of their products. For instance, a car is evaluated by consumers for its intrinsic features (as

5 For example, green washing products had lower cleaning performance or, in the same vein, initial prototypes of electric car were noisy and uncomfortable.

comfort, safety and power) as well as, specifically, for its environmental footprint (like CO_2 emissions). It is not infrequent to notice that, some of the most environmentally friendly firms are also those producing goods with higher hedonic attributes. For example, the BMW Group has been recently ranked first in the Automobiles category of the Dow Jones Sustainability Index. (Automotive World Magazine, November 2020).

With the environmental advantages in most cases coming at the expense of high performances, more recently firms have started to align the hedonic and the environmental attributes of goods

The aim of this note is to analyse through a highly simplified model the effects that a higher supply of environmentalism and anti-consumerism yield on the demands of green and brown products and, hence, on the level of pollution (and environmental footprint) arising in the economy.[6] Using a highly stylised model (whose details are relegated to the Appendix), we show that the effects of higher levels of environmentalism and anti-consumerism are not necessarily so easy to predict. In particular, according to whether the green product embodies more or less hedonic attributes than the brown one, the effect of environmentalism and anti-consumerism can produce different effects on the environment.

In particular, the attribute alignment seems to play a crucial role for the consequences that a higher supply of anti-consumerism and environmentalism causes on society

6 Notice for our purpose that the same effect of a more intense presence of environmentalism (resp. anti-consumerism) in a given society would arise as effect of higher advertising in favor of the environmental (resp. hedonic) attributes of all existing products.

ecological footprint of consumption. In particular, if the hedonic and environmental attributes of products are aligned, a higher supply of environmentalism and anti-consumerism leads to a market outcome that downgrades the ecological footprint, since the market share of the brown firms expands (whereas that of the green shrinks). This paradox is shown to be even stronger for anti-consumerism, which boosts the sales of the brown (low-quality) good to detriment of the green one even in absence of strategic price adjustment of firms. In contrast, when good B has a hedonic advantage over good G, a stronger environmental ideology and a higher anti-consumerism yield, in line with the intuition, an increase of the green (and a decrease of the brown) firm's market share. In conclusion, whether environmentalism (and anti-consumerism) leads to a worse or a better ecological market outcome ultimately depends on the alignment of hedonic and environmental characteristics embedded in the green and brown products. In addition, it can be shown that the negative effect of a stronger environmental ideology is basically driven by the price-effect which follows the rise of environmentalism while, surprisingly, the effect of anti-consumerism can be detrimental for the environment even without strategic price adjustment by firms.

In line with other existing studies (see for instance Eriksson, 2004 and Marini et al. 2020) we can therefore preliminarily conclude that green consumerism or, in turn, anti-consumerism ideologies are not alone immediately good or bad for the environment and, thus, cannot replace tout court more traditional forms of environmental regulations.

Related Literature

Some recent works focus on the behaviour of environmentally aware consumers generally assumed to perceive the products as vertically differentiated on the basis of their environmental impact. In accordance to this, firms segment strategically the market supplying green and brown variants of the same good, which are sold at a high and low price (see, on this line, Moraga Gonzales and Padron-Fumero, 2002, Rodriguez-Ibeas et al., 2003, Conrad, 2005 and Bansal, 2008). In another stream of literature, consumers partially internalize the environmental damages generated by the consumption of polluting goods (see, e.g., Bansal and Gangopadhyay, 2003, Amacher et al., 2004, Lombardini 2005).

> The effect of anti-consumerism can be detrimental for the environment even without strategic price adjustment by firms

Some authors highlighted how in some cases a higher social awareness of consumers may lead to a worse market outcome. Dosi and Moretto (2001) showed how the use of eco-labelling may lead in some cases to a worse market outcome than in absence of eco-labelling. Garcìa-Gallego and Georgantzìs (2009) found, in a context where firms sell products embedding different degrees of corporate social responsibility, that an increase in social awareness (as due to campaigns by firms) does not necessarily generate a higher social welfare. Grolleau et al. (2009) showed that the presence of consumers with high willingness-to-pay for green products prevent in some cases other consumers from purchasing them, hence leading to a socially inefficient outcome. Deltas et al. (2013) focused on the existence of negative effects associated with policies aimed to improve the environmental performance of the market. In a very recent paper where consumers perceive psychic costs and benefits from brown and green consumption, Marini et al. (2020) showed that a higher level of environmentalism may reduce the environmental surplus of the economy, just because endows the green firm with a higher market power.[7] Finally, Maccarrone and Marini (2021) present a bi-dimensional attribute model which also takes into account the price-effects specifically caused by green and brown consumerism in society.

