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L’outil stratégique majeur de l’anticipation

En quelques années, la mise en cohérence des stratégies d’entreprises avec les megatrends et les grandes transitions, avec une capacité de résilience aux risques majeurs, s’est imposée comme pour l’engagement financier des actionnaires institutionnels et investisseurs à long terme. Elle est également devenue un préalable à la définition des grands projets d’innovation des entreprises leaders.

L’ampleur des travaux de recherche et d’analyse nécessaires à l’élaboration de ces megatrends de façon rigoureuse et approfondie les limite à quelques dizaines d’institutions, banques et entreprises globales dans le monde. Leur intégration en éléments génériques pertinents, nécessite également un très important travail de synthèse.

Depuis quelques années, l’European Institut for Creative Strategies and Innovation (EICSI) réalise régulièrement cette synthèse pour le Club de Paris des Directeurs de l’Innovation et d’autres institutions.

Une nouvelle version a été présentée le 16 mars 2023 au Grand Forum des Stratégies d’Innovation du Club de Paris des Directeurs de l’Innovation, puis le 29 juin au Ministère de l'Économie, des Finances et de la Souveraineté industrielle et numérique dans le cadre de BercyINNOV.
La vidéo de la présentation est disponible sur la Web TV « Les Mardis de l’innovation » depuis le 30 juin. Elle est à jour des travaux de prospective réalisés ces derniers mois jusqu’au printemps 2023.

Pour permettre aux participants d’approfondir l’analyse des évolutions, transitions et risques qui les concernent le plus, 120 études et analyses internationales prises en compte sont référencées dans une bibliothèque numérique téléchargeable sur **https://www.directeur-innovation.com/download/21327/**

La version intégrale de ces études est disponible sur demande à contact@institut-innovation.com pour les directions Innovation, Stratégie, R&D, RSE d’entreprises et directions d’instituts de recherche et agences d’innovations publiques.

Marc Giget

EUROPEAN INSTITUTE
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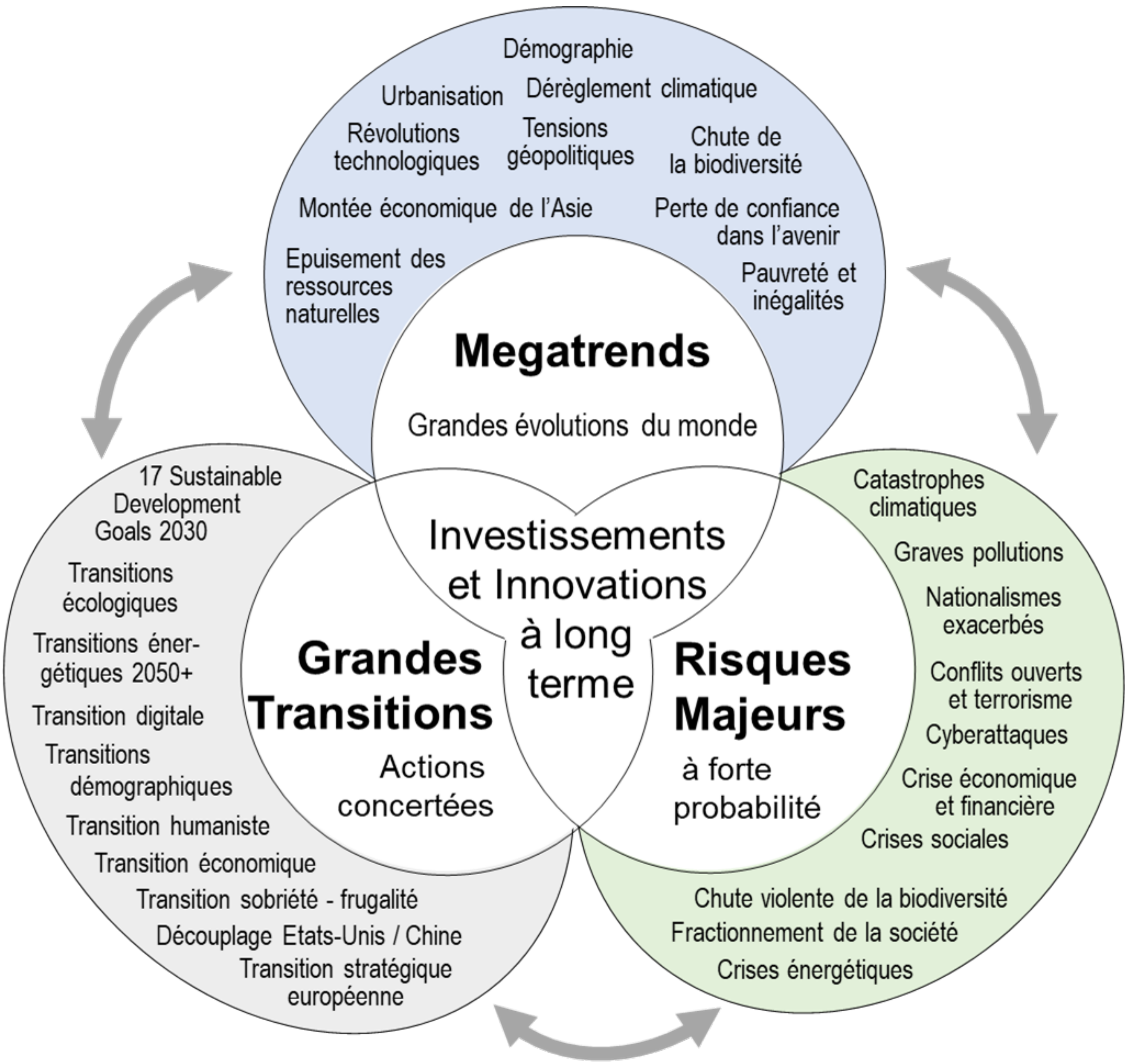
Le triptyque de l'anticipation stratégique

pour mieux piloter des projets d'innovation à long terme,
en phase avec les megatrends,
engagées dans les grandes transitions en cours,
et résilients aux risques majeurs.



Interrelations, mise en cohérence

Megatrends
Risques majeurs
▶
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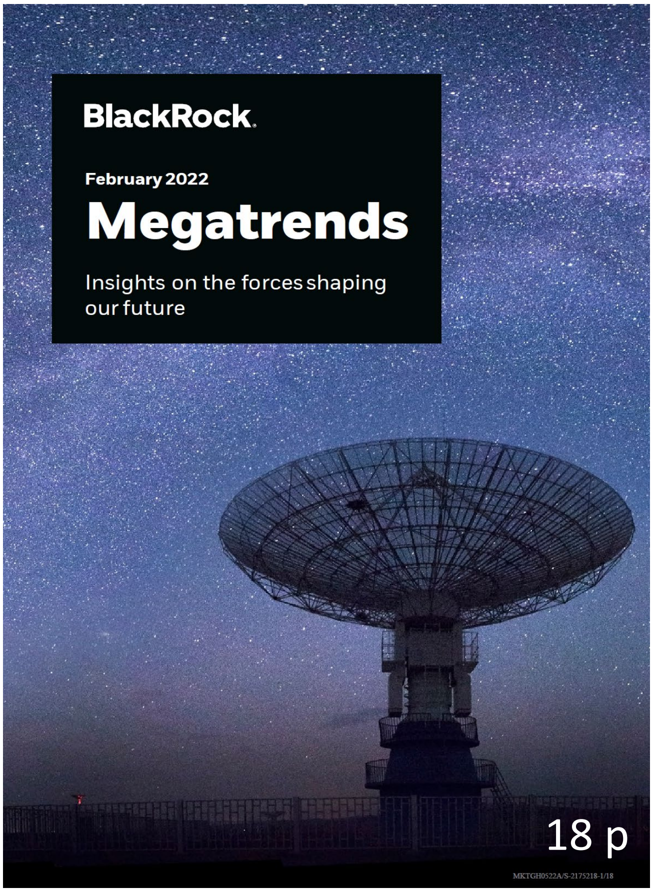
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Das Potenzial der Megatrends für Strategie und Management
Megatrends formen langfristig gesamte Gesellschaften um und zwingen nicht selten ganze Branchen dazu, ihre Strukturen, Geschäftsmodelle, Prozesse, Angebote und ihre Kommunikation neu auszurichten. Die Arbeit mit Megatrends ist daher ein unverzichtbares Instrument für das Management und die strategische Planung in Unternehmen und Institutionen.
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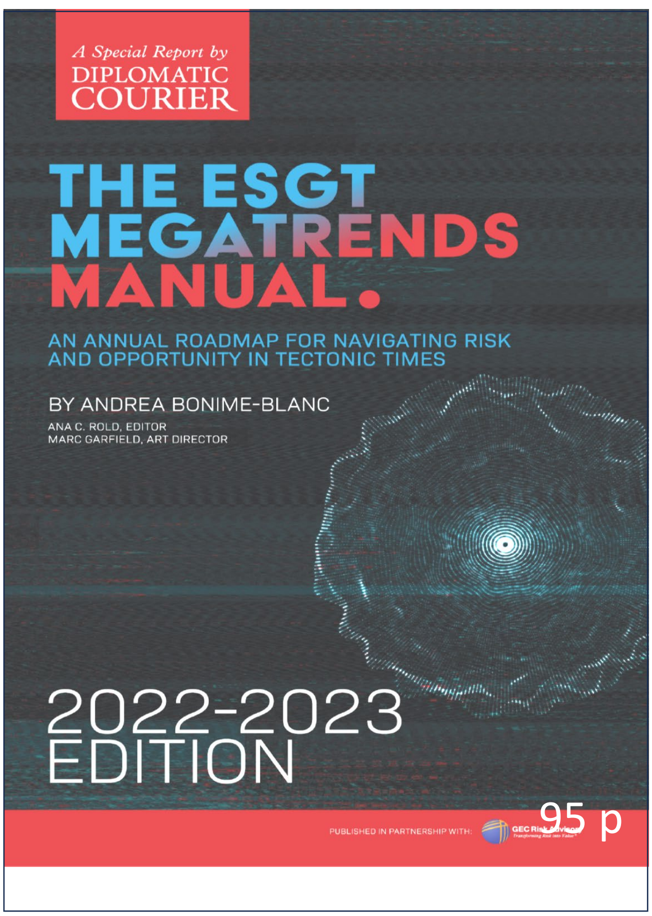
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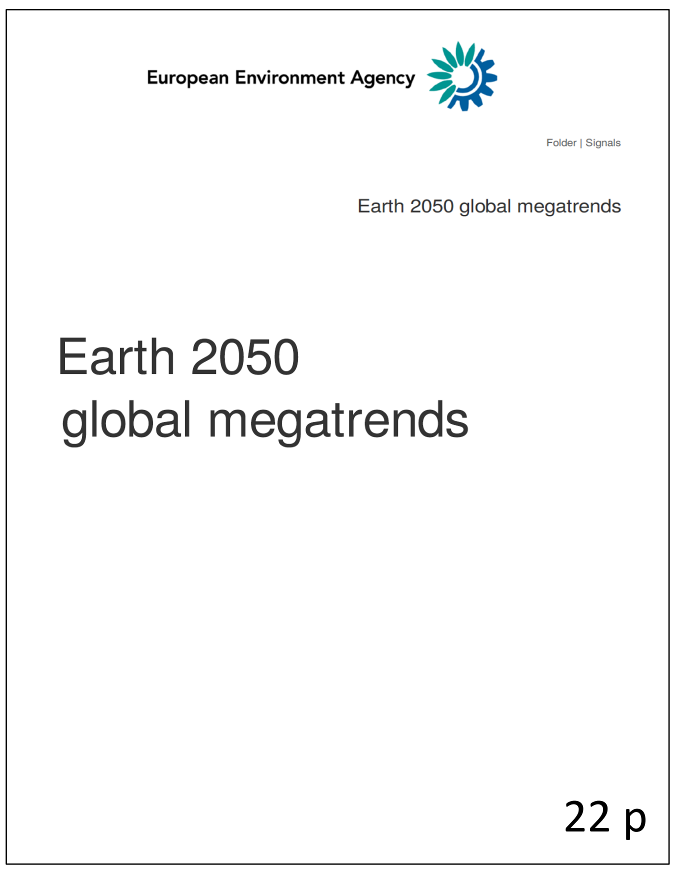
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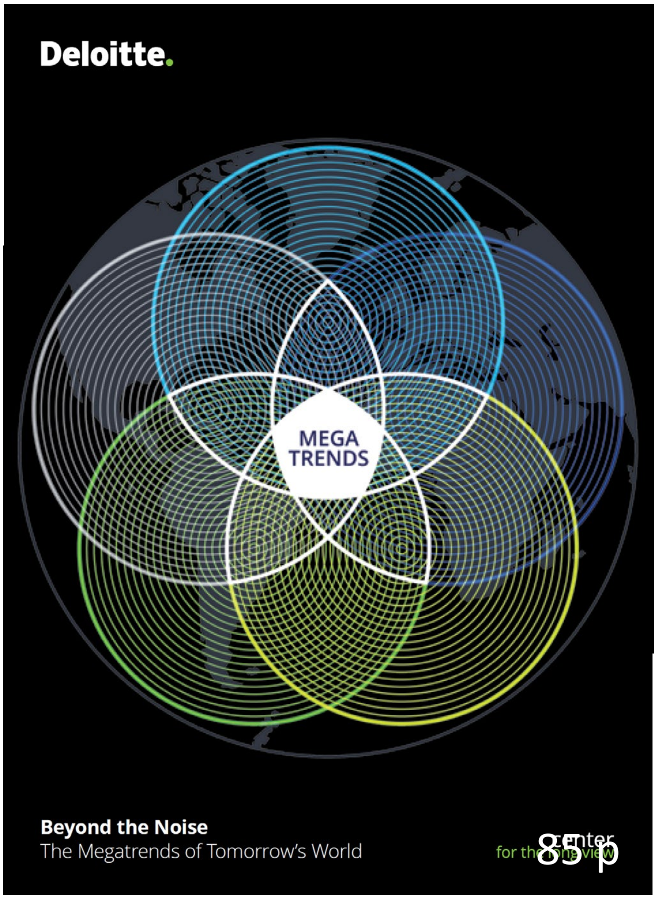


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Research Report
Avoiding a trap and embracing the megatrends
Proposals for a new growth model in EU-CEE

Suggested Citation: Grieveson, Richard et al. (2021) : Avoiding a trap and embracing the megatrends: Proposals for a new growth model in EU-CEE, wiiw Research Report, No. 458, The Vienna Institute for International Economic Studies (wiiw), Vienna

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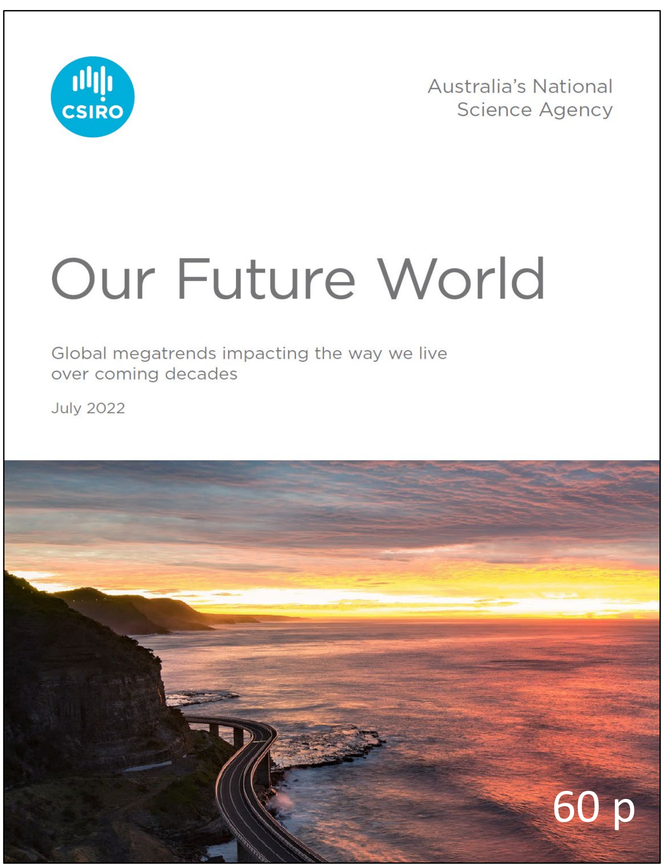
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Analysis

KEYNOTE INTERVIEW

Tapping into sustainability mega-trends

The need to decarbonise and society's expectations for a more circular economy are driving new investment opportunities across PE and infrastructure, say 3i's Sophia Walwyn-James and Céline Maronne

Q What sustainability mega-trends are you currently seeing?

