Blue Transition Policy Roadmap

Towards Transparent, Responsible, Inclusive and Sustainable (TRIS) Development in the Mediterranean

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EMNES
EURO-MEDITERRANEAN NETWORK FOR ECONOMIC STUDIES
الشبكة الأورو-متوسطية للدراسات الإقتصادية

ABOUT THIS STUDY

EMEA-EMNES Studies – MAR 2020

This study describes a new strategic framework using the Three Horizons Methodology that engages experts, stakeholders and citizens in a participatory foresight exercise. Together they think ahead towards four entangled responsible transitions within the planetary system boundaries. The aim is to achieve "**T**ransparent" governance, "**R**esponsible" living, "**I**nclusive" economy and "**S**ustainable" energy and environmental goals – the so-called **TRIS development model** introduced by the authors**.** Amidst the global pandemic of Covid-19, this framework can guide policy responses to manage the medium and long term challenges facing our economies and societies.

The study introduces the Blue Transition Scenario (BTS) to develop the narratives of TRIS development in the Mediterranean. The narratives all have in common the mission of raising an "eco-system awareness" of the challenges and opportunities ahead for the Mediterranean – North, South and East – to move away from the current unsustainable development model, shaping instead a new pathway of development based on the three pillars: dialogue, a common purpose and project, regional coordinated strategies and roadmaps for a TRIS development of the whole region. The narratives of the BTS were co-developed by EMNES team during 2018-19 to "imagine" the futures of the region. The BTS anchored in the TRIS development model guided EMNES researchers and fellows to produce the Blue Transition Policy Roadmap for the Mediterranean. The Roadmap covers the research undertaken by EMNES on governance, institutions, STI, private sector, labour, finance and trade. The Covid-19 outbreak in 2020, predicted by very few, shook the societies and economies around the globe. The propagation of the infection was quicker than the response capacity of the governments. This event should make us think about what future we want and how to achieve it.

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DISCLAIMER:
The EMNES studies are produced with the financial assistance of the European Union within the context of the EU project "Support to economic research, studies and dialogue of the Euro-Mediterranean Partnership" under contract number ENPI/2014/354-488 (2014 -2019). The contents of the documents are the sole responsibility of the authors and can under no circumstances be regarded as reflecting the position of the European Union.

Published by the Euro-Mediterranean Economists Association

ISBN-13-978-84-18352-00-3

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EXECUTIVE SUMMARY

The Euro-Mediterranean region brings together a diverse set of countries with different cultural backgrounds, variable geometry and separate economic, social and political realities - each developing at a varying pace.

The "Euro-Mediterranean sustainable co-development scenario", labelled "Blue Transition", introduced in Ayadi and Sessa (2013), explores the diversity of Euro-Mediterranean regions and sub-regions built on the active contribution of people, civil society and universities, as well as the win-win policies from each shore of the Mediterranean, emphasising the complementarities between all actors and regions.

The assessment being that decades of Euro-Mediterranean partnership have not delivered on the promise of achieving stability and shared prosperity through enhanced political association and economic integration. In the decades leading up to the 2011 Arab uprisings and subsequent battle zones, the reality of the region has been its failure to maintain economic growth potential and to create the conditions for the emergence of regional value chains – from which the private sector, particularly Micro, Small and Medium Sized Enterprises (MSMEs), can prosper, transfer technology and create decent and sustainable jobs for the educated. As suggested in Ayadi and Sessa (2017), this failure calls for the rethinking of cooperation frameworks and integration schemes - to accommodate the emergence of regional value chains and the creation of a Euro-Mediterranean industrial policy.

Regional developments in the Mediterranean region and beyond must be placed in the context of ongoing globalisation, digitalisation and automation trends, prospects and consider the impacts of external shocks, such as the Covid-19 global pandemic. Global transitions (e.g. energy/environmental, digital, societal, governance…) call for a coordinated strategic framework and policy agenda, in order to avert and to manage threats and global/regional shocks and, possibly, to benefit from the opportunities resulting from these speedy transitions.

In this study, we describe a strategic framework, using the 'Three Horizons' methodology to engage experts, stakeholders and citizens in a participatory foresight exercise, looking ahead to introduce **four connected transitions, leading to**:

- **Transparent governance**, to build trust based on a greater accountability of past and present decisions, actions and intentions.

- **Responsible living**, to take care of future consequences of our choices and actions – for ourselves, for others, for the environment – in our personal or social living experiences.

- **Inclusive economy**, shifting to a new pathway of societally desirable progress.

- **Sustainable energy and environment**, which means taking care of our environment and how we leave it to future generations.

The framework has been designed for stakeholders and public engagement in foreseeing "the future we want" to achieve transparent governance, responsible living, an inclusive economy and sustainable energy and environment goals – the so-called **"TRIS-development" model.**

The TRIS development model is applied to define the Blue Transition Scenario for 2050.

The Blue Transition Scenario (BTS) looks to the future of the Mediterranean and is based on three pillars:

- **Promoting a dialogue across the different civilisations of** the Mediterranean set against the "clash" rhetoric that apparently still dominates nowadays. Developing a dialogue across different civilisations settled around the Mediterranean, to promote integration and co-create new regional identities, is an overarching aim at the core of the Blue Transition Vision.
- **Adherence to a common project – a Mediterranean partnership**, i.e. a multi-dimensional, flexible and differentiated integration project – to address the human, economic, social and environmental challenges in the Mediterranean. The common project shall be coherent with the principle that all human beings can live in dignity and access basic services, whatever their sex, religion or social condition – we can name this the **inclusive society principle** – and shall pursue in the Mediterranean (and in relation to neighbouring regions) the UN agenda 2030 for sustainable transformation (Sustainable Developments Goals – SDGs) and complemented with the TRIS development model.
- **Building regional strategies and shared action plans for transparent, responsible, inclusive and sustainable development**, using an integrated "Three Horizons" approach to frame them. This is used to assess the long-term trends and challenges in the Mediterranean (Horizon 1), to develop a desirable response scenario (Horizon 3), to define a roadmap and mid-term action plan (Horizon 2) identifying the policy instruments and actions necessary either to cope with the Horizon 1 challenges and to shift towards the Horizon 3 desired scenario.

More than being a single narrative on the future of the Mediterranean, the Blue Transition Scenario is a **process** – potentially a never-ending one – to develop dialogue around the transparent, responsible, inclusive and sustainable development of the Mediterranean. The narratives all have

in common the mission of raising an "eco-system awareness" of the challenges and opportunities that lie today and ahead for the Mediterranean – North, South and East – moving away from current unsustainable development, shaping instead a new pathway of development based on the three pillars: dialogue, a common purpose and project, and regional coordinated strategies and roadmaps for a TRIS development of the whole region.

This process was applied to develop the Blue Transition Scenario (BTS) for 2050 in order to produce the Blue Transition Policy Roadmap applied on the socio economic pillars: institutions, Science Technology and Innovation (STI), private sector, labour and trade.

The BTS and the strategic foresight thinking stimulated by the TRIS development model could enhance our systems resilience to the emerging transitions and to respond to external shocks, such as the COVID-19 global pandemic. This pandemic hit the world starting from China's Wuhan City, and propagating in an impressive speed to Europe, the Mediterranean, Africa and the globe. It has put under heavy pressure national health and economic systems and the models of regional integration and solidarity principle. In the times of writing, the events of the COVID-19 are still unfolding. Further analysis will be performed to better assess the external shocks in general and COVID-19 in particular and the capacity of the countries and the region to withstand and remain resilient.

1. INTRODUCTION

The Euro-Mediterranean region brings together a diverse set of countries with different cultural backgrounds, variable geometry and separate economic, social and political realities - each developing at a varying pace.

In line with complex dynamics of intertwined integration and disintegration characterising the region, Ayadi and Sessa (2011, 2013) devised four alternative scenarios of Euro-Mediterranean relations at Horizon 2030.[1]

In the "Euro-Mediterranean under threats" scenario, labelled "Red Transition", the Mediterranean Sea becomes a dividing line between diverse but conflicting civilisations, leading to deeper political uncertainties and mounting economic and social difficulties, as tensions escalate between, but also within, the two shores, which are linked by the effects of contagion covering a number of issues, without being able to resort to cooperation. In the "Euro-Mediterranean sustainable co-development scenario", labelled "Blue Transition", the diversity of Euro-Mediterranean regions and sub-regions are built on the active contribution of people, civil society and universities, as well as win-win policies from each side of the Mediterranean, all emphasising the complementarities between actors and regions. Neither the "Business as Usual" scenario, i.e. continuing the political and socio-economic dynamics of the decades preceding the Arab uprisings, nor the Euro-Mediterranean Union scenario are retained, in view of the latest developments.

Indeed, the latest developments surrounding the Mediterranean Sea indicate that the region has plunged into the red transition, with few defences. To the North, the European Union has grappled with a timid recovery from the financial and economic crises, whilst struggling with the dangerous imbalance between Northern and Southern European countries and the failure to find a satisfactory common response to the migration crisis for example. The latter fuelled the related upsurge of nationalist sentiments, often disguised amongst populist claims, whilst Brexit eventually turned the threat of European Union fragmentation from adventurous speculation into reality. The Covid-19 pandemic that hit Europe in 2020 is another example of the failure of the EU to provide a common EU health emergency policy to manage the rapid contagion and to save lives of EU citizens (on 01 April 2020, Italy registered 110,574 infected cases and 13,155 deaths, Spain registered 102,179 infected cases and 9131 deaths, France registered 56,989 infected cases and 4,032 deaths).

1. See Annexe 1.

To the South, the Arab countries witnessed disruptive social and political transformations, with both the democratic aspirations of large segments of the population and the rise of extremism in a small, yet growing minority, erupting in a series of upheavals, destabilising the region's politics, economies and societies. These dynamics led to the exacerbation of tensions in several areas of the Mediterranean Basin, such as in Syria and Libya, where civil uprisings unfolded into international theatres of war and where different factions pursue their contradicting geo-political agendas, with little regard for the human and social consequences. The region continues to register double digit rates of unemployment, twice as high as the global average, primarily affecting youths and women. Equally, high numbers of Not in Education, Employment or Training (NEET) rates make them easy target for terrorists and criminal organisations seeking to further destabilise the region. Adding this this gloomy picture, in the time of writing, on 20 March 2020, the region started to respond to Covid-19 pandemic with underdeveloped, unequipped national health systems and weak government finances.

In light of these developments, it is difficult to argue that several decades of Euro-Mediterranean relations and economic partnerships have delivered on the promise of achieving stability and shared prosperity through enhanced political association and economic integration. In the decades leading to the 2011 Arab uprisings, Euro-Mediterranean policy makers seemingly equated stagnation with stability, choosing to give priority to combatting terrorism and controlling borders. On the economic front, trade negotiations led to the substantial waiving of tariffs but failed to create the conditions for the emergence of regional value chains, within which the private sector and, in particular, Micro, Small and Medium Sized Enterprises (MSMEs) can prosper through the transfer of technology, the creation of decent and sustainable jobs for the educated - notwithstanding the undoubted similarities between the structural characteristics that could have been exploited by economies on both shores of the Mediterranean Sea. Ayadi and Sessa[2] (2017) argued for the importance of rethinking cooperation frameworks and integration schemes to accommodate the emergence of regional value chains and the emergence of a Euro-Mediterranean industrial policy.

However, regional developments in the Mediterranean region (North, South and East) and beyond must be put in the context of ongoing globalisation and automation trends, prospects, and consider the impacts of external shocks, such as global pandemics (i.e. the rapid global propagation of Covid -19 from China to Europe to Africa…). Global transitions (e.g. energy/environmental, digital, societal, governance) will be discussed together with a related strategic framework and coordinated

2. Ayadi and Sessa (2017).

policy agenda, in order to avert and manage threats and, possibly to benefit from, the opportunities of these speedy transitions.

In March 2020, Covid-19 global pandemic hit hard the world starting from China's Wuhan city, and propagating in an impressive speed to Europe, the Mediterranean, Africa and the globe. This pandemic put under heavy pressure unprepared national health and economic systems, poorly responsive and uncoordinated governments, and seemingly resilient models of regional integration and solidarity. On 01 April 2020, the events of the Covid-19 are still unfolding. Further analysis will be performed to better assess external shocks in general and the pandemics in particular and the capacity and response functions of countries and regions to withstand threats and to remain resilient.

In this study, the first section summarises the globalisation and automation trends and prospects. The second section provides a new approach to shape responsible transitions towards a new model for development that is Transparent, Responsible, Inclusive and Sustainable – called the **TRIS model for development**. The third section applies the TRIS model to the Mediterranean and defines the Blue Transition Scenario 2050, that builds on the Euro-Mediterranean sustainable co-development scenario 2030, defined in Ayadi and Sessa (2013). The fourth section summarises the Blue Transition Policy Roadmap and, finally, the fifth section concludes with the list of the Blue Transition Fellows who contributed to the foresight exercise.

2. CONTEXT: GLOBALISATION AND AUTOMATION TRENDS AND PROSPECTS

A. GLOBALISATION TRENDS

Globalisation, manifested in technology, flows of capital, people, goods and services, binds economies together. Increasingly open and unrestricted trade in goods and services improves productivity and contributes to economic growth. The availability of a greater variety of cheaper products, the creation of new and different opportunities for work, and the possibility for countries to specialise in the production of what they are good at, has lifted millions out of poverty and raised living standards for billions. An exchange in goods and services also goes hand-in-hand with an exchange of new ideas, innovations and technologies.

But there are two sides to every coin. Trade also sets off the restructuring of economic activity. In the process, some workers gain jobs whilst others lose them; some workers see their wages rise, whilst others see them stagnate or decline. Recent decades have also seen a reorganisation of trade into increasingly complex value chains. World trade in intermediate goods is now greater than all other non-oil traded goods put together (ILO, 2016). Up to 80 percent of global trade, measured in gross exports, is now linked to the production of multinational firms (UNCTAD, 2013).

In recent years, inequality between nations has declined, due to economic growth in emerging economies, but inequality within nations has increased. This is true for many developing economies, as well as most members of the Organisation of Economic Cooperation and Development (OECD, 2017). The gap between the rich and poor is at its highest level in decades in developed economies. The picture is more mixed in emerging and developing countries, but access to quality education, healthcare, finance, housing and other basics remains deeply unequal in many nations.

One of the major developments in the modern era of globalisation has been the growing trade with emerging economies in Asia, especially China. In the mid-1980s, China was essentially still a closed economy. This has changed dramatically since 1990, especially after China's accession to the World Trade Organisation in 2001. As of today, China accounts for almost one quarter of worldwide merchandise exports.

Trade theory suggests that globalisation induces industrial change within countries. Some industries shrink and domestic production is replaced by imported goods. Exporting industries expand to produce for foreign markets. In theory, displaced workers from import-competing branches are instantaneously absorbed by expanding export-oriented ones. But empirical evidence shows that this labour reallocation process can be slow, frictional, and scarring. Workers in import-competing industries face a substantially higher risk of unemployment (Autor et al. 2013). And when they lose their jobs, many of them do not transition into well-paid jobs in expanding sectors at all, but are pushed out of the manufacturing sector altogether, often ending up in low-paid service jobs, suffering a cumulative loss of earnings over their career trajectory (Autor et al. 2014).

To make globalisation work for all, and to avoid individual losses, it is essential to facilitate a smooth adjustment in the labour market, and to support workers finding their way back into better jobs quicker, in case of a trade-induced job loss.

Another important question is how international trade affects overall manufacturing employment in an economy. For instance, in the 1960s, about one in four American workers were employed in the manufacturing sector. This share has declined over the years, from roughly 12 percent at the turn of the millennium to below 9 percent today. Globalisation, and particularly rising trade with China, has been blamed for a substantial part of this decline in manufacturing jobs in the United States. However, it is difficult to disentangle the employment impacts of technology, trade, and other facets of globalisation, such as offshoring in global value chains. In absolute terms, between 2000 and 2014, there were approximately 5 million fewer manufacturing workers in the U.S. A certain portion of this decline is attributable to rising import penetration (Acemoglu et al. 2016; Krugman 2016; Pierce and Schott 2016). But the conclusion that trade contributes to the overall decline of manufacturing employment may not apply equally to all developed, industrialised countries. They all tend to observe a secular decline in manufacturing jobs. Technology certainly adds to this trend, as production processes become increasingly automated and digitalised everywhere (ILO, 2017). But the contribution of international trade to the decline of manufacturing employment varies substantially across different industrialised countries.[3]

Focusing now on developing nations, **for many of them, trade provided a vehicle for integration, economic growth and development.** Trade agreements, backed by capacity building assistance, can provide an impetus to strengthen institutions for governance and social dialogue.

[3] The experience of Germany -- a traditional manufacturing powerhouse - may be particularly interesting in this respect. German trade with China also picked up quickly in the 1990s, and especially after China's WTO accession. European countries also experienced another major event during the same time frame, namely the fall of the Iron Curtain, with the subsequent transformation of the former socialist countries into market economies. German trade volumes with Eastern Europe increased even faster after 1990 than with China. Yet Germany's trade relationship with China and Eastern Europe is much more balanced than America's trade relationship with China.

But continuing to reap the benefits of trade requires the right domestic policy framework, institutional capacity and economic infrastructure in order to apply those benefits towards achieving development goals.

In *The Globalisation Paradox*, Dani Rodrik notes that the countries that benefited most from opening their economies – for instance China, India and South Korea - spent several years protecting and subsidising important industries, before exposing them to foreign competition (Rodrik, 2011). The 1980s and 1990s then marked a period of significant, though iterative, economic reforms in several of these developing nations. Developing countries, most notably China, gradually shifted away from import substitution to a model of export-led growth, introducing a new and potent source of low-wage competition into the global economy.

By the middle of the 1990s, the economies in developing countries like China, India and Brazil, were rapidly developing their export sectors. These nations did not just offer cheaper labour, they had more of it. This allowed for larger-scale and faster production that catered to shifting consumer preferences in the global North, facilitated by technological advancements and cheaper transportation, creating a world in which developing and emerging economies began to stake larger claims in the global economy, as well as asserting greater authority in the production processes that drove it.

But leveraging a greater supply of low-wage, low-skilled labour as a comparative advantage comes with several problems. First, it can create incentives to maintain low standards. Suppliers depress wage costs, sometimes for higher margins, other times because of pressure from buyers and brands – intra-industry trade - to keep costs and/or the time it takes to produce a good, low (WRC, JJN and CAP, 2013). This also leads to a disempowerment of social institutions, such as unions, that fight for higher standards and fair compensation.

Second, using trade as a spring board to spark development, is also contingent on a country's capacity and willingness to (i) move from low value add production to higher levels of production, (ii) diversify its economy to provide greater opportunities for employment at different skill levels, and (iii) redistribute the gains from trade through domestic policies that help people adjust to the churn.

An increasing number of developing countries recognise that "race to the bottom economics" is detrimental to their own development trajectories. Trade agreements, alongside capacity building and technical assistance, can help equip these nations in building the institutions that ensure that regular workers benefit from an expanding economic pie and that trade is pursued in the service of development (Dewan, 2016). Rodrik, Acemoglu and other scholars have asserted that greater economic openness is fruitful when complimented by institutions that ensure that the

benefits are widely shared. The absence of appropriate social, political and legal institutions leads to an elite capture of benefits, high adjustment costs and growing inequality, which is ultimately bad for economic growth in developing and developed countries alike. Labour's shrinking share of income and the growing divergence between productivity growth and wage growth are outcomes of weak institutions - inadequate regulations and enforcement, and fragile industrial relations (IMF, 2017).

In this context, other less developed economies are struggling to become global industrial players in a landscape that has grown ever more competitive and crowded. Global Value Chains have also concentrated in Asia and Eastern Europe and not as much in Latin America, the Middle East and Africa. Many countries in Africa struggle with poor infrastructure, low regional integration and weak political institutions to fully participate in value chains.

Finally, while technology at one time enabled developing nations to participate in the global economy, it now threatens to disrupt their economies. But this is another story – the impact of automation trends – that we will discuss in the next section.

B. AUTOMATION TRENDS: THE ON-GOING FOURTH INDUSTRIAL REVOLUTION

As stated by Klaus Schwab, who first described the Fourth Industrial Revolution, we stand on the brink of a technological revolution that will fundamentally alter the way we live, work and relate to one another. In its scale, scope and complexity, the transformation will be unlike anything humankind has experienced before.

The First Industrial Revolution used water and steam power to mechanise production. The Second used electric power to create mass production. The Third used electronics and information technology to automate production. Now, a Fourth Industrial Revolution is building on the Third, the digital revolution that has been occurring since the middle of the last century. It is characterised by a fusion of technologies that is blurring the lines between the physical, digital and biological spheres.

Like the revolutions that preceded it, the Fourth Industrial Revolution has the potential to raise global income levels and improve the quality of life for populations around the world. To date, those who have gained the most from it have been consumers able to afford and access the digital world; technology has made possible new products and services that increase the efficiency and pleasure of our personal lives. Ordering a cab, booking a flight, buying a product, making a payment, listening to music, watching a film, or playing a game—any of these can now be done remotely.

In the future, technological innovation will also lead to a supply-side miracle, with long-term gains in efficiency and productivity. Transportation and communication costs will drop, logistics and global supply chains will become more effective and the cost of trade will diminish, all of which will open new markets and drive economic growth.

At the same time, as the economists Erik Brynjolfsson and Andrew McAfee have pointed out, the revolution could yield greater inequality, particularly in its potential to disrupt labour markets. As automation replaces labour across the entire economy, the net displacement of workers by machines might exacerbate the gap between returns to capital and returns to labour. One thing seems certain - that in the future, talent, more than capital, will represent the critical factor of production. This will give rise to a job market increasingly segregated into “low-skill/low-pay” and “high-skill/high-pay” segments which, in turn, will lead to an increase in social tensions.

In addition to the key economic concern, inequality represents the greatest societal challenge associated with the Fourth Industrial Revolution. The largest beneficiaries of innovation tend to be the providers of intellectual and physical capital—the innovators, shareholders, and investors. This explains the rising gap in wealth between those dependent on capital versus labour. Technology is, therefore, one of the main reasons why incomes have stagnated, or even decreased, for a majority of the population in high-income countries: the demand for highly skilled workers has increased whilst the demand for workers with less education and lower skills has decreased. The result is a job market with a strong demand at the high and low ends, but a hollowing out of the middle.