This contribution is organised as follows. A simple illustrative model dealing with the effects of anti-consumerism and environmentalism is illustrated in Section 3, whose details are briefly presented in the Appendix. This section also discusses in details the results by providing some additional economic intuitions on the ways a higher supply of environmentalism and anti-consumerism affects the environmental surplus generated by the market equilibrium. Section 4 concludes.

A Simple Model

Let us consider a market with a unit mass of consumers, where each consumer buys one unit of a product (Mussa and Rosen, 1978, Gabszewicz and Thisse, 1979, Shaked and Sutton, 1983, Tirole, 1988). As in Neven and Thisse (1990), Irmen and Thisse, (1998), Lauga and Ofek (2011) and Maccarrone and Marini (2021), we consider here a two-dimensional setting where, for our purposes, consumers are heterogeneous in their attitudes toward hedonic as well as environmental qualities of the products on sale. As explained in more detail in the Appendix, consumers are assumed heterogeneous in both their willingness to pay for the hedonic quality of the good (denoted and measured on the horizontal axis) and for the environmental quality (denoted and measured on the vertical axis). Let both and be uniformly distributed in (0,1). It descends that all consumers are geometrically contained in a unit-square (a square of area 1) as the one represented in Figure (1) below.

7 As noted there, these results are reminiscent of Jevons's paradox (see, for instance, Alcott, 2005 and Sorrell, 2009) which states that energy-saving policies may increase rather than decrease energy consumption. Direct and indirect rebound effects can occur, where the former is obtained under a ceteris paribus assumption, while the latter occurs taking into account the endogeneity of a few other variables.

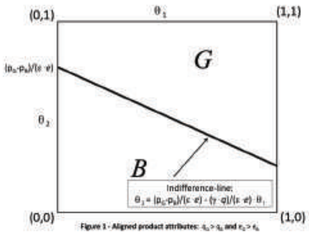

Figure 1 - Aligned product attributes:

Notice that each consumer is represented by one point of the square of coordinates (,). Consumers with very high willingness to pay for the hedonic quality and very low willingness to pay for the environmental quality are located in the bottom-right (or south-east) part of the square and can be imagined as individuals mainly interested (resp. uninterested) in the intrinsic hedonic (resp. environmental) quality of goods: in brief, they are consumerists, i.e., highly sensitive to the sirens of consumerism. On the other hand, those with very low willingness to pay for the hedonic quality and a very high willingness to pay for the environmental quality are located at the top-left (north-west) part of the square and can be loosely labelled as anti-consumerists and environmentalists, namely, in short, people with low hedonic and high environmental sensitivity. Obviously, there exist also people who are highly or lowly reactive to both attributes. Finally, the people located at the centre of the square are simply people who are averagely concerned about both types of good attributes.

For our purpose, what is highly relevant about this taxonomy, is the indifference-line made of all consumers in the square who are perfectly indifferent of whether purchase either the green or the brown product. This indifference-line simply divides the unit-square in two, thus partitioning the consumers into two groups: those who buy the green good G and those who buy the brown one, B. Importantly, every product (i = G, B) embeds attributes which characterise both its hedonic quality   as well its environmental quality . By definition, the green product (G) has a milder environmental impact (and higher environmental quality) than the brown one (B).

As explained above, two cases may arise. In the first one, product G, (endowed with a higher environmental quality, eG > eB), is also the high hedonic quality product, with qG > qB and, therefore, here hedonic and environmental attributes are aligned. This may easily happen, e.g., when a hybrid or electric car is also endowed with a powerful engine as well as, say, comfortable interior design. In the second case, the hedonic quality of B exceeds that of the green product, and qB > qG. This is the case of a beautiful and highly performing car with a very bad environmental impact. In this latter case, hedonic and environmental attributes are simply misaligned.

Figure (1) represents the case of aligned attributes for which the indifference-line dividing the consumers is negatively sloped (see the Appendix) and, as a result, the consumers who buy G are, with more probability, those with both high hedonic and high environmental willingness to pay, with the G-market located at the north-west of the unit-square. In contrast, the consumers who buy B are with more probability those with a low environmental willingness to pay, and the B-market is located at the south-east of the unit-square.

Figure (2) represents, instead, the second case, where environmental and hedonic attributes of goods are misaligned. In this case, the indifference-line is positively sloped (see the Appendix) and the consumers purchasing G (resp. B) possess on average a low (resp. high) willingness to pay for the hedonic quality and a high (resp. low) willingness to pay for the environmental quality of products.