Céline Maronne: In infrastructure, we are seeing the prioritisation of domestic energy security, heightened by geopolitical events. The drive to make a meaningful contribution to achieving national net-zero targets is also very clear, with a shift from concept towards practical action. This leads to more capital being required to fund the production of renewable energy and other projects contributing to decarbonisation, which requires huge investment in underlying infrastructure. Linked to this, we also see a drive to create a more circular economy, with dealflow in areas such as the production of biogas and recycling of waste.

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Sophia Walwyn-James: In addition to decarbonisation and the circular economy, new sustainability mega-trends include supply chain transparency and resilience, which have become paramount in the wake of both the covid pandemic and the Ukraine conflict.

Supply chain disruption, high energy prices and inflation are all topics that have direct consequences for business operations. Therefore, sustainability now lies at the heart of commercial discussions rather than being a side issue.

Q Which of your investments contribute most to those mega-trends?

SWJ: In our private equity portfolio, we have backed a number of companies whose core offering is based on the circular economy principles of repair, reduce, reuse and recycle. One example is Evernex, which helps customers prolong the life of their IT equipment through maintenance, reuses

February 2023 • Responsible Investment 35

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Publications

European Environment Agency

Growth without economic growth

Growth without economic growth

Economic growth is closely linked to increases in production, consumption and resource use and has detrimental effects on the natural environment and human health. It is unlikely that a long-lasting, absolute decoupling of economic growth from environmental pressures and impacts can be achieved at the global scale; therefore, societies need to rethink what is meant by growth and progress and their meaning for global sustainability.

Key messages

- The ongoing 'Great Acceleration' [1] in loss of biodiversity, climate change, pollution and loss of natural capital is tightly coupled to economic activities and economic growth.
- Full decoupling of economic growth and resource consumption may not be possible.
- Doughnut economics, post-growth and degrowth are alternatives to mainstream conceptions of economic growth that offer valuable insights.
- The European Green Deal and other political initiatives for a sustainable future require not only technological change but also changes in consumption and social practices.
- Growth is culturally, politically and institutionally ingrained. Change requires us to address these barriers democratically. The various communities that live simply offer inspiration for social innovation.

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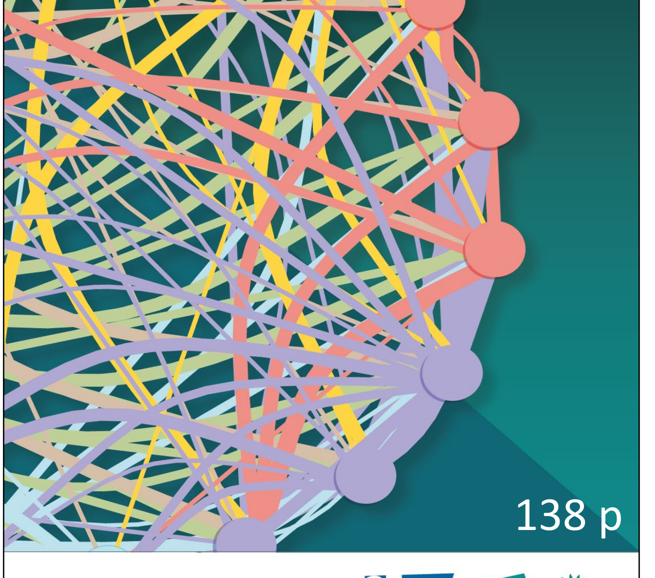
EEA Report | No 25/2019

Drivers of change of relevance for Europe's environment and sustainability

ISSN 1977-8449



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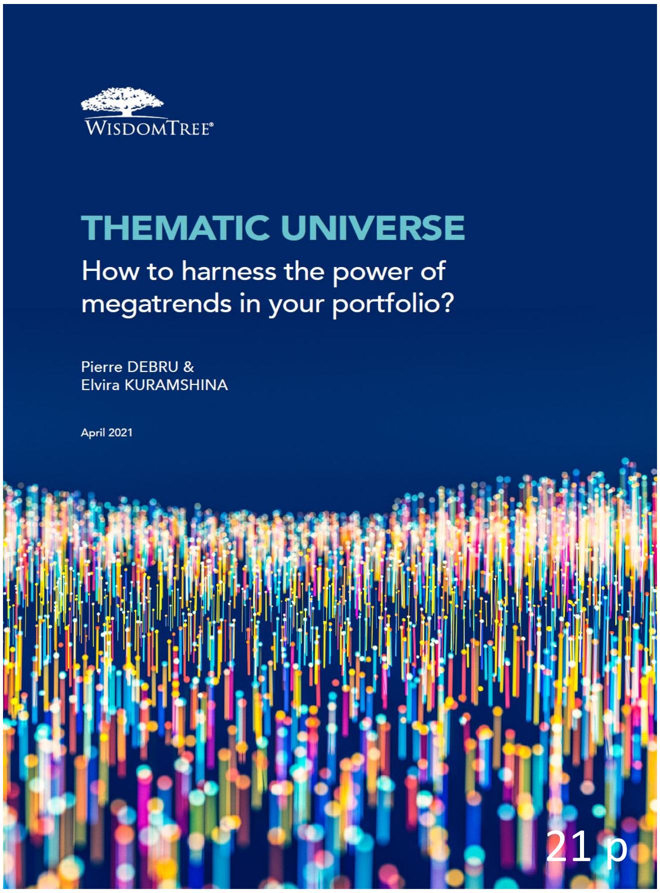

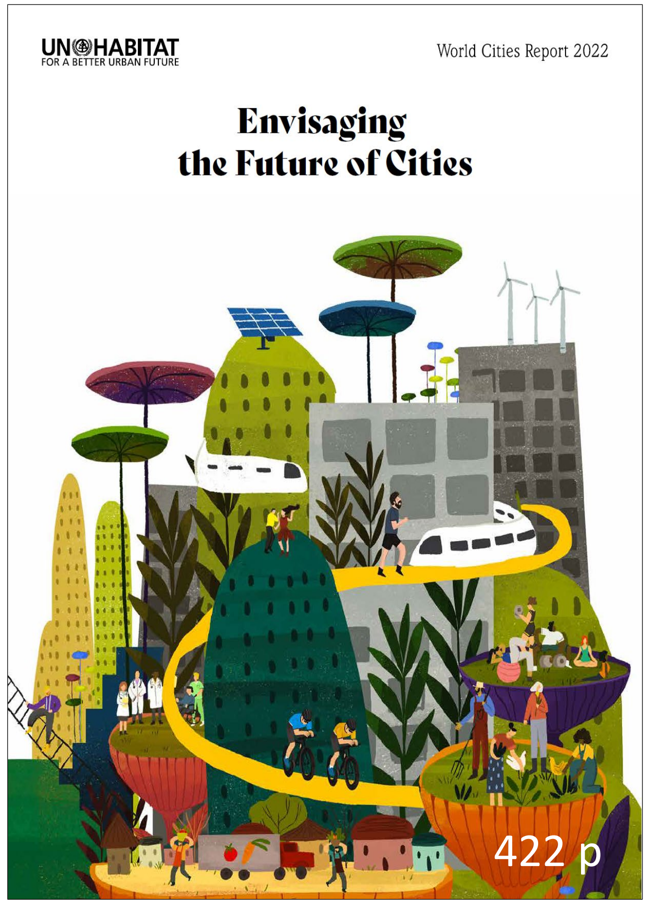

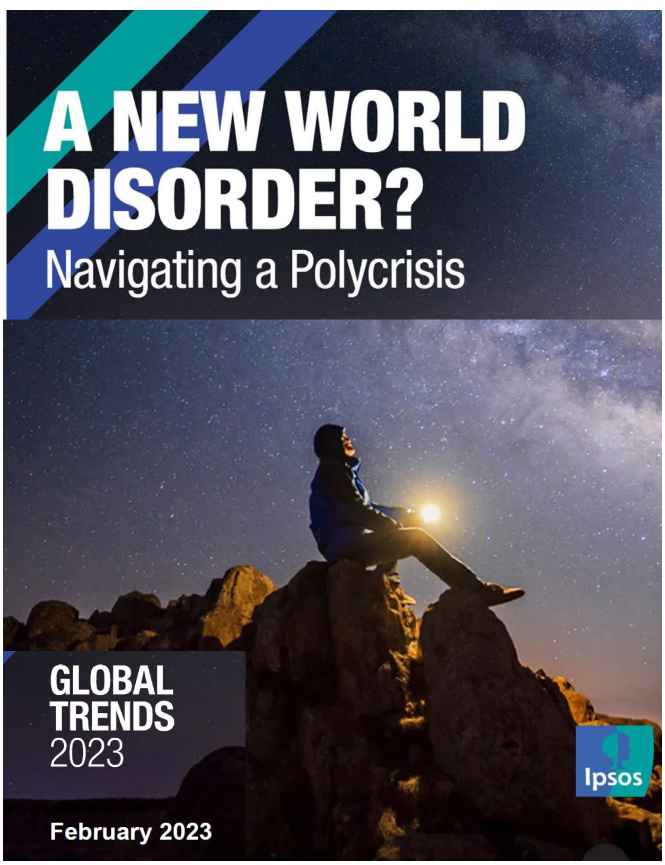

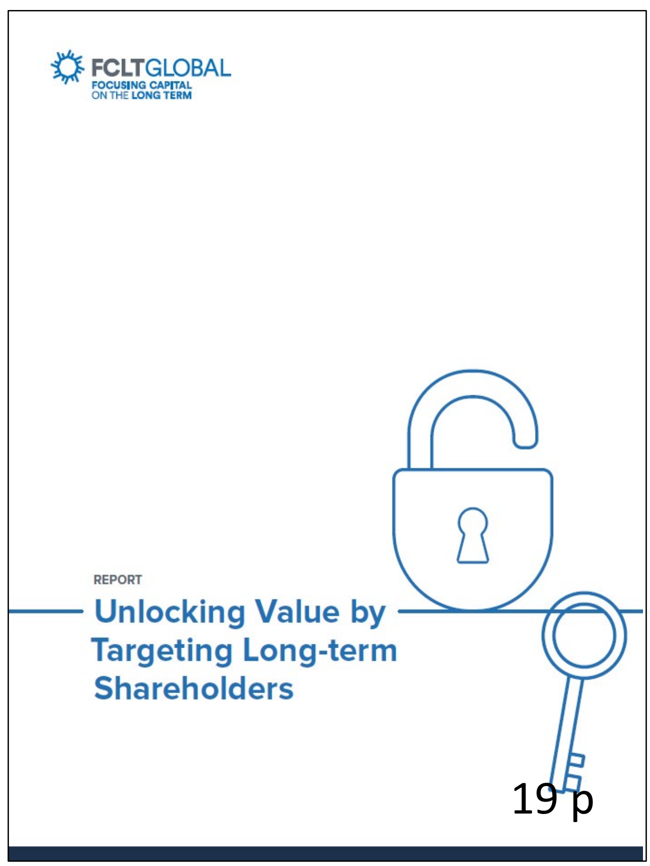

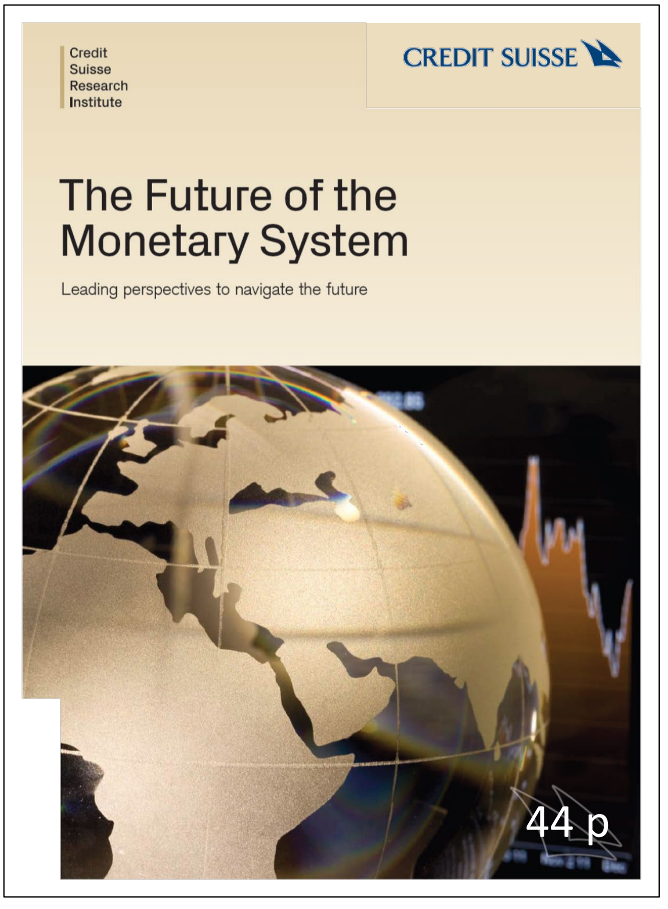
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Démographie

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World Population Prospects 2022

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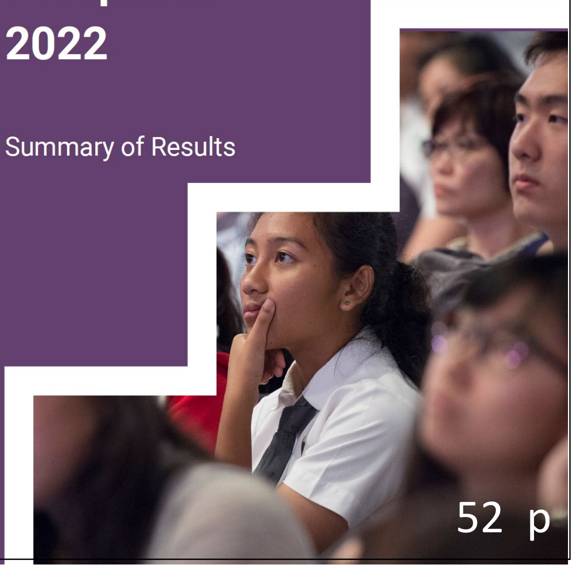

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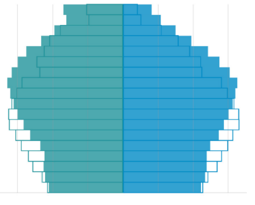

STUDY

EPRS | European Parliamentary Research Service

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PE 729.461 – May 2022

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HSBC Global Research

6 January 2021

Population and the pandemic

The demographic impact of COVID-19

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Economics - Global

- The pandemic looks set to accelerate falling birth numbers across the world…
- …further weakening the pace of population growth …
- … with potentially big implications for growth potential and challenges for policymakers

James Pomeroy
Economist
HSBC Bank plc

Henry Ward
Analyst
HSBC Bank plc

Discussing demographics may seem frivolous amidst a global health emergency – but demographic trends matter for the future growth rates of the global economy. The last thing governments facing deep recessions and burdened by high debt levels want to contemplate is the possibility of their working-age populations shrinking by more than their current projections. But that is likely to happen – and COVID-19 is to blame.

