

FRANCE 2030 PLAN: AN ECONOMIC RESPONSE TO TOMORROW'S CHALLENGES

Since the late 1990s, French and European industrial policy has primarily relied on “horizontal” instruments available to all businesses, particularly support for innovation (e.g. research tax credits) or competitiveness (e.g. production cost reductions). The lack of interest in employing support policies that are more targeted on businesses or specific sectors was driven by the idea that market mechanisms can most effectively shift production factors towards the most productive activities. This prevailing approach to economic policy has increasingly been challenged over the past decade. A growing number of institutions, such as the OECD and the IMF, are now highlighting the benefits – under certain circumstances – of a “vertical” approach. This approach is being considered a complement to horizontal policies, with a view to taking action in specific sectors and gearing innovation in particular to the green transition. The recent series of crises (the 2008 financial crash and the 2020 COVID-19 pandemic) have also demonstrated the importance of retaining certain industrial activities to boost resilience against a variety of shocks.

At EU level, the 2019 Franco-German Manifesto for a European Industrial Policy Fit for the 21st Century has stimulated a paradigm shift, encouraging a large-scale vertical approach akin to what has been implemented in countries like the United States, China and South Korea. As a result, Important Projects of Common European Interest (IPCEIs) have become more widely used, with several large-scale projects launched for strategic products and technologies: microelectronics, batteries, hydrogen, cloud computing technology and, most recently, healthcare.

The €54bn France 2030 Plan is fully aligned with this shift and aims to primarily support industrial strategies to address the challenges of economic and societal transition by targeting stakeholders with high growth potential. Its ten societal objectives and six drivers (excluding Regional France 2030) are cross-cutting, covering the entire value chain, from basic research to innovation and industrialisation.

Governance structure and the project selection process under the France 2030 Plan are based on a number of principles: transparency, leveraging adapted skills, evaluation, and “fail fast” for ineffective projects, as well as significant risk-taking. €8.4bn have been committed under the plan just one year after its launch. Roughly 60% of the beneficiary businesses are small- and medium-sized enterprises.

Authors: Milena Gradeva, Valentin Dillies (SCIDE)

1. Across the globe industrial policy has undergone a radical change for the past decade, with vertical intervention gaining increasing legitimacy

Since the late 1990s, industrial policies in France and the European Union have, by and large, primarily involved the use of horizontal instruments, namely public support measures that are available to all businesses regardless of their activity. The lack of interest in employing support policies that are more targeted on specific businesses or sectors was driven by the idea that the market is the best mechanism for ensuring effective economic development. In contrast, an interventionist approach taken by governments was considered to pose numerous risks, potentially jeopardising the sound industrial development of countries¹.

Given the generally mixed outcomes of the vertical policies implemented in the past², the French government has tended to focus on creating a healthy environment through horizontal policies. This is how R&D and innovation – which bring positive externalities³ – came to receive large-scale support, with a ramp-up in tax incentives such as the research tax

¹ The arguments that have long been made against an interventionist approach relate to a government's lack of information about technology and markets, hindering the identification of winning strategies for frontier technology projects and running the risk of state capture by private players and the poor allocation of public resources.

² See, for example, J. Tirole (2016), *Economics for the Common Good*, Presses Universitaires de France.

³ A positive externality is a situation in which the production or consumption of a good by an economic agent is beneficial to other economic agents. The production of knowledge by a business through their R&D expenditure can thus benefit other businesses.

credit (CIR) and the development of aid provided by Bpifrance (including loans and guarantees for investment in innovative businesses and direct aid for collaborative R&D). Support for framework conditions also took the form of cross-cutting competitiveness policies (e.g. production cost reductions).

The dominance of this approach has increasingly been challenged since the 2010s. The growing importance of the green transition in EU public policies has in particular fuelled a new debate on the multi-faceted approach that public authorities must take to address the challenge of the necessary major societal transformations. **Consequently, the so-called “vertical” government interventions, intended to support sectors and technologies identified as priorities by public authorities due to their economic, environmental and societal impact or to related sovereignty issues, are considered increasingly warranted.** The recent series of crises (the 2008 financial crash and the 2020 COVID-19 pandemic) have also demonstrated the importance of preserving industrial activities to boost resilience against certain shocks. Measures that target specific technologies or sectors have gained legitimacy as a tool for addressing new concerns about resilience and strategic autonomy, especially in the wake of the COVID-19 pandemic.

A growing number of economists and institutions now believe that targeted intervention⁴ can be a useful complement to horizontal policies. According to Mazzucato (2013, 2015)⁵, the government's role is not limited to correcting market failures but should also consist in guiding innovation and structuring new markets, as market mechanisms are not able to guarantee the required innovation when the coordination of major public and private stakeholders and significant investment are necessary amid an uncertain environment. Mazzucato especially advocates for an industrial policy organised into “missions” that should tackle major societal issues (e.g. artificial intelligence and the data economy, the mobility of the future, an ageing population and related healthcare issues, and the green transition). **Studies from several institutions⁶ such as the OECD (2022), the World Bank (2008), the IMF (2019), the Council of Economic Analysis (2014) and France**

Stratégie (2020) also highlight that targeted policies can complement their horizontal counterparts.