This helps explain why so many workers are disillusioned and fearful that their own real incomes and those of their children will continue to stagnate. It also helps explain why middle classes around the world are increasingly experiencing a pervasive sense of dissatisfaction and unfairness.

Discontent can also be fuelled by the pervasiveness of digital technologies and the dynamics of information sharing, typified by social media. More than 30 percent of the global population now uses social media platforms to connect, learn and share information. In an ideal world, these interactions would provide an opportunity for cross-cultural understanding and cohesion. However, they can also create and propagate unrealistic expectations as to what constitutes success for an individual or a group, as well as offer opportunities for extreme ideas and ideologies to spread.

Overall, the inexorable shift from simple digitisation (the Third Industrial Revolution) to innovation based on combinations of technologies (the Fourth Industrial Revolution) is forcing companies to re-examine the way they do business.

Indeed, there is clear evidence that the technologies that underpin the Fourth Industrial Revolution are having a major impact on businesses. On the supply side, many industries are seeing the introduction of new technologies that create entirely new ways of serving existing needs and significantly disrupt existing industry value chains. Disruption is also flowing from agile, innovative competitors who, thanks to access to global digital platforms for research, development, marketing, sales and distribution, can oust well-established incumbents faster than ever by improving the quality, speed, or price at which value is delivered. Major shifts on the demand side are also occurring, as growing transparency, consumer engagement and new patterns of consumer behaviour (increasingly built upon access to mobile networks and data) force companies to adapt the way they design, market and deliver products and services.

A key trend is the development of technology-enabled platforms that combine both demand and supply to disrupt existing industry structures, such as those we see within the "sharing" or "on demand" economy. These technology platforms, rendered easy-to-use by the smartphone, convene people, assets and data —thus creating entirely new ways of consuming goods and services in the process. In addition, they lower the barriers for businesses and individuals to create wealth, altering the personal and professional environments of workers. These new platform businesses are rapidly multiplying into many new services.

Focusing now on developing nations, Fourth Industrial Revolution trends – as mentioned – threaten to disrupt their economies in at least three ways. First, the threat of automation and robotics looms over developing nations as it does over industrial ones; though the impact and pace of change is likely to vary across countries based on their level of development. Automation and robotics threaten to prompt a decline in manufacturing's share of employment. Second, there may also be a shortening of supply chains, where cheaper technology makes it possible to produce closer to consumers and innovation centres, fuelling a re-shoring phenomenon that is aided by protectionist sentiments. And third, though both these threats may still be some time away for developing nations, greater technology threatens to make employment more skill biased, changing the task requirements, especially in mid-level occupations. [4]

C. PROSPECTS

There are three reasons why today's transformations represent not merely a prolongation of the Third Industrial Revolution but rather the arrival of a Fourth and distinct one: velocity, scope

[4] When shoes, say, can be cheaply produced with 3D printing, major brands will be less interested in offshoring to developing countries where labour is cheap. Re-shoring will be more common. In other words, many if not most of the newest technologies, imply that the comparative advantage of low-income countries in standard manufacturing will tend to dissipate. Skill-biased technological change requires developing countries to double up their investment in human capital, just to stay where they are. (Rodrik D., 2018)

and systems impact. The speed of current breakthroughs has no historical precedent. When compared with previous industrial revolutions, the Fourth is evolving at an exponential rather than a linear pace. Moreover, it is disrupting almost every industry in every country. And the breadth and depth of these changes herald the transformation of entire systems of production, management and governance.

The possibilities of billions of people connected by mobile devices, with unprecedented processing power, storage capacity and access to knowledge, are unlimited. And these possibilities will be multiplied by emerging technological breakthroughs in fields such as artificial intelligence, robotics, the Internet of Things, autonomous vehicles, 3-D printing, nanotechnology, biotechnology, materials science, energy storage, to name some.

Already, artificial intelligence is all around us, from self-driving cars and drones to virtual assistants and software that translate or invest. Impressive progress has been made in AI in recent years, driven by exponential increases in computing power and by the availability of vast amounts of data - from software used to discover new drugs to the algorithms used to predict our cultural interests. Digital fabrication technologies, meanwhile, are interacting with the biological world on a daily basis. Engineers, designers and architects are combining computational design, additive manufacturing, materials engineering and synthetic biology to pioneer a symbiosis between microorganisms, our bodies, the products we consume and even the buildings we inhabit.

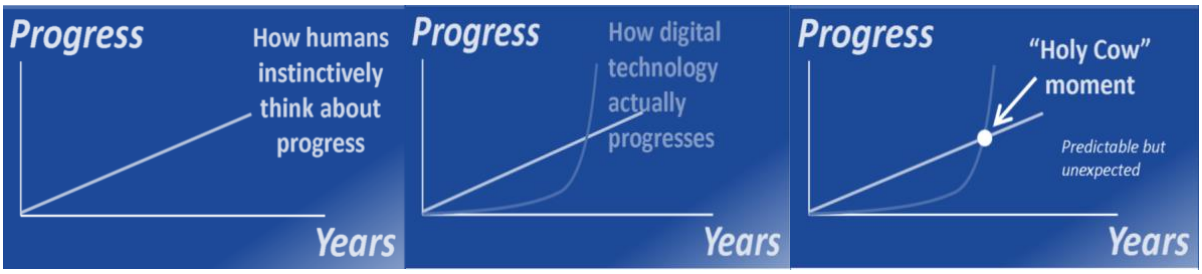
Recently, the great transformation ahead of us has been analysed from different angles in three ponderous foresight studies that we are going to present in the next three sub-sections.

i. Globotics transformation

The economist, Richard Baldwin, warn us in his last book about how speedy the Globotics Transformation will come. “Globots” and “**Globotics**” are neologisms merging a new form of **globalisation** exploiting remote intelligence (RI) with **robotics** exploiting the advancements in artificial intelligence (AI).

Globotics will manifest with an exponential growth, not linear, and penetration of globots will happen – is the Baldwin assumption – like the penetration of i-phones and smartphones we are now seeing in our daily life. Exponential growth – and digital technologies are indeed following this path – advances by small increments, since it starts from zero, doubling the amount at each step (year). For years, the progress is almost imperceptible, but then the increments become immense. This imperceptible-for-decades-then-explosive feature is why many are either unaware of how fast the changes are coming or living in denial. We can draw a picture of this mismatch between our

natural tendency to straight-line the future and the actual shape of the exponential growth, as in the figures below:



When the explosive growth of digital progress crosses the human projection of progress – Baldwin says – we get the "holy cow" moment. This is when digitech is disruptive. People knew it was coming – they just didn't expect it to come so fast. They just can't comprehend why things are changing so fast now, when they weren't changing that fast in the past. The progress during the explosive growth phase just doesn't seem feasible or reasonable given past experience.

Globotics will further challenge the American and European economies and workforces. Unlike the old globalisation, where foreign competition showed up in the form of foreign goods, this wave of globalisation will show up in the form of telemigrants working in our offices. We will see their faces and know their stories. This will be humanising but won't change the basic fact that they will undermine our pay and, therefore, our standard of living. These new competitors will accept lower pay, at least in part because they won't pay the same taxes or face the same costs of housing, medical care, schooling, or transportation. They won't be subject to the same labour laws or workplace regulations. They won't ask for severance pay, paid holidays, pension contributions, or maternity and paternity leave. They won't pay taxes that support social security, social medical insurance, or any other social policy.

The robot part of globots will be unfair for us in similar ways. White-collar robots are paid zero wages and they are incapable of accepting perks. You cannot force "cogitating computers" to take holidays, lunch breaks, or sick days. They aren't subject to workplace regulations. They can work 24/7 if need be and be cloned without limits. The industry calls them "digital workers", but in fact they are nothing more than computer software – algorithms at play.

The most important implications are those for the future of work and jobs. Baldwin's main assumption here is that artificial intelligence and machine learning will not acquire social

competences that will remain an exclusive endowment of humans, at least within the next two decades or so.[5]

The easy definition of artificial intelligence is a computer programme that can 'think' and, thus, has some form of intelligence. But what then is intelligence? Psychologists define intelligence as: 'A very general mental capacity that, among other things, Involves the ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, learn quickly and learn from experience'. Today's AI is not intelligent in this sense. Machine learning performs only the last two functions in the psychological list: learn quickly and learn from experience. Even the revolutionary machine learning applications we see today – like SIRI and self-driving cars – are just computer programmes that recognise patterns in data and then act, or that make suggestions based on the patterns they find. The pattern recognition is astonishing, often superhuman in specific areas. But pattern recognition is not 'intelligence' as the word is generally used when speaking about intelligent animals like humans, chimpanzees, or dolphins. AI should really stand for 'almost intelligent', not artificial intelligence.'

By studying the things that AI-trained robots can already do well, we can predict that the jobs that survive competition from AI and the new jobs that will be created are those that highlight humanity's great advantages. Machines have not been very successful at acquiring social intelligence, emotional intelligence, creativity, innovativeness, or the ability to deal with unknown situations. Experts estimate that it will take something like fifty years for AI to attain top-level human performance in social skills that are useful in the workplace, like social and emotional reasoning, coordination with many people, acting in emotionally appropriate ways, and social and emotional sensing. This suggests that most human skills will be sheltered from AI competition for many years. The implication is as simple as it is profound. **Humanity will be important in most jobs of the future**.

Three rules, therefore, will help prepare ourselves and our children for the globotics revolution. First, seek jobs that don't compete directly with white-collar robots (AI) or telemigrants (RI). Second, seek to build up skills that allow you to avoid direct competition with RI and with AI. Third, realise that humanity is an advantage not a handicap. In the future, having a good heart may be as important to economic success as having a good head was in the twentieth century and a strong hand was in the nineteenth century. The first rule tells us to move away from skills that draw solely on experience-based pattern recognition, since AI is getting very good at such things. If it is possible to gather a big data set on a specific task, that task will soon be taken over by AI-trained software robots. Try to stay away from jobs where that have, are, or soon will happen. Likewise, we

[5] Nothing prevents thinking, however, that artificially empathic robots will be around and interact at least under given circumstances with humans over the longer horizon, 2050 or beyond – thanks to possible breakthrough innovations in social robotics.

should move toward skills that help us deal with real people who have to be in frequent in-person contact, since that is something telemigrants can't do. Try to stay away from jobs and tasks where you don't actually have to be in the room with others; these are the tasks and jobs where you will soon be competing with educated foreigners who can support a middle-class lifestyle on $10 an hour.

To prepare for a better future of work and jobs, we should invest in building soft skills, like being able to work in groups and being creative, socially aware, emphatic and ethical. These will be the workplace skills in demand because globots aren't good at these things. Of course, it can't be 100 percent soft skills. We will have to be more technically fluent. One point that it is often lacking in the public debate is as simple as it is obvious. Most people who win from the Globotics Transformation will be *using* globots, not *designing* them. A few AI and telecommunication experts will get fabulously wealthy, but that is an irrelevance in the world of work. Putting it starkly, if you don't want to be replaced by globots, you will probably have to learn how to use them as tools in your job.

The final conclusions of the Baldwin analysis are particularly straightforward: **"Globotics" is coming faster than most think, in ways few expect. It will create a better world of work and living – but only if we manage the transition. Mismatched speed is the key problem.** We can control the speed of the transformation. It is our choice.

ii. Pan-industrial revolution

Another major techno economic pathway – the so called "pan-industrial revolution" – is described by Richard D'Aveni (2018). According to this foresight study, there is a remarkable, still-evolving array of new technologies called "**additive manufacturing**"[6] that will have a strong impact on the world economy.

In the years ahead, additive manufacturing (AM) is likely to transform the way practically everything is made. The changes will affect the nature, size, organisation and location of manufacturing facilities; the scale and structure of employment in the manufacturing sector; the ways R&D, innovation and product development are conducted; the internal and external structures

[6] "3D printing" has been the first form of additive manufacturing (AM), invented back in 1983. The term refers to any kind of production in which materials are built up to create a product rather than cut, ground, drilled, or otherwise reduced into shape – techniques known as subtractive manufacturing. Nowadays, some industries have already shifted to AM, especially where nano-precision matters (e.g. in the hip and knee implant industries in the health sector). Prototype buses and houses – big things – are being developed as well. And AM is already extensively used to manufacture parts of engines in the aviation and car industries. Other remarkable AM innovations include nano-printing, used to print objects at molecule scale, particularly in medicine and bioprinting, a form of AM that uses so-called bio-inks to create structures that mimic the functioning of naturally created living tissues.

of companies and the interrelationships amongst them; the nature of competition; the structure of entire industries; and even the global balance of power among countries in the developed and developing worlds.

These changes will take time, of course. But all of them will be the ultimate outcome of the playing-out of new emerging trends, launched with the invention, spread and development of additive manufacturing.[7] Today, additive manufacturing technologies are being combined with more familiar traditional manufacturing techniques. In many factories around the world, 3D printers are being installed in spare corners, where they are used to turn out parts or tools on demand, whilst the items so produced help to feed the conventional manufacturing process, usually with marginal efficiency gains. These systems, in which AM tools serve merely as accessories to traditional production methods, are just the first stage in the emerging manufacturing revolution. In the next stage – already beginning – the new AM techniques will increasingly be combined with other high-tech tools that are themselves undergoing rapid development and advancement – robotics, lasers, cloud computing, artificial intelligence, machine learning and the Internet of Things (IoT). All these tools are made possible by digitalisation, which makes the entire system more flexible, efficient and versatile, since it is controlled by software systems that can quickly and easily be revised, updated and enhanced, as circumstances require.

The powers of 3D printers and other additive manufacturing tools will enable manufacturers for the first time to benefit from economies of scope. These are economic benefits that arise from the ability to make almost everything, anywhere, rather than being forced to specialise in one or few products.[8]

At the same time, the new AM technologies are rapidly achieving the quality, speed and efficiency they need to produce mass quantities of identical goods in certain vanguard industries, beating old-style plants based on the economies of scale from which giant companies have long benefitted. **Conventional wisdom says there are no economies of scale with AM. But today, AM is achieving economies of scale in a variety of ways – and doing so without sacrificing economies of scope.** As a result, we are now seeing the increasing application of AM to the making of standardised products in mass quantities. AM is no longer limited to product prototypes, customized one-offs, or

[7] As noted by Richard D'Aveni, if it seems far-fetched to imagine that a single breakthrough could have this kind of impact, consider the long-term effects of James Watt's 1781 development of the first steam engine – the core technology underlying the first industrial revolution.

[8] A flexible AM factory can widen or narrow its product scope much more quickly and easily than a traditional manufacturing facility. This means that, when market demand for one product falls whilst demand for a new product increases, the company can shift gears swiftly. Moreover, AM factories making a given product mix can be located almost anywhere in the world. They can vary in size, be positioned close to customers and can be moved closer to sources of raw materials, expanded or shrunk more easily than traditional facilities. Thus, the reallocation of production across geographies is easier.

specialised items made in small quantities. Equally impressive is the fact that these new, more efficient AM technologies enable cost savings in adjacent business functions, not part of the manufacturing process – i.e. outbound logistics and distribution, purchasing costs, marketing, sales and distribution overhead costs.

The natural result of the new capacity of combining the economics of scope with the economics of scale will be – D'Aveni says - the emergence of **pan-industrials** – i.e. manufacturing corporations that are gigantic in size, highly diverse in their product offerings and enormously profitable.

Platforms of various kinds have revolutionised many markets and created some entirely new ones in the service sector. Familiar examples from the business-to-consumer (B2C) and consumer-to-consumer (C2C) markets include Amazon, eBay, Facebook, Google, Apple's iPhone and more specialised platforms such as Uber and Lyft, Airbnb, Trivago, Trip Advisor, etc. All these platforms have, as their competence, not just the ability to produce goods or to deliver services directly to customers, but rather to make connections between those who do produce goods or deliver services and consumers who want them. They make these connections through their ability to attract, amass, analyse and exploit vast quantities of data. And they rely on network effects to generate much of their value.[9]

Platform businesses have revolutionised one consumer market after another. However, until recently, they haven't made much of a dent in the industrial arena. But now, the digitisation of manufacturing is a game changer in this respect. In a world of AM and other digital technologies for automating production, industrial platforms can have incredible power to increase the speed, accuracy, efficiency and flexibility of manufacturing. These industrial platforms will be quite different from the now-familiar consumer platforms. Their structure and functions will be more complex and they will operate within a business ecosystem and a marketplace which typically will involve hundreds or thousands of organisations in the value chain and potentially millions of individual participants at different levels in the managerial hierarchy of their organisations.

Industrial platforms will bridge the B2B and B2C arenas, will engage participants in more complicated user interactions – not only simple matching functions, as those used in the consumers platforms, but a wider range of activities aimed at ecosystem optimisation.[10] Finally, the winner-

[9] The greater the number, the more attractive the platform and the greater the economic value created, both for users of the platform and for the company that owns and manage it.

[10] The owners of an industrial platform will be able to enjoy a full range of network effects, growing from the interactions between the business network and the consumer network. Over time, these beneficial effects will tend to "lock in" business users of the platform. They will be reluctant to abandon the platform and consider changing platforms because of the benefits they have been able to tap.

takes-all dynamics, commonly found in consumer platforms, will probably not be prevalent amongst industrial platforms. Instead, within any given industrial marketplace, it is likely that some industrial platforms will survive and compete with one another, creating an oligopolistic landscape. This is primarily because the importance of confidentiality as a competitive advantage in the industrial world will create natural, inherent limits in the amount of sharing that companies will permit, especially when they are rivals for the same customers. Another reason is the relative complexity of the services and benefits that an industrial platform will offer, compared to the simple matching functions of a consumer platform.

iii. Blockchain revolution

To understand the possible – for many scholars and business leaders likely – impact of the blockchain, it is useful to explain what this technology adds to the most transformative technology we are used to thinking of in our times, the Internet.

The first four decades of Internet brought us e-mail, the World Wide Web, dot-coms, social media, the mobile Web, big data, cloud computing and the early days of the Internet of Things. It has been great for reducing the cost and enhancing our capacity of searching, collaborating and exchanging information. It has lowered the barriers to entry for new media and entertainment, new forms of retailing and organising work and unprecedented digital ventures. Through sensor technology, it has infused intelligence into our wallets, our clothing, our cars, our buildings, our cities and even our biology. Overall, the Internet has enabled many positive changes – for those with access to it – but it has serious limitations for business and economic activity: online, we still can't reliably establish one another's identities, or trust one another to transact and exchange money without validation from a third party, like a bank or a government.

This is what the blockchain adds to the picture: it enables trusted transactions directly between two or more parties, authenticated by mass collaboration and powered by collective self-interests, rather than by large corporations (the banks). The first – and now more famous – instance of blockchain application is the protocol for a peer-to-peer electronic cash system, using a cryptocurrency called Bitcoin.[11] This first protocol has been followed by a growing number of global distributed ledgers called blockchains – of which the Bitcoin blockchain is the largest.

[11] Cryptocurrencies (digital currencies) are different from traditional flat currencies because they are not created or controlled by countries. The Bitcoin protocol was outlined in 2008 by a pseudonymous person, or persons, named Satoshi Nakamoto. It established a set of rules – in the form of distributed computations – that ensured the integrity of the data exchanged amongst billions of devices, without going through a trusted third party.

Whilst the technology is complicated and the world blockchain isn't exactly intuitive[12], the main idea is simple. Blockchain enables us to send money directly and safely from me to you, without going through a bank, a credit card company, or PayPal. Rather than the Internet of Information, it is the Internet of Value or Money. It is also a platform for everyone to know what it is true – at least with regard to structured recorded information. **It can be used not only for exchanging money, but for authenticating any kind of transaction, for instance the issuing of education and training certificates, transactions of property rights on any kind of assets, contractual obligations (smart contracts), and to access to basic certified health services etc**. And at its most basic, it is an open source code: anyone can download it for free, run it and use it to develop new tools for managing transactions online. As such, it holds the potential for unleashing countless new applications and, as yet, unrealised capabilities that have the potential to transform many things.

[12] For an explanation of how the technology works and why it is named "blockchain", see D. & A. Tapscott (2018), page 6.

3. SHAPING THE FUTURE: RESPONSIBLE TRANSITION TOWARDS TRIS MODEL OF DEVELOPMENT

Neither technology, nor the disruption that comes with it, is an exogenous force over which humans have no control. The great transformations described in the previous sections are possible and even likely scenarios, but not predictions of the future, which remains uncertain and open to different possibilities. All of us are responsible, therefore, for shaping it by guiding its evolution, in the decisions we make today as citizens, consumers and investors. "Responsibility" and a responsible attitude require taking care of the future consequences of what we do now, for us (individual life), for others (at societal level) and for the planet (our local and global environment).

We consider **responsible, or "just", transitions** as technological transformations of the system, driven by transformations in the personal awareness of the actors partaking the system, as well as in the social sphere (e.g. governance rules, behavioural and cultural norms); awareness and mindset shifts, and social transformations, that are able to anticipate and orient technological change towards addressing societal needs and not neglecting them, as happens with top-down and technocratic approaches. Transitions are "responsible" insofar as they are made the subject of responsible research and innovation thinking and strategies, focusing on economic, social, environmental and ethical consequences of the transition.

One main assumption here is that there is not impactful, sustainable transition in the outer (real) world, without transformation in the inner dimension of engagement of the people involved in the system. In short, it is essential to accompany the implementation of technological changes with the change of mindsets, beliefs and values in the people's inner dimension, in order to see new practice and behaviour shaped in the outer world. More concretely, "transitions" can be understood as tangible changes in the techno-sphere, e.g. the transition in energy, production and consumption patterns of the economy, whilst "transformations" include associated awareness and socio-cultural changes. Evolutions in technical and social spheres are interwined in a dynamic co-evolution process and this is where, in any context, the analysis is focussed – i.e. the system boundaries (global, territorial, sectoral, a single organisation, etc.).