The clearest impact of the pandemic on demographics is via the huge number of deaths across the world. The virus has claimed the lives of nearly two million people, many of them elderly, but with many more likely underreported or dying from other conditions as a consequence of the number of COVID-19 patients in hospitals. The official worldwide death toll currently stands at just over 1.85 million, but the true figure could be much higher.

Understandably, the impact of the pandemic on births has been much less in focus. But there are clear signs that birth numbers are falling because many people feel uncertain and face financial constraints. In 2019, it is estimated that roughly 140m babies were born across the world - even a c. 1.5% drop in that number would mean that the hit to the world's population from the drop in births would equal the number of COVID-19 deaths.

We think the impact could be much bigger than that. Evidence from previous pandemics, natural disasters and recessions suggests it is likely that the number of births in 2020 and 2021 will drop by closer to 10-15% - so nearly 10 times more of an impact on the global population than the number of deaths.

And the effects will be long-lasting. As we have argued previously, we already think the UN's estimates for global births are too high. If the hit to employment, incomes and relationships from COVID-19 means the number of global births stays lower for the next few years, there could be a mini demographic cliff. Even assuming a temporary bounce in 2021, we could easily see the world's population start to shrink by the start of 2050s, rather than the start of the 2060s, as we have been projecting before.

The implications of this are huge. For governments burdened with more debt, facing even slower potential growth further down the line would be worrying. We may have to see even more aggressive policy changes to fight the trend – most likely via higher tax rates and higher retirement ages - than any vote-seeking politician would like to see.

This is a redacted version of the report published on 06-Jan-21. Please contact your HSBC representative or email AskResearch@hsbc.com for information.

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Direction des Statistiques Démographiques et Sociales

N° F0603

PROJECTION DE POPULATION 2005-2050
POUR LA FRANCE METROPOLITAINE

Methodes et résultats

Isabelle Robert-Bobée

Document de travail

INSEE

Institut National de la Statistique et des Etudes Economiques

106 p

EARTH4ALL: WORKING PAPER #1

March 2023

People and Planet

21st-century sustainable population scenarios and possible living standards within planetary boundaries

A report from the Earth4All initiative to the Global Challenges Foundation (GCF) in response to GCF's research call, May 2021.

Suggested citation: Callegari B., Stoknes P.E., People and Planet: 21st-century sustainable population scenarios and possible living standards within planetary boundaries. *Earth4All*, March 2023, version 1.0.

The report is based on Earth4All modelling outputs produced by Jorgen Randers, Ulrich Goluke, David Collste and Sarah Mashhadi.

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Earth 4All

Global Health Metrics

World population scenarios 2017 - 2100

Fertility, mortality, migration, and population scenarios for 195 countries and territories from 2017 to 2100: a forecasting analysis for the Global Burden of Disease Study

Stein Emil Vollset, Emily Goren, Chun-Wei Yuan, Jackie Cao, Amanda E Smith, Thomas Hsiao, Catherine Bisignano, Gulrez S Azhar, Emma Castro, Julian Chalek, Andrew J Dolgert, Tahvi Frank, Kai Fukutaki, Simon I Hay, Rafael Lozano, Ali H Mokdad, Vishnu Nandakumar, Maxwell Pierce, Martin Pletcher, Toshana Robalik, Krista M Steuben, Han Yong Wunrow, Bianca S Zlavog, Christopher J L Murray

oa

Summary

Background Understanding potential patterns in future population levels is crucial for anticipating and planning for changing age structures, resource and health-care needs, and environmental and economic landscapes. Future fertility patterns are a key input to estimation of future population size, but they are surrounded by substantial uncertainty and diverging methodologies of estimation and forecasting, leading to important differences in global population projections. Changing population size and age structure might have profound economic, social, and geopolitical impacts in many countries. In this study, we developed novel methods for forecasting mortality, fertility, migration, and population. We also assessed potential economic and geopolitical effects of future demographic shifts.

Methods We modelled future population in reference and alternative scenarios as a function of fertility, migration, and mortality rates. We developed statistical models for completed cohort fertility at age 50 years (CCF50). Completed cohort fertility is much more stable over time than the period measure of the total fertility rate (TFR). We modelled CCF50 as a time-series random walk function of educational attainment and contraceptive met need. Age-specific fertility rates were modelled as a function of CCF50 and covariates. We modelled age-specific mortality to 2100 using underlying mortality, a risk factor scalar, and an autoregressive integrated moving average (ARIMA) model. Net migration was modelled as a function of the Socio-demographic Index, crude population growth rate, and deaths from war and natural disasters; and use of an ARIMA model. The model framework was used to develop a reference scenario and alternative scenarios based on the pace of change in educational attainment and contraceptive met need. We estimated the size of gross domestic product for each country and territory in the reference scenario. Forecast uncertainty intervals (UIs) incorporated uncertainty propagated from past data inputs, model estimation, and forecast data distributions.

Findings The global TFR in the reference scenario was forecasted to be 1·66 (95% UI 1·33–2·08) in 2100. In the reference scenario, the global population was projected to peak in 2064 at 9·73 billion (8·84–10·9) people and decline to 8·79 billion (6·83–11·8) in 2100. The reference projections for the five largest countries in 2100 were India (1·09 billion [0·72–1·71], Nigeria (791 million [594–1056]), China (732 million [456–1499]), the USA (336 million [248–456]), and Pakistan (248 million [151–427]). Findings also suggest a shifting age structure in many parts of the world, with 2·37 billion (1·91–2·87) individuals older than 65 years and 1·70 billion (1·11–2·81) individuals younger than 20 years, forecasted globally in 2100. By 2050, 151 countries were forecasted to have a TFR lower than the replacement level (TFR <2·1), and 183 were forecasted to have a TFR lower than replacement by 2100. 23 countries in the reference scenario, including Japan, Thailand, and Spain, were forecasted to have population declines greater than 50% from 2017 to 2100; China's population was forecasted to decline by 48·0% (–6·1 to 68·4). China was forecasted to become the largest economy by 2035 but in the reference scenario, the USA was forecasted to once again become the largest economy in 2098. Our alternative scenarios suggest that meeting the Sustainable Development Goals targets for education and contraceptive met need would result in a global population of 6·29 billion (4·82–8·73) in 2100 and a population of 6·88 billion (5·27–9·51) when assuming 99th percentile rates of change in these drivers.

Interpretation Our findings suggest that continued trends in female educational attainment and access to contraception will hasten declines in fertility and slow population growth. A sustained TFR lower than the replacement level in many countries, including China and India, would have economic, social, environmental, and geopolitical consequences. Policy options to adapt to continued low fertility, while sustaining and enhancing female reproductive health, will be crucial in the years to come.

Funding Bill & Melinda Gates Foundation.

Lancet 2020; 396: 1285–306

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See **Comment** pages 1131 and 1133

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For **full past and future trends in population and fertility by scenario, location, sex, age group, and year** see https://vizhub.healthdata.org/population-forecast/

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American Economic Review 2022, 112(11): 3489–3527
https://doi.org/10.1257/aer.20201605

The End of Economic Growth? Unintended Consequences of a Declining Population†

By CHARLES I. JONES*

In many models, economic growth is driven by people discovering new ideas. These models typically assume either a constant or growing population. However, in high income countries today, fertility is already below its replacement rate: women are having fewer than two children on average. It is a distinct possibility that global population will decline rather than stabilize in the long run. In standard models, this has profound implications: rather than continued exponential growth, living standards stagnate for a population that vanishes. Moreover, even the optimal allocation can get trapped in this outcome if there are delays in implementing optimal policy. (*JEL* I12, J11, J13, O41)

In many growth models based on the discovery of new ideas, the size of the population plays a crucial role. Other things equal, a larger population means more researchers which in turn leads to more new ideas and to higher living standards. This basic feature is shared by the original endogenous growth models of Romer (1990); Aghion and Howitt (1992); and Grossman and Helpman (1991) (henceforth, Romer/AH/GH) as well as by the semi-endogenous growth models of Jones (1995); Kortum (1997); and Segerstrom (1998) in which standard policies have level effects instead of growth effects. It is a feature of numerous other models.[1]

In a recent book entitled *Empty Planet*, Bricker and Ibbitson (2019) make the case based on a rich body of demographic research that global population growth in the future may not only fall to zero but may actually turn negative. For example, the natural rate of population growth (i.e., births minus deaths, ignoring immigration) is already negative in Japan and in many European countries such as Germany, Italy, and Spain (United Nations 2019).

Figure 1 shows historical data on the total fertility rate for various regions. This measure is the average number of live births a cohort of women would have over their reproductive life if they were subject to the fertility rates of a given five-year

* Stanford University, Graduate School of Business and NBER (email: chad.jones@stanford.edu). Mikhail Golosov was the coeditor for this article. I am grateful to Sebastian Di Tella, Matthias Doepke, Jesus Fernandez-Villaverde, Oded Galor, Jeremy Greenwood, Pete Klenow, Chris Tonetti, David Weil and to many seminar participants for helpful comments. Rishabh Aggarwal and Charlotte Siegmann provided excellent research assistance.

† Go to https://doi.org/10.1257/aer.20201605 to visit the article page for additional materials and author disclosure statement.

[1] Examples include Kremer (1993); Acemoglu (1998); Ngai and Samaniego (2011); Doepke and Zilibotti (2014); Acemoglu and Restrepo (2018); Akcigit and Kerr (2018); Atkeson and Burstein (2019); and Buera and Oberfield (2020).

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La Chine face au défi de sa démographie

Isabelle ATTANÉ

Points clés

- En raison d'une très faible natalité, la Chine fait face à un vieillissement démographique rapide et à une réduction de sa population d'âge actif. À l'horizon 2050, plus d'un habitant sur trois en Chine sera âgé de 60 ans ou plus.
- Cette tendance risque de peser lourdement sur le développement économique du pays, qui de surcroît n'a pas encore atteint le niveau des grandes économies développées, en matière de produit intérieur brut par habitant ou d'indice de développement humain par exemple.
- Le gouvernement chinois prend d'ores et déjà des mesures pour pallier le vieillissement de la population. La politique de l'enfant unique a été abolie et de nouvelles politiques natalistes se dessinent, mais sans effet sur la démographie pour l'heure.
- D'autres leviers existent pouvant atténuer quelque peu le défi démographique, mais ils demeurent difficiles à activer dans un contexte économique contraint : l'augmentation massive des dépenses publiques dans l'éducation et la santé, la réforme de l'économie pour lutter contre les inégalités et encourager la consommation intérieure, et l'immigration de main-d'œuvre.