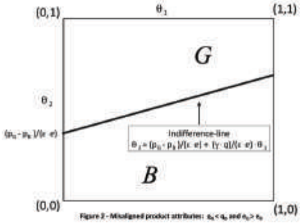

Figure 2 - Misaligned product attributes: $q_G < q_B$ and $e_G > e_B$

We are now ready to investigate the impact that, in turn, higher (or lower) anti-consumerism and higher (or lower) environmentalism cause on overall consumers' choice.

Most of paradoxical cases arise in the case of aligned attributes as in Figure (3) and (4). Here, when the level of anti-consumerism increases, this yields an effect which is similar to a reduction of consumers' willingness to pay for the hedonic attributes of the products, the more so the higher is the hedonic quality embedded in a certain good. Since the green product in this case also possesses a higher hedonic quality, a higher anti-consumerism impacts positively on the brown product to the detriment of the green product. Graphically, the negatively sloped indifference line becomes less steep, and this favours firm B's market share. On the other hand, a higher environmentalism yields, with a different intensity, a boost on the environmental interest of all consumers. This has the graphical effect of a simultaneous reduction of the negative slope of the indifference-line and that of its intercept.

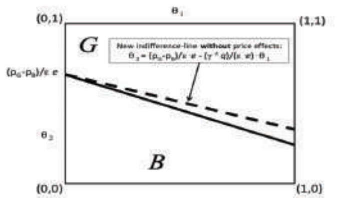

Figure 3 - Aligned product attributes: increase of anti-consumerism (α' < α) without price effects (black dotted line).

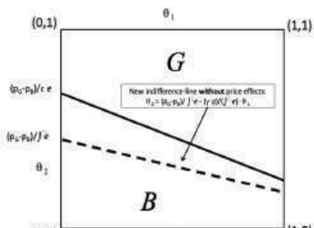

Figure 4a - Aligned product attributes: increase of environmentalism without price effects (black dotted line).

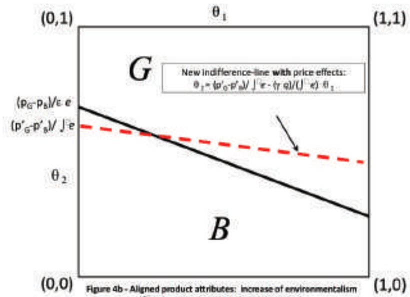

Figure 4b - Aligned product attributes: increase of environmentalism ([illegible] > ε) with price effects (red dotted line).

As a result, the green firm gains some new consumers with low hedonic willingness to pay (and higher environmental one), while at the same time - and to a lower extent – it also gains some of those having higher willingness to pay for hedonic attributes and lower for environmental ones. Note that if the boost in environmentalism also causes an increase in the price-gap between the two goods (pG - pB) the positive effect of environmentalism turns into a negative one.[8] This occurs simply because the higher societal supply of environmental ideology (lower supply of consumerism) leads the green firm to rise its price proportionally more than the brown one, thus making the brown good relatively cheaper and, hence, now more attractive to consumers than the green one

Consider now the effects that occur when hedonic and environmental attributes of products on sale are misaligned. In this latter case, graphically the effect of a higher anti-consumerism is to decrease the (positive) slope of the indifference-line, and this, in turn, unambiguously rises the market share of good G to detriment of good B, as largely expected. Anti-consumerism favours the good with lower hedonic quality and this is, now, the green good (Figure (5)).

This occurs indifferently when either the top-quality good in the market

8 See for more details on this strategic price-effect in a one-dimensional model, Marini et al. (2020) and, for a two-dimensional attribute case, Maccarrone and Marini (2021).

is G (and, therefore, pG-pB > 0) or B (in which case pG - pB < 0). In contrast, an increase of environmentalism reduces both the (positive) slope and the intercept of the indifference-line, thus yielding a relative advantage on the market share of rm G over rm B (Figure 5)

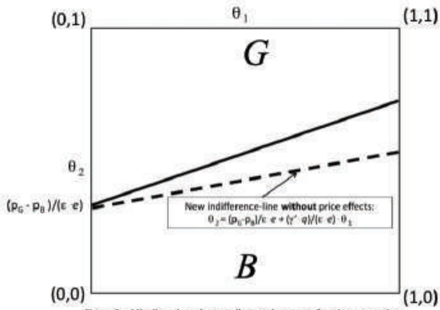

Figure 5a. Misaligned product attributes: ***increase of anti-consumerism*** ($\gamma' < \gamma$) ***without price effect (black dotted line).***

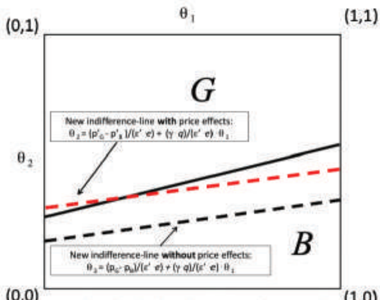

Figure 5b - Misaligned product attributes: Increase of environmentalism ($\varepsilon' > \varepsilon$) with (red dotted) and without (black dotted line) price effects.