Below, we describe a strategic framework using the Three Horizons methodology[13] to engage experts, stakeholders, citizens in a participatory foresight exercise, thinking ahead to **four entangled responsible transitions within the planetary system boundaries[14] leading to**:

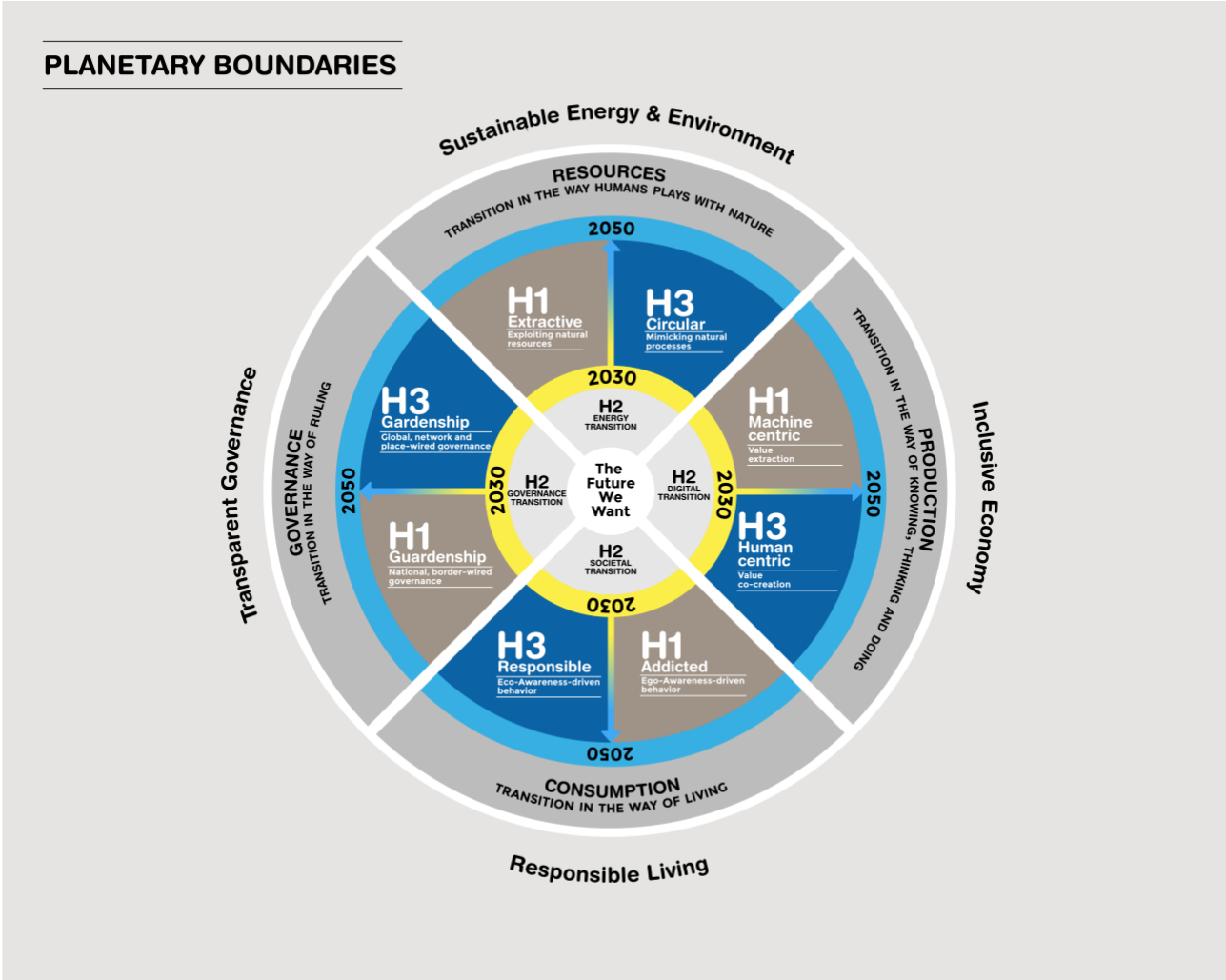
- **Transparent governance**, to build trust based on a greater accountability of past and present decisions, actions and intentions.

[13] See Annexe 2.
[14] See Annexe 3.

- **Responsible living**, to take care of future consequences of our choices and actions – for ourselves, for others, for the environment – in our personal or social living experience.
- **Inclusive economy**, shifting to a new pathway of societally desirable progress.
- **Sustainable energy and environment**, which means taking care of our environment and how we leave it to the next generations.

The framework has been designed for engaging experts, stakeholders, citizens[15] in thinking and imagining "the future we want" to achieve transparent governance, responsible living, inclusive economy and sustainable energy and environmental goals – the so-called **"TRIS-development" model**.

The following infographic shows the framework structured with a set of questions according to the Three Horizons logic.



[15] Depending on the context of application, there can be a different mix of participants involved, e.g. only experts, experts and stakeholders, or citizens engaged in a public dialogue

Source: Authors

At the centre, we have "**the future we (participants in the exercise) want**". Four directions point to the end points of the four transitions at the long-term horizon (2050): the visions of transparent governance, responsible living, inclusive economy, sustainable energy and environment.

To build up these visions, participants in the foresight exercise are asked to envision the features of two somehow "extreme" scenarios, the Horizon 1 (H1) conservative scenario (more of the same) *vs* the Horizon 3 (H3) transformative scenario (paradigm shift), in a first step for each responsible transition separately. A second step will require consolidating the features in a coherent list and developing a narrative out of it, which will take into account the interactions – the four transitions in reality are entangled – and how the whole thing will fit (or not) with the planetary boundaries (the green box in the background).

The scenario narrative at the outset could combine features of the two extreme scenarios in a "middle range" vision, including transformative changes together with the more permanent heritages of the conservative scenarios.

As part of the strategic foresight exercise, participants are also asked to sketch out policy recommendations for the mid-term horizon (2030), eventually taking the form of policy roadmaps or strategic agendas for the energy and climate transition, the digital transition, the societal and governance transitions. This Horizon 2 back-casting step completes the foresight exercise.

In the following sub-sections, we provide some background about the different parts of the framework, i.e. the planetary boundary (the green box) and the four sectors, which we suggest calling the "mandala graph".[16]

To discuss the four sectors, we will start from the "softest" governance transition, focussing on the potential change a disruptive technology – distributed ledger – can bring in the way of ruling our economy and society, continuing then with the transition to a responsible way of living, the digital transition and how to achieve an inclusive economy and ending with the "hardest", more material transition to a low carbon and circular economy.

A. TRANSFORMATION IS FEASIBLE: HOW TO ACHIEVE THE SUSTAINABLE DEVELOPMENT GOALS WITHIN PLANETARY BOUNDARIES[17]

The adoption of the SDGs by the UN General Assembly in 2015 was a landmark decision.[18] The Declaration accompanying the SDGs contains a vision statement, including "we envisage a world in which development and the application of technology are climate-sensitive, respect biodiversity and are resilient. One in which humanity lives in harmony with nature and in which wildlife and

[16] Because we see it as a support to stimulate meditation on the complexity of the "responsible transitions" – something that cannot be fully grasped without understanding the deeper connections between the different aspects of socio-technical transition and cultural transformation.

[17] This section is based on Randers, J. and others (2018).

[18] For the list of the 17 Sustainable Development Goals (SDGs) see Annexe 2.

other living species are protected." We believe that most people lend support to such a transformational vision. The problem, however, is that very little is said in Agenda 2030 about its implementation.

Against this backdrop, an obvious task must be to examine the consistency of the SDGs and the modalities under which the goals will be implemented. What is really the meaning of the quoted statement? It surely relates to the three environmental SDGs, speaking in affirmative language about urgent action needed to combat climate change (Goal 13); conserving and sustainably using the oceans, seas and marine resources (Goal 14), and protecting, restoring and promoting sustainable use of terrestrial ecosystems, ... and halting biodiversity loss (Goal 15). Nowhere, however, is it admitted in the 2030 Agenda that the successes in reaching the eleven social and economic goals (Goals 1 – 11), *if achieved based on conventional growth policies,* would make it virtually impossible to reduce the speed of global warming, to stop overfishing in the oceans or to stop land degradation, let alone to halt biodiversity loss.

The last report to the Club of Rome *"Achieving the Sustainable Development Goals within Planetary Boundaries"*, by Jörgen Randers, Johan Rockström and Per-Espen Stoknes, is the forty-sixth report of its kind. Ever since Limits to Growth, the first report to the Club of Rome, the ambition within the Club has been to promote and stimulate a discussion around conventional economic growth and its implications- and the last report is no exception.

The report explores different pathways for the implementation of Agenda 2030. The report confirms that meeting the SDGs in an integrated fashion is not possible, based on conventional growth policies. By accelerating growth, an increasing number of the socio-economic goals may be reached, but it will occur at the expense of the environmental SDGs and push planetary boundaries into high-risk zones. In other words, assuming no major changes in the way economic growth is defined and pursued, humanity would be confronted with massive trade-offs, between the socio-economic and the environmental SDGs.

The only way that, according to the report, to meet most of the goals by 2030 is one built on transformational change, starting now. Such a pathway rests on at least five transformational actions with systems-wide effects of the SDGs:

- Accelerated renewable energy growth;
- Accelerated productivity in food chains;
- New development models in poorer countries;
- Active inequality reduction;
- Investments in education for all, gender equality and family planning;

The choice is the simplest way the pathway analysis for achieving SDGs within Planetary Boundaries (PBs)[19] has found to achieve all SDGs, both social and environmental. They represent five "leverage points" to intervene in the globally interconnected geo-bio-socio-economic system. Together, they contribute to shifting the global system onto a new path in the decades ahead.

Behavioural transformation is also required, particularly in the rich parts of the world. Given current trajectories, it seems very unlikely that SDGs within PBs can be attained without a shift in mind-set and values that are broad enough to support the acceleration of transformational actions. 2030 is only 12 years away and it is urgent that both world leaders and citizens move into a domain where everyone, not only knows the information, but also acknowledges the implications.

B. TRANSPARENT GOVERNANCE[20]

As the Forth Industrial Revolution will continue and the physical, digital and biological worlds converge, new technologies and platforms will increasingly enable citizens to engage with governments, voice their opinions, coordinate their efforts and even circumvent the supervision of public authorities. Simultaneously, governments will gain new technological powers to increase their control over populations, based on pervasive surveillance systems and the ability to control digital infrastructure. Overall, however, governments will increasingly face pressure to change their current approach to public engagement and policymaking, as their central role of conducting policy diminishes, owing to new sources of competition and the redistribution and decentralisation of power that new technologies make possible.

Ultimately, the ability of government systems and public authorities to adapt will determine their survival. If they prove capable of embracing a world of disruptive change, subjecting their structures to the levels of transparency and efficiency that will enable them to maintain their competitive edge, they will endure. If they cannot evolve, they will face increasing trouble.

This will be particularly true in the realm of regulation. Current systems of public policy and decision-making evolved alongside the Second Industrial Revolution, when decision-makers had time to study a specific issue and develop the necessary response or appropriate regulatory framework. The whole process was designed to be linear and mechanistic, following a strict "top down" approach.

But such a technocratic approach is no longer feasible. Given the Fourth Industrial Revolution's rapid pace of change and broad impacts, legislators and regulators are being challenged to an unprecedented degree and for the most part are proving unable to cope.

How, then, can they preserve the interest of consumers and the public at large whilst continuing to support innovation and technological development? The answer is, by embracing

[19] Integrated scenario analyses of pathways to attain the SDGs within PBs have been elaborated, on the basis of a transparent, integrated and easily understandable modelling framework, called Earth3. This calculates the effects on the 17 SDGs of major socio-economic developments for seven regions of the world and assesses the status of global environmental pressures on the nine PBs. The Earth3 model system is more extensively described in Annexe 2.
[20] This section is based on World Economic Forum (2017).

"agile" governance, just as the private sector has increasingly adopted agile responses to software development and business operations more generally. This means regulators must continuously adapt to a new, fast-changing environment, reinventing themselves, so they can truly understand what it is they are regulating. To do so, governments and regulatory agencies will need to collaborate closely with business and civil society.

The blockchain (distributed ledger) technology is a game changer, as it has the potential to bring and enforce transparent governance in many sectors of our society. Indeed, distributed ledger technology promises to have far-reaching economic and social implications. By leveraging a global peer network to assure directly and transparently the integrity of value exchanged between parties, blockchain appears likely to transform some important industries that supply or rely upon third-party assurance. **The blockchain could prove to be a broader force for transparency and integrity in society, including in the fight against bribery and corruption.** It could also lead to extensive changes in supply chains and governmental functions, such as central banking.

Unlike the internet alone, blockchains are distributed, not centralised; open, not hidden; inclusive, not exclusive; immutable, not alterable; and secure. **Blockchain gives us unprecedented capabilities to create and trade value in society.** As the foundational platform of the Fourth Industrial Revolution, it enables such innovations as artificial intelligence (AI), machine learning, the internet of things (IoT), robotics and even technology in our bodies, so that more people can participate in the economy, create wealth and improve the state of the world.

However, this extraordinary technology may be stalled, side-tracked, captured or otherwise sub-optimised depending on how all the stakeholders behave in stewarding this set of resources – i.e. how it is governed. Indeed, **the extent to which this new technology realises its potential will depend, in substantial part, upon how well stakeholders steward its development**. There remain important open governance questions regarding both the functioning of the technology and its current and potential applications.

Like the first era of the internet, this blockchain era should not be governed by nation states, state-based institutions or corporations. How we govern the internet of information as a global resource serves as a model for how to govern this new resource: through a multi-stakeholder approach using what we call "global governance networks". But there are core differences between the internet of information as a network of similar networks and the blockchain as a balkanised internet of value, where real assets are at stake, which make governance challenges the most urgent threats to this resource. By governance, we mean stewardship, which involves collaborating, identifying common interests and creating incentives to act on them. We do not mean government, regulation or top-down control.

Unlike the internet of information, which is a vast network of similar networks, this internet of value requires stewardship, at not just one level but three: 1) at the platform level, with issues about Bitcoin's scalability and energy consumption, Ethereum's switch to proof-of-stake and crisis management by consensus, and Hyperledger's call for both urgency and moderation around standards; 2) at the application level, with the need for oversight, skilled talent and user-friendly interfaces; 3) at the overall ecosystem level, with the need for developing a proper legal structure,

regulatory restraint, diversity of viewpoints and scientific research in tandem with business development. These issues concern eight categories of stakeholders in the ecosystem: innovators, venture capitalists, banks and financial services, developers, academics, non-governmental organisations (NGOs), government bodies and users, or citizens.

C. RESPONSIBLE LIVING[21]

A new paradigm of 'Responsible Research and Innovation' (RRI) asks to be more broadly accountable for the consequences of research and innovation projects and initiatives, building a transparent, interactive process by which societal actors and innovators become mutually responsive to each other, taking care of the ethical acceptability, sustainability and societal desirability of the research and innovation process, its outcomes and possible societal impacts.

The quest for critical thinking of science and technology implications is not confined to researchers, innovators, policy makers and business organisations, it is increasingly extended to society – civil society organisations, citizens, users of the technologies – as the perception of climate change and digital transition challenges is growing.[22]

The Fourth Industrial Revolution will change not only what we do but also who we are. It will affect our identity and all the issues associated with it: our sense of privacy, our notions of ownership, our consumption patterns, the time we devote to work and leisure and how we develop our careers, cultivate our skills, meet people and nurture relationships. It is already changing our health and leading to a "quantified" self - and sooner than we think, it may lead to human augmentation.

There are reasons to cultivate a great enthusiasm, but also to wonder whether the inexorable integration of technology in our lives could diminish some of our quintessential human capacities, such as compassion and cooperation. Our relationship with our smartphones is a case in point. Constant connection may deprive us of one of life's most important assets: the time to pause, reflect and engage in meaningful conversation.

A paradigm shift is needed towards more "responsible" ways of living, consumption and production processes and, eventually, in how we relate to progress in science and technology. Indeed, our society relies on the power that comes from technology. It is this that has reshaped the world and continues to do so – from the first industrial revolution and now up to the fourth. It is this power that holds the promise for great benefit – and unprecedented destruction. It is this power that drives wealth creation and the economic incentives for research and development. And it is

[21] This section is based on Senge, P. and others (2005).

[22] Engaging experts, stakeholders and citizens from different walks of life in RRI dialogues makes sense especially for dealing with transformative technologies and potentially disruptive innovation. In such circumstances, critical thinking and participatory foresight exercises will help to anticipate possible effects – good, bad, or neutral – and possibly alter the research and innovation goals and implementation design, to minimise risks in advance, identify alternative paths forward and build support.

this power that preserves a status quo that undermines human development, in ways that few of us see.

Indeed, our increasing reliance comes at a cost: our equally growing sense of disconnection, powerlessness and uncertainty we feel in front of the increasingly complex society we all live. There is a "shifting-the-burden dynamic" at play here. This is an archetypical systemic structure that arises when people act to ameliorate the symptoms of a problem and end up becoming more and more dependent upon these "symptomatic solutions".[23]

Shifting-the-burden dynamics can arise whenever people face difficult problems and there is a difference between "symptomatic" and "fundamental" solutions. Symptomatic solutions are "quick fixes" – like taking an aspirin – that address the symptoms of a problem without dealing with deeper causes and more fundamental solutions – like reducing over-commitment. As the fundamental sources of the problem are ignored, symptoms (the headaches) get worse, the symptomatic solutions get more intense (we use increasingly powerful drugs) and the ability to address fundamental causes of the problem atrophies. Finally, increasing reliance on short-term symptomatic solutions usually brings unintended side effects in the longer term.

We tend to think of addiction as a personal problem. But the shifting-the-burden dynamic shows that it is actually a systemic phenomenon that recurs at many levels. Just as people can become addicted to prescription drugs, alcohol, or cigarettes, companies becomes addicted to cost cutting to improve profits, governments become addicted to lotteries to raise revenues and the agricultural industry becomes addicted to pesticides and chemical fertilisers to improve crop yields. Often, individuals and institutions fail to see how their capacities for fundamental solutions are eroding, until dependency and side effects build to overwhelming proportions, eventually leading to unavoidable breakdown.

However, the innate human drive to flourish, to make things better and to aspire to a "good life" matters as well. This natural "desire for efficacy" may be the desire to help a sick child, to solve a pressing problem, or to feel secure. One way to expand our efficacy is, again, through modern science and technology – somehow an "external" support provided by economic and societal progress. But another is through integrated (emotional, mental, physical) development and enhanced wisdom. This means growing in our sense of connection with nature and with one another and learning to live in ways that naturally cultivate our capacity to be human. The two approaches are not mutually exclusive, but it is easy to shift the burden to technological solutions and, thereby, lose sight of developing our own capacities.[24]

[23] For example, taking two aspirins to relieve a headache seems innocent enough to be perfectly appropriate. But what if the source of the headaches is stress from work and family commitments that simply exceed your capacity? In that case, the "successful" medical intervention may actually mask a deeper problem and, not facing the real problem, may cause it to get worse.

[24] For instance, we use hand calculators and forget arithmetic. We rely on our cars to take us everywhere and lose the joy of walking. We relieve the symptoms of an illness through modern medicine without learning how to heal ourselves. We buy a larger car, in order to feel more secure, instead of learning how to understand one another and create personal security for one another.

Most of us have little idea of our capacity to create the qualities we truly value in living, because our culture has encouraged shifting the burden away from this sort of knowledge, for a very long time. By giving us perceived power, modern technology reduces the felt need to cultivate our own sources of power. There is nothing inherently wrong with technology: advances in technology can further our understanding of the nature of the universe, as well as of our lives. But like many shifting-the-burden situations, the dangerous aspect of our growing reliance on modern technology is the way it distracts attention from more fundamental sources of progress. **The growing gap between technological power and wisdom arises not from technological progress alone, but from the way it interacts with more integrative human development**. After a while, the very need for such development is all but forgotten.

Today, we basically define progress by new developments in technologies rather than by any broader notion of advance in well-being. Seeing this widening gap between our technological power and our wisdom is getting harder, because one of the most insidious side effects of our reliance on a fragmented science and technology is the increasing complexity of our social and environmental challenges. As complexity increases, the need for wisdom grows, even as our wisdom atrophies.[25]

In this context, **responsible living is a strategy to reverse the growing gap between our technological power and our wisdom and especially collective wisdom**. It is a strategy to avoid hard backlashes against technological progress and global economic growth, by strengthening instead the other side of the gap, i.e. our fundamental response - to find ways that lead to increasing reliance on enhancing human development and wisdom.

D. INCLUSIVE ECONOMY

Transformative technologies open new horizons. But do new technologies present an opportunity or a threat to developing economies? Where will the jobs of the future jobs come from? These are the key questions to which an **inclusive model of development** aims to find a positive answer.

For the optimists, the knowledge economy, artificial intelligence and advances in robotics represent a historical chance for developing economies to leapfrog to a more advanced-economy status. Others worry about the ability of poor countries to compete in a world economy, in which others have much greater capacity to capitalise on new technologies. In many ways, this debate evokes the discussion about the impact of technology on labour markets and inequality within rich nations.

The introduction of new technologies in production in developing countries often takes place through global value chains (GVCs). GVCs are, in effect, part and parcel of the new technology. Improvements in communication and information technologies have enabled large firms based in

[25] Today, many of the negative social and environmental side effects of actions manifest on the other side of the world. A corporate decision on one side of the world can, literally, change lives on the other side. This is true for countries' decisions as well. Then, when people in other countries oppose or challenge us, we have great difficulty understanding their actions. This is one technical definition of complexity in system thinking, when cause and effect are no longer close in time and space.

advanced nations, whether retailers or manufacturers, to divide the production chain into specific tasks that can then be dispersed around the globe to take advantage of lower costs. In turn, GVCs serve as the vehicle for the dissemination of technology from the lead firms to their suppliers.

However – as mentioned above at the conclusion of our analysis of the automation trends - GVCs and new technologies also exhibit features that limit the upside and may even undermine developing countries' economic performance. First, they are generally biased towards employing higher skills and other capabilities. This bias reduces the comparative advantage of developing countries in traditionally labour-intensive manufacturing and other activities and it decreases their gains from trade. Second, GVCs make it harder for low-income countries to use their labour cost advantage to offset their technological disadvantage, by reducing their ability to substitute unskilled labour for other production inputs.[26]

GVCs have, of course, made inroads in developing countries, in manufacturing, services and agriculture. Many of the exports of developing countries are channelled through GVCs. But the affected sectors and activities remain a very small part of the domestic economy. New capabilities and productive employment remain limited to a tiny sliver of globally integrated firms. Therefore, **more inclusive development strategies should focus somewhat less on international economic integration and considerably more on what we might call "domestic integration", or "regional integration" when an entire region is involved**.