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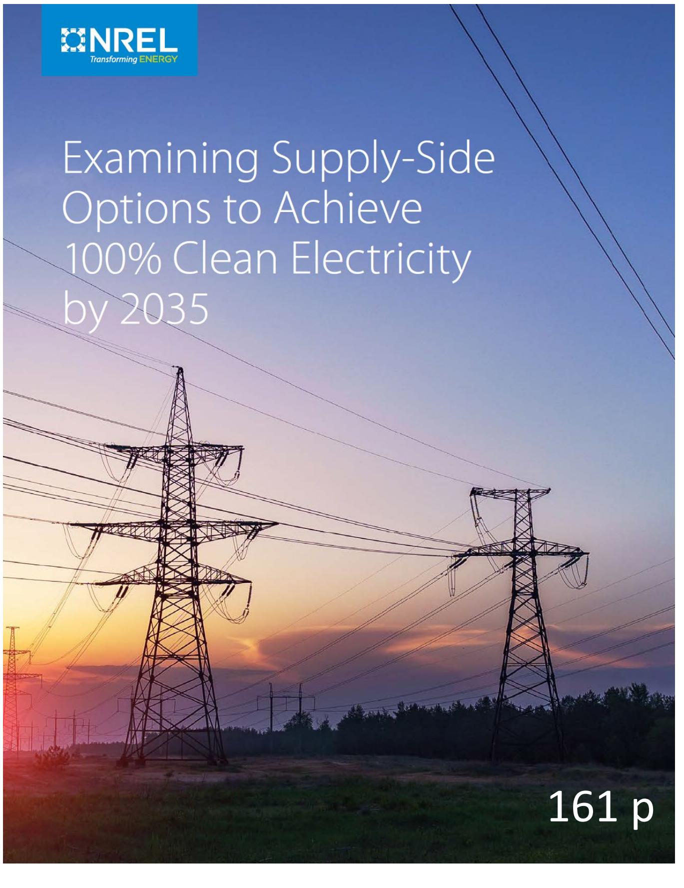
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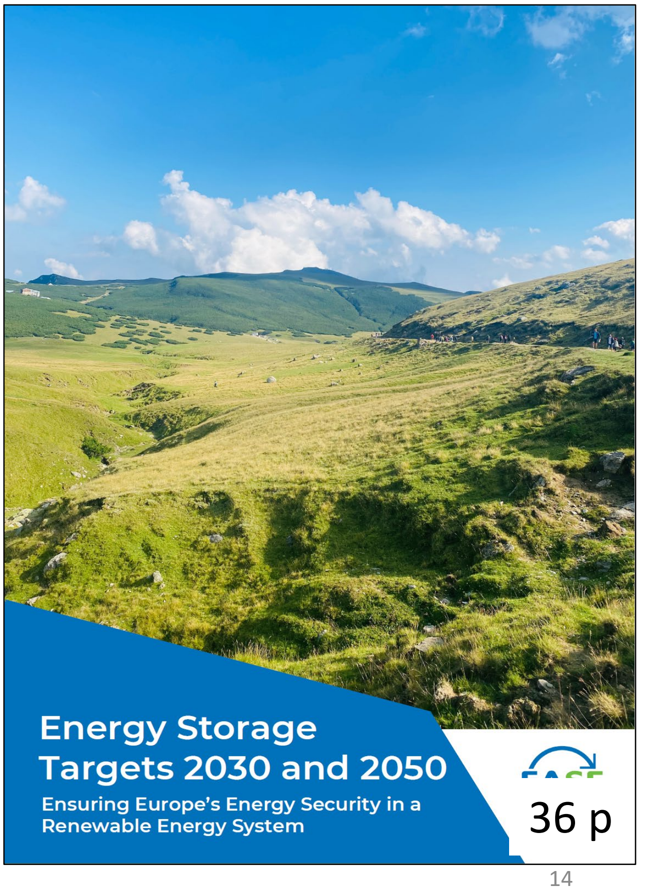
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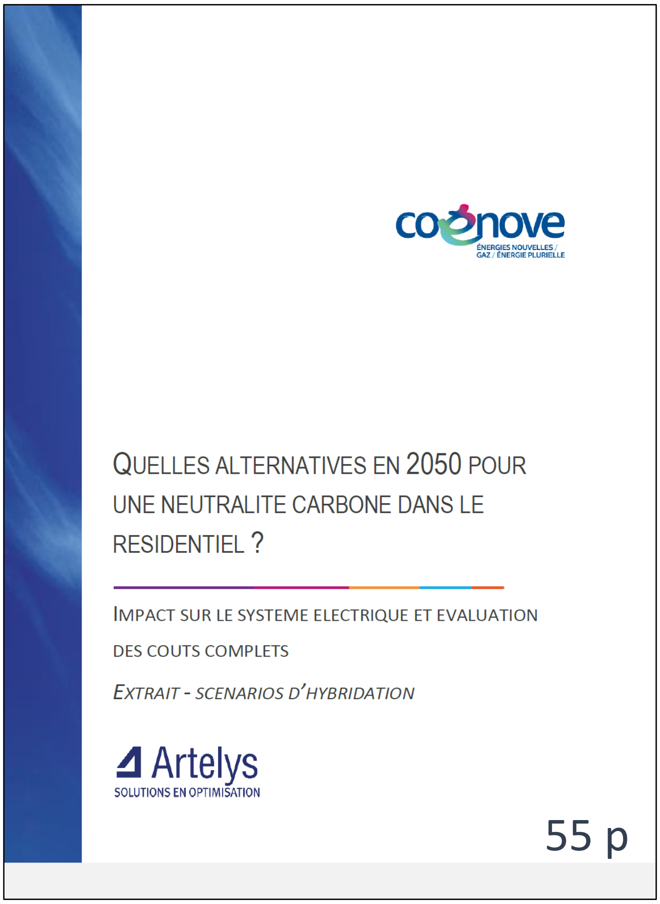
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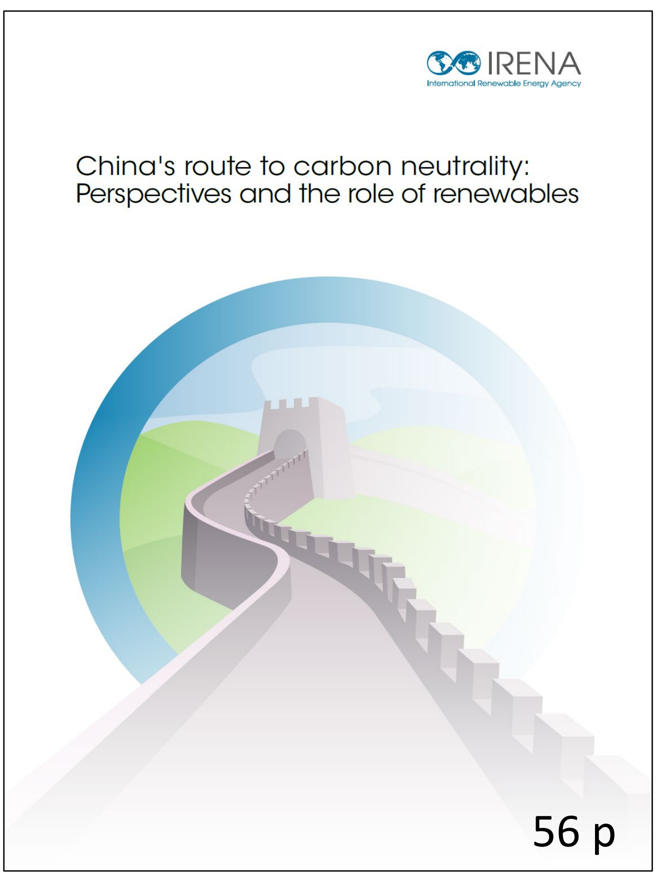
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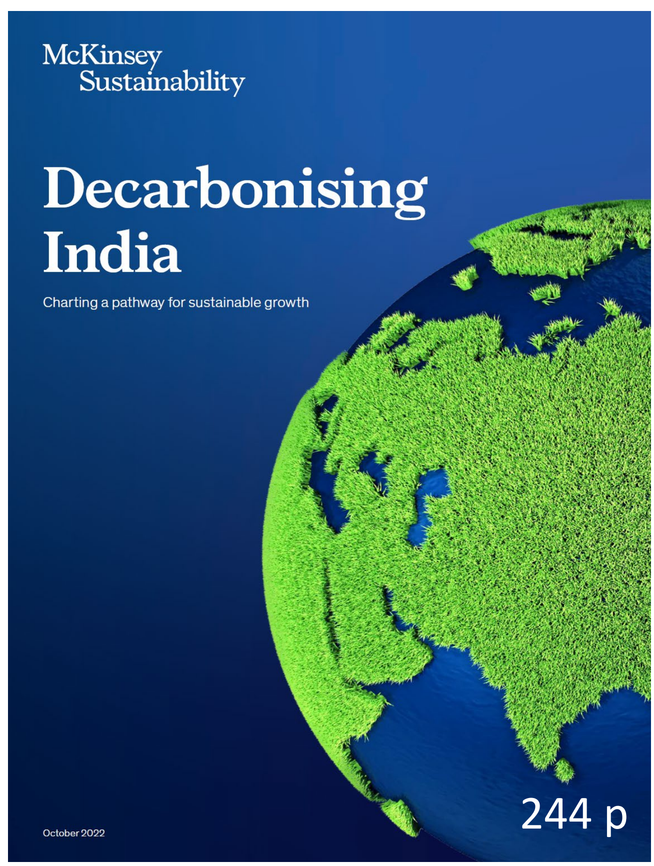
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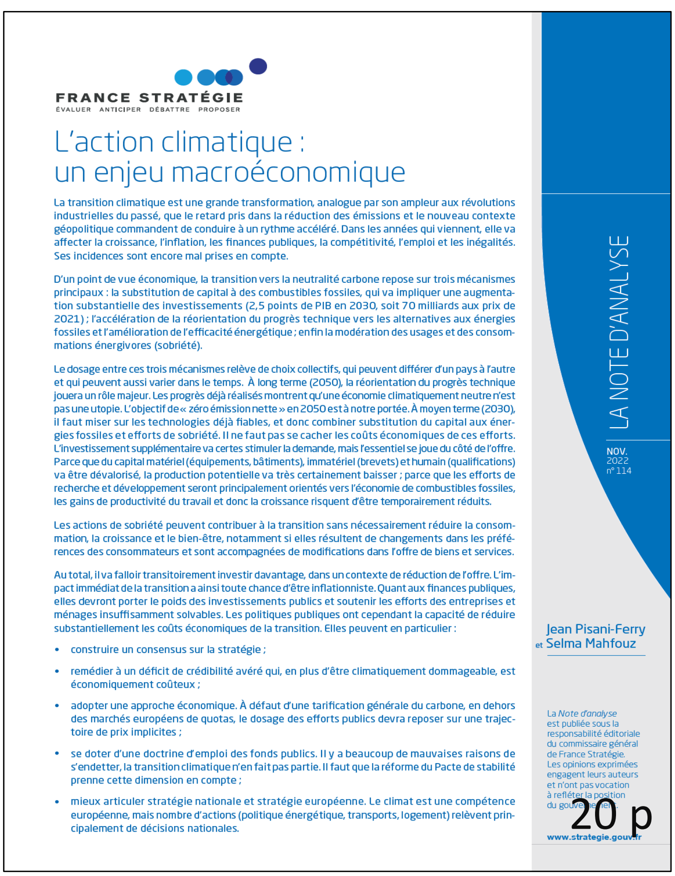

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L'action climatique : un enjeu macroéconomique

La transition climatique est une grande transformation, analogue par son ampleur aux révolutions industrielles du passé, que le retard pris dans la réduction des émissions et le nouveau contexte géopolitique commandent de conduire à un rythme accéléré. Dans les années qui viennent, elle va affecter la croissance, l'inflation, les finances publiques, la compétitivité, l'emploi et les inégalités. Ses incidences sont encore mal prises en compte.

D'un point de vue économique, la transition vers la neutralité carbone repose sur trois mécanismes principaux : la substitution de capital à des combustibles fossiles, qui va impliquer une augmentation substantielle des investissements (2,5 points de PIB en 2030, soit 70 milliards aux prix de 2021) ; l'accélération de la réorientation du progrès technique vers les alternatives aux énergies fossiles et l'amélioration de l'efficacité énergétique ; enfin la modération des usages et des consommations énergivores (sobriété).

Le dosage entre ces trois mécanismes relève de choix collectifs, qui peuvent différer d'un pays à l'autre et qui peuvent aussi varier dans le temps. À long terme (2050), la réorientation du progrès technique jouera un rôle majeur. Les progrès déjà réalisés montrent qu'une économie climatiquement neutre n'est pas une utopie. L'objectif de « zéro émission nette » en 2050 est à notre portée. À moyen terme (2030), il faut miser sur les technologies déjà fiables, et donc combiner substitution du capital aux énergies fossiles et efforts de sobriété. Il ne faut pas se cacher les coûts économiques de ces efforts. L'investissement supplémentaire va certes stimuler la demande, mais l'essentiel se joue du côté de l'offre. Parce que du capital matériel (équipements, bâtiments), immatériel (brevets) et humain (qualifications) va être dévalorisé, la production potentielle va très certainement baisser ; parce que les efforts de recherche et développement seront principalement orientés vers l'économie de combustibles fossiles, les gains de productivité du travail et donc la croissance risquent d'être temporairement réduits.

Les actions de sobriété peuvent contribuer à la transition sans nécessairement réduire la consommation, la croissance et le bien-être, notamment si elles résultent de changements dans les préférences des consommateurs et sont accompagnées de modifications dans l'offre de biens et services.

Au total, il va falloir transitoirement investir davantage, dans un contexte de réduction de l'offre. L'impact immédiat de la transition a ainsi toute chance d'être inflationniste. Quant aux finances publiques, elles devront porter le poids des investissements publics et soutenir les efforts des entreprises et ménages insuffisamment solvables. Les politiques publiques ont cependant la capacité de réduire substantiellement les coûts économiques de la transition. Elles peuvent en particulier :

- construire un consensus sur la stratégie ;
- remédier à un déficit de crédibilité avéré qui, en plus d'être climatiquement dommageable, est économiquement coûteux ;
- adopter une approche économique. À défaut d'une tarification générale du carbone, en dehors des marchés européens de quotas, le dosage des efforts publics devra reposer sur une trajectoire de prix implicites ;
- se doter d'une doctrine d'emploi des fonds publics. Il y a beaucoup de mauvaises raisons de s'endetter, la transition climatique n'en fait pas partie. Il faut que la réforme du Pacte de stabilité prenne cette dimension en compte ;
- mieux articuler stratégie nationale et stratégie européenne. Le climat est une compétence européenne, mais nombre d'actions (politique énergétique, transports, logement) relèvent principalement de décisions nationales.

LA NOTE D'ANALYSE
NOV. 2022 n° 114

Jean Pisani-Ferry et Selma Mahfouz

La *Note d'analyse* est publiée sous la responsabilité éditoriale du commissaire général de France Stratégie. Les opinions exprimées engagent leurs auteurs et n'ont pas vocation à refléter la position du gouvernement.

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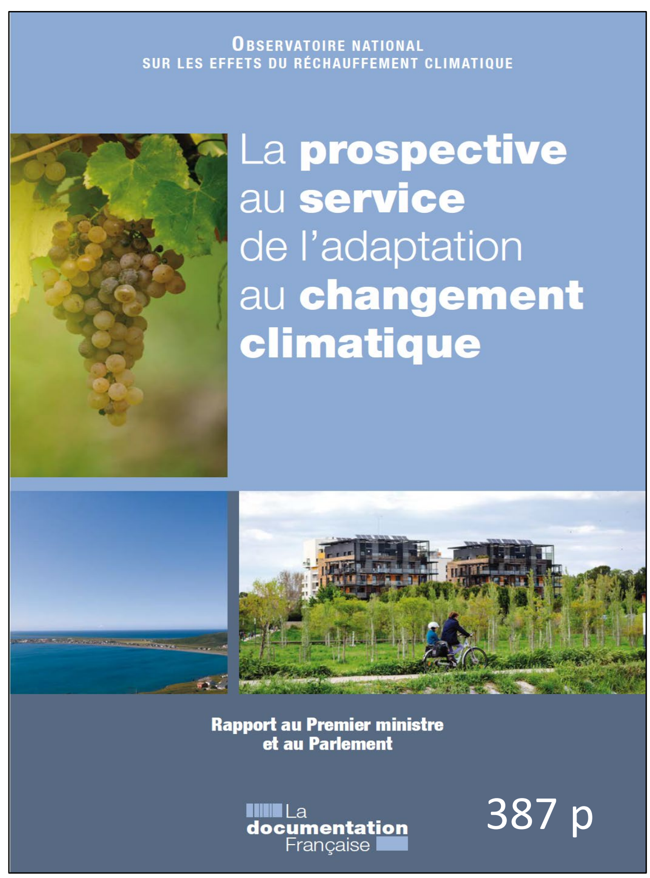

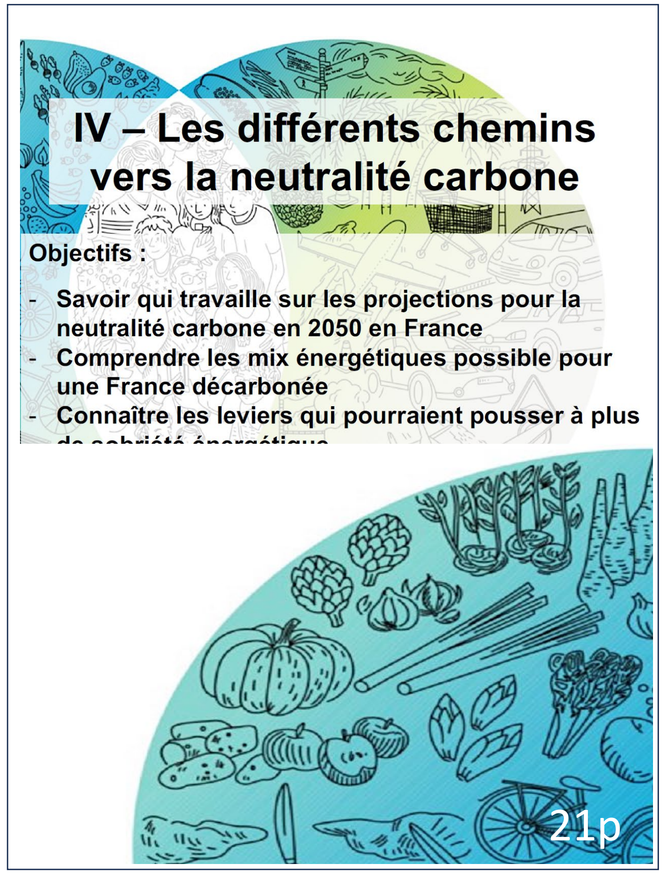

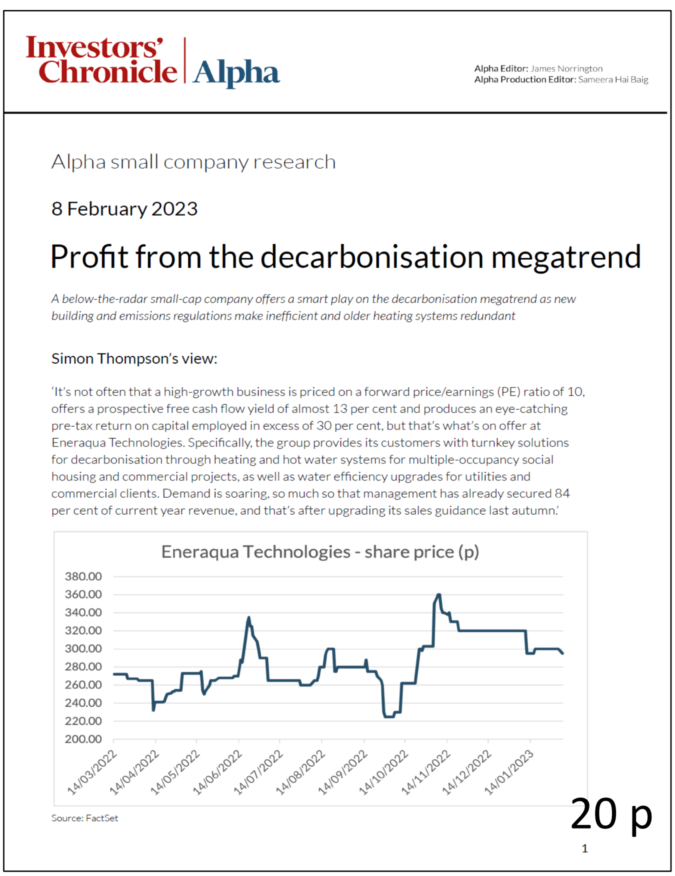
Investors' Chronicle | Alpha

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Alpha small company research

8 February 2023

Profit from the decarbonisation megatrend

A below-the-radar small-cap company offers a smart play on the decarbonisation megatrend as new building and emissions regulations make inefficient and older heating systems redundant

Simon Thompson's view:

'It's not often that a high-growth business is priced on a forward price/earnings (PE) ratio of 10, offers a prospective free cash flow yield of almost 13 per cent and produces an eye-catching pre-tax return on capital employed in excess of 30 per cent, but that's what's on offer at Eneraqua Technologies. Specifically, the group provides its customers with turnkey solutions for decarbonisation through heating and hot water systems for multiple-occupancy social housing and commercial projects, as well as water efficiency upgrades for utilities and commercial clients. Demand is soaring, so much so that management has already secured 84 per cent of current year revenue, and that's after upgrading its sales guidance last autumn.'