Note that, even if a price-effect can milder-up this effect, in the latter case, as a whole, environmentalism and consumerism yield their expected results.

Let us now try to shortly discuss the economic nature underlying the apparently surprising results presented above.

When attributes are aligned, a higher dose of consumerism on society provides a higher incentive to consume the brand rather than the standard good on sale in the market. Since, by comparison, the green good is the most luxury available to consumers, the effect is to boost the share of the green good to detriment of the brown one. Graphically, the marginal rate of substitution between hedonic and environmental willingness to pay (which is the slope of the indifference line), for given hedonic and environmental qualities of the products, becomes higher. As a reference here happens the opposite effect, i.e., a decrease in the anti-consumerism, with respect to the Figure (3). This leads, for given prices of the two product B and G, to a higher purchase of the green good. Then, when the supply of environmentalism increases, the marginal rate of substitution between hedonic and environmental willingness to pay becomes less pronounced, and this, for given prices and qualities, leads consumers to buy more expansive and environmentally friendly products. Oppositely, when considering the effect on prices, the impact of environmentalism becomes negative for firm G, since it exploits the social force to raise its price. As a consequence, it obtains less market share.

When attributes are misaligned, the above counter-intuitive effect disappears, just because a higher anti-consumerism provides consumers an incentive to buy the lower quality good (here good G) to detriment of the high quality good (which is now good B) whereas a higher environmentalism simply yields the same result.

A more conclusive analysis, which however goes outside the aim of this short note, should consider the simultaneous strategic decisions of competing firms in terms of prices and qualities under different levels of consumerism and environmentalism into the society.

Concluding remarks

Green consumerism and anti-consumerism are often presented as a central pillar to support all recent environmental reforms. However, so far not much investigation has been performed to take into account the analysis of the firms' strategic decisions in reply to environmentalism and anti-consumerism. This note attempts to describe some basic mechanisms that arise when some general doctrines, such as green consumerism and anti-consumerism, are instilled on consumers. The adoption of a highly stylised setting has allowed us to show that straightforward environmental and anti-consumerism doctrines can be ineffective and, in some cases, even counterproductive in moderating the damages yielded by consumption in a market economy. This has been shown to occur when the hedonic and environmental attributes are embedded with the same intensity in products, namely when they are aligned. As shown also in Marini et al. (2020), the pursuit of green consumerism yields clear-cut advantage when combined with more traditional policies, as for instance, minimum environmental standard and incentives for firms to adopt green technologies. We strongly hope that the present chapter will sparkle additional interest in what we believe is a highly relevant topic that needs further exploration.

Green consumerism and anti-consumerism are often presented as a central pillar to support all recent environmental reforms

Appendix

Let us assume that every consumer has an indirect utility function given by

$$V(\theta_1,\theta_2) = \begin{cases} \gamma \cdot \theta_1 q_G + \varepsilon \cdot \theta_2 e_G - p_G, & \text{if she consumes } G \\ \gamma \cdot \theta_1 q_B + \varepsilon \cdot \theta_2 e_B - p_B, & \text{if she consumes } B \end{cases} \quad (1)$$

where [0, 1] denotes her willingness-to-pay for the hedonic quality of the good qi, for i = G, B, while, in turn, [0, 1] measures her willingness-to-pay for the environmental quality of products, denoted ei. Let 0 express the degree of consumerism in the society and 0 the level of environmentalism. In order to find the consumer line separating the consumers who prefer to buy the brown product from those preferring to buy the green one, one can solve the following linear equality:

$$\gamma \cdot \theta_1 q_G + \varepsilon \cdot \theta_2 e_G - p_G = \gamma \cdot \theta_1 q_B + \varepsilon \cdot \theta_2 e_B - p_B \quad (1)$$

which yields the following indifference line:

$$\bar{\theta}_2(\theta_1) = \frac{p_G - p_B}{\varepsilon \cdot e} - \frac{\gamma \cdot q}{\varepsilon \cdot e} \cdot \theta_1 \quad (2)$$

their hedonic gap, which can either be positive for qG > qB or negative for qG < qB. Thus, for qG > qB (2) is a decreasing line which crosses the unitary square with slope

$$\partial\bar{\theta}_2(\theta_1)/\partial\theta_1 = -\frac{\gamma \cdot q}{\varepsilon \cdot e} \quad (3)$$