The key challenge is to disseminate, throughout the rest of the economy, the capabilities already in place in the most advanced parts of the productive sector. Improving the economy's fundamentals through investment in human capital and governance certainly helps. But, in addition, countries may require more proactive policies of government-business collaboration, targeted at strengthening the connection between highly productive global firms, potential local suppliers and the domestic labour force.

About the potential contribution of GVCs, it shall be noted that they encompass agriculture and services, in addition to manufacturing. With respect to agriculture, no doubt developing countries have significant potential for productivity increases in the countryside through better use of inputs, application of new technologies and diversification into new crops. But it is very unlikely that agriculture could absorb labour, rather than release it, during the process of economic development – even if the new technologies were not labour-saving. The budget shares of food and other agricultural products tend to decline during economic growth. One way or another, growing economies should create jobs for unskilled workers, outside of agriculture and in urban areas.

Can services be a substitute for weak industrialisation (or deindustrialisation) and drive economic growth? Apparently, the answer is positive. Services are increasingly traded and the volume of trade has been expanding more rapidly than in trade for goods. Second, thanks in part to

[26] The introduction of new technologies also makes it more difficult for unskilled labour to substitute for other production inputs, including skilled labour, capital and other capabilities, especially in the more advanced firms where production is integrated in GVCs. This is because of the demanding precision and quality standards associated with these technologies. It is often impossible to satisfy these standards by substituting manual work, which necessarily introduces irregularities in production. (Rodrik, D., 2018)

GVCs, productivity in services is often no longer stagnant and can increase rapidly. Third, many services can absorb large amounts of employment. Finally, services are friendlier to the environment- and a service-led growth pattern would be greener.

However, services are a hodgepodge of very diverse activities. Some, such as tourism, IT, or finance, are indeed highly tradable. They share, with manufacturing, the feature that they are technologically dynamic, offering possibilities of productivity convergence with advanced nations. Others, such as many personal and retail services, are non-tradable, technologically stagnant and dominated by small informal enterprises. The trouble is that very few in the first category can absorb significant amounts of unskilled labour. Business services, which offer great potential in trade and GVCs, are easily the most skill-intensive across GVC categories. They do not have much potential for generating employment for low-skilled workers. With respect to traditional services, such as retail and wholesale, some countries have had success in increasing productivity, often by allowing foreign firms in. But the consequent reorganisation of these activities around larger, more capital-intensive producers often tends to be detrimental to employment. A large part of the problem in such services (e.g. retail trade) is the preponderance of small, low-productivity firms that absorb the excess supply of labour. When these firms are driven out, employment is hit.

Eventually, the solution could be charting a new path – a Global Deal – focussing on getting the technology development process right, i.e. a "responsible transition". Such a policy should come out of an appropriate institutional setting rather than from a top-down, technocratic framework. This policy should be thought as an on-going process of strategic collaboration between private and public sectors, a sort of "smart specialisation strategy" enabling a policy cycle of learning, experimentation, coordination, monitoring and evaluation, and continuous policy revision. Some key policy implications of this approach are listed below. They can be considered the **pillars of an inclusive development approach**:

- **Trade liberalisation must be accompanied by policies that actively re-distribute the gains from globalisation across all members of society.** A free trade agenda must be accompanied by a complementary set of policies, to share the gains from globalisation and technological progress and to compensate those that stand to lose from these processes. A combination of liberalisation and appropriate redistributive measures, which are feasible given the aggregate welfare gains that are generated, is preferable to a protectionist agenda from an economic and social point of view. The latter may shield certain groups from individual losses in the short term. But it foregoes the various benefits from globalisation and, thereby, misses the potential to improve living standards at large. Although important, the classical approach of income re-distribution may not be sufficient to meet the challenges posed by globalisation and technological change. It must be complemented by efforts of stakeholders and, specifically, targetted public policies in the labour market where most individual losses from trade and globalisation typically have their origin.

- **Labour market policies are an important and practical step to compensate those that stand to lose from trade and globalisation. After a trade-induced job loss, the goal should be to foster a quicker return into better jobs.** Labour market policies may be specifically tailored towards workers who face trade-induced job or wage losses, implementing Trade Adjustment Assistance

(TAA) programmes. However, the reasons for an individual job loss are often difficult to identify in practice. Moreover, technology shocks matter for workers just as much, if not more, as rising international trade exposure. The appropriate policy response to globalisation, therefore, is a general increase of active and passive labour market policies, not just specific trade assistance programmes. Such labour market policies do not just redistribute income or compensate those that stand to lose from globalisation through passive monetary transfers. They take an active approach and underscore work as a crucial element in an individual's life. Specifically, they try to facilitate a quicker comeback into better jobs after a job displacement, for example through qualification and re-training efforts.

- **Industrial Relations and Social Dialogue is an important tool for adjustment.** Ensuring a well-functioning labour market, in which all economic players can adjust to trade and other economic shocks, requires the cooperation of multiple stakeholders. As major transformations, ranging from technology to the fragmentation of trade into value chains, rapidly alter labour markets, the private sector and their representative organisations and workers' organisations must form a renewed partnership to cope with the changes. This is an economic imperative because strong, stable labour markets benefit the economy at large. Sound industrial relations and social dialogue are essential to this effort. The private sector must be an integral part of both the demand and supply side solutions. Supply side solutions include the provision of benefits, especially where these are not provided by the state, but also active measures such as training, retraining and life-long learning efforts (although skills training and retraining must be built on a foundation of a strong education system, not in place of it). Unions also have an important role to play, which includes advocacy agendas for greater transparency in value chains, better governance and regulation of international, regional and domestic trade, as well as domestic policies that ensure a fair distribution of the benefits from trade.

- **Qualification and re-training efforts should be accompanied by regional policies.** One important challenge for this policy agenda, of addressing the individual losses from globalisation and technological change by means of labour market policies, is the regional dimension. The problematic consequences of those major economic shocks – the displacements, the wage reductions for some workers – are often much stronger in some local labour markets within a country than in others. Vulnerable regions often have a strong local concentration of import-competing or automatable manufacturing. Active labour market policy should, therefore, be complemented by regional transfers to the most exposed areas and they should provide incentives for firms to create jobs in those communities. Redistributing the gains is undoubtedly highly important to achieve inclusive growth and to allow more people to benefit from globalisation and technological progress.

What has been described so far is the mainstream concept of inclusive economy, i.e. a model and a set of policies to shelter jobs and, more broadly, to moderate the disruptive impacts of too fast globalisation and automation trends on society.

A more radical concept of inclusive economy, however, can go beyond this, disclosing **a new vision of a low-income market as the place where "prodigious" opportunities can be found for the**

world's wealthiest companies – the so called "fortune at the bottom of the pyramid" vision and strategy, presented in a seminal paper at the turn of the century (Prahalad C.K, Stuart L. Hart, 2000).

At the time, the combined sales of the world's top 200 Multi-national Corporations (MNCs) equaled nearly 30 percent of total world gross domestic product. Yet these same corporations employed less than 1 percent of the world's labour force. Of the world's 100 largest economies, 51 were economies internal to corporations. The world economic pyramid included four tiers of the global population classified according to the level of annual per capita income. At the very top of the world economic pyramid were 75 to 100 million affluent Tier 1 consumers from around the world, a cosmopolitan group composed of middle- and upper-income people in developed countries and the few rich elites from the developing world. In the middle of the pyramid, in Tiers 2 and 3, were poor customers in developed nations and the rising middle classes in developing countries. Finally, the 4 billion people in Tier 4, at the bottom of the pyramid, earned an annual per capita income — based on purchasing power parity in U.S. dollars — of less than $1,500, the minimum considered necessary to sustain a decent life. For well over a billion people — roughly one-sixth of humanity — per capita income was less than $1 per day. Since 2000, also thanks to the success of global Millennium Development Goals and SDG policies, the number of people living at the bottom Tier 4 is reduced and the number of people in the middle Tiers 2 and 3 is greatly increased – especially in Asia, but the gap between Tier 4 rich and Tier 1 poor is dramatically increased.

The pyramid is still there, portraying the opportunity to improve the life of the poor – the fortune at the bottom of the pyramid. The main argument here is that the real source of market promise is not the wealthy few in the developing world, or even the emerging middle-income consumers - it is the billions of "aspiring poor" who are joining the market economy for the first time. For MNCs with the resources and persistence to compete at the bottom of the world economic pyramid, the prospective rewards include growth, profits and incalculable contributions to humankind. Countries that still don't have the modern infrastructure, or products to meet basic human needs, are an ideal testing ground for developing environmentally sustainable technologies and products for the entire world. Furthermore, MNC investment at "the bottom of the pyramid" means lifting billions of people out of poverty and desperation, averting the social decay, political chaos, terrorism and environmental meltdown that is certain to continue if the gap between rich and poor countries continues to widen.

Doing business with the world's billions poorest people will require radical innovations in technology and business models. Companies will be forced to transform their understanding of scale - from a "bigger is better" ideal to an ideal of highly distributed, small-scale operations married to world-scale capabilities.

The basic tenet of this new global strategy is simple: If MNCs are to thrive in the 21st century they must broaden their economic base and share it more widely. They must play a more active role in narrowing the gap between rich and poor. This cannot be achieved if these companies produce only so-called global products for consumption primarily by Tier 1 consumers. They must nurture local markets and cultures, leverage local solutions and generate wealth at the lowest levels on the pyramid. Producing in, rather than extracting wealth from, these countries should be the guiding principle. To do this, MNCs must combine their advanced technology with deep local insights,

marrying local capabilities and market knowledge with global best practices. But whether an initiative involves an MNC entering Tier 4 or an entrepreneur from Tier 4, the development principles remain the same: New business models must not disrupt the cultures and lifestyles of local people. An effective combination of local and global knowledge is needed, not a replication of the Western industrial system.

The potential of Tier 4 markets cannot be realised without a new entrepreneurial orientation: The real strategic challenge for managers is to visualise an active market where only abject poverty exists today. It takes tremendous imagination and creativity to engineer a market infrastructure out of a completely unorganised sector. Serving Tier 4 markets is not the same as serving existing markets better or more efficiently. Managers must first develop a commercial infrastructure tailored to the needs and challenges of Tier 4. Creating such an infrastructure must be seen as an investment, much like the more familiar investments in plants, processes, products and R&D. Furthermore, contrary to more conventional investment strategies, no firm can do this alone. Multiple players must be involved in multi-stakeholder cooperation schemes, including local governmental authorities, non-governmental organisations (NGOs), communities, financial institutions and other companies. **Four elements — creating buying power by providing access to credit and so increasing the earning potential of the poor, shaping aspirations towards consumptions of sustainable products and services, improving access by providing better distribution systems and communication links, and tailoring local solutions — are the keys to a thriving "bottom of the pyramid" (Tier 4) market**.

The inclusive economy pillars of a Tier 4 targeted strategy are:

- **Increase employment intensity**. MNCs, accustomed to Tier 1 markets, think in terms of capital intensity and labour productivity. Exactly the opposite logic applies in Tier 4. Given the vast number of people at the bottom of the pyramid, the production and distribution approach must provide jobs for many.

- **Re-invent cost structures**. Managers must dramatically reduce cost levels relative to those in Tier 1. To create products and services the poor can afford, MNCs must reduce their costs significantly — to, say, 10 percent of what they are today. But this cannot be achieved by fine-tuning the current approaches to product development, production and logistics. The entire business process must be rethought with a focus on functionality, not on the product itself.[27]

Nowadays, the need for the global Tier 4 targeted market strategy, advocated in the Prahalad and Stuart L. Hart paper, is not changed – it's only more urgent. And the transformative technologies, described in previous sections of this paper, are only increasing the technical and economic feasibility of the same strategy.

[27] For example, financial services need not only be distributed through branch offices open from 9am to 5pm. Such services can be provided at a time and place convenient to the poor consumer. Cash-dispensing machines can be placed in safe areas — police stations and post offices, etc.

Again, particularly relevant in this respect is the blockchain and the prospect it opens for solving the "prosperity paradox"[28], fostering a scenario of economic inclusion and distributed entrepreneurship. Prosperity, first and foremost, is about one's standard of living. To achieve it, people must have the means, tools and opportunities to create material wealth and thrive economically. But it includes even more – personal security, safety, health, education, environmental sustainability, opportunities to shape and control one's destiny and to participate in an economy and society. In order to achieve prosperity, an individual must possess, at minimum, access to some form of basic financial services to reliably store and move value, communication and transaction tools to connect to the global economy, together with security, protection and enforcement of the title to land and other assets they legally possess. These, and more, are all things that the blockchain potentially enables everyone to manage autonomously.

A "blockchain revolution" can contribute in many ways to make the economy inclusive:

- **Creating a true peer-to-peer sharing economy**: Airbnb, Uber, Lyft, TaskRabbit and other platforms are referred to as the "sharing economy". But these businesses have little to do with sharing. In fact, they are successful precisely because they do not share – they aggregate. It is an aggregating economy. In the process, they collect data for commercial exploitation. None of these companies existed a decade ago because the technological preconditions were not there: ubiquitous smartphones, full GPS and sophisticated payment systems. Now, with blockchains, the technology exists to re-invent these industries again. Imagine instead of the centralised company Airbnb, a distributed application – call it blockchain Airbnb or bAirbnb – essentially a cooperative owned by its members. When a renter wants to find a listing, the bAirbnb software scans the blockchain for all the listings and filters and displays those that meet the required criteria. Because the network creates a record of the transaction on the blockchain, a positive user review improves their respective reputations and establishes their identities – now without an intermediary (Airbnb and other customer platforms, therefore, risk running out of a job…)

- **Rewriting the financial system for speed and inclusion**: Blockchain technology can liberate many financial services from the confines of old institutions, fostering competition and innovation. Even when connected to the old Internet, billions of people are excluded from the economy - for the simple reason that financial institutions don't provide services to them, like banking, because they would be unprofitable and risky customers. With the blockchain, these people can not only become connected but, more important, become included in financial activity, able to purchase, borrow, sell and otherwise have a chance at building a prosperous life.

[28] This is the paradox, as described in Don and Alex Tapscott (2018), page 172: "For the first time in modern history, the global economy is growing but few are benefiting. On the one hand, the digital age is bringing limitless possibilities for innovation and economic progress. Corporate profits are ballooning. On the other hand, prosperity has stalled. Throughout modern history, individuals and families at the 51st percentile were on the rise. Despite depression and upheavals, prosperity for these individuals, and for society as a whole, steadily increased. This is no longer the case. Standards of living are even declining in the developed world. Median wages are stagnating in OECD countries. And, according to the International Labour Organisation, youth unemployment in most of the world is stuck at 20 percent."

- **Protecting economic rights globally**: A majority of the world's property holders can have still their homes or their bit of land seized arbitrarily by corrupt government functionaries, with the flick of a software switch in their centralised government property database. Without proof of property ownership, landowners can't secure a loan, get a building permit, or sell the property and they can be expropriated – all serious impediments to prosperity. Blockchain could change all that. In this new paradigm, universal property rights are protected by technology, not by guns or militias or anonymous men.

- **Ending the remittances rip-off:** The largest flow of funds into the developing world is not foreign aid or direct foreign investment. Rather, it is remittance money repatriated to poor countries from their diasporas living abroad. Abra and other companies are building payment networks using the blockchain. Abra's goal is to turn every one of its users into a teller. The whole process – from the funds leaving one country to their arriving into another, takes an hour rather than a week and costs 2 percent versus 7 percent or higher.

- **Cutting out bureaucracy and corruption in foreign aid**: The blockchain can improve the delivery of foreign aid, by eliminating the middlemen who take the aid before it reaches its destination. Second, as an immutable ledger of the flow of funds, blockchain holds institutions more accountable for their actions.

- **Reconfiguring the corporation as the engine of capitalism**: With the rise of a global peer-to-peer platform for identity, trust, reputation and transactions, it will be possible to re-architect the deep structure of the firm. Enterprises will look more like networks rather than the vertically integrated hierarchies of the industrial age. There will be also the opportunity to distribute (not redistribute) wealth more democratically, with the rise of smart contracts and the creation of distributed autonomous enterprises, where intelligent software takes over the management and organisation of many resources and capabilities (perhaps displacing corporations). Smart contracts enable the creation of networked enterprises based on a new set of business models (e.g. blockchain cooperatives, prosumer platforms).

- **Animating objects and putting them to work**: Blockchain technology will enable things to collaborate, exchange units of value – energy, time and money – and reconfigure supply chains and production processes according to shared information on demand and capacity. As the physical world comes to life, everyone can prosper – from small farmers who need electrical power for their business, to homeowners everywhere who can become part of a distributed blockchain power grid – without the intermediation of large utilities.

- **Cultivating the blockchain entrepreneur**: The Internet was supposed to liberate entrepreneurs, giving them the tools and capabilities of big companies without many of the liabilities. However, in the developing world, the Internet has done little to lower the barriers of would-be entrepreneurs who must suffer deadening government bureaucracies. The Internet has also not liberated the financial tools essential to starting a business. Not everyone is destined to be an entrepreneur, but even for the average person trying to earn a decent wage, the lack of financial tools and the prevalence of government red tape, make doing so challenging. This is a complex

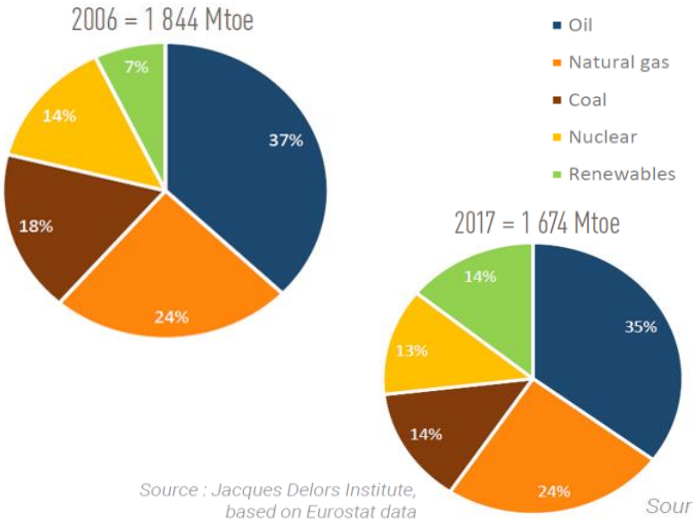
issue, but blockchain can help. For the average person living in the developing world to have a reliable store of value and a way to conduct business beyond his community, all he needs now is an Internet-enabled device. Access to the global economy means greater access to new sources of credit, funding, suppliers, partners and investment opportunities. No talent or resource is too small to monetise on the blockchain.

- **Realising governments by the People for the People**: Blockchain technologies can change what it means to be a citizen and participate in the political process - from voting and accessing social services to solving some of society's hairiest problems and holding elected representatives accountable for the promises that got them elected.

E. SUSTAINABLE ENERGY & ENVIRONMENT

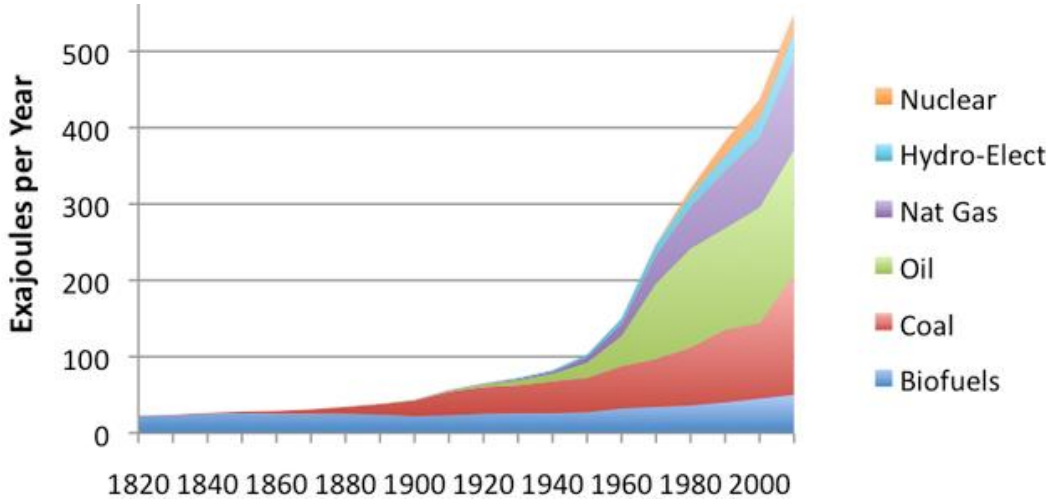
In this study, we decided to start from the softest governance transition, ending now with the hardest one - the energy transition. But we could have decided to proceed the opposite way round, giving priority first to the energy transition, for two good reasons:

The first reason is that, compared to the other transitions – which are only possible developments in which today we see emerging a greater attention to public discourse – the energy transition is the only one that has already started. "Energy transition" is a term coined in 1976 by the US Administration. It aimed at reducing US dependence on Middle-Eastern oil. In Europe today, "energy transition" roughly refers to the transition from an inefficient energy system based on fossil fuels, to an efficient system based on renewables. As can be seen from the following figure, in Europe, primary energy demand declines, fossil fuel consumption decreases whilst renewables are on the rise. But this is slow – far too slow to decisively tackle climate change.



As recently noted by an energy policy scholar[29], putting the issue in a wider historical perspective, we should be reminded that Renewable Energy (RE) was almost the only source of energy used by humans for millennia. In 1781, James Watt introduced a new steam engine. This technology was technically worse than the existing one (the water wheel). But it allowed employers to move factories to cities – where labour was cheaper. Fossil fuels then became predominant in the 20th century.