Eneraqua Technologies - share price (p)

Source: FactSet

1


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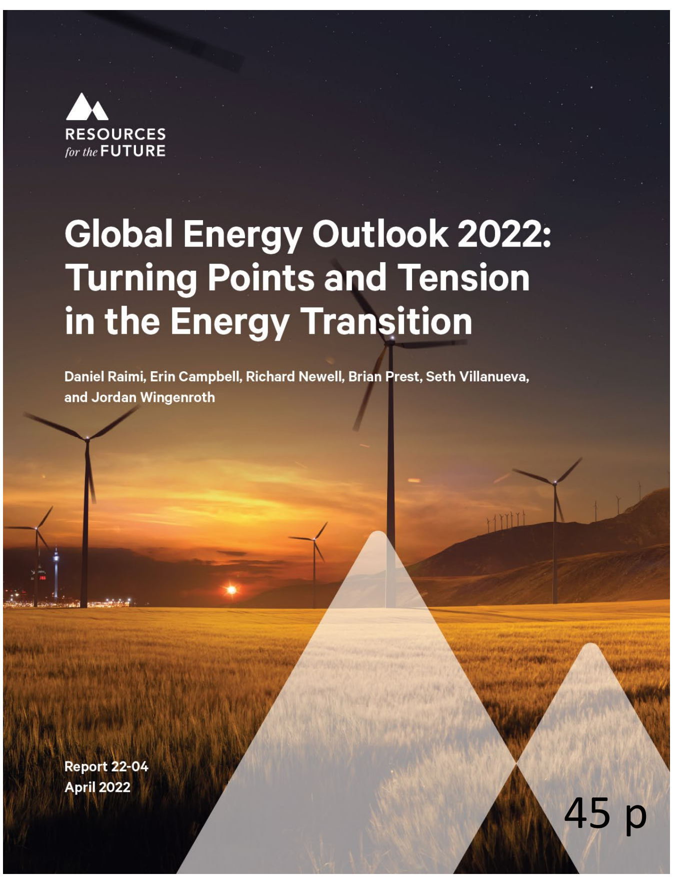
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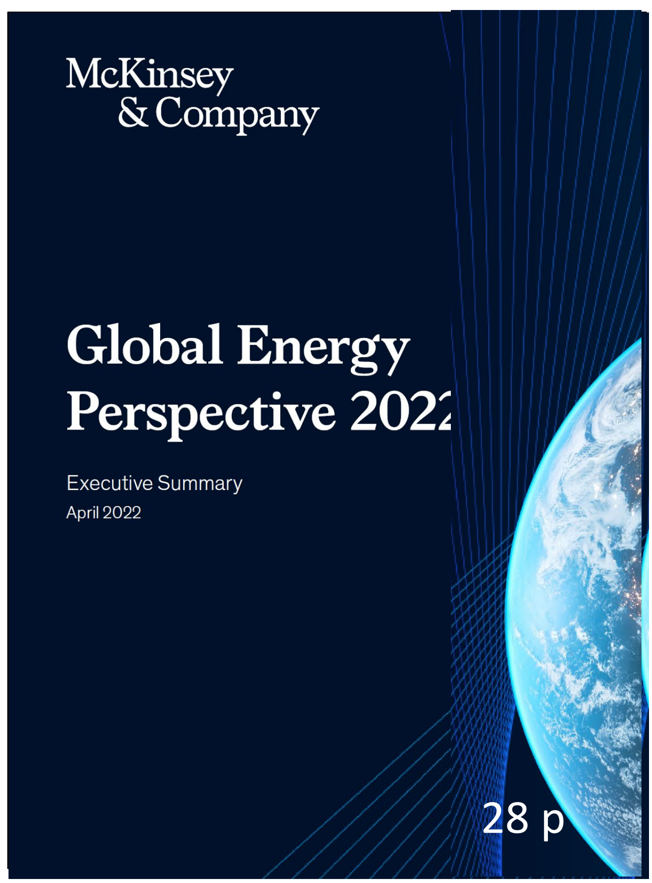
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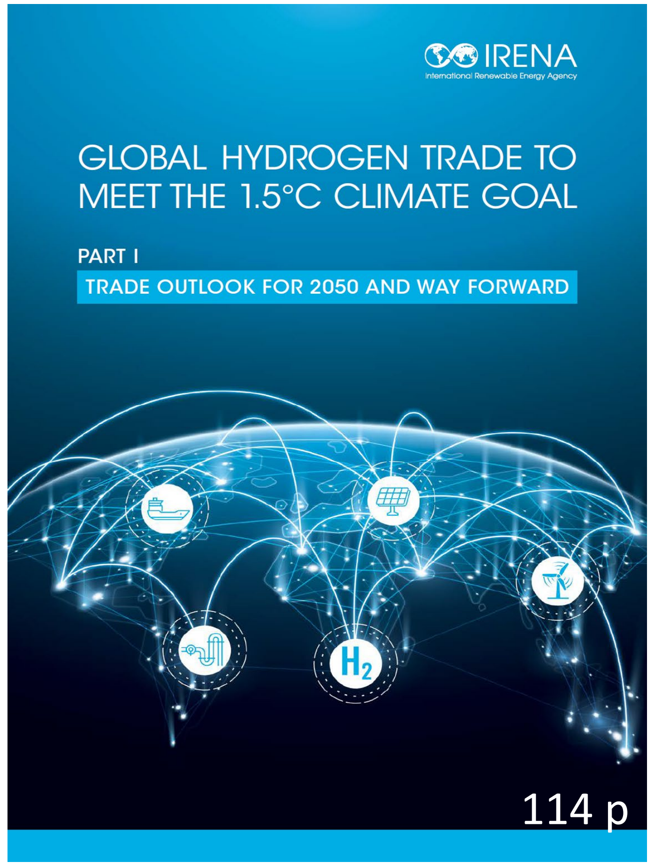

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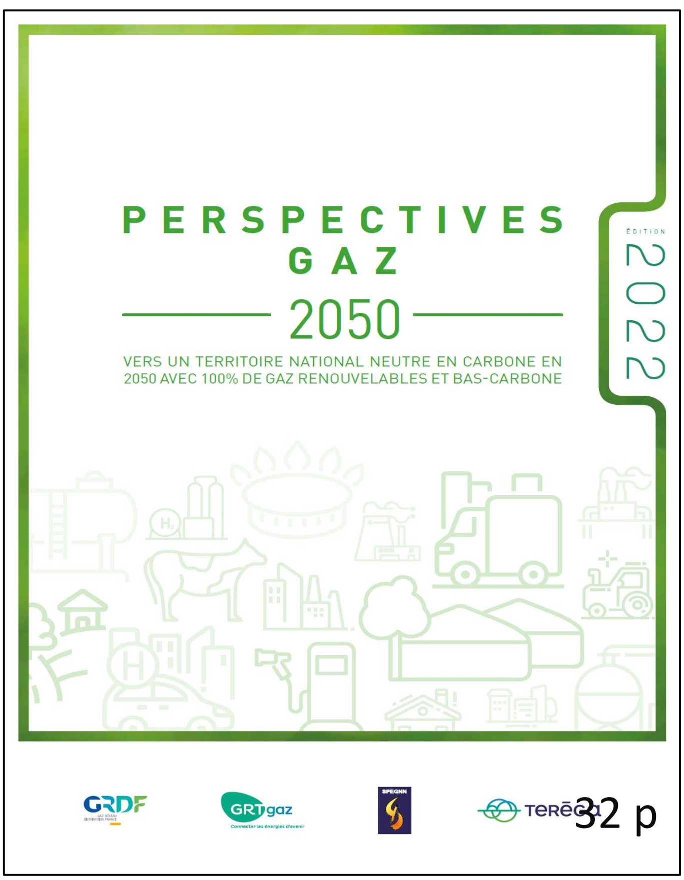

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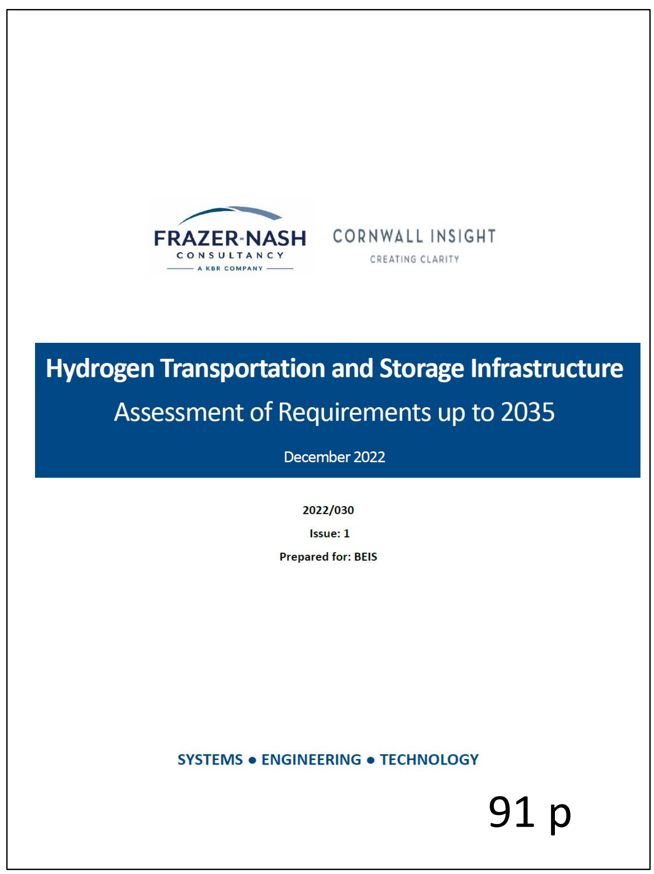