vertical intercepts equal to

$$\bar{\theta}_2(0) = \frac{p_G - p_B}{\varepsilon \cdot e}, \text{ and } \bar{\theta}_2(1) = \frac{p_G - p_B}{\varepsilon \cdot e} - \frac{\gamma \cdot q}{\varepsilon \cdot e} \quad (4)$$

and horizontal intercepts given By

$$\bar{\theta}_1(0) = \frac{p_G - p_B}{\gamma \cdot q}, \text{ and } \bar{\theta}_1(1) = \frac{p_G - p_B}{\gamma \cdot q} - \frac{\varepsilon \cdot e}{\gamma \cdot q} \quad (5)$$

which are both positive for pG > pB and negative for pG < pB. Alternatively, the slope of (2) becomes positive for qB > qG, yielding q = (qG - qB) < 0. Moreover, if the brown good is perceived by consumers as the high quality good, also the price gap pG - pB between products becomes negative, as well as the vertical intercept (4) of the indifference-line (2). This explains the opposite slopes of the lines separating the market shares of brown and green firms in Figures (1) and (2). It is immediate to see that an increase in environmentalism for given prices of the goods and of the environmental gap e, always decreases the intercept of (2) and of its negative (resp. positive) slope. An increase in the society consumerism causes, in turn, an increase of the slope of (2) and an increase in the ntercept $\bar{\theta}_2(1)$.

CHAPTER 4

ABSTRACT

This contribution brings attention to the theme of globalisation, pointing out the implication that this phenomenon has with environmentalism, and analysing both the direct and indirect ways through which it affects national policies and the consumer behaviour. Data and surveys have revealed a link between globalisation and the increased levels of gas emissions, due to the rise of transport-related emissions, which include both goods trading and people travels. Another issue that has been exposed by these surveys is the existing connection between globalisation and the proliferation of nationalistic movements in several countries. In the following paragraphs, the misuse/abuse that the nationalistic movements made of the "green issues" and the common misconceptions provided by the "buy-local" campaigns will be investigated. Conclusions will try to bring out some tools to face and overcome these problems.

Globalisation, environment and buy local campaigns: the role of domestication

Ornella Tarola

Globalisation, environment and buy local campaigns: the role of domestication

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CHAPTER 4

Chapter 4

Globalisation, environment and buy local campaigns: the role of domestication

Ornella Tarola

Introduction

According to Dicken (2003), the word globalisation entered the social sciences in the 1960s when a lively debate took place on the impact of new communication technologies. Globalisation was expected to determine "a world in which nation-states are no longer significant actors or meaningful economic units; in which consumer tastes and cultures are homogenised and satisfied through the provision of standardised global products created by global corporations with no allegiance to place or community". (Dicken 2003, ch. 2, 10) Thus, it comes with no surprise that globalisation has collapsed the geographical space, made the world borderless and transportation faster and cheaper. This process of interlinkages between different geographical spaces, people belonging to different ethnic groups and having different cultural traits has generated many consequences. In the following, we shall focus on two classes of them.

First of all, casual observations show that, due to the globalisation of markets, the quantity of traded goods has dramatically increased in the last decades with a natural rise of emissions due to their transportation. Behind freight mobility, the number of passengers has increased, too. Of course, ad hoc policy measures can reduce the impact of transportation on emissions. Still, they require a clear understanding of the relationship between transportation and the environment to be adequate. Nonetheless, collecting data on this relationship is far from easy.

The impact of transportation on the environment passes through different channels. A direct impact of transportation is grasped by considering how it contributes to climate change. In this case, it is helpful to consider the amount of greenhouse gas emissions by sectors: then, we know that global emissions from transportation are 14% of total emissions, with emissions from road transportation being 12.5% of total emissions (World Resources Institute, 2021). Most important, since 1990, transportation is among the three sectors jumping out as the fastest-growing sources of greenhouse gas emissions: it grew by 79%. Finally, while other economic sectors have reduced emissions since 1990, those from transport have risen.

According to International Transport Forum, transport (including international shipping and aviation) emitted 32% of the EU's greenhouse gas in 2019, up from 24% in 2000. Even worse, "the transport decarbonisation policies currently in place or in the pipeline in the EU (the Current Ambition scenario) will not suffice remotely to reduce Europe's transport emissions sufficiently to meet the target of 90% less transport CO2 in 2050 compared to 1990." Despite these figures, EU 27 is responsible for 1.7 of global greenhouse emissions, whereas China 1.93% and US for 3.71. Incidentally, it is worth stressing that according to

Epa (2021), in the USA, between 1990 and 2019, GHG emissions in the transportation sector increased more in absolute terms than in any other sector. (EPA, 2021)

Of course, these data underestimate the environmental effects of transportation when considering that this sector is also a source of air pollution in cities due to particulate matter (PM) and nitrogen dioxide (NO2), thereby harming human health.