Contrary to popular belief, historically, new energy sources never replaced old ones. They came on top, as energy additions to global energy production in the 19th & 20th centuries: as a result, humans only use more energy, more coal, more oil, more gas - and also most recently, more nuclear and more new renewable. They didn't really substitute one form of energy for another in the global energy balance, as shown in the following figure:

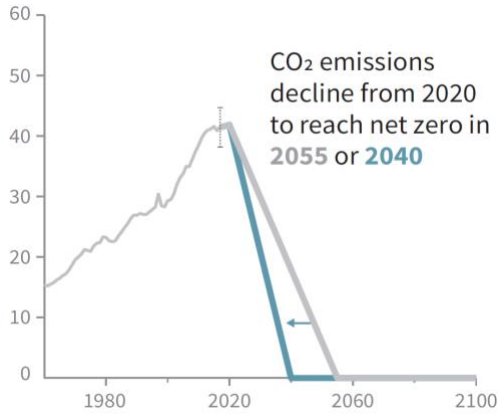


Additions of energy sources over time

Source: Gvail Tverberg, based on Vaclav Smil estimates and BP Statistical Data for 1965 and subsequent

For a genuine energy transition to begin, we should see a decline in the sheer amount of one energy source (e.g. coal, oil, gas) and the rise of another source (e.g. wind, solar). This was not the case in the past, but now is different, and a genuine transition is started, at least in Europe since 2006. Climate change is quickly forcing all of us back to renewable. We all know the story now: as humans burnt fossil fuels, they emitted greenhouse gases in the atmosphere, including CO2. This is apparently leading to global warming and climate change. As it is shown in the figure below, to reduce the rise of global average temperatures, global carbon dioxide emissions need to fall rapidly to net-zero by, roughly, 2040 (to keep the rise below 1,5°C) or 2055 (to keep the rise below 2°C).

[29] Thomas Pellerin-Carlin (2019).

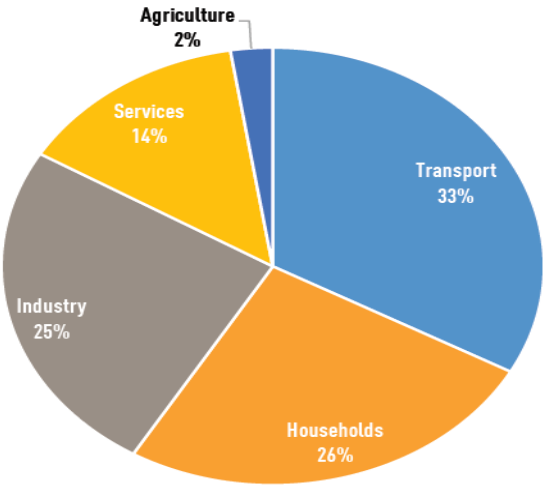


Stylised net global CO2 emissions pathways -BnTCO2/y, IPCC, 1,5°C Report

This raises a fundamental question: how can we decrease greenhouse gas emissions fast?

Well, the second reason why energy transition should take priority is exactly that it addresses this question! Indeed, the energy transition is changing:

- How we move. Transport represents 33% of EU energy consumption, coming mostly from oil.
- How we live. Residential buildings are the locations where 26% of EU energy is consumed (space heating/cooling, water heating, cooking, food cooling, specific use of electricity).
- How we produce. Industry accounts for 25% of energy demand and services accounts for 14%.



Energy consumption, by sector in the EU-28 in 2016.

Source: Jacques Delors Institute, based on Eurostat data.

In other terms, all energy choices are embedded into wider societal choices and a genuine energy transition requires a whole system change, bringing :

- New technologies
- New infrastructure
- New economic incentives
- New social norms
- New routines/habits

Being so comprehensive, the energy transition is also a massive political challenge, as there is the need to articulate all policies in order to foster change in all the relevant elements of the system.

There are many energy transition scenarios around, describing the world promised by a global energy transition to a low carbon economy. One of them is the “Smarter” transformational change scenario, presented in the last Report to the Club of Rome. According to this scenario, a worldwide rapid electrification in power, transport, as well as heating and cooling, is rolled out. This happens by scaling up mainly solar and wind power, distributed energy storage, electric vehicles, heat pumps and the necessary distribution infrastructure, all digitised and integrated in smart grids to replace fossil fuels. Nearly all investments in fossil fuels (a historical average of 1.5% – 2% of GDP per year) are shifted to renewables and power infrastructure during the 2020s. The larger investments are driven both by a combination of demand-side pull as renewables start delivering higher profitability than fossils and a government push through tougher regulations. This results in a doubling of the annual growth rates in wind, solar and other renewables during the 2020s. Most countries also put bans in place on any new fossil-fuel-capacity investments, including announcements, during the 2020s, of upcoming bans on sales of new fossil-fuel cars. Most regions adopt some form of the “Carbon Law”: That means halving carbon emissions every decade, starting in 2020. This rapidly reduces global carbon emissions and, at the same time, eliminates human suffering by spreading affordable electricity to cities, slums and remote areas. In this field, China takes the global lead, with policies for transforming coal-reliance to low-cost distributed renewables and electric mobility that make it profitable for other countries to follow. The direct use of fossil fuels and in buildings is mostly replaced with electrification and smart system redesign. In the “Smarter” scenario, global carbon emissions fall from over 30 GtCO2 in 2015 to 20 in 2030 - and to just 6 in 2050.

This is a consistent picture. However, the key issue remains how to implement the energy transition scenario. In this respect, it is worth considering two possible scenarios of energy transition

- a top-down implementation approach called “network in control” vs a bottom-up approach called “people have the power”[30]:

- **Top-down**: In this approach, energy production remains concentrated with the predominance of large power plants and top-down transmission and distribution of energy (“network in control” scenario). Electricity production is mainly entrusted to offshore wind and a limited number of large PV plants. The distribution system remains primarily hierarchical, with electricity flowing one way from generators to end consumers. Concerning heating, different geographical contexts may enable different uses: district heating mainly fed by biomass and/or using waste industrial heat, or heat pumps and solar thermal plants. Electric vehicles (mainly cars and light duty vehicles) and biofuels (mainly biodiesel) assure sustainability in the transport sector. The first H2 fuel-cell based vehicles appear in the market. Gas power plants remain the primary source for providing backup capacity and grid balancing, but there is growing concern about the difficulty of managing periods of low demand and high generation from wind parks and, at the same time, ensuring the security of supply. To enhance interconnection capacity and ensure the flexibility of the network by integrating variable RES, a reinforced grid infrastructure (including superconducting solutions) is able to manage data exchange and communications across countries, in order to store and trade electricity. ICT devices and sensors are deployed in the grid at low voltage level as well. However, their use is limited to the Distribution Services Operators (Electricity utilities), to allow them to monitor the status of the grid and electricity consumption / injection.

- **Bottom-up**: In this approach, power generation and distribution is decentralised, with a greater “empowerment” of active consumers and prosumers (“people have the power” scenario). The electricity market is well developed with many new actors, including aggregators, renewable energy suppliers, prosumers and ICT developers of energy efficiency solutions. An efficient management of heat and electricity (CHP, micro-CHP and heat pumps with heat storage systems) increases system flexibility, allowing effective demand response schemes. Demand response is then an attractive option for both residential and industrial customers. Consumers and prosumers engage in the grid at low and medium voltage level, providing the required flexibility both on the demand and on the supply side. Heating is mostly provided by large and micro district heating, fed by biomasses (and biogas) and Electric Vehicles (EVs). Biodiesel heavy duty vehicles assure the RES coverage of road transport energy needs. A fully digitalised infrastructure allows for the multidirectional flow of electricity. An extensive ICT layer enables high interoperability of network operators and devices, allowing for complete and real-time interaction amongst all actors in the system. Sensors are widespread and data communication and ownership are well regulated. In addition to the upgraded and smart main grid, micro-grids are deployed in many locations, with back-up connections to the local grid operators. Wherever and whenever this is convenient, the micro-grids are used as an alternative to the electricity supply from the grid operators, in order to provide a reserve balancing capacity. The EVs assure additional storage capacity, to balance the electricity flow at the low voltage level.

[30] They were recently devised in a participatory foresight exercise, organised by the EU project ENABLE-EU.

At a global level, the effect of energy system transformation on the environment has been assessed in the last Report to the Club of Rome, by measuring the achievement of the SDG targets. In the Smarter scenario, the effect of the energy transformation is that it starts to wean the world off fossil fuels and hits the nail on the head as far as the clean energy goal (SDG7) is concerned. Giving most people access to safe and clean energy creates true energy democracy, which improves the development of many other SDGs (1, 2, 6, 8, 9, 11 – 13). It provides better access to lighting, education, clean water and communications. In addition to reducing climate change (13), it also helps fight poverty (1) and generate more jobs (8). It makes innovation and infrastructure (9) more available, reduces food-waste and hunger by access to refrigeration and helps makes city air cleaner (11) by replacing combustion. In summary, cheap and clean electricity changes everything.

4. TOWARDS A TRIS MEDITERRANEAN: BLUE TRANSITION SCENARIO

"Blue" is the colour of the Mediterranean: a closed sea, with very particular geology, climate, water currents and wind patterns favouring exchanges between shore-side and island civilisations over the millennia. Now and forever, the Mediterranean is the only geographical area connecting, in a single unity, three continents and a plurality of regions that are very different in terms of history, culture, economy, society and religions. They also have a long history of trade, migration, inter-cultural breeding and knowledge exchange, as well as of conflicts, fears, slavery and wars. Nowadays there is an increasing challenge from climate change, as well as demographic pressures from Sub-Saharan Africa, growing geo-political tensions and the energy transition away from fossil fuels, to name a few.

You would expect that increasing common challenges and pressures would call for a greater association, cooperation and coordination, but the reality is different. Today, the Mediterranean is increasingly seen as a *limes* – a frontier dividing the populations living on the two shores – not the core of a region sharing a common project. Being divided by a *limes* makes both Southern European, North African and Eastern Mediterranean countries more peripheral than central, as they could be in an enhanced cooperation scenario, at the centre of the wider Europe-Middle East-Africa (EMEA) region. Shifting from separation/fragmentation to integration, from having the sea as a dangerous space to cross to one that encourages exchange. A true paradigm shift in the way current policies are handled in the North, South and Eastern regions of the Mediterranean – this is the game and policy mind-set change needed to enable a plurality of identities to live and prosper together around the same sea.[31]

The Blue Transition Scenario (BTS) looks, therefore, to the future of the Mediterranean and it is based on three pillars:

- **Promoting a dialogue across the different civilisations** in the Mediterranean, against the "clash" rhetoric that apparently dominates nowadays. Any dialogue needs to recognise that all different participants have the same dignity. When different identities meet – people from the North and

[31] Something similar to what happened at the turn of the 19th Century between Britain and the United States, as their relation turned almost overnight from the dividing heritage of the colonial past to a new attitude for developing free trade and cultural exchanges. Between Britons and Americans it was easy to rediscover common roots and aspirations, but the same deep roots – although more complex to rediscover under the strata of historical conflicts – are common to the people living in the Mediterranean, whilst common future aspirations can be cultivated too.

the South of the Mediterranean in this case – feeling respected in what you consider to be your identity, leads to opening up to others, rather than to defensive withdrawal amongst one's own kind. However, every individual – anywhere in the world – takes on numerous identities, to a variable extent: *cultural identities*, these are already multiple; *civic identity*, or belonging to a nation; finally, it is possible to build a new *identity in adherence to a common project*, to a set of shared values (e.g. the European Union project in the North of the Mediterranean). Developing a dialogue across different civilisations settled around the Mediterranean, promoting integration and co-creating new regional identities is an overarching aim at the core of the Blue Transition Vision.

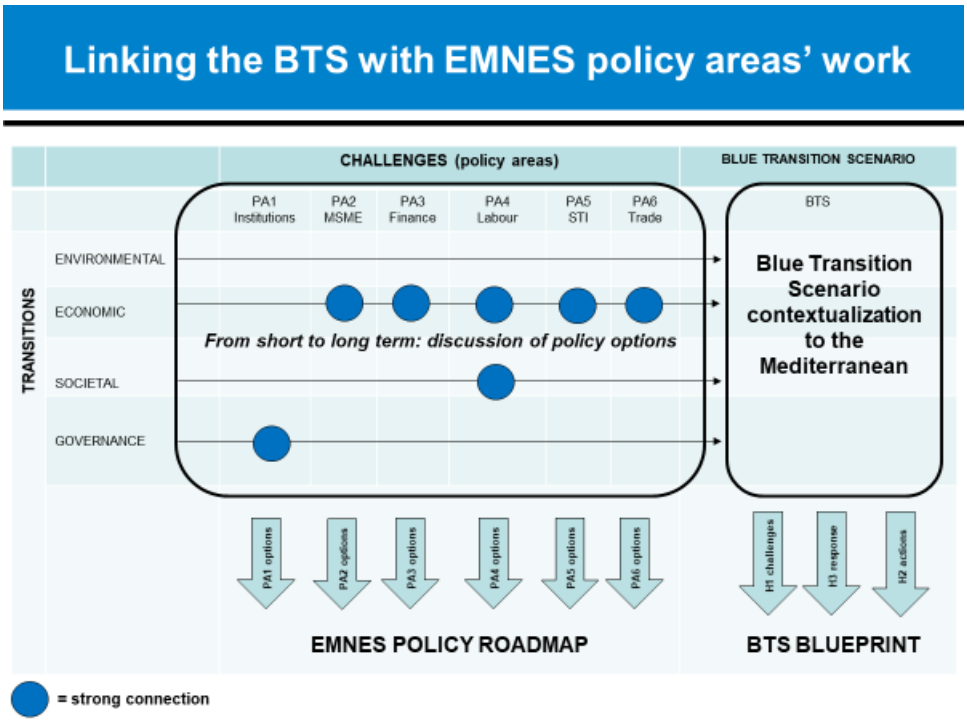
- **Adherence to a common project – a Mediterranean partnership**, i.e. a multi-dimensional, flexible and differentiated integration project – to address the economic, social and environmental challenges in the Mediterranean. The common project shall be coherent with the principle that all human beings can live in dignity, whatever their sex, religion or social condition – we can name this the **inclusive society principle** – and shall pursue in the Mediterranean (and in relation to the neighbouring regions) the UN agenda 2030 for sustainable transformation (Sustainable Developments Goals – SDGs).
- **Building regional strategies and shared action plans for inclusive and sustainable development**, using an integrated "Three Horizons" approach to frame them. This is used to assess the long-term trends and challenges in the Mediterranean (Horizon 1), to develop a desirable response scenario (Horizon 3), to define a roadmap and mid-term action plan (Horizon 2), identifying the policy instruments and actions necessary either to cope with the Horizon 1 challenges and to shift towards the Horizon 3 desired scenario.

More than being a single narrative on the future of the Mediterranean, the Blue Transition Scenario is a process – potentially never-ending – to develop narratives of transparent, responsible, inclusive and sustainable development of the Mediterranean. The narratives all have in common the mission of raising an "eco-system awareness" of the challenges and opportunities ahead for the whole Mediterranean – North, South and East – to move away from the current unsustainable developments, shaping instead a new pathway of development based on the three pillars: dialogue, a common purpose and project, regional strategies and roadmaps for a TRIS development of the whole region.

The process started with the initial idea in the MEDPRO project and then continued with a second step in EMNES, culminating in the BTS Workshop held at EMUNI, in Piran, on 24-26 October 2018. The workshop was organised with two objectives in mind. First, to discuss the interim versions of the papers drafted by the EMNES partners for the six policy areas: Institutions, Medium-Small Enterprises, Finance, Labour, Science, Technology and Innovation, Trade. Second, to discuss a

comprehensive policy road map, linking the work done in each policy area to the Blue Transition Scenario (BTS).

The framework to link the single policy area papers and the collaborative elaboration of the BTS is illustrated in the figure below:



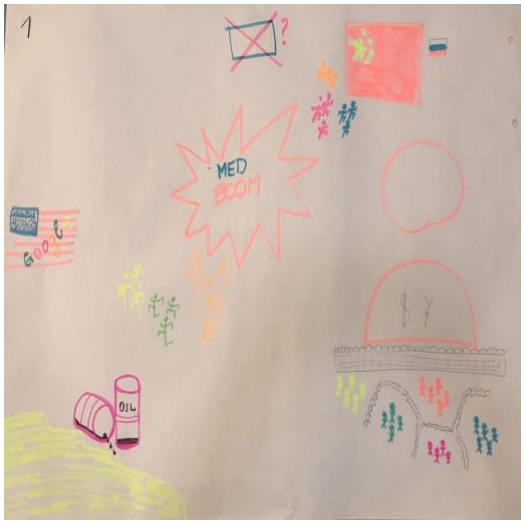
Source: Authors

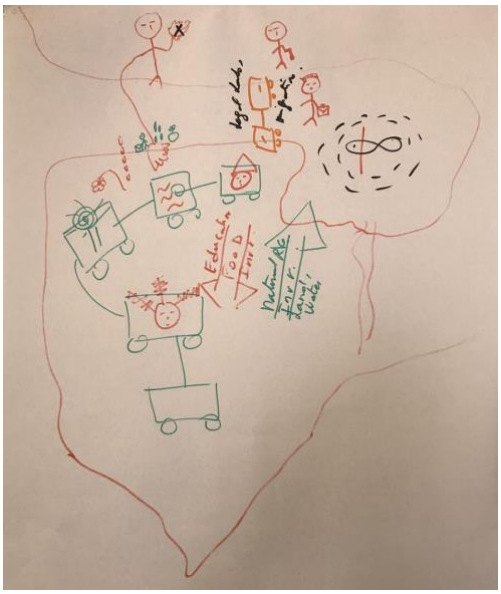
The outcomes of the exercise include a blueprint of the BTS scenario and policy roadmaps to implement aspects of the scenario in each area. The aspects addressed in the policy areas mostly cover the economic dimension and, partially, the governance and societal dimensions of the scenario. To cover the energy and environmental dimension was beyond the scope of the EMNES (first phase of research).

The foresight exercise was initially structured according to the Three Horizons framework, asking the groups in charge of the six policy areas to look forward and develop their own visions of the "business-as-usual" (Horizon 1) and transformative (Horizon 3) scenarios, and then to identify mid-term actions, innovations, policy priorities (Horizon 2) to steer and shape the future in their own policy areas. This was actually done before the workshop in Piran, starting with engaging the partners in charge of the different policy areas in the previous EMNES meetings held in Amman (May 2018) and in Brussels (July 2018), where they were trained and guided to apply the Three Horizons methodology in their own policy area context.

In the Piran workshop, participants were again introduced to the purpose of the foresight exercise. The idea was to sketch together the BTS from the bottom, with ideas and insights coming from the network, rather than imposing a vision from the top. The Three Horizons approach was reiterated to all, for the purpose of developing a comprehensive vision and Blue Transition Scenario roadmap, combining the perspectives of the different policy areas in one framework: The first horizon is for telling what happens in 2050 if the current status quo will continue, the second horizon is the desirable future (in 2050). The road map is set as a strategic agenda in the second horizon (until 2030), thinking about what is needed for the transition from the first to the third horizon.

Participants then divided into five groups, with a balance of junior and senior, female and male researchers from the different countries. Each group convened twice. In the first session, the researchers were asked to draw the present socio-economic situation of the Euro-Mediterranean region. This would be taken implicitly as being a representation of what may happen in the Horizon 1 scenario, if nothing changes. In the second session, they were asked to draw the region's future socio-economic situation. Some groups were asked to imagine what the region would look like in 2050 if a business-as-usual scenario unfolded, others were asked what the region would look like if the policies recommended in the various policy areas were implemented. Every group presented their drawings and explained their visions in a plenary session. These are presented below:

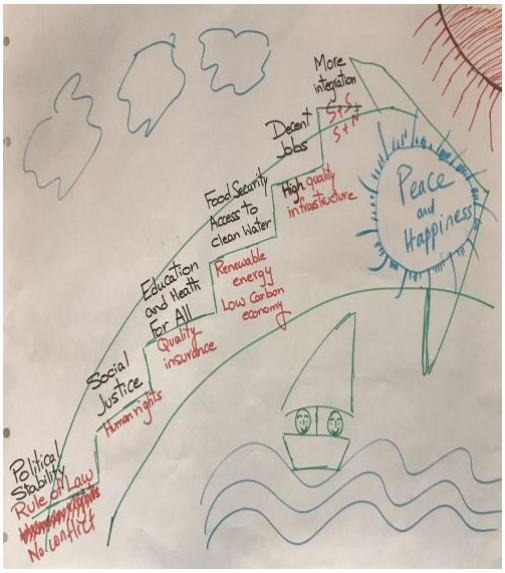
The Mediterranean ***is a battleground!***  	**Group 1** envisioned the Mediterranean region in 2050, as a battle ground in a new Cold War between China and the US which, in turn, was taken over by tech giants such as Google, Facebook and Amazon who greatly benefitted from an increasingly unequal distribution of wealth in the world economy, now for the most part digital. The EU, having failed to construct a common foreign policy and to promote its model of worldwide integration, is grappling with its own disintegration. The unequal wealth distribution will also have important negative consequences within countries, regardless of which shore of the Mediterranean they are located, North or South. Wealth will be concentrated in the hands of a few, whilst the majority will face increasing competition for increasingly scarce resources, exacerbating social and political tensions in society. As regards to energy resources, the world went away from fossil fuels without having succesfully transitioned to renewable energies and, thus, failed to reverse the trend of climate change, leading to problems of desertification and water scarcity in the Mediterranean.
The South of the Mediterranean ***is the North of Africa!***	**Group 2** envisioned a business-as-usual scenario at the Horizon 2050, in which Africa will only develop a weak relationship with the EU, which will have failed to find a positive and unitary policy to migration challenges, instead increasing protectionism (“Fortress Europe”). North-South Mediterranean exchanges will be limited to high-level education and research, with limited flows of students and researchers from the South to North and back, acquiring new competences and skills. This is illustrated in the upper part of the drawing. On the positive side, this scenario will see a growing importance of South-South cooperation for economic development, with human resources and trade development between North Africa and Sub- Saharan Africa. The trains connecting the two areas in the drawing



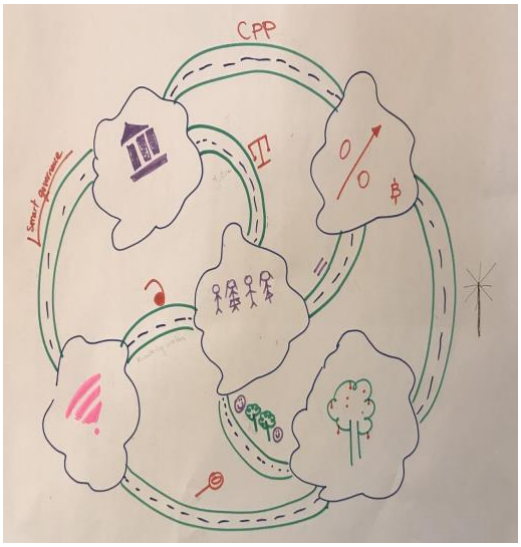
show this. The trains are metaphors – there is no need or desire to build heavy rail infrastructure crossing the Sahara, even if it's possible – for connections that will be mostly intangible flows of knowledge (education, online services, financial). Important physical infrastructure will instead be realised in the energy sector (solar in the Sahara and hydropower from Sub-Saharan Africa). In this vision, investments from Asia (especially West Asia and China) will play a much greater role than those from companies and governments in Europe.