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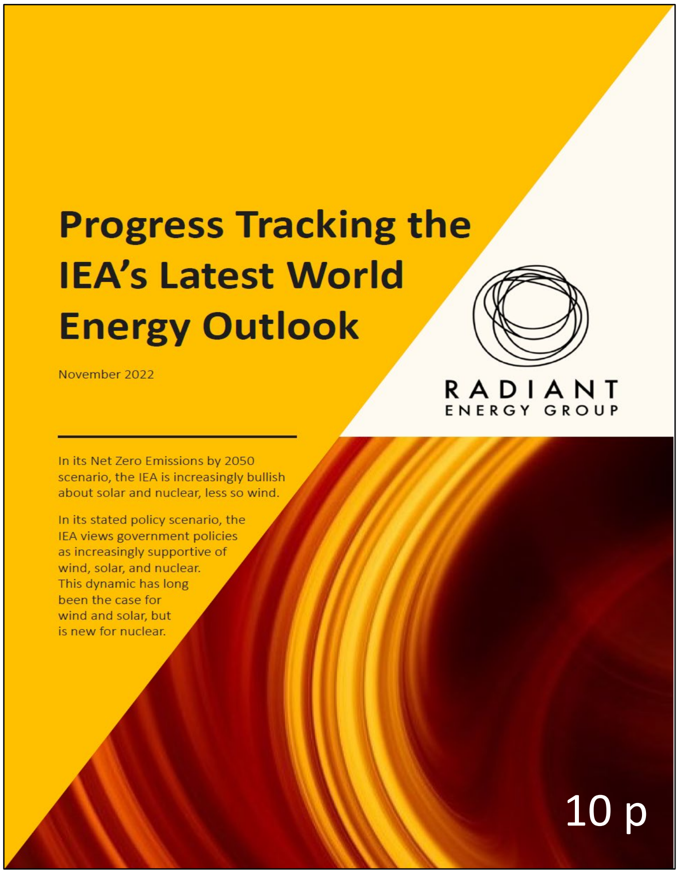
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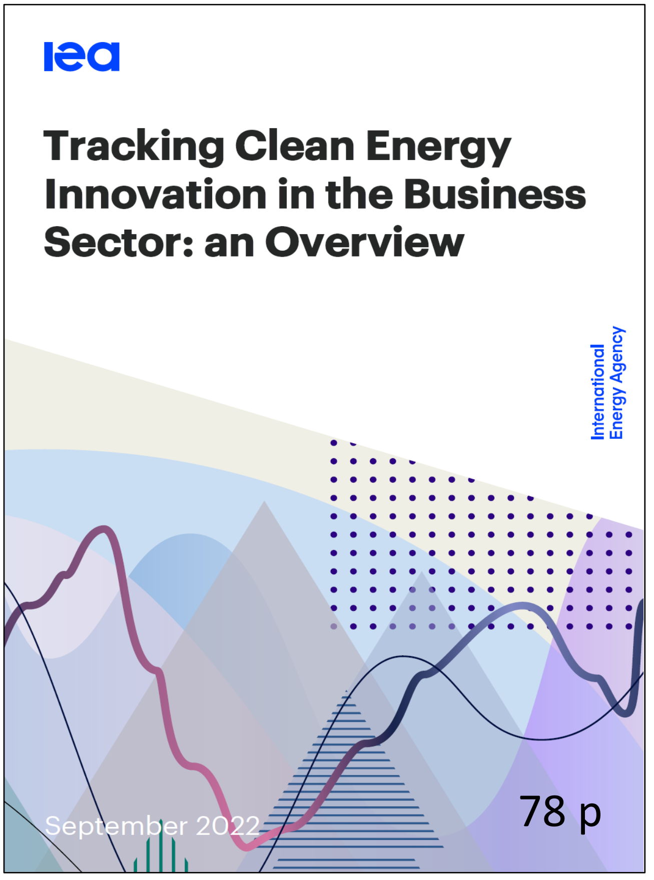
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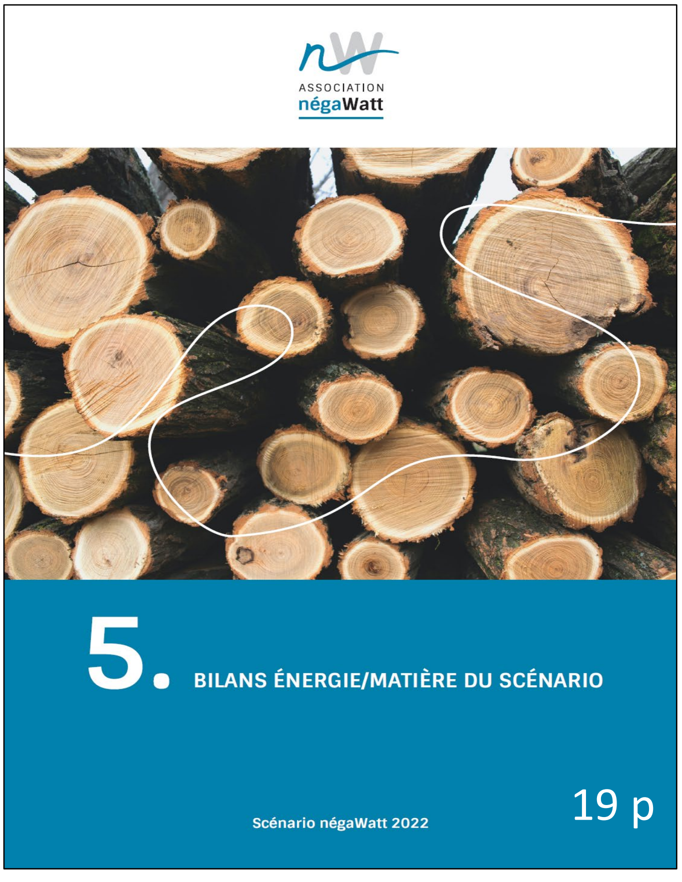
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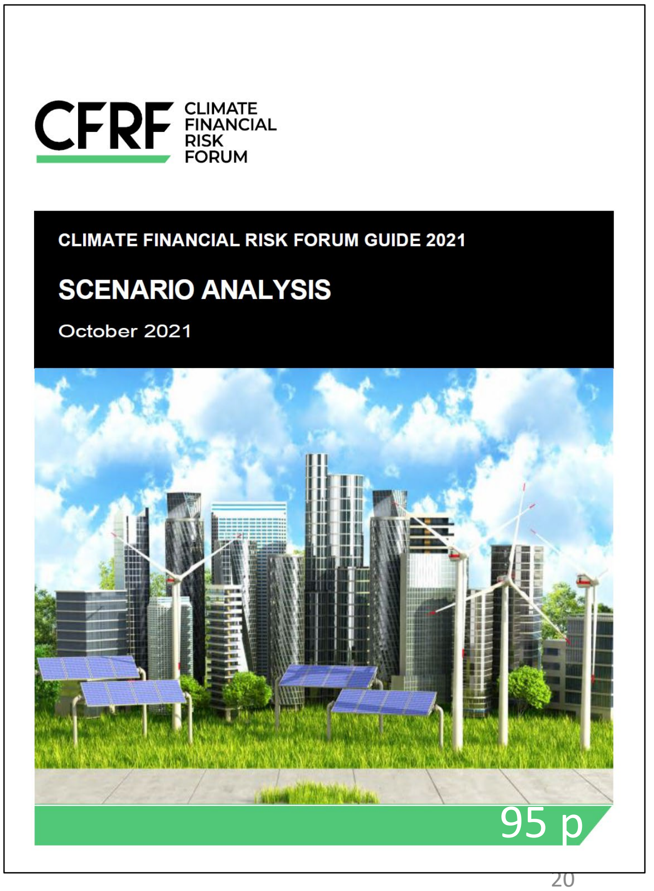
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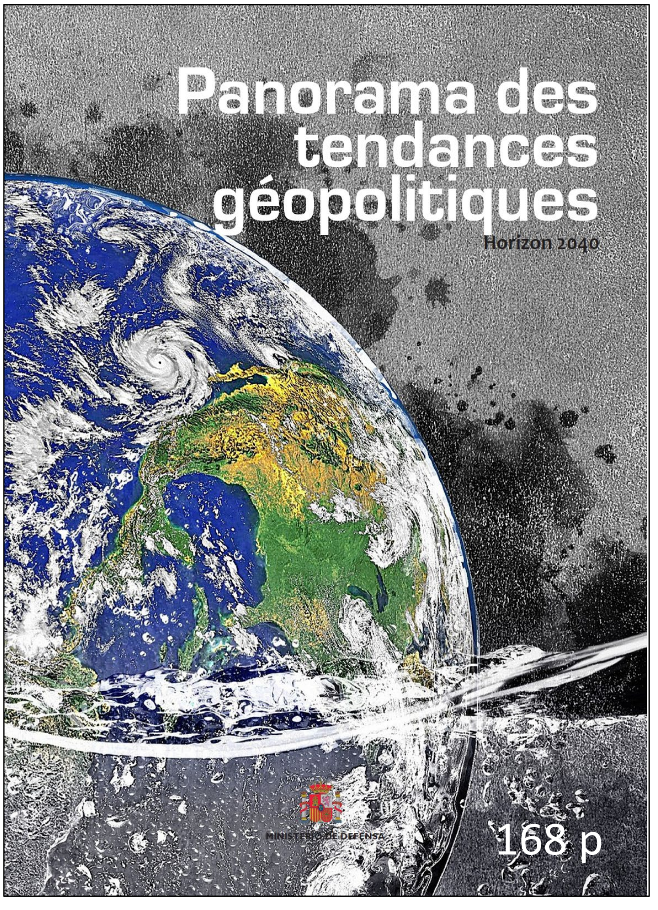
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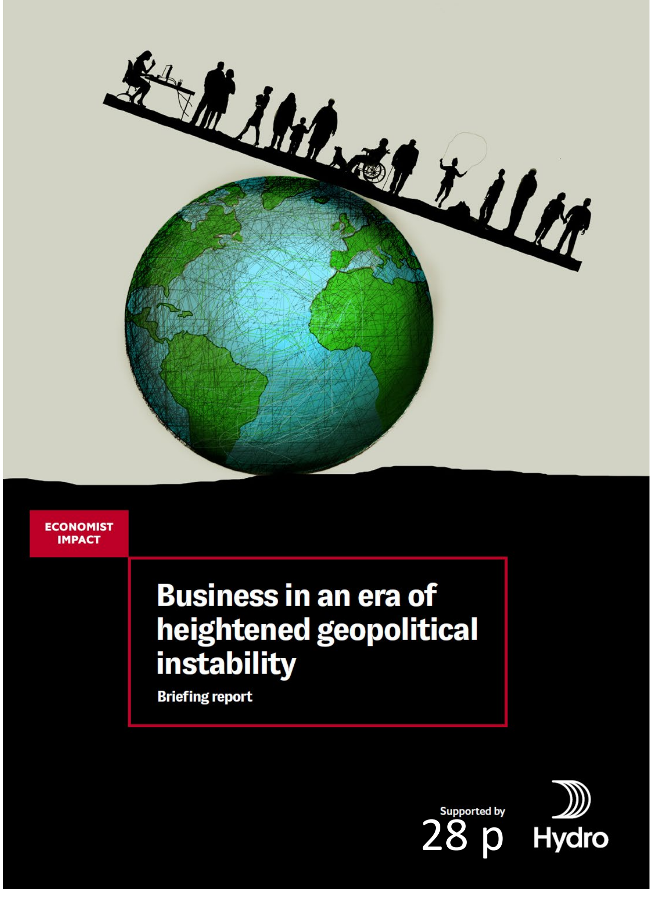
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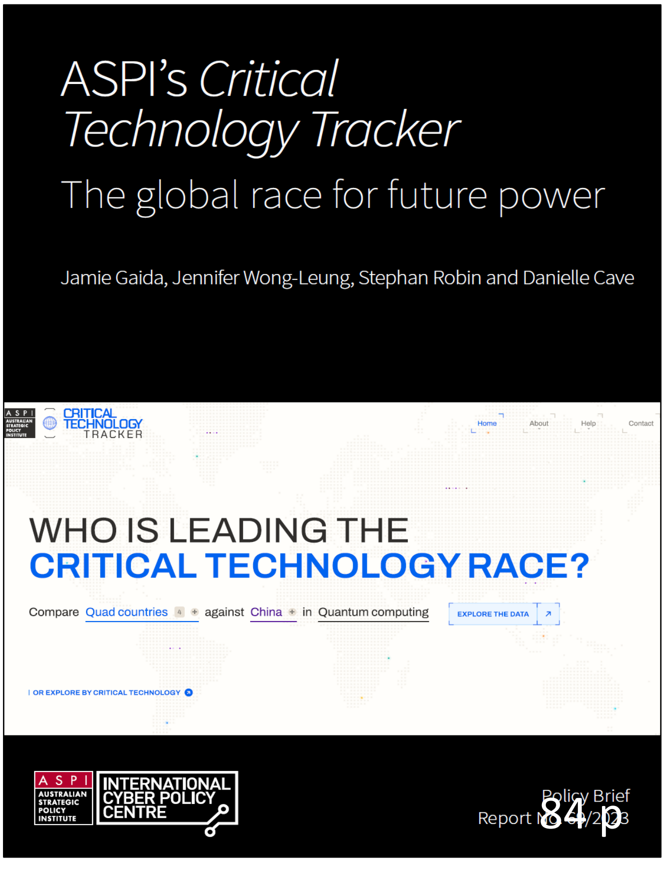
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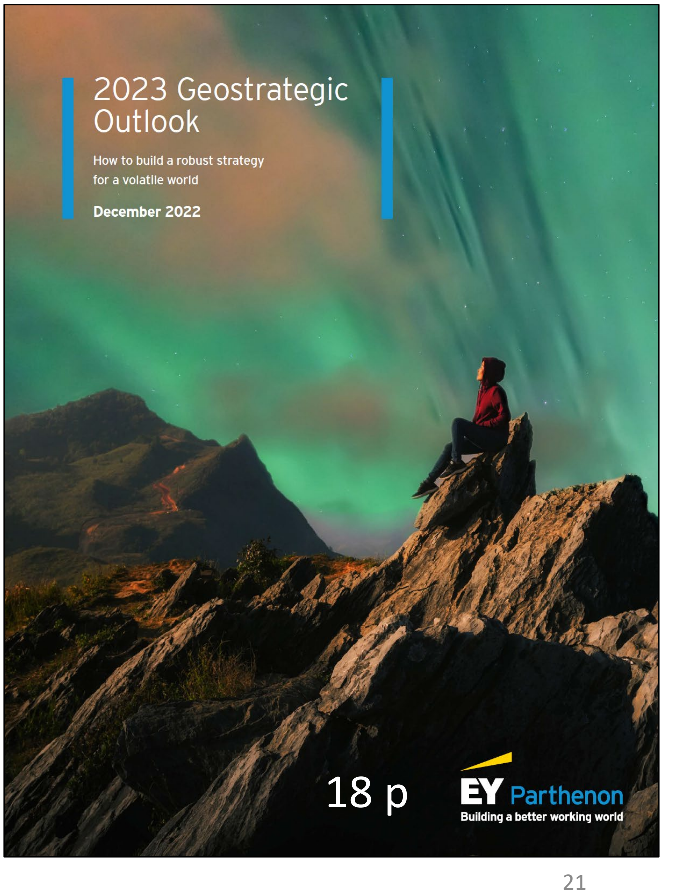
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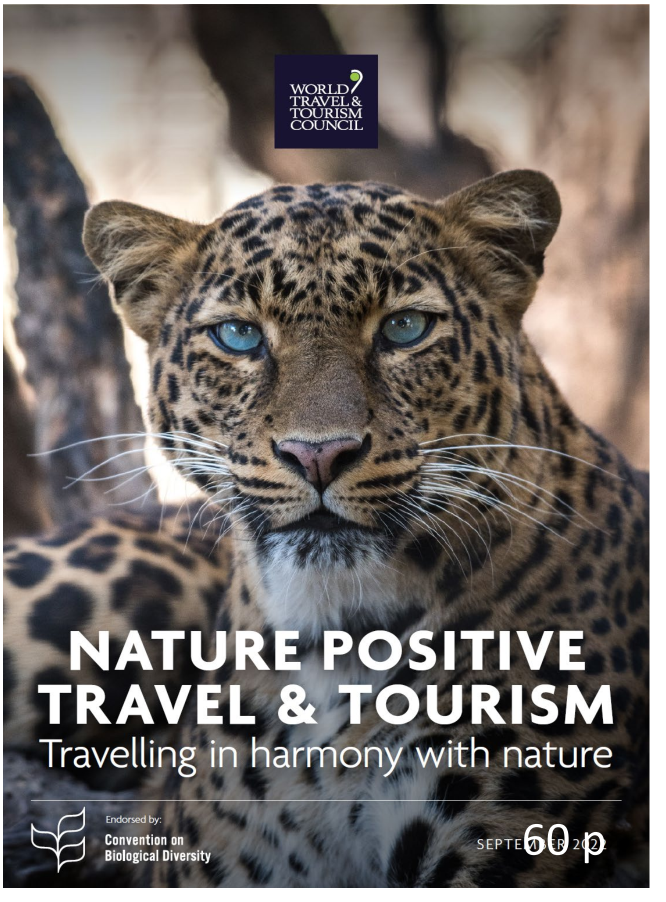
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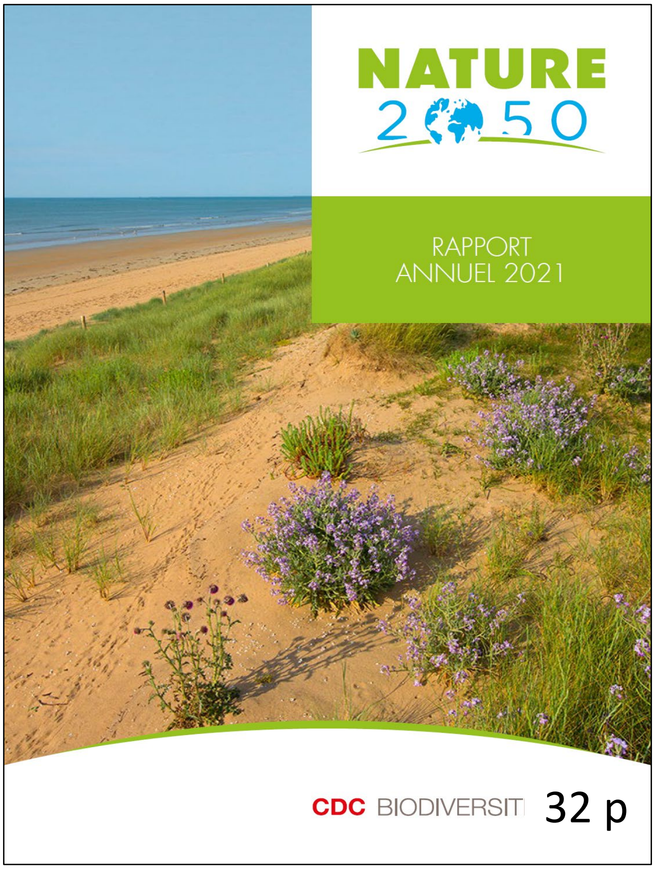
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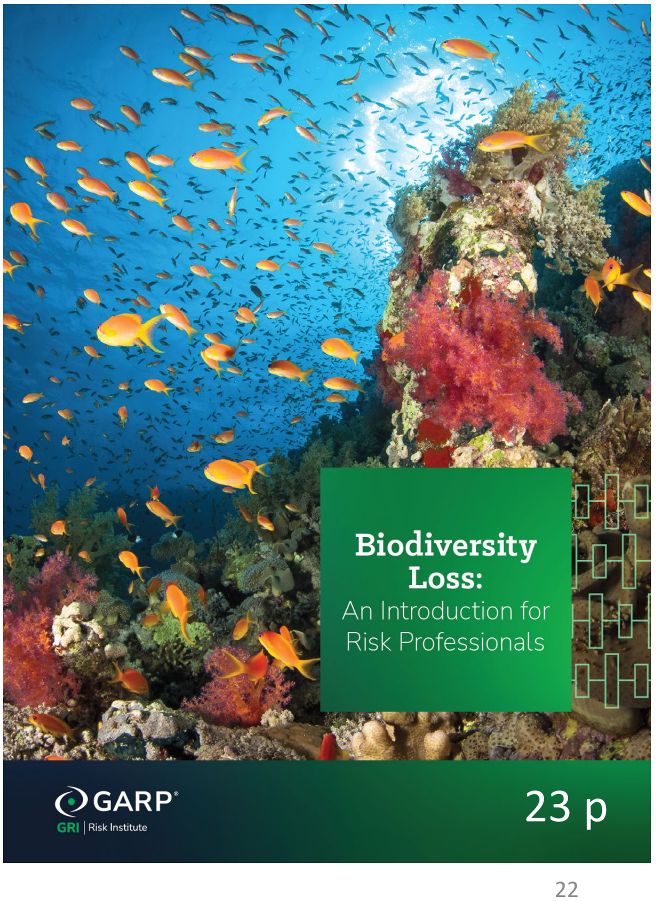
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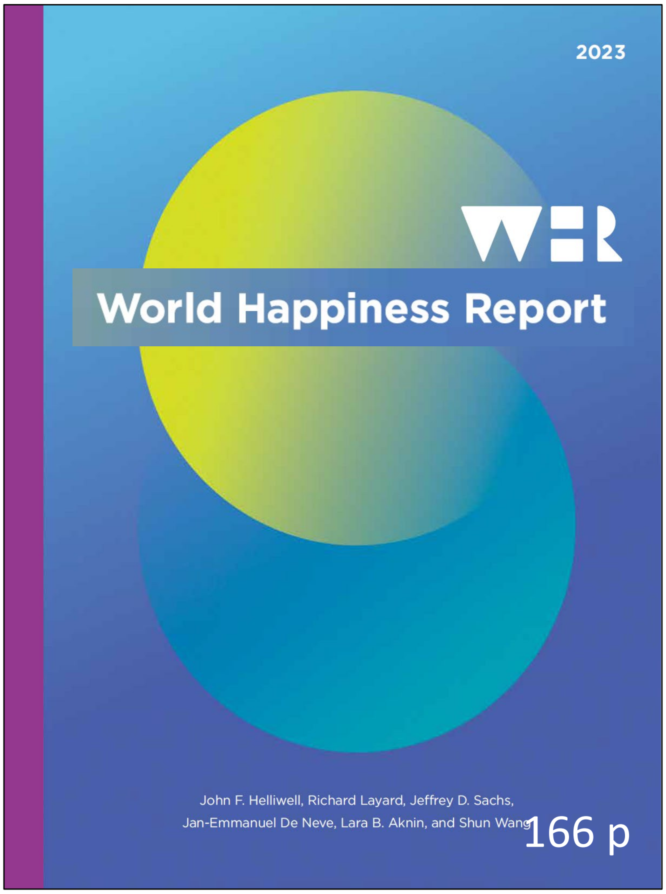
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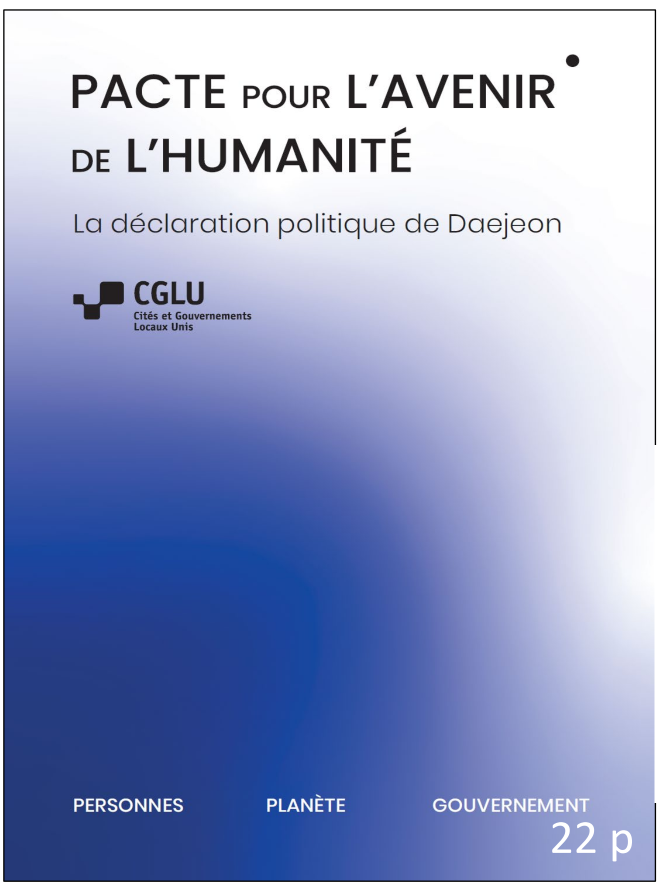
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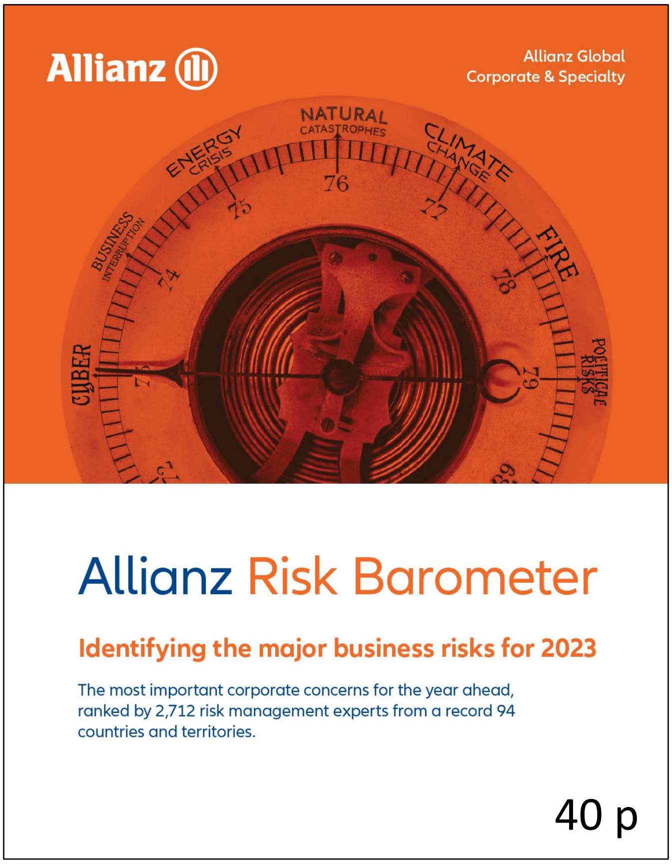