Further complexity comes from the scale of the impact: some effects on the environment are global, whereas others are local. Moreover, since some of them are observable at the national level, while others occur at the regional level, it is not clear a priori how the policymaker should tackle the environmental issue.

Second, driven by concerns on the possible detrimental effects of globalisation on cultural diversity and the homogenising trend of consumption, nationalistic movements have surged in several countries. While in the US, Donald Trump was embracing the «America First» philosophy, in 2017, the OECD warned that growing income inequality among European countries could favour protectionism, nationalism and populism. «All over Europe, you see the same split,» says France Economy Minister Le Maire. «One part benefiting from globalisation, and the other suffering from globalisation.» Without a drastic fix, nationalism will increase its hold on the continent. «The status quo is not an option,» he says. «The status quo will lead to the end of Europe.» (Time, April 11, 2019) The rising consensus obtained by Le Pen in France, Salvini in Italy and Orban in Hungary consolidated ethnocentric feelings across the union. Close in spirit to nationalism and populism, «buy local» campaigns targeted to spread consumers' preferences over domestic products flourished worldwide and, partially due to the recent economic crises, most of them translated in «More jobs for local».

Not too surprisingly, several green movements have sustained these campaigns and valorised the use of GI (geographical indication) as a means to identify a good as originating in a specific area. They embraced the view that local consumption is a means to abate transportation emissions and thus to protect the environment, thereby indirectly supporting the view that goods' quality, reputation, or other features are essentially ascribable to the geographical origin of products.

Although the phenomenon of buy local to be green is relatively recent, the literature on it is not scarce. The analysis of consumer attitudes towards foreignness has been developed in marketing and dates back to the 1960s when consumer bias favouring domestic products was defined as home-country bias. In 1987, Shimp and Sharma coined the expression «consumers ethnocentrism» to capture the moral legitimacy of domestic products over foreign ones.

In a companion vein, the term gastronationalism was recently introduced in sociology by DeSoucey in 2010. It describes the desire to see a geographical indication on food packaging to sustain an emotive power of national attachment. Gastronationalism identifies the choice of food as a means to obtain and signal a national identity. It demarcates a geographical space and, mainly, an ethnic space where only people belonging to the same (religious or cultural) community can live.

"Gastronationalism, as a form of claims-making and a project of collective identity, is responsive to and reflective of the political ramifications of connecting nationalist projects with food culture at local levels. It presumes that attacks (symbolic or otherwise) against a nation's food practices are assaults on heritage and culture, not just on the food item itself." (DeSoucey, 2010) It grasps consumers' preferences over domestic goods - mainly food -, which are somehow perceived as superior to foreign variants. This superiority can flow from an intrinsic attribute of food. However, more often, "foods function symbolically as markers of identity and community for otherwise geographically, socially, and politically divided populations" (DeSoucely, 2010, 434)

Gastronationalism is mainly a European phenomenon. It is not by chance that in its Council Regulation (EEC) 2081/92, adopted in 1992, the EU introduced a harmonised system of GI protection for agricultural products that consists of two types of GIs, Protected Designations of Origin (PDOs) and Protected Geographical Indications (PGIs), depending on the strength of the relation between a product and a geographical area (European Commission, 2007).

Nonetheless, research from the US supports the view that ethnocentric consumers perceive domestic products to be of higher quality than imported merchandise and may feel a moral obligation to buy domestic items in many developed countries (Shimp and Sharma, 1987; Netemeyer et al., 1991; Sharma et al., 1995). In contrast, consumers living in developing areas do not attribute any superiority to their domestic products (Huysmans and Swinnen 2019; Raustiala and Munzer, 2007).

No doubt, inducing consumers to prefer domestic goods can have a direct positive impact on global emissions. Nonetheless, the consequences of local buying campaigns are far more complex than those that can be captured at first sight, as we will discuss.

First of all, the claim that buying local reduces emissions is far from being obvious. It is well known that products are not homogeneous. There exist different variants of the same good. For example, goods can be differentiated along a quality dimension. Organic food has a better reputation than ordinary food since it is healthier and more environmentally friendly.