The Mediterranean

as a space of friendship!



Group 3 graphically represented the steps needed for the Mediterranean region in 2050 to be a haven of peace and happiness. The policies foreseen to be implemented are mentioned in red, their expected outcomes in black. Policies aimed at enhancing the rule of law and tackling conflicts at their roots will bring political stability. Those aimed at defending human rights will lead to social justice. Improvements in infrastructure will ensure access to education and health for all. Quality insurance mechanisms will ensure that every worker has a decent job. Last but not the least, deeper and better integration will enhance South – South and North – South relationships between countries. The boat in the middle of the sea, with two smiling figures on board, represents the future of the Mediterranean Sea, which will become a space of friendship, co-owned and co-managed.

The Mediterranean thriving in a connected, borderless world! 	**Group 4** envisioned the Mediterranean region in 2050 as an integral part of an interconnected world with no borders. The region is characterised by gender equality at all levels, whereas a better connection with nature will be central to enhanced personal well-being and quality of life. Technology will create new employment opportunities for a more knowledgeable workforce. It will also serve the purpose of making the green economy more efficient, whilst supporting green innovations that will, in turn, drive the economic transition. The adoption of smart governance tools will ensure that justice will prevail, whilst high levels of competition will erase market inefficiencies, allowing sustainable growth coupled with a low level of income inequality. In this interconnected vision of the future, the focus of policy should be on the weaker links.
A Mediterranean of open doors and bridges! 	**Group 5** envisioned the North and the South of the Mediterranean region in 2050 as two houses linked by a number of bridges, which represent areas of collaboration. In some of these areas, collaboration will be smooth, in others more difficult, but people will always collaborate with the well-being of the region as a whole in mind. The two houses are also linked to other houses around the world, although not with the same number and type of bridges. The houses are fuelled with renewable energy and are endowed with green technologies. Each window represents a policy area that is crucial for the overall well-being. There is gender equality; politics of consent and love, rather than politics of fear; reduced income inequality; common goals, common markets and common currency; sustainable economic growth; and knowledge-based economy. The machines on the roofs represent common governance institutions (Mediterranean Bank, Mediterranean Commission, etc.). Open doors stand for open door policies.

These are visions expressing the feelings and values of the participants. They include important insights for orienting the Blue Transition Scenario towards a transparent, responsible, inclusive and sustainable Mediterranean region in the world. In a nutshell, these visions make clear that in the future:

- Things cannot continue as they are (Group 1);
- The Southern Mediterranean may become a central region, connecting Europe with the people, talents and new market opportunities in South-Sahara Africa – no more a periphery of Europe (Group 2);
- To transform the Mediterranean into a space of friendship is possible, through co-owned and co-managed political stability and the rule of law enforcing policies, social justice agendas, education and health provided for all, food security and water access policies, decent job policies and more regional integration (Group 3);
- The Mediterranean Sea always was a vehicle for connections and exchanges. Green technology and truly smart governance can again make the region the centre of a new model of sustainable growth for the whole planet (Group 4);
- Bridges, not walls; open doors, not closed doors are needed to let the Mediterranean region thrive (Group 5).

5. BLUE TRANSITION POLICY ROADMAP

As mentioned, the second part of the collaborative exercise with the EMNES partners was to discuss and draft a comprehensive policy roadmap, linking the work done in each policy area to the Blue Transition Scenario (BTS).

The outcome has taken the form of a table, presented in the following pages, listing for each policy area the main challenges identified in the policy papers[32] and specific policy recommendations. Taken together, they represent an agenda for moving towards a more transparent, responsible, inclusive and sustainable (TRIS) Mediterranean in the years and decades to come.

The policy recommendations are offered here to stimulate future discussion and adoption of "Blue Transition" agendas and roadmaps – with a timeline for their implementation - with decision-makers and stakeholders in the region.

[32] EMNES policy papers are published on https://emnes.org/publications/?fwp_publications_categories=3-policy-papers

Elements for a "Blue Transition" Policy Roadmap

Policy Area	Challenges	Policy recommendations for moving towards a more transparent, responsible, inclusive and sustainable development in the Mediterranean
INSTITUTIONS	Dysfunctional institutions (uncertainty, informality and corruption) are pervasive and this negatively affects economic performance, thus leading to lower net welfare for society. Foreign aid is used for undertaking institutional reforms that have had no lasting effect or, worse, had led to a deterioration of institutional quality in recipient countries. Strong power asymmetries affect the success of any attempt at institutional reform. The three levers advocated by the World Bank to cope with these asymmetries – elite bargains, citizen engagement and international interventions – are often not enough to overcome institutional failure.	**Comprehensive strategies and leadership**. Because of institutional levels being embedded in one another, it is not probable that interventions at the lowest levels would succeed without prior changes at the higher levels. **Two strategies are recommended:** • Identify and transplant "pockets of institutional efficiency" that may be found at the lower levels. • Focus on reforming those bureaucratic units that have higher chances of being reformed. The crucial factor here is leadership. Identifying such leaders, dialoguing with them and tailoring the intervention based on their actual needs, not the presumed needs of a policy advisor living elsewhere, should be a manageable task. **More research is needed on power asymmetries** and how they could be changed. Getting out from under bad institutions is likely to be the most difficult part of trying to develop new ones. Without transforming the constitutional framework and the balance of social forces underpinning it, it is unlikely that piecemeal institutional reforms would contribute much to

		the performance of the overall institutional structure in a sustainable manner. How to achieve such engineered cultural and political transformations is a question that should be placed at the centre of the research agenda of the international development policy community.
Science Technology and Innovation (STI)	Cooperation in the field of STI (between EU and SEMCs) has so far failed to have a real impact on the economic development of the Mediterranean Partner Countries (MPCs). This is not only because MPCs occupy a marginal place in terms of financial allocation, but mostly because making the shift from doing research into "utilising" knowledge, in a way that could transform the economies of the MPCs and enhance their long-term stability, has been elusive. The main obstacle to a more effective EU-SMCs cooperation is the asymmetries which exists between STI systems in the member states of the EU and the SEMCs: • the EU and the SEMCs have largely "non-compatible" STI national systems, leading to the outcome that most researchers from the SEMCs find it difficult to handle the administrative aspects of participating in EU funded projects (institutional asymmetry).	**Overhaul the STI ecosystem to create an enabling environment** that can establish and reinforce linkages between the research and the business sectors. This eco-system should encourage the private sector, providing incentives to entrepreneurs with a view to investing in research and development. To this end, the SEMCs should follow suit with the EU member states in adopting *Smart Specialisation Strategies* (S3). This is a location-based and context-based approach, which builds on the assets, resources and peculiarities of the different regions and on their specific socio-economic challenges, in order to identify unique opportunities for development and growth. SEMCs should also embrace a broader view of innovation, supporting technological, as well as practice-based and social innovation. Encourage the development of frugal and inclusive innovation, especially appropriate and locally-based technologies to address pressing societal challenges and capitalise on opportunities offered by these technologies in both rural and urban areas. **Develop and implement a robust industrial policy** focussing on carefully selected strategic sectors, providing comparative and competitive advantages for the economy, with credible sanctions against non-performing private sector actors. This adopted policy would serve to attract R&D functions of multinationals through tax and other incentives. The focus should be first placed on developing the capacity for learning, and then later, the capacity for innovation. Modify the free trade agreements with the SEMCs to allow for some protection for strategic industrial sectors until they could be integrated into global value chains on better terms.

	• Almost all EU budgets are decided upon within the EU's structure and follow its administrative and financial rules. Everything is a 'project', leaving little space for synergies and strategies and not much room for joint decision-making (financial and decision-making asymmetry). Technology parks in the SEMCs, about 75% of them created after 2005, are suffering from inadequate interest from researchers and firms. The incubators are either traditional university incubators with little activity, or small businesses providing mainly administrative services. And the technology transfer units, 80% of them created after 2008, are poorly staffed and have little capacity to provide an adequate service. Cumbersome regulations, especially with regards to financial compensation for researchers, do not provide a sufficient incentive for researchers to explore opportunities for cooperation with industry. The number of publications in scientific journals remains the main indicator for evaluating researchers' productivity. On the demand side, most industrial entrepreneurs do not have long-term strategic visions to make best use of available or to invest in	**Improve educational systems on all levels**, encouraging and fostering STEM (Science Technology Engineering and Mathematics) education and linking education to the job market. Special attention should also be dedicated to inter-disciplinary education and, in particular, to competences promising future employability, i.e. enhancing creativity and critical thinking skills. Life-long learning and on-the-job training should be nurtured. To this end, a concrete option would be to create a "**Transdisciplinary Learning Hub for the Future of the Mediterranean**". Inspired by the Blue Transition vision, this is not a new infrastructure, but rather a network of labs for co-creating knowledge and prototyping solutions for the implementation of Sustainable Development Goals in the Mediterranean. It could be regarded as a hub, linking existing teams of researchers and other stakeholders and providing training on-line and off-line (e.g. summer schools) for a range of methods to be applied in local labs. The labs could range from fab-lab (e.g. 3D printing labs) to civic policy labs to devise and prototype solutions for complex challenges in the cities. **The EU needs to encourage regional cooperation in the Mediterranean**. In many sectors, for example, energy, environment, food and water, there is a need for regional action and not bilateral fragmented efforts. Think of pollution in the Mediterranean. Energy security requires the integration of the Mediterranean into a common grid. Regional cooperation should enhance the existing partnerships, including in particular PRIMA (Partnership for Research and Innovation in the Mediterranean Area). by: • Expanding the scheme to a PRIMA-URBAN scope, focussing on urban planning (transport, energy, waste, etc.), urban governance (urban policy coordination and coherence) and urban value chains (infrastructure, standards and skills to support SMEs development in the urban environments).

	new, locally produced technologies. The lack of entrepreneurial culture to invest in innovation, together with the risks involved in operating investment climates that are far from being optimal, lead them to choose import ready-made technologies rather than building their own research and development capacity. Moreover, most industries in the SMCs are small or medium-sized and they lack the financial and human resources to start meaningful and long-term cooperation with academia.	• Scaling up its implementation to include not only collaborative research funding (R&I actions funded by H2020), but also leverage funding of investments to implement sustainable solutions (as again is done in Europe, for example, with the Covenant of Mayor Investment Forum). The aim is to deliver impacts in terms of knowledge-based job creation, strengthening cooperation and business development across Mediterranean cities and the implementation of SDGs in the cities.
LABOUR	Mediterranean countries face persistently high unemployment rates, averaging about 12% in both North (Portugal, Spain, Malta, Italy, Slovenia, Croatia, Greece, Cyprus) and South Mediterranean countries (Morocco, Algeria, Tunisia, Egypt, Jordan, Lebanon) in 2017. The unemployment phenomenon primarily affects youths, for which unemployment rates are twice as high as the total in Egypt and close to 40% in Jordan, as of 2017. In SMCs, the underlying demographic trend is one important factor behind chronic and persistent unemployment. Population projections until 2050 point to a substantial increase in population and, particularly, of the share of youths amongst the working age population. In principle, population growth, associated with an expanding working age population, should be beneficial to long-term economic growth. Most growth models call it the "demographic	**Labour market data availability** in the region is a major obstacle to identifying labour market problems and formulating appropriate policy measures, as well as monitoring their implementation. In SMCs, information systems can be set from scratch at the national level and harmonised from the very beginning, to form an intra-regional information system for labour matching. Such a system could enable information exchange on best practices and labour market opportunities within the region. **Labour migration within the region and between the region and the EU** can alleviate the unemployment problem in SMCs and lead to better allocation of human capital. However, information on labour market opportunities in other countries is not always easily available to potential migrants and vice versa for employers. Furthermore, given existing limited legal pathways for international labour migration, many would-be economic migrants from SMCs resort to family or even illegal entry channels. As a result, they cannot fully benefit from economic opportunities in the destination countries. Legal channels for labour migration in the Mediterranean region and between the region and the EU should be established in a

	dividend". However, high youth unemployment can transform the dividend into a "penalty", if unemployed young adults are unable to participate in the productive system and, instead, become a source of political instability. Both growing population and high rates of unemployment usually work as push factors for migration. The South-Med region does not seem to be an exception. According to Eurostat data (see Figure 3 LHS), in the last 8 years, every year almost 400,000 people moved from the SMCs to the EU, using legal pathways. However, according to the data (see Figure 4, RHS), at least formally, the largest part of those flows – about 50% - are driven by family reunification issues and a much smaller part – about 15% - by work reasons. SMCs have achieved significant progress in expanding access to education, as attested by increasing enrolment rates at the primary, secondary and tertiary levels, as well as considerably higher shares of public spending allocated to education. However, these positive developments in the "quantity" of education were not accompanied by any substantial improvement in terms of employment rates. Oddly enough, in the extreme case of Tunisia, the unemployment rate is higher amongst those with tertiary educational attainments. This can be symptomatic of three problems:	collaborative effort by countries concerned, using a sustainable migration policy framework that benefits both origins and destinations. Related policy tools would comprise a joint information system on emigration candidates and employment opportunities, as well as the implementation of migrant support measures from an employment and skills perspective. These could include measures to reduce the brain drain, which can happen when educated individuals migrate and end up in lower-end jobs with lower salaries compared to their native-born counterparts. For example, if the reason for brain drain is due to problems in recognising diplomas, origin countries could take steps to negotiate with the destination countries to find solutions for this friction. Over-educated and low-paid, skilled migrants are not a desired outcome for the sending country. Moreover, the connections with diaspora should also be strengthened to develop further economic linkages with origin countries. **Re-thinking education systems** in the direction of not only aiming at a growing number of pupils or tertiary graduates, but also delivering good employees for companies and potentially new entrepreneurs, is of crucial importance in SMCs. In some countries this will require a cultural and mind set transformation. The strong segmentation of labour markets, whereby the public sector tends to absorb most opportunities and most talented workers, is deemed to have kept the economy underdeveloped for a long time. Therefore, there is the need to actively foster entrepreneurship, i.e. private sector development, through the initiative of individuals and address the issue of how to make the private sector at least equally attractive as the public sector for workers. In this respect, social security coverage is one of the main sources of division. Incentivising firms in the private sector to affiliate workers into social security would be an important step forward.

	• Labour demand problem: the economy is unable to generate jobs for highly educated workers; • The quality of the education: competences and skills associated with the diplomas do not match the needs of the demand. • Horizontal mismatch: the field of education chosen does not match the demand for labour, e.g. social sciences vs. STEM The SMCs are usually characterised by low level of employment and high level of informality. Low rate of employment reflects on the one hand low labour market participation, especially of women[33], and on the other hand a large informal economy. According to ILO, informal sector accounts for 40%of non-agricultural jobs in North Africa. Only 30% of workers in Morocco, 46%in Tunisia and 50% in Egypt have an employment contract. Informal employment is often characterised by poor working conditions, low remuneration and insufficient social protection. Another feature of SMCs is the large size of the public sector. According to the World Bank (2016), South Med countries have the highest ratio of public employment wage bills to GDP of all regions and one of the highest ratios of wage bill spending to total government revenue and spending. Productivity in the public sector	**Changes in the approach to social security** could also have an important impact on the informal sector. Whilst it is unrealistic to believe that very large swathes of the economy could become formal from one day to another, incentives to become formal can be designed. These could include the offer of insurance, a decrease in the transaction costs (mostly administrative) increasing transparency, for instance through making digital transactions more accessible and having mandatory licensing in professional sectors.

[33] Policy papers published https://emnes.org/publications/?fwp_publications_categories=3-policy-papers

	is traditionally very low (admittedly difficult to measure in certain areas) and this is even more likely to be the case when the public sector becomes employer of last resort and a social protection mechanism. In these situations, economic growth is deemed to remain low and, in the long terms, jobs cannot be sustained. In addition, a large public sector usually crowds out the private sector, which remains highly underdeveloped, both in terms of growth opportunities and capacity to attract more educated and skilled workers.	
FINANCE	SEMCs are substantially less developed than the EU-MED countries, with financial intermediation dominated by the banking sector and an non-existent role of the financial markets. This diagnosis hides large disparities in the level of financial development between SEMCs (with Turkey and Israel standing out and Syria, Libya and Algeria showing abysmal levels of financial development). The dominant banking intermediation allocates large shares of funding on government and liquid assets, leading to a low access of households and micro-, small- and medium-sized enterprises (MSMEs) to financial services. One challenge is the high cost of lending. This can be explained by high bank funding costs due primarily to the countries' risk factors. Additionally, the high level of non-performing loans due to MSME	**To reduce the costs of lending** by managing the financial risk of the country and reducing the current high levels of non-performing loans. There is an urgent need to reach a sustainable government debt and ensure that monetary policy achieves price and financial stability, to allow lower interest rates on loans. Moreover, regulators and liquidity providers should address the high levels of non-performing loans (NPLs) accumulated in bank balance sheets. An initial step is to define non-performing loans at the national level and to monitor their developments. Then, to create bad banks or asset management companies to resolve the legacy asset issues in order to enhance the asset quality of banks which, in turn, will lead to higher levels of credit supply. Additionally, insolvency legislation and judicial systems need to be improved reducing the costs of lending. **To widen the access to affordable financial services for MSMEs and households** by creating or developing existing credit registries and promoting the role of guarantee schemes for MSMEs. Credit registries (for households and MSMEs) reduce the informational asymmetry and ensure higher transparency. Guarantee schemes, when well designed and functioning,

	failures and lack of accountability and financial transparency, add further burden to bank balance sheets. Affordable access to finance is a major obstacle faced by MSMEs and households in the SEMCs. Banks generally require high collateral (real estate assets and cash), because of poor asset registrations and weak judicial systems. Turning to households, financial inclusion is fundamental for enhancing the quality of life. Financial inclusion for households involves having access to affordable basic financial services, such as a bank account to make transfers and to save money, but also basic insurance products (health insurance, disability insurance, life insurance, etc.).	allow MSMEs to borrow at lower costs to grow and develop their economic activity, partly solving the issue of costly access to finance. The guarantee fees must be low enough to ensure the participation of lenders and borrowers, but high enough to cover the administrative costs. Regarding donors, the private and public sector are beneficial for the guarantee schemes and to ensure the sustainability of guarantee funds. **The use of information technology** has shown to be a driver for financial inclusion by providing alternatives for funding and saving. The experience of mobile banking in Egypt has proven its reliability for accessing a bank account and a lot needs to be done to further develop these digital financial services that can accelerate financial inclusion of both households and MSMEs. Moreover, post offices, as well as ATMs, can play an important role in financial inclusion; they are present across the country and can be developed and trained up at low costs to provide basic financial services. Also, policy makers should require banks and insurers to provide basic (digital) financial services accounts at affordable prices, whilst keeping a close eye on monitoring the consequences of this on overall financial stability. Finally, financial literacy initiatives, engaging all financial development actors, are required. They should be implemented in schools, universities, in urban and rural areas and promoted via media campaigns. Also, e-learning platforms should be developed for basic use of financial services. **To enhance financial system diversity** for efficient lending, thus fostering investment and growth. At a system level, this includes creating or developing existing financial markets: debt markets, as well as financial intermediation institutions. At an institutional level, diversity is evident in the presence of alternative regimes alongside the existing commercial and state-owned banks, such as credit unions, mutual insurers, microfinance institutions, Islamic finance

		etc. Regulators should encourage diversity and institutional diversity at a system level, by developing legislative regimes for alternative financial sectors and providers. Diversity can also occur by enabling different types of funding of investments, such as private equity, venture capital, business angels or crowdfunding. Also, new technologies (e.g. blockchain, AI, IoT, data analytics) provide a possibility to accelerate financial development, as they contribute to reducing costs, improving efficiency, safety and the user-friendliness of financial services and financial intermediation. These new technologies are likely to be adopted, because of the self-interest of financial service providers. In parallel, legislators and supervisors in the SEMCs can also promote the adoption of these new technologies by making their legislation technology neutral and providing opportunities for financial institutions to test new technologies, such as adopting regulatory sandboxes (these allow the testing of new business models that are not protected by existing regulation nor are supervised by regulatory institutions, whilst keeping the client protected). **Improve the impact of EU funding.** The EU employs significant financial instruments in the SEMCs, with several EU institutions and other European bilateral investment institutions, along with different actors at regional and international levels. However, a clear assessment of their impact is needed and synergy of these different instruments can be beneficial and increase their impact. Amongst the key instruments is the External Investment Plan (EIP), a new initiative by the EU Commission, designed to attract more investments, in particular from businesses and private sectors in the EU neighbourhood and Africa. It aims to create jobs, support entrepreneurs and enable growth. Its main component remains on the financing side, by creating the European fund for Sustainable Development (EFSD) providing guarantees and blending instruments. The guarantee scheme enables mobilising private investment, especially for MSMEs and projects in rural areas. The EIP also engages in technical assistance for SMEs to