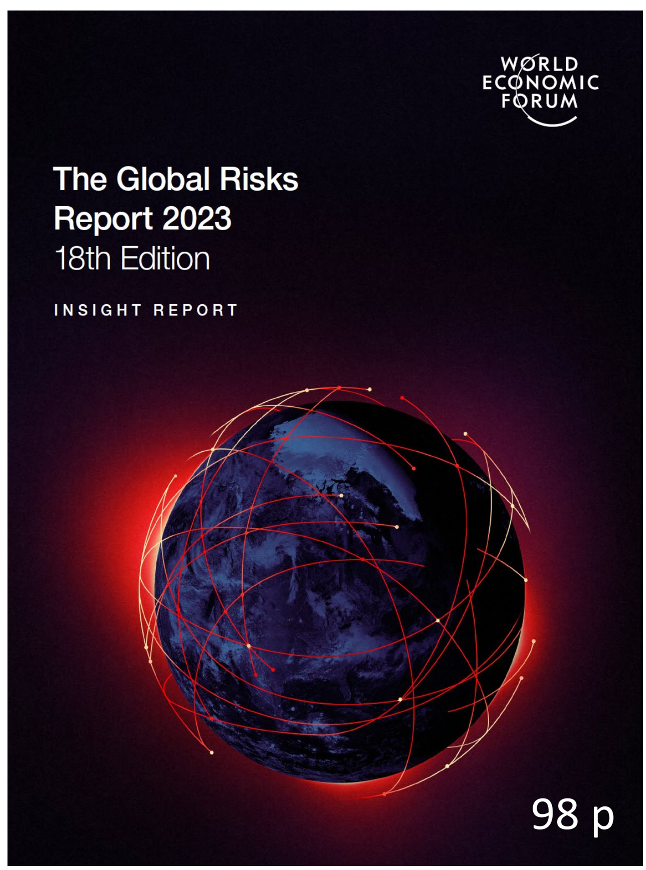

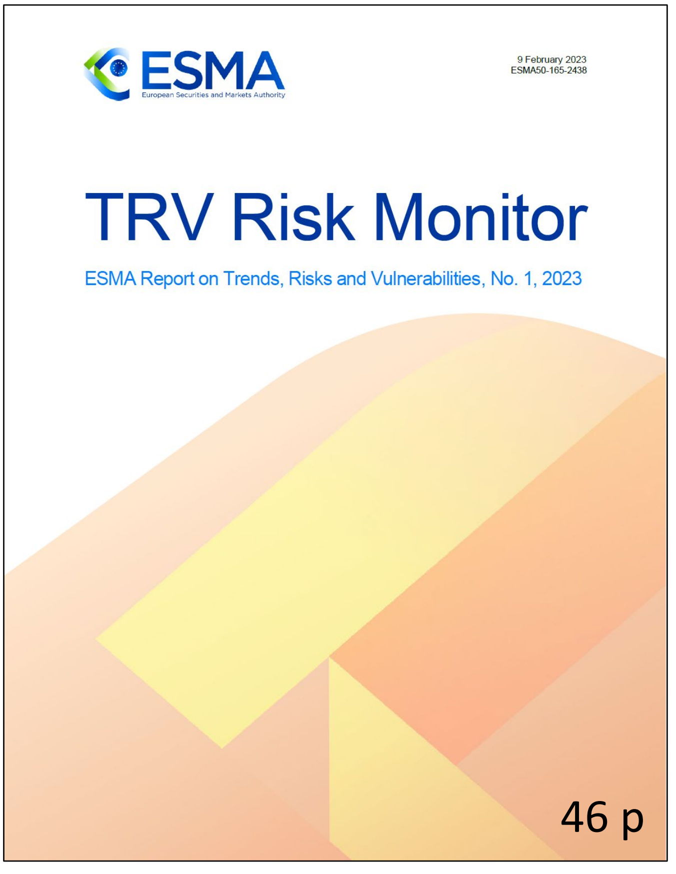
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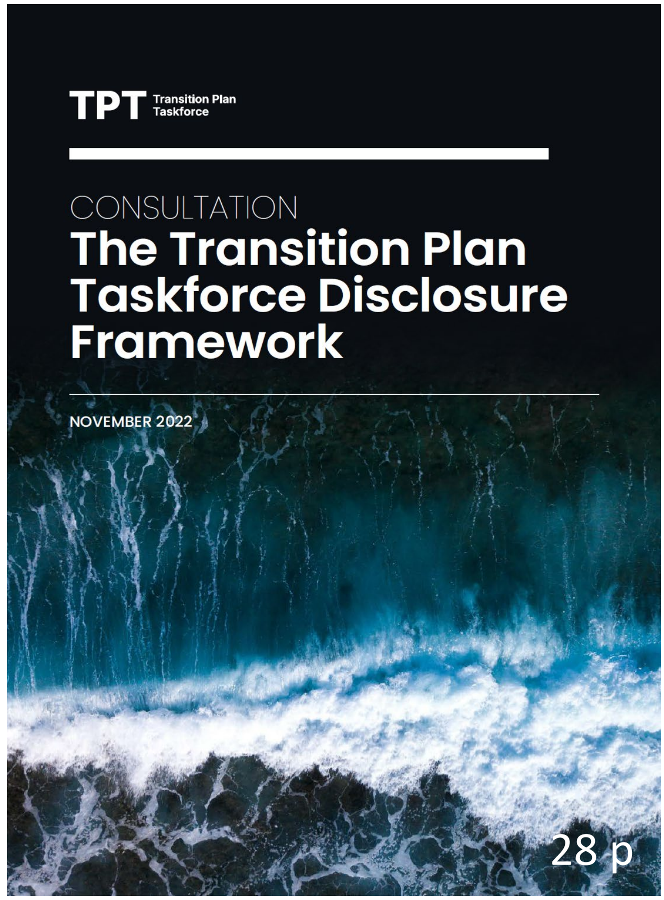

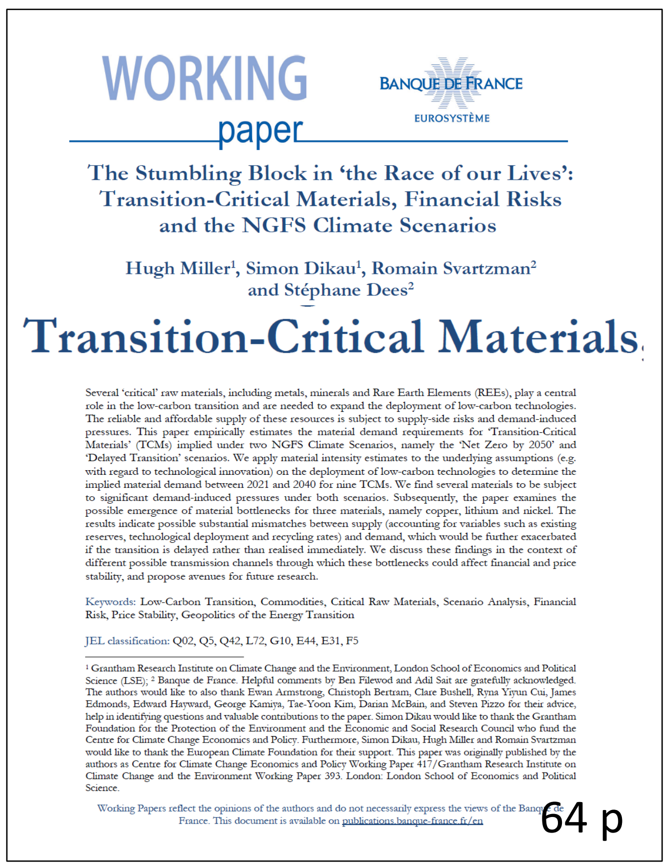
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BANQUE DE FRANCE
EUROSYSTÈME

The Stumbling Block in 'the Race of our Lives': Transition-Critical Materials, Financial Risks and the NGFS Climate Scenarios

Hugh Miller[1], Simon Dikau[1], Romain Svartzman[2] and Stéphane Dees[2]

Transition-Critical Materials

Several 'critical' raw materials, including metals, minerals and Rare Earth Elements (REEs), play a central role in the low-carbon transition and are needed to expand the deployment of low-carbon technologies. The reliable and affordable supply of these resources is subject to supply-side risks and demand-induced pressures. This paper empirically estimates the material demand requirements for 'Transition-Critical Materials' (TCMs) implied under two NGFS Climate Scenarios, namely the 'Net Zero by 2050' and 'Delayed Transition' scenarios. We apply material intensity estimates to the underlying assumptions (e.g. with regard to technological innovation) on the deployment of low-carbon technologies to determine the implied material demand between 2021 and 2040 for nine TCMs. We find several materials to be subject to significant demand-induced pressures under both scenarios. Subsequently, the paper examines the possible emergence of material bottlenecks for three materials, namely copper, lithium and nickel. The results indicate possible substantial mismatches between supply (accounting for variables such as existing reserves, technological deployment and recycling rates) and demand, which would be further exacerbated if the transition is delayed rather than realised immediately. We discuss these findings in the context of different possible transmission channels through which these bottlenecks could affect financial and price stability, and propose avenues for future research.

Keywords: Low-Carbon Transition, Commodities, Critical Raw Materials, Scenario Analysis, Financial Risk, Price Stability, Geopolitics of the Energy Transition

JEL classification: Q02, Q5, Q42, L72, G10, E44, E31, F5

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Five technology mega-trends impacting society

November 22, 2022

Sandy Kaul
Head of Digital Assets and Industry Advisory Services
Franklin Templeton

Introduction

I am in the process of completing a three-part series of papers about technology megatrends impacting society and what to expect with the Web3 revolution. This article recaps the innovation cycles that gave rise to these megatrends featured in my first paper—"Evolution of commercial technologies and impact on business delivery." It also offers a preview of the five megatrends that I will discuss in more detail in my second paper coming out in the first quarter of 2023.

Tech-driven innovation cycles create new business approaches

Since the 1960s, commercial enterprises have benefited from a rapid evolution in the technologies available to them—adapting many innovations originally designed for the military and previously deployed only to large universities. As these new commercial technologies have emerged, they alter what is possible for businesses and their customers. The push to adopt new capabilities requires enterprises to rebuild their delivery infrastructure. This cycle of new technology changing business abilities, and thus prompting upgrades to an organization's platform, has now happened three times since the 1960s, and we are on the verge of a fourth innovation cycle.