In the economic literature on pro-environmental behaviours (Moraga-Gonzalez and Padron-Fumero, 2002; Lombardini-Riipinen, 2005; Brécard, 2013, among others), environmentally aware consumers differentiate goods based on their environmental impact and are willing to pay a price premium for products with higher environmental quality (Sartzetakis et al., 2012; Marini et al., 2020). In the real world, companies invest more and more in green products to take advantage of the consumers' growing willingness to pay for cleaner variants. For example, the BMW Group is ranked first in the «Automobiles» category of the Dow Jones Sustainability Index. In Europe, BMW has reduced its CO_2 emissions by around 42% between 1995 and 2019. Since this company aims to reduce emissions by a further 80% by 2030, BMW.s CO2 emissions will be less than 10% of what they were in 2006 (Automotive World, November 2020). In a different industry, Kering, a global luxury group managing the development of a series of prestigious houses in fashion, leather goods, jewellery and watches, is among the top 10 of the most sustainable companies in the world (Corporate Knights, Annual Global 100 ranking, 2020).

Beauty products are currently evaluated on their coverage and fragrance, toxicity, and whether they were tested on animals. To illustrate, Estée Lauder Companies, a global leader in prestige beauty products, selling more than 25 brands in 150 countries, is committed to achieving two goals: sourcing 100% renewable electricity and producing net-zero carbon emissions (Citizenship & Sustainability Report, 2020).

Interestingly, both in academic research and among buyers, environmental quality is mainly linked to emissions per unit generated by a good when it is purchased or produced. Pollution determined when goods are shipped is not taken into account. Hence, the view that local consumption can abate emissions from transportation somehow complements the traditional approach to environmental quality. However, it provides some insights only when combined with this literature approach, while possibly being misleading when missing to consider that there exist three sources of pollution: consumption, production and transportation.

More precisely, when producing goods, firms can adopt different techniques, thereby generating different emissions per-unit from production. Moreover, goods can generate different emissions per-unit during consumption: a hybrid/electric vehicle is by far less polluting than a vehicle with a standard combustion engine. Thus, even if the demand for domestic products comes at the expense of foreign products, local consumption can have an indirect and undesirable effect on global emissions. For example, suppose demand increases for goods with high emissions per_unit from consumption at the expense of cleaner variants. In that case, global emissions will decrease if and only if the corresponding emissions per-unit from production, jointly with emissions per-unit from transportation, decrease enough to counterbalance this increase. Otherwise, the expected gains from local consumption will be so low that preferences over domestic products will generate a perverse impact on global pollution.

Furthermore, some of this literature pushes forward the hypothesis that consumption choices are not exclusively driven by the desire to satisfy material needs, but also by other considerations, such as impure altruism (Andreoni, 1990), reputational payoff (Bènabou and Tirole 2006), or simply, social norms (e.g., Ostrom, 2000). In terms of the environment (Carlsson et al., 2010; Czajkowski et al., 2017), these norms state that consumers shall reduce their ecological footprint to save the planet and the future of their children (Nyborg, 2000; Brekke et al., 2003). Nonetheless, the supply of environmentalism through green persuasion can have unexpected effects. In particular, driven by the goal of saving the planet through consumption, people usually refraining from buying can decide to purchase goods with a paradoxical rise in global emissions. Typically, this phenomenon is observed when people usually using public transport decide to buy hybrid vehicles because of their green footprint.

Second, and even more relevant, green movements have promoted buy local campaigns and GIs only as a means to protect the environment, far from any political ideology. Nonetheless, populists and nationalists can exploit the large echo gained from these environmental tools to erect national boundaries against "foreign people". As a result, GIs can feed tensions between national attachment and a neo-liberal attitude toward a globalised world, and consumption choices can be intended as a demarcation between those favouring a borderless world and its opponents, who promote cultural resistance to economic and political openness.

The role that globalisation plays in solving these tensions is far from evident. Globalisation enhances interconnections between different countries, thereby inducing internationalisation and openness. Nonetheless, to the extent that it promotes cultural transmissions, paradoxically, it can disseminate nationalistic feelings among consumers, with unexpected economic and social consequences.

At first sight, the dilemma is only between a homogenising consumption trend and a local culture struggling against space without identity. Nonetheless, there exists a third way.

Borrowing from Jackson (2004), we claim that global attitude can be 'domesticated' (tamed and localised) in specific consumption contexts. "It is now widely appreciated that even the most global brands, such as McDonald's or Coca-Cola, have different cultural connotations and are consumed quite differently in different places. [...] The history of international advertising is particularly telling in this regard, littered with examples that demonstrate the cultural limits of globalisation. Rather than simply rolling out their existing products across a geographically undifferentiated market, producers have had to adapt their 'global' brands to a variety of local conditions. Paradoxically, then, 'globalisation' has itself required companies to adopt a variety of localising strategies in order to succeed commercially." (Jackson, 169, 2004)

When L'Oreal tried to enter Asian markets, it recruited the Chinese film star Gong Li as the local 'face of L'Oréal': she represented the face of the Asian women, thereby showing how L'Oreal make-up could be sold to many different types of women if adequately adapted to the local market.