		develop their projects and governments to improve regulations, as well as dialogue with different stakeholders for a better investment environment. Such initiatives are very important to promote sustainable financial development, but a lot still needs to be done. **On the three pillars of funding, assistance and expertise, the EU can provide further instruments.** On funding, develop the EU-MED guarantee fund covering up to 80% of losses of defaulted loans (with no cap at portfolio level) and fund financial literacy initiatives. On assistance and sharing expertise, the EU should step up its efforts to assist the development of a long term action plan for financial market integration, especially EU-MED banking/financial integration and to develop alternative financial instruments that already exist in the EU and have been adapted for the neighbourhood countries.
TRADE	Non Tariff Measures (NTMs) tend to mitigate the effects of easier market access and are considered to be the most serious obstacles to the movement of goods and services. So, they are mostly perceived in the global arena as having protectionist intentions. Yet, with the evolution of the international environment, they are currently serving the precautionary motives of the SDGs, being designed to protect the environment and human, animal and plant life. If implemented and applied in a non-discriminatory way to domestic and foreign firms, they directly regulate issues related to SDGs: food, nutrition and health, sustainable energy, sustainable production and consumption, climate change and the environment. However, whilst serving the SDGs, NTMs also restrict trade, causing reduced income in exporting countries and higher consumer prices in importing countries. And although exporting and importing countries may share the same	**Harmonising the rules of origin and standards and norms** are vital for reducing the number of TBTs and SPSs imposed by different economies. One of the effective frameworks to facilitate the elimination of non-tariff measures is the Agreement for Conformity Assessment and Acceptance (ACAA). The latter is a comprehensive effort of harmonisation, undertaken with technical assistance from the EU in a number of sectors wherebu products coming from the Southern shore of the Mediterranean and that are covered by the agreement will enjoy full access to the EU market. **Increasing the number of accredited and recognised laboratories or certification bodies** is important to facilitate the access of products in foreign markets. **Providing technical assistance from both the government and international donors to different firms** is vital for improving the quality of exported products and producing goods that are up to international standards. One of the channels that can help improve the adoption of

	objectives, they often apply different standards or methods to ensure compliance with regulatory measures. These differences may represent additional costs and various challenges for firms seeking to access more than one market. Standards and conformity assessment procedures represent a serious obstacle amongst Arab countries (especially sanitary and phyto-sanitary measures, as well as technical barriers). Furthermore, the lack of infrastructure for facilitating trade still hinders trade. At the destination level, despite an increase in exports between the two shores of the Mediterranean, trade remains low and in traditional sectors. This can be chiefly explained by two main reasons: • First, as it was highlighted in the literature, the European Association agreements are shallow and do not address non-tariff measures, services, or investment. • Second, non-tariff measures imposed by governments are still a serious impediment to intra-regional trade. Hence, the latter still exists and competition remains distorted.	harmonised standards and norms is the insertion of small and medium firms in regional value chains (between countries from the North and the South of the Mediterranean). This will require a more skilled labour force, endowed with higher qualifications (especially for blue collar workers that are abundant in the MENA countries and that are used intensively in the production of several manufactured goods). **Improve the availability of comprehensive trade information** on duty rates, rules of origin, preferences, applicable fees and other NTMs, as well as charges on the customs website, with the aim of reducing the time required for customs clearance and improving the impartiality and transparency of customs procedures. **To have a deep integration between the two shores of the Mediterranean, the EU must also boost South-South integration** (such as GAFTA and Agadir agreement). Indeed, South-South free trade agreements are shallower than North-South ones and they cover services and non-tariff measures in a less comprehensive way, leading to a sub-optimal trade performance. Therefore, to promote a deep integration between the two shores, more integration is required amongst countries in the South. This will bring more exports and, hence, higher growth - especially for developing economies that have more room for growth thanks to trade, as compared to more developed or mature economies. Four main factors need to be present in order to achieve this. • First, a clear political will on the part of national governments and the EU to deepen their agreements. This is particularly important because both the required funds and technical assistance might be present but without political support, nothing can be implemented. • Second, funds must be made available for these measures (laboratories, compliance, etc.).

		• Third, the legal framework also has to be adapted to these new changes. • Fourth, an effective communication strategy must be put in place, contributing to effective information for the private sector through a constantly updated website.
MSME & Global Value Chains (GVG)	The share of firms that belong to a GVC is extremely low for most of the SEMC countries and especially when the firm exports, imports, has foreign capital and foreign certification (on average 1.5%). The problem is more pronounced for small and medium-sized firms whose share never exceeds 0.4%, based on the strictest definition. So, MSMEs, having the lion's share of the total number of enterprises in the region, are still excluded from global markets and they remain weak, with low value-added and unsustainable activities. This is why their integration in GVCs can be perceived as a tool favouring their export growth whilst building on their comparative advantage. There are several reasons explaining the poor inclusion of MSMEs in GVCs: • The first reason is inadequate skills endowments (blue collar workers), which is particularly critical when a firm adopts a new logistics method, a new production method, a new product and a new organisational structure. • The second reason is an inefficient business environment that hinders the expansion of MSMEs. The most severe obstacle in the MENA region, as reported by firms, are chiefly political instability, electricity, access to finance, corruption, tax rates and practices from the informal sector.	**Attracting foreign direct investments in the manufacturing sector is vital.** Indeed, since most of European FDI is channelled to oil sectors (that are capital intensive and have a limited value-added), they do not generate jobs and do not lead to any technology transfer. Investing in the manufacturing sector (especially in high value-added products) will lead to more job creation and, hence, more inclusiveness. Technology transfer will help firms integrate into GVCs and, therefore, build trust between firms on both shores of the Mediterranean. This is also related to the development of clusters that should attract foreign investors, such as technopoles in Tunisia. **Improving workers' skills will help Southern economies integrate into GVCs.** Indeed, more GVCs will increase the demand for skilled workers, in order to face up to fierce competition from international markets. Considering that most products exported by the Southern shore of the Mediterranean predominantly involve skilled blue-collar workers, the lack of serious steps towards enhancing the quality of vocational training is likely to offset any trade and investment policy efforts and to limit their outcome. Another important useful stepping stone for the countries to consider is the recognition of qualifications and skills through bilateral agreements and firm-to-firm secondments between countries, in order to let workers benefit from international experiences which will improve their skills. **Improving infrastructure and business environment (in terms of licenses, business permits, red tape costs) will improve firms' total productivity,** helping them export and, hence, become more eligible to integrate into GVCs. We should rely more on "domestic integration",

	• The third reason is related to non-harmonised standards and regulations, which represent significant barriers to exports coming from the Southern shore of the Mediterranean and, hence, to the inclusion in a GVC. • Finally, **low investment in physical and digital infrastructure** also impedes the integration of Arab firms into a GVC. Indeed, whilst the latter is indispensable for the transportation of goods from plants to markets/ports, the former will boost e-commerce and trade with larger firms within the same regional chains.	improving the capabilities and the fundamentals of the economy through investment in human capital, the business environment and governance. More efforts should be deployed to strengthen the connection between highly productive global firms, potential local suppliers and the domestic labour force. The European Investment Bank can play a crucial role in fostering the physical infrastructure through cross-border projects (roads and ports), Moreover, it can seek public-private partnerships (PPP) to support this process, with a special focus on technological infrastructure to boost e-commerce, via block chains and other technologies. **Increasing the integration of the Mediterranean economy into GVCs is not enough to achieve a more inclusive, job-intensive development in the region.** The argument is valid for manufacturing. But GVCs encompass agriculture and services, in addition to manufacturing. With respect to agriculture, no doubt, developing countries have significant potential for increasing productivity in the countryside through better use of inputs, application of new technologies and diversification into new crops. But it is very unlikely that agriculture could absorb labour, rather than release it, during the process of economic development – even if the new technologies were not labour-saving. The budget shares of food and other agricultural products tend to decline during periods of economic growth. **One way or another, growing economies have to create jobs for unskilled workers, away from agriculture and in urban areas.**

6. BLUE TRANSITION FELLOWS

Here are the actors of the first EMNES participatory foresight exercise. They are all now committed to the "Blue Transition" mission – thinking ahead to shape the transition to a transparent, responsible, inclusive and sustainable Mediterranean. They have become the Blue Transition Fellows, ready for the Blue Transition movement!

GROUPS	Blue Transition Fellows
PA1 – Institutions	**Egypt:** Chahir Zaki (FEPS), Nesreen Seleem (FEPS), Racha Ramadan (FEPS) **Jordan:** Serena Sandri (YU) **Tunisia:** Dorra Mezzez-Hmaied (IHEC), Moez Ben Tahar (IHEC). **Europe:** Carlo Sessa (EMEA).
PA2 – MSME	**Egypt:** Heba Zaki (FEPS) **Morocco:** Sara Loukili (UEMF) **Palestine:** Samir Abdallah (Palestinian Economists Association) **Tunisia:** Rim Mouelhi (IHEC), Olfa Benouda-Sioud (IHEC), Sami Ben Naceur (IMF) **Europe:** Rym Ayadi (EMNES), Willem Pieter de Groen (CEPS), Aya Elewa (Paris School of Economics), Jacques Charmes (Institute of Research for Development)
PA3 – Finance	**Jordan:** Serena Sandri (YU) **Morocco:** Najat El Mekkaoui (UEMF) **Tunisia:** Olfa Benouda-Sioud (IHEC), Dorra Mezzez-Hmaied (IHEC), Sami Ben Naceur (IMF) **Europe:** Rym Ayadi (EMNES), Sandra Challita (EMEA), Willem Pieter de Groen (CEPS), Mais Sha'ban (University of Essex)

	Other: Basma Majerbi (University of Victoria), Samir Abdallah (Palestinian Economists Association)
PA4 – Labour	**Egypt:** Marwa Biltagy (FEPS) **Jordan:** Nooh Alshyab (YU), Mahmoud Hailat (YU) **Morocco:** Najat El Mekkaoui (UEMF) **Tunisia:** Rihab Bellakhal (IHEC), Wajdi Kthiri (IHEC) **Europe:** Cinzia Alcidi (CEPS), Nadzeya Laurentsyeva (CEPS), Emanuele Sessa (EMEA), Sandra Challita (EMEA), Jacques Charmes (Institute of Research for Development)
PA5 – STI	**Egypt:** Racha Ramadan (FEPS), Heba Zaki (FEPS), Hamid El Zoheiry (EMUNI) **Tunisia:** Rim Mouelhi (IHEC), Wajdi Kthiri (IHEC) **Europe:** Carlo Sessa (EMEA), Ahmed Badawi (FUB), Nadzeya Laurentsyeva (CEPS)
PA6 – Trade	**Egypt:** Chahir Zaki (FEPS), Nesreen Seleem (FEPS), Aya Elewa (Paris School of Economics) **Jordan:** Nooh Alshyab (YU), Soheil Magableh (YU), Mahmoud Hailat (YU) **Tunisia:** Moez Ben Tahar (IHEC), Basma Majerbi (University of Victoria) **Europe:** Cinzia Alcidi (CEPS), Emanuele Sessa (EMEA)

REFERENCES

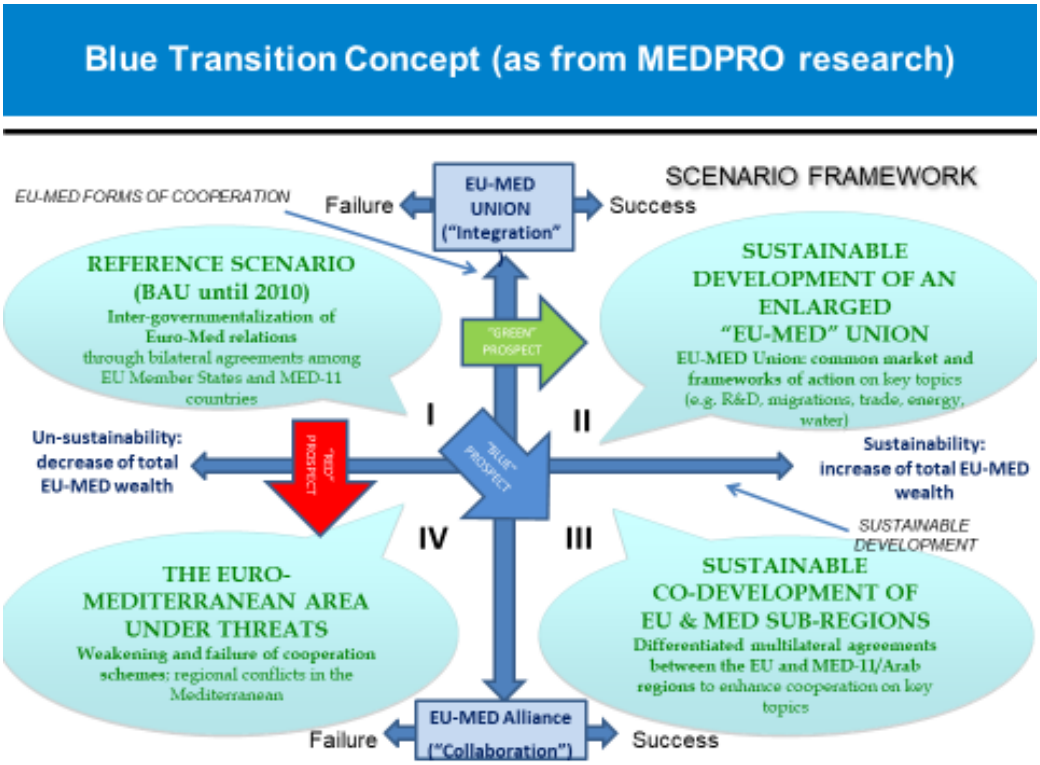
- Acemoglu, D., Autor, D., Dorn, D., Hanson, G. H. and Price, B. (2016). Import Competition and the Great U.S. Employment Sag of the 2000s, Journal of Labour Economics 34(1): 141–198.
- Autor, D., Dorn, D. and Hanson, G. (2013). *The China Syndrome: Local Labour Market Effects of Import Competition in the United States*, American Economic Review **103**: 2121–68.
- Autor, D. H., Dorn, D., Hanson, G. H., & Song, J. (2014). *Trade adjustment: Worker-level evidence. The Quarterly Journal of Economics*, *129*(4), 1799-1860.
- Ayadi, R. and Sessa, C. (2011), What Scenarios for the Euro-Mediterranean in 2030 in the wake of the Post Arab-Spring, *MEDPRO Policy Paper*, No. 2 / October 2011.
- Ayadi, R. and Sessa, C. (2013), Scenarios Assessment and Transitions towards a Sustainable Euro-Mediterranean in 2030, *MEDPRO Policy Paper*, No. 9 / July 2013.
- Ayadi, R. and Sessa, E. (2017), Regional integration in the Euro-Mediterranean, *EMNES Working Paper*, No. 1 / June 2017.
- Baldwin, R., (2019) *The Globotics Upheaval. Globalisation, Robotics, and the Future of Work*. Oxford University Press.
- D'Aveni, R., (2018), *The Pan-Industrial Revolution. How New Manufacturing Titans will Transform the World*. Houghton Mifflin Harcourt, New York.
- Dewan, S. and Suedekum, J., (2017) *The Global Deal and Trade: Harnessing the Benefits for Greater Development, Equality and Growth*. Discussion Paper. JustJobs Network, DICE and CEPR.
- Dewan, S. (2016). *Statement to Congress: The Labour Provisions in the Trans-Pacific Partnership*.
- Durand, C. and Winkler D. (2018), *Intellectual Monopoly in Global Value Chains*, Pre-print available on Research Gate.
- ILO. (2016). *Decent Work in Global Supply Chains*. Report prepared for 105th session, International Labour Conference, 8 April 2016.
- ILO. (2017). *Employment Policy Brief: New Automation Technologies: Job Creation and Destruction Dynamics*.

- IMF. (2017). *World Economic Outlook: Understanding the Downward Trend in Labour Income Shares*, see: chapter 3.
- Krugman, P. (2016). *Trade and Jobs – A Note*. New York Times vol 3. July 2016
- Mazzucato, M., (2018), *The Value of Everything. Making and Taking in the Global Economy*, Penguin Books, UK.
- Pellerin-Carlin, T., (2019), *Understanding the Drivers of Our Energy Choices*. Jacques Delors Institute, Paris
- Pierce, J. R. and Schott, P. K. (2016). *The Surprisingly Swift Decline of US Manufacturing Employment*, American Economic Review 106(7): 1632–1662.
- Prahalad C. K. and Hart, S., L. (2000) *The Fortune at the Bottom of the Pyramid*. Strategy & Competition. Reprint No 02106.
- OECD. (2017). *Making Trade Work for All*, Paris.
- Randers, J., Rockstrom, J., Stoknes, P. E., Goluke, U., Collste, D., Cornell, S., (2018). *Transformation is feasible. How to achieve the Sustainable Development Goals within Planetary Boundaries*. A report to the Club of Rome, for its 50 year anniversary, 17 October 2018. Stockholm Resilience Centre.
- Rodrik, D., (2018). *New Technologies, Global Value Chains, and Developing Economies*. NBER Working Paper Series, Working Paper 25164, Cambridge, MA, U.S.
- Rodrik, D. (2011). *The Globalisation Paradox: Why Global Markets, States, and Democracy can't co-exist*. Oxford University Press.
- Sharpe, B. (2013), *Three Horizons: The Patterning of Hope*, International Futures Forum
- Schwab, K., (2016). *The Fourth Industrial Revolution: what it means, how to respond*. World Economic Forum.
- Senge, P., Scharmer, C. O., Jaworski, J., Flowers, B. S., (2005). *Presence. Exploring Profound Change in People, Organisations and Society*. Nicholas Brealey Publishing, London, UK
- Sessa, E. (2018). *Second EMNES Policy Workshop Report*, Piran, 24-26 October 2018
- Tapscott, D. and Tapscott, A., (2018) *Blockchain Revolution. How the Technology Behind BITCOIN and Other CRYPTOCURRENCIES is Changing the World*. Penguin Books, UK.

- UNCTAD. (2013). *World Investment Report 2013: Global Value Chains: Investment and Trade for Development.* United Nations Publication, Geneva.
- World Economic Forum (2017), *Realising the Potential of Blockchain. A Multi-stakeholder Approach to the Stewardship of Blockchain and Cryptocurrencies*. White Paper, June 2017.
- Worker Rights Consortium, JustJobs Network and Centre for American Progress. (2013). *Global Wage Trends for Apparel Workers, 2001–2011*.

ANNEXE 1 – THE MEDPRO TRANSITION SCENARIOS

The first concept of "Blue Transition" in the Mediterranean was introduced by the EU FP7 project MEDPRO. The MEDPRO scenario framework was proposed to look beyond the short-term, to long-term prospects of evolution of the Mediterranean region (2030 and beyond), considering two main factors driving cooperation in the Euro-Mediterranean – the main focus of MEDPRO research[34]:



Source: Ayadi and Sessa (2013)

[34] To access documents of MEDPRO - Link - http://www.medpro-foresight.eu

The first factor – vertical axis in the framework – was the type of cooperation between the European Union countries in the North of the Mediterranean and the South and East Mediterranean countries (SEMCs), with two opposite modalities: "integration" with the enlargement of the European Union to progressively form an EU-MED region at the top, and "collaboration" between two distinct regional realities in the North and in the South-East of the Mediterranean, joined into an EU-MED alliance, at the bottom.

The second factor – horizontal axis in the framework – was sustainability intended as the wider concept of economic, environmental and social sustainable development (not only environmental), virtually measured by means of a total wealth indicator, gauging the variation of natural, economic and social assets in the region, not only the progress of Gross Domestic Product (GDP).

At the time of ending the MEDPRO research, this scenario framework helped to identify four possible visions for the Mediterranean in the year 2030:

- **Quadrant I: A "Business As Usual" (BAU) scenario** taken as a reference, with the continuation of Euro-Mediterranean cooperation through bilateral policies and agreements between single countries and a weak multilateral integration and unsustainable patterns of development. This was, indeed, the BAU scenario until 2010, no longer "usual" after the Arab Spring events which disrupted apparently stable conditions in the area.
- **Quadrant II: A "Green scenario" of sustainable development** and integration in the whole EU-MED region, with the progressive enlargement of a common market and frameworks for action, mostly defined by enlarging and adapting the scope of EU policy roadmaps to include the Mediterranean, in several sectors and primarily energy, water, trade, migrations and R&D.
- **Quadrant III: A "Blue scenario" of co-development of the North and South shores of the Mediterranean,** with a co-development and inclusive paradigm fostering regional integration centred on the Mediterranean and its Western and Eastern sub-regions and aiming to address common challenges and achieve sustainability development goals for the whole region.
- **Quadrant IV: A "Red scenario" of increasing threats** in the whole EU-MED area and radicalisation of conflicts

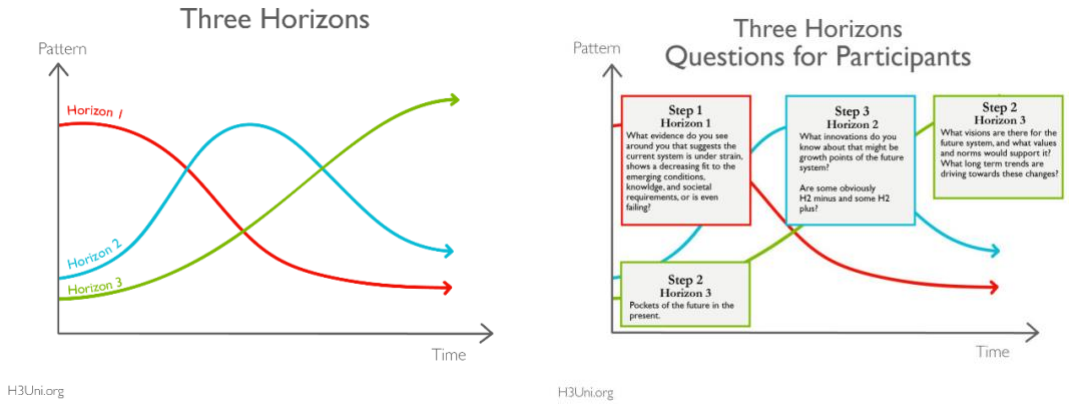
ANNEXE 2 – LEARNING TO DEAL WITH UNCERTAIN PROSPECTS: THREE HORIZONS METHODOLOGY

Traditionally, learning is based on the transmission and application of existing knowledge, within which there is expertise and authority. However, in the face of an unknown and uncertain future, the relevance of expertise based on the past, is limited to those aspects of life which repeat themselves, whilst the future holds emergent properties that are inherently unknown. Expert knowledge on its own, therefore, is insufficient in the face of this. The question is: what is the optimal form of knowledge that can be applied in these new conditions? Essentially, we need to switch from an emphasis on content knowledge to an emphasis on process knowledge.