Waves of Commercial Technology Innovation

Cycle 1	Cycle 2	Cycle 3	Cycle 4
Automation	Digitization	Virtualization	Decentralization
1960s-Late 1970s	Late 1970s-Mid-2000s	Mid-2000s-Present	Emerging

Time

Source: Franklin Templeton Industry Advisory Services.

The first cycle, automation, was when computers became more compact, resulting in more efficient business tasks and more centralized data processing. In the 1970s, the second cycle of digitization began with the emergence of personal computers as well as commercial off-the-shelf software. Networking also progressed, with the internet becoming publicly available in the late 1980s and websites exploding by the early 2000s. We are currently finishing up the third cycle, virtualization, that features the introduction of cloud computing, APIs and big data. These new technologies have allowed for the embedding of our social interactions into digital networks and have fostered new commercial platforms that allow individuals and businesses to interact at-will across a range of business activities.

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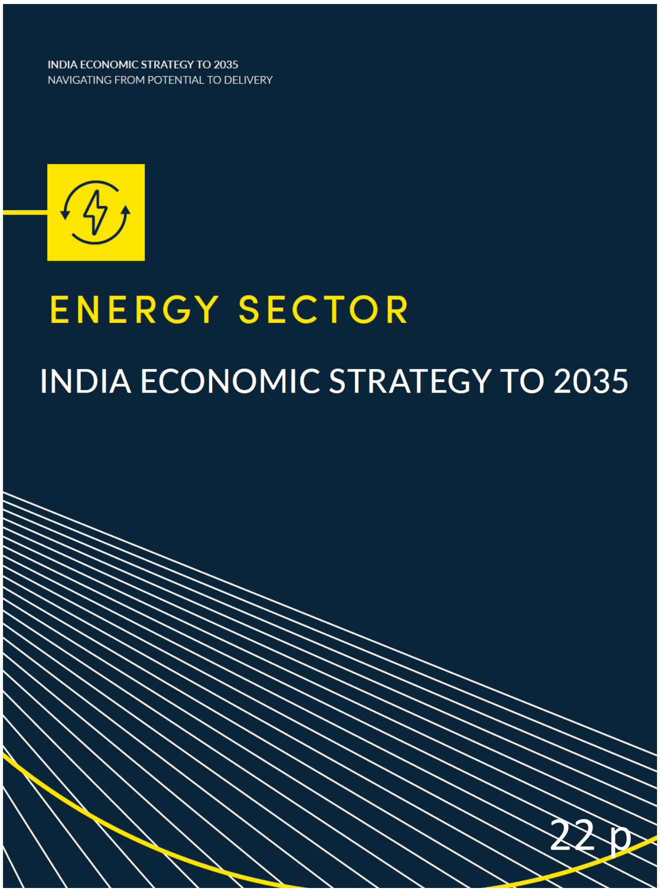

CEEW THE COUNCIL | Centre for Energy Finance

Investment Sizing India's 2070 Net-Zero Target

Vaibhav Pratap Singh and Gagan Sidhu

Issue Brief | November 2021

Executive summary

On 1 November 2021, India's Prime Minister declared that India would achieve net-zero emissions by 2070. The announcement made at COP26 in Glasgow was in tandem with a declaration of an enhancement of India's Paris commitments. Achieving net-zero involves technology pathways as well as financial flows. These finance flows, or investments, are required to fund the construction of the associated physical infrastructure (**total investment**). In India's case, such investments will run into trillions of dollars. The investment requirement curve would have been steeper if the time taken to reach net-zero was to be reduced further. The mobilisation of investments to achieve net-zero expectedly will be sourced from domestic banks, Non-Banking Finance Companies (NBFC), and debt capital markets, both domestic and international. However, a gap remains (**investment gap**) between the total investment required to achieve net-zero and the amount that can be reasonably mustered from conventional sources.

Along with the sectoral deployment of different technologies, India's net-zero commitment will require immense capital investment in infrastructure.

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African Cities: Unlocking Financing for Urbanisation

Astrid R.N. Haas

The nexus between urbanisation and industrialisation provides the foundation for a structural transformation process that increases economic growth and incomes. However, in Africa, unlike most other regions of the world, urbanisation has not been associated with greater industrialisation: Africa is

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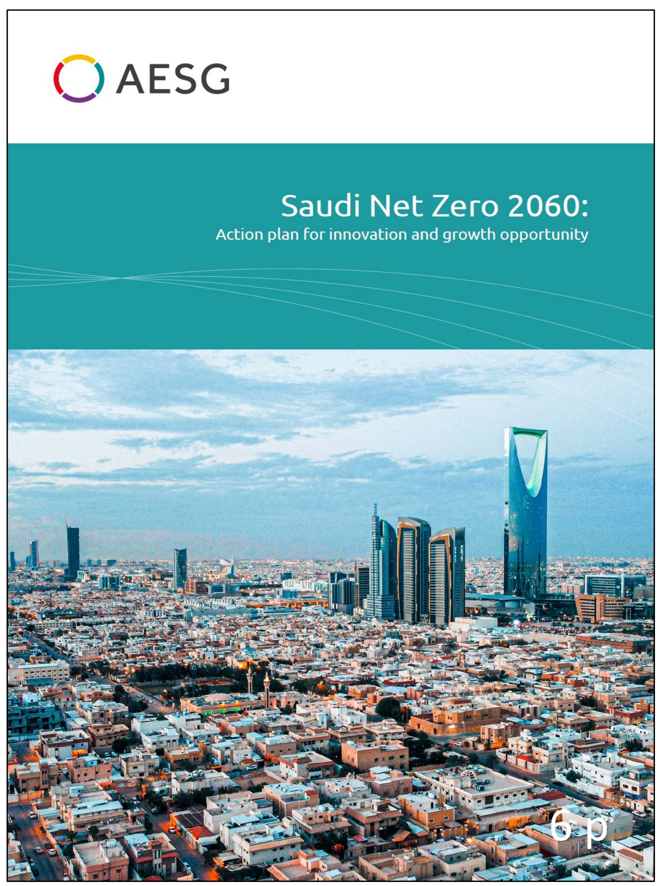
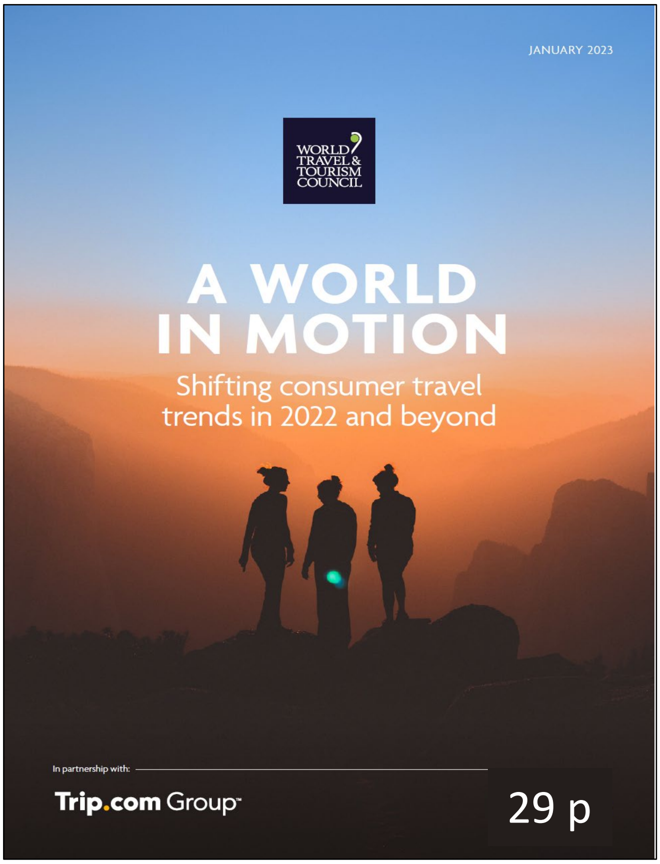
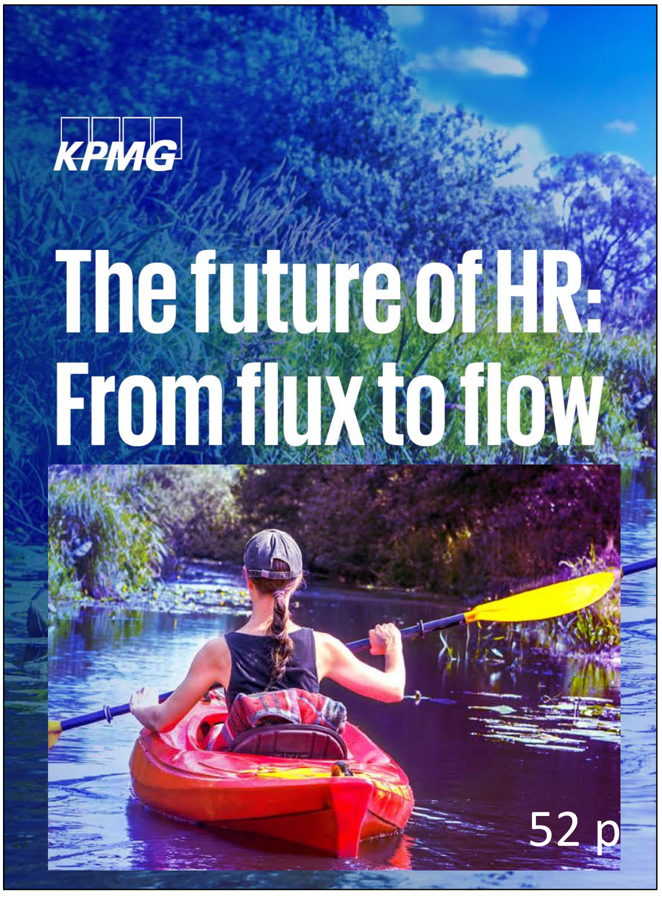


Mobilités, voyage

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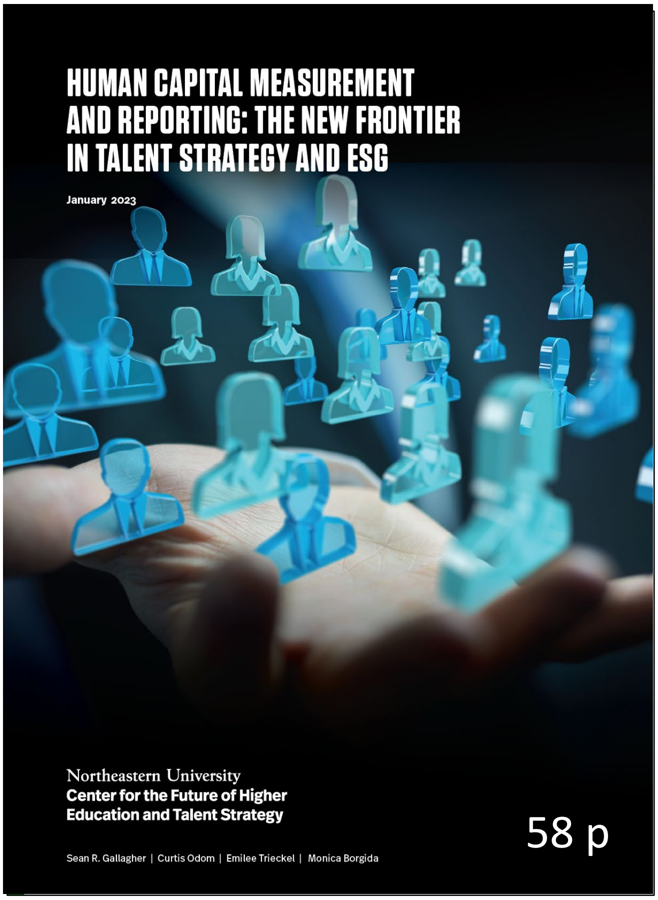
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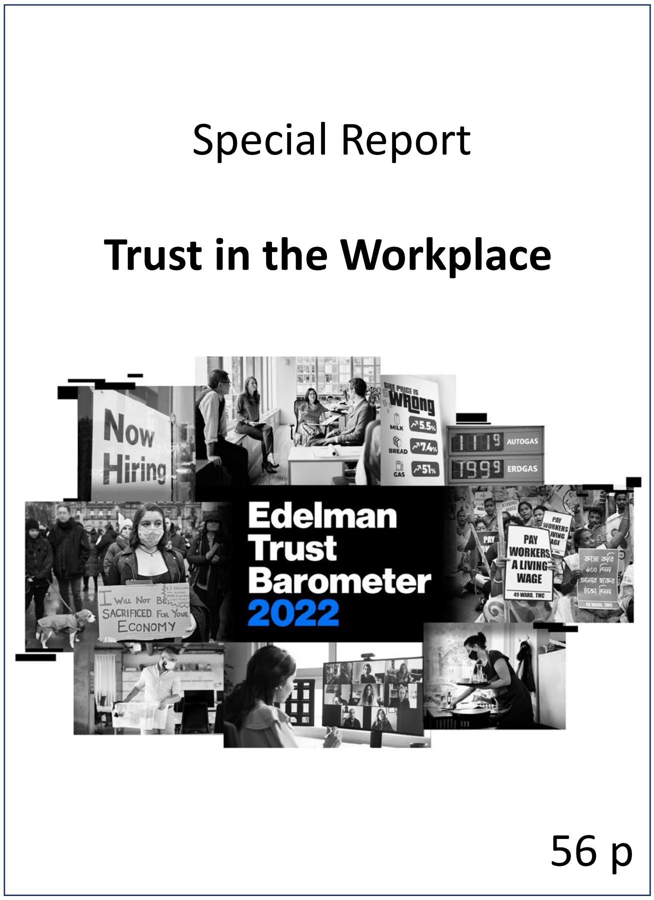
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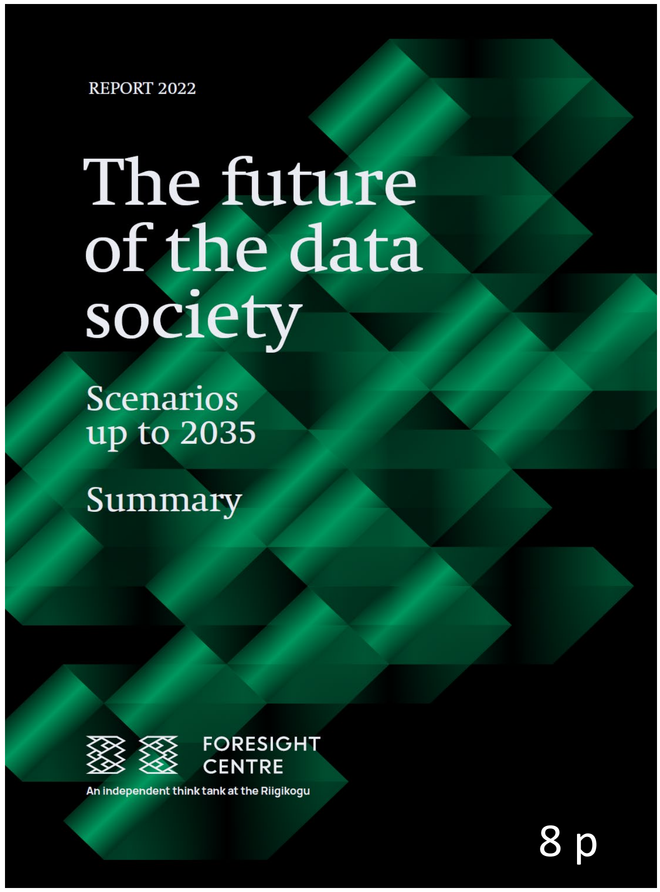

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