Along with the same rationale, McDonald stresses the use of Italian meat for its hamburger in Italy.

While the domestication described by Jackson only aimed to comply with local cultural standards, we argue that environmental targets can also inspire it.

Then, its goal could be twofold. On the one hand, it could contribute to abate emissions. On the other hand, it could prevent populist movements from exploiting GIs to promote ideological claims.

Currently, this third pattern is far from being realised.

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CONCLUSION

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In December 2019, the European Commission announced the "European Green Deal", a set of policy initiatives to reduce emissions by 55% by 2030 and make Europe a net-zero emitter of greenhouse gases by 2050. The European Green Deal is expected to play a vital role in addressing long-term climate change threats by focusing on eight policy areas: biodiversity, sustainable food systems, sustainable agriculture, clean energy, sustainable industry, building and renovating, sustainable mobility, eliminating pollution and climate action. Although it is too soon to make a preliminary impact evaluation on this new set of environmental policies, we can discuss some of its components and assess whether the Green Deal can bring the EU to the hoped-for "happy growth".

This book provides an inclusive debate on an ecological-economic transition within the European Union through the use of market instruments and technological innovation. It also introduces a relevant topic, such as the procurement of critical raw materials. The first goal is to encourage a theoretically and empirically informed debate on some parts of the European Green Deal that, despite being common, are still understudied. A second goal of the book is to fuel further debate on the maximalist thesis of happy degrowth. The most important lesson to be drawn from this book is that the EU should not overlook key aspects such as the potential "negative" influence of populist parties on fulfilling the European Green Deal goals, nor take for granted the role played by green consumerism.

The first chapter of the book is by Patrizia Feletig, and it is titled "Decoupling will save us from the fallout of the trap of carbon emissions, demography, and prosperity". It discusses future scenarios concerning several aspects related to climate change. This study disagrees with the negative views on the future of our planet by arguing that trust, cultural and commercial exchange, cooperation, and the innovative energy of entrepreneurs will help us in overcoming the current and future global challenges. This optimistic forecast of the future is based on two crucial aspects: cultural and commercial exchange and innovation. Concerning the former, the EU should try to limit the influence of right-wing populist parties on commercial and environmental policies as they typically propose conservative economic policies with nationalist views on globalisation and cooperation. In addition, the EU should invest a large share of the "promised" 1 trillion euros of investments in Research, Development and Innovation (R&D&I) to directly support sustainable investments and innovative entrepreneurs.

The study "Towards a sustainable economy with (critical) raw materials" by Balazs Ivanics presents the role played by critical raw materials (CRM) for a sustainable economy and builds awareness of the critical role of raw materials for the European Union. The author argues that if the EU wants to save its competitiveness and deliver modern, clean technologies for the industry, it has to achieve resource security and diversify the supply from different resources. The study then focuses on mining explorations and domestic sourcing in Hungary. In light of the evidence presented in this study, there is a clear policy recommendation for the European Union and for the European countries in general of investing much more financial resources on CRMs. There is evidence that some European countries have important raw material deposits but do not invest enough in exploring and mining these materials. Currently, the procurement of these materials is not given the deserved importance by the European Commission's climate change strategy.

The theoretical paper "Are Environmentalism and Anti-consumerism Environmentally Friendly" by Marco A. Marini and Giovanni Maccarrone explores the effects of a higher level of environmentalism or, alternatively, higher consumerism in an economy where consumers possess heterogeneous willingness to pay both for the environmental and hedonic qualities of the products. In a highly stylised setting, the authors demonstrate that green consumerism can be ineffective or even, in some cases, counterproductive in moderating the damages yielded by consumption in a market economy if the green product is also the most desired by consumers hedonically. The somewhat surprising findings of this study suggest that the EU should not merely hope that a more intense diffusion of environmental doctrines will automatically lead the EU towards an ecological transition. This chapter also shows that economic theory deserves a central role in the ex-ante evaluation of the Green Deal effectiveness.

The last chapter of the book is by Ornella Tarola, titled "Globalisation, environment and buy local campaigns the role of domestication". It discusses the complex relationship between globalisation and pro-environmental behaviour, with a particular focus on domestication. The author claims that global attitudes can be potentially tamed and localised in specific consumption contexts. This could contribute to abate emissions and prevent populist movements from exploiting geographical indications (GIs) to promote ideological claims. A deeper investigation of the linkage between domestication and populism is crucial in a world where populists are gaining power in many European countries. Populist agenda rarely gives environmental issues the relevance they deserve, which will likely undermine the accomplishment of the European Green Deal goals.

A liberal future in a united Europe

ISBN: 978-2-39067-016-2

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