Process knowledge here means ways of structuring the exploration of partially known uncertain situations, to understand and realise new possibilities. This is a different type of knowledge to content knowledge, although it includes the capacity to operate with content knowledge. Process knowledge is essentially practice; it involves creating the conditions for groups to work together to harness their creative capacities to the full, so they can take steps forward whilst remaining open to the emerging future.

Examples of structured knowledge process practices include several **participatory foresight methods,** such as the classic scenario building methodology (2x2 matrix), which describes possible transitions towards a future scenario discounting unfolding megatrends and major uncertainties.

A meta-model of participatory foresight – a method which helps to frame, in one coherent format and sequence of steps, any specific participatory foresight exercise – is the so-called **Three Horizons approach** (Sharpe, B. 2013). This helps to structure the engagement of experts, stakeholders and citizens in a challenge-focussed dialogue, e.g. involving a group of invited participants in a workshop to think together and discuss future scenarios. Participants are first presented with the 3H simple diagram and concept, and a set of questions:



***Source**: Three Horizons University*

The horizontal axe is "Time", from now – the present – to a long-term end point. It may be, for instance, 2030 or 2050, depending on the scope and context of the foresight exercise. The vertical axe is usually labelled as 'Pattern', 'Viability', 'Prevalence' or 'Strategic Fit', which captures the idea of a shift of the dominant pattern, moving over time. All three horizons are always present over time and their dynamics interact. Some aspects of H1 will persist over time, even if a new paradigm will become dominant; on the other hand, aspects of H3 can be already evident in current discourses and in activities on the fringes of the dominant system; whilst H2, like a moving border between past and future, represents the wave of innovations, strategic policies, governing ideas flourishing and realising the transition to the new H3 dominance. In more detail:

- **The First Horizon – H1 - is the dominant system at present**. It represents the inertial scenario, i.e. where the system will stand if current drivers and trends will continue unchanged. We rely on the current system being stable and reliable but as the world changes, so aspects of business as usual begin to feel out of place or no longer fit for purpose. Eventually, the inertial scenario will be superseded by new ways of doing things and this is shown by the red curve going down – reducing its strategic fit over time.

- **The Third Horizon – H3 – starts in the present**, with some visible "seeds of change" or "pockets of future", i.e. early manifestations of transformation and shift of the current paradigm towards a new emerging paradigm, that is thought to become the long-term successor to business-as-usual. It grows from fringe activities in the present that

introduce completely new ways of doing things, but which turn out to be much better suited to the world that is emerging than the currently dominant H1 system.

- **The Second Horizon – H2 - is the pattern of innovations, strategic roadmaps, governing ideas** that are tried out in response to the ways in which the landscape is changing. Some of these innovations will be taken up by the H1 system to prolong its life, whilst others will pave the way for the emergence of the radically different H3 system.

Whilst thinking about the horizons and their interaction, participants are asked to follow a forecasting-backcasting sequence of forward-looking steps (H1 → H3 → H2): think first to what will happen if nothing in the current system operation changes (inertial scenario), then imagine the sustainable and desirable scenario emerging as a possible future (transformative scenario) and, finally, take a step back to consider what is needed to help the future scenario to emerge (recommendations and action roadmaps).

Bringing all three horizons together as interrelated patterns, it is possible to eventually develop with the participants a shared narrative of possibilities for navigating towards a better future - a mature perspective that accepts the need both to address the challenges to the First Horizon and nurture the seeds of the Third. This is not an either/or, good/bad discussion. We need both to 'keep the lights on' today and to find a way of keeping them on in the future, in very different circumstances.

The method has been implemented by engaging experts of the EMNES network to elaborate the Blue Transition Scenario, envisioning a shift to inclusive and sustainable development in the Mediterranean.

Three Horizon scenario narratives were developed in two steps:

Step 1: **H1 trends and challenges *vs* H3 desired response scenario** **(Long-term scenarios**	In the first step, participants are asked to identify now, in the present, dominant patterns (H1) and the challenges to fit sustainability goals in the future – i.e. the case for change – as well as the pockets of the emerging future state (H3) and the drivers conducive to change. Starting with the first horizon, brings into view why it is felt that the current 'business as usual' can no longer make the changes needed. Moving to the third horizon, participants talk about their own visions but also of all the other alternative and competing views of the future of which they are aware. This is a chance to surface underlying assumptions and different value systems and where

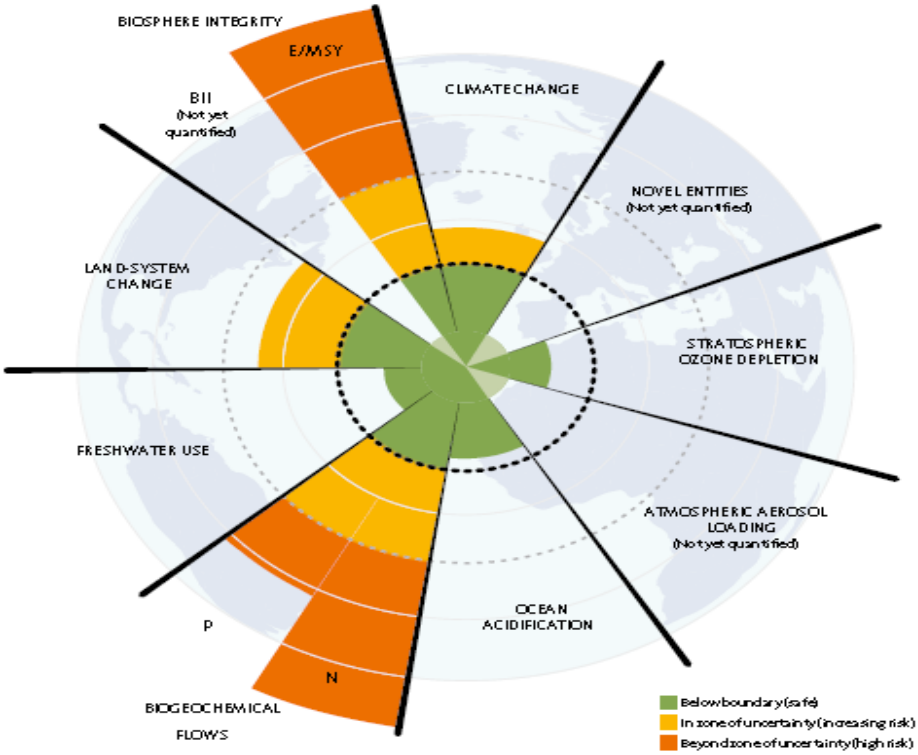
2030-2050)	power to shape the future lies. Real examples populate the 'pockets of the future'.
Step 2: **H2 action plans** **(Medium-term policy roadmaps 2020-2030)**	In the second step, participants are asked to identify initiatives underway in the transition zone – policies, emerging technological, social, business innovations, etc. – and how they relate to H1 sustaining and H3 transformative change. It is the nature of H2 innovation that it is full of uncertainty over who will win, who will lose, what standards will emerge, what people will accept and reject, and so on. The distinction between "sustaining innovation" (H2-) and "transformative innovation" (H2+) is useful to describe how the latter responds to the limitation of the first horizon and the opportunity of the third, facilitating the shift of dominant patterns. As for the former, it also needs to be considered as, whilst supporting the continuation and adaptation of the H1 system, it will obviously influence the opposite dynamics of transformative change.[35]

[35] Paradoxically, this H2- "sustaining innovation" is biased towards the past not the future and there are important reasons for this kind of innovation to appear. First, most resources for doing new things are in the hands of the H1 system providers and they will generally try to co-opt new possibilities, to extend their own position. Governments will often actively support this co-option, either because the system is an infrastructure and their responsibility is to "keep the light on" or because they have no particular reason to challenge the incumbents and their view of the future. In the worst case, they continue to support and even subsidise H1 players, just because those players have special interest power over the political process. On the other side, as an H2+ transformative innovation gains a foothold, it starts to become embedded in society and gradually builds up a new distribution of power between producers and users, creating new interest groups with positions to protect. As a transformative innovation is taken up into more and more uses, so it locks in many interests in its continuation, benefitting from the effect of increasing returns from a growing network of users, gaining a rapidly increasing advantage over other alternatives until it becomes the dominant pattern.

ANNEXE 3 – THE EARTH3 MODEL SYSTEM FOR SCENARIO ANALYSIS OF PATHWAYS TO ATTAIN THE SUSTAINABLE DEVELOPMENT GOALS (SDGS) WITHIN PLANETARY BOUNDARIES (PBS)

Earth3 is a Global Systems Model, linking socio-economic and biophysical processes. It builds on more than 100,000 historic and new data points, from existing databases all over the world.

The model is used for calculating the effects of policy actions needed for meeting the globally agreed aspirational goals for human development, within the safe operating space of a stable planet. Earth's safe operating space is defined through the nine planetary boundaries - global quantifications of human-caused environmental changes, where continued pressure risks destabilising the long-term dynamics of the Earth system (see figure below).

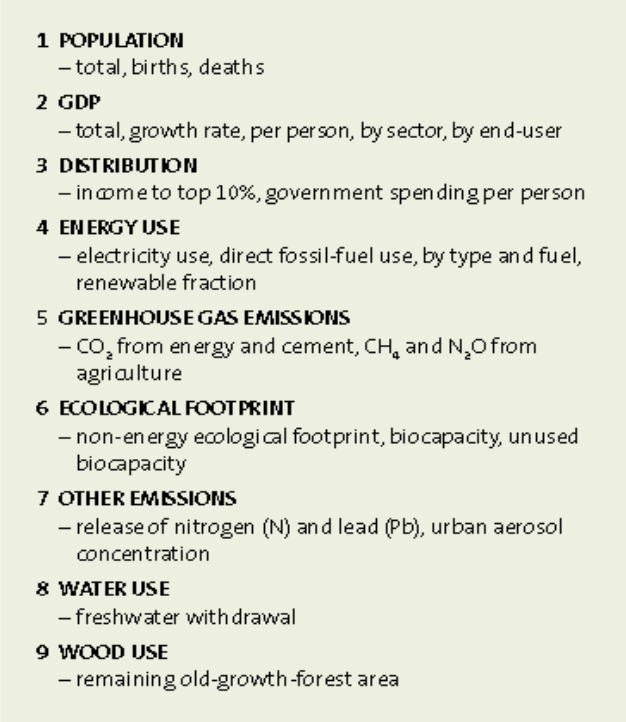


The “globally agreed aspirational goals for human development” are the United Nations 17 Sustainable Development Goals:

To measure the whole world’s progress on the SDGs into the future, the model calculates the number of SDGs achieved every year, the “SDG success score”. The SDG success score, thus, goes from 0 to 17. This is done for each region in the world, as well as the whole world weighted by population. The model also calculates how this progress impacts the Earth’s safety margin over time, to see if any SDG achievement is inside the planetary boundaries. Earth’s safety margin goes from 0 to 9. If all PBs are in the safe zone (green), the safety margin is nine. If all PBs are violated (high risk = red), the safety margin is zero. The assumption is that most of humanity would agree that a SDG success score of 17 with a PB safety margin of 9 is where we all want to be, whatever the population size is.

A paper (Randers et al. 2018) that describes the Earth3 model system in scientific terms can be found and downloaded at doi.org/10.31223/osf.io/xwevb. In this annexe, we summarise the main features of the model system. This information is useful to understand the merits and the limits of the model and to correctly interpret its results.

The core of the system is the **Earth3-core spreadsheet model**, which tracks history from 1980 to 2015 and generates consistent scenarios for the period 2015 to 2050. Earth3-core does so for the world split into seven 'regions' or country clusters: United States, Other Rich Countries, Emerging Economies, China, South-Sahara Africa, Rest of the World. Not all clustered countries (e.g. 'Rest of World' and 'Other Rich Countries') are in the same geographic region. But they share other characteristics. Scenarios for the whole world are achieved by adding up the seven regional scenarios. The figure below gives an aggregate list of the main variables in the Earth3-core model – the full list numbers nearly 100 variables for each of the 7 regions.



1 **POPULATION**
– total, births, deaths

2 **GDP**
– total, growth rate, per person, by sector, by end-user

3 **DISTRIBUTION**
– income to top 10%, government spending per person

4 **ENERGY USE**
– electricity use, direct fossil-fuel use, by type and fuel, renewable fraction

5 **GREENHOUSE GAS EMISSIONS**
– CO_2 from energy and cement, CH_4 and N_2O from agriculture

6 **ECOLOGICAL FOOTPRINT**
– non-energy ecological footprint, biocapacity, unused biocapacity

7 **OTHER EMISSIONS**
– release of nitrogen (N) and lead (Pb), urban aerosol concentration

8 **WATER USE**
– freshwater withdrawal

9 **WOOD USE**
– remaining old-growth-forest area

An overall check of model quality has been made by comparing the output of Earth3-core with two major global modelling initiatives: DNV-GL's Energy Transition Outlook 2017 and the IIASA's global population model.

The descriptions of the future, produced with the Earth3-core model, are used as inputs for the second model in our model system, the **ESCIMO system dynamics model**. The ESCIMO model calculates the impact on the global ecosystem of the anthropogenic "drivers" that are the outputs from Earth3-core. The model includes most well-known Earth "tipping points" – in the form of potentially self-reinforcing mechanisms. The output from ESCIMO has been compared with the major Earth-system models in the literature. It is important to keep in mind that ESCIMO is a global model, calculating global averages for the variables involved (like global warming and sea-level rise). ESCIMO does not produce regionalised results. Both Earth3 and ESCIMO are based on a dynamic perspective of the world, viewing it as a causal mechanism, where the current situation and external drivers create the future (in a big system of non-linear differential equations that are solved through simulation).

Once the two models (Earth3-core and ESCIMO) have produced a quantitative picture of both the socio-economic and environmental outcomes for a scenario of the world to 2050, this information is used to provide a reasoned answer to a fundamental question: to what extent will the 17 SDGs be achieved in the future – in this scenario?

In order to quantify the response, a numerical indicator is chosen for each of the 17 SDGs and decisions need to be taken on what constitutes full achievement of the goal (the "target") and what can be seen as a half-way achievement (the "half-way target"). The figure below shows our selection of SDG indicators, units, targets and half-way targets:

SDG		Indicator	Target	Halfway-target
The 17 goals for humanity agreed by the UN in 2015		*Indicator for the achievement of each sustainable development goal*	*Threshold value for "green"*	*Threshold value for "yellow"*
1	No poverty	Fraction of population living below 1,90$ per day (%)	< 2%	<1,3%
2	Zero hunger	Fraction of population undernourished (%)	< 7%	<1,5%
3	Good health	Life expectancy at birth (years)	> 75 years	> 70 years
4	Quality education	School life expectancy (years)	>1,2 years	>1,0 years
5	Gender equality	Gender parity in schooling (1)	>0.95	>0.8
6	Safe water	Fraction of population with access to safe water (%)	>98 %	>80 %
7	Enough energy	Fraction of population with access to electricity (%)	>98 %	>80 %
8	Decent jobs	Job market growth (%/y)	>1, % / year	>0 % / year
9	Industrial output	GDP per person in manufacturing & construction (2011, PPP US$/p-y)	>6.000 2011, PPP $/p-y	>4.000 2011, PPP $/p-y
10	Reduced inequality	Share of national income to richest 10 % (%)	< 40 %	< 50 %
11	Clean cities	Urban aerosol concentration (µg 2.5M /m3)	<10 µg 2.5M /m³	< 20 µg 2.5M /m³
12	Responsible consumption	Ecological footprint per person (gha/p)	< 1,4 gha/p	< 2 gha/p
13	Climate action	Temperature rise (deg C above 1,850)	<1,deg C	<1,5 deg C
14	Life below water	Acidity of ocean surface water (pH)	> pH 8,15	> pH 8,1
15	Life on land	Old-growth forest area (Mkm2)	>25	>19
16	Good governance	Government spending per person (2011, PPP US$/p-y)	>3.000 2011, PPP $/p-y	>2.000 2011, PPP $/ p-y
17	More partnership	Exports as fraction of GDP (%)	>15 %	>10 %

Once it is known to what extent the sustainable development goals will be achieved in a given scenario, it is necessary to answer a second basic question, namely: to what extent will this achievement lead to further pressure on and higher risk of pushing the planetary boundaries beyond points of irreversible change?

In order to quantify the response to this second question, one numerical indicator has to be chosen for each of the nine planetary boundaries that are seen as most relevant – and, importantly, indicators for which there exist historical data and for which it is possible make forecasts using Earth3-core and ESCIMO. A decision must be taken on what constitutes for each boundary the limit of the safe operating zone for human activity (the boundary between the green and the red zone) and what constitutes the limit to the danger zone (the limit between the yellow and the red zone).

The figure below shows the selection of planetary boundaries, with pressure indicators, units, threshold values for the safe or “green” and high-risk “red” zones. The

risk refers to the boundary conditions beyond which irreversible decline may start in the Earth's life-supporting systems.

Planetary boundary		Indicator	Safe zone	High-risk zone
Man-made processes that threaten to exceed a planetary boundary in 21st century		*Indicator of the current pressure on each planetary boundary*	*Green zone*	*Red zone*
1	Global warming	Temperature rise (deg C above 1850)	< 1 deg C	>= 1,5 deg C in 2050, 2.0 in 2100.
2	Ozone depletion	Montreal-gas emissions (Mt/y)	< 0,25 Mt/y	>= 2 Mt/y
3	Ocean acidification	Acidity of ocean surface water (pH)	> pH 8.15	<= pH 8.1
4	Forest degradation	Old-growth forest area (Mkm²)	> 25 Mkm²	<= 19 Mkm²
5	Nutrient overloading	a) Release of bioactive N (Mt/y) b) Release of bioactive P (Mt/y)	< 100 N Mt/y < 10 Mt/y	>=200 Mt/y not set yet
6	Freshwater overuse	Freshwater withdrawal (km3/y)	< 3.000 km³/y	>= 4.000 km³/y
7	Biodiversity loss	Unused biocapacity (% of biocapacity)	> 25 %	<= 12 %
8	Air pollution	Urban aerosol concentration (µg 2.5M/m³)	< 10 µg 2.5M/m³	>= 35 µg 2.5 M/m³
9	Toxics contamination	Release of Pb (Mt/y)	< 5 Mt/y	>= 10 Mt/y

To summarise: the modelling system uses the two models (Earth3-core and ESCIMO) to produce a quantitative picture of one scenario for the world to 2050. Then, the SDG module is used to calculate an estimate of the extent to which the 17 SDGs will be achieved in that scenario. And then the PB module is used to estimate the resulting pressure on planetary boundaries.

The information challenge is that this leads to 17 conclusions for 7 regions, plus 9 conclusions for the world as a whole. That is 128 numbers in total - much too much for an effective discussion of global policy. Thus, two aggregate measures of system performance have been defined, to make it simpler to discuss the relative merit of different scenarios and different policy interventions.

The two measures are the SDG success score (by region) and the safety margin (for the planet as a whole). The **SDG success score** measures the extent to which sustainable development goals (SDGs) are achieved, on a scale from 0 (no achievement at all) to 17 (full achievement of all goals). The SDG success score is computed for every year from 1970 to 2050, for each of the seven regions. Also, a global average score is computed, weighing the regions by population.

The **safety margin** measures the gap between man-made pressure on the ecosystem and the estimate of the sustainable carrying capacity of the planet. The safety margin is given on a scale from 9 (little pressure on all of the 9 planetary boundaries and, hence, “full” safety margin) to 0 (when human pressure has pushed the boundary to the red, high-risk zone for all 9 of them, so there is “zero” safety margin). The safety margin should be thought of as the margin of safety between current human pressure on the planet and the maximum pressure that can be handled by the planet in a sustainable manner.

ABOUT EMEA AND EMNES

The Euro-Mediterranean Economists Association (EMEA) is a Barcelona-based regional think-tank established in 2012 that serves as a leading independent and innovative policy research institution; a forum for debate on the political and socio-economic reforms in Mediterranean and Africa; and promoter of actions and initiatives that fulfill objectives of sustainability, inclusiveness, regional integration and prosperity. It strives to contribute to the rethinking of the Euro-Mediterranean and Africa partnerships in view of the new dynamics of an emerging multi-polar world. EMEA has a large network of economists, high-level experts and institutional partners (research institutes, think tanks and universities) in the Euro-Mediterranean and Africa. EMEA builds on the collaborative research network MEDPRO (funded by the EU's Seventh Framework Programme (2009-13) and provides forward-looking thinking and political and socio-economic integrated analyses on the Euro-Mediterranean region. EMEA is also the promoter and co-funder of the Euro-Mediterranean Network for Economic Studies (EMNES), co-funded by the European Commission (DG NEAR) between 2015 and 2019. EMNES is a regional network composed of 30 institutions and more than 100 experts and researchers in the Mediterranean region. From January 2020, EMEA coordinates EMNES.

The Euro-Mediterranean Network for Economic Studies (EMNES) aims to provide a renewed vision for socio-economic development in the Mediterranean region, mainly focusing on employment creation, social inclusion, sustainable development and regional integration. It performs economic and policy research exploring the pillars of inclusive and sustainable economic models in the Euro-Mediterranean region along the following research areas:

1. Institutions and institutional reforms;
2. Private sector, micro, small and medium sized enterprises and social business development;
3. Entrepreneurship and innovation;
4. Human capital development, education, labour markets and migration;
5. Macroeconomic policy, inequality, and social inclusion;
6. Inclusive and sustainable finance;
7. Regional integration, trade, investment and infrastructure;
8. Energy, water, environment and sustainable development;
9. Euro-Mediterranean partnership;
10. Scenario analysis and foresight;
11. Other evolving research areas.

EMNES is a network of research institutions and think tanks from Algeria, Belgium, Egypt, France, Germany, Greece, Italy, Jordan, Morocco, Slovenia, Spain, Tunisia, Turkey and the UK. Between 2014-2019, EMNES was co-funded by the European Commission – under Grant Contract N° ENPI/2014/354-488 and EMNES Partners and Associates. EMNES is built on four core principles: independence, excellence, policy relevance and deep knowledge on Euro-Mediterranean affairs.

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