The 2019 Franco-German Manifesto⁷ gave EU industrial policy a major push by advocating greater innovation in Europe, particularly through bolstering EU-level action, so that European businesses can step onto the global stage and European strategic interests can be protected, given that other countries directly support their businesses. **This manifesto has led to a much more extensive use of IPCEIs⁸ in recent years, with the launch of several large-scale projects dedicated to strategic technologies and products:** microelectronics, batteries, hydrogen. Other IPCEIs on cloud computing technology and healthcare, for example, are in the preparatory stages. The EU-level coordination of businesses and public funding contributed by Member States seem adapted to this kind of innovative projects, which are costly, high risk and interdependent, enabling them in particular to reach critical mass, pool risks and generate economies of scale⁹.

2. From an economic standpoint, vertical intervention may be warranted for a variety of reasons, such as to address major societal challenges

a) According to economic literature, there are various arguments in favour of vertical intervention

The OECD has developed a typology of vertical interventions and their economic justifications. There are various types of targeted industrial strategies, such as sector-oriented (with eligibility being determined based on the activity of a given business), technological (support for a specific technology), mission-oriented (seeking to provide solutions to complex societal challenges such as the consequences of artificial intelligence, an ageing population and the green transition, utilising several policy

⁴ Source: Pianta (2015), “What Is to Be Produced? The Case for Industrial Policy”, in “Which Industrial Policy Does Europe Need?”, *Intereconomics*, vol. 50, 2015/3, pp. 139–145.

⁵ Source: Mazzucato (2013), *The Entrepreneurial State: Debunking Public vs. Private Sector Myths*, Anthem Press; Mazzucato (2015), “Innovation Systems: From Fixing Market Failures to Creating Markets”, in “Which Industrial Policy Does Europe Need?”, *Intereconomics*, vol. 50, 2015/3, pp. 120–125.

⁶ Source: OECD (2022), “An industrial policy framework for OECD countries: Old debates, new perspectives”, *OECD Science, Technology and Industry Policy Papers*, No. 127, OECD Publishing, Paris, <https://doi.org/10.1787/0002217c-en>; Fontagné et al. (2014), “No Industry, No Future?”, *Les notes du conseil d'analyse économique*, No. 13; France Stratégie (2020), *Industrial policies in France*; Rodrik (2008), “Normalizing Industrial Policy”, *Commission on Growth and Development Working Paper*, no. 3, World Bank; Cherif and Hasanov (2019), “The Return of the Policy That Shall Not Be Named: Principles of Industrial Policy”, *IMF Working Paper*, WP/19/74.WP/19/74.

⁷ Source: Franco-German Manifesto for a European Industrial Policy Fit for the 21st Century.

⁸ IPCEIs are an EU mechanism designed to promote innovation in strategic industries of the future through cross-border European projects. Under IPCEIs, the public authorities of Member States are authorised to finance private initiatives under specific rules.

⁹ Economies of scale exist when the production cost per unit of a product (or service) decreases as its output increases.

tools) and regional. **The economic arguments supporting vertical intervention¹⁰ can be classified into three main categories:**

A. Arguments relating to the economy's sectoral structure

1. Industrial catch-up and/or development of new industries. This line of argument takes into account that, for certain goods, productivity greatly increases with experience (i.e. the production volume that has been manufactured). If there are external learning effects at play (the productivity of a business based in France increases along with the overall output level of its sector) and imperfect financial markets (financial markets undervalue the learning gains within a business), government support is justified to help an industry climb the learning curve and consequently benefit from economies of scale. This is the case, for example, with the manufacture of electric vehicle batteries, which is currently mainly done in Asia. This industry has been developing rapidly in France, with the construction of the first French gigafactory currently under way in the Hauts-de-France region, a project led by Automotive Cells Company (ACC)¹¹.

2. Emergence of competition in sectors dominated by a few foreign firms and with major barriers to entry. If one foreign firm is dominating a given market, government support can be justified, particularly in monopolistic sectors with high fixed costs in which there is inherently little private incentive to enter the market. The founding of Airbus is a clear example of this type of policy. This argument is also valid for digital platforms where there is a need to diversify the economic stakeholders, against a backdrop in which a rapidly emerging local supply is required to address sovereignty or data protection issues. While the recent EU Digital Markets Act regulation seeks to step up competition in the activities of major digital platforms, it needs to be rounded out by government support to ensure the emergence of European competitors in the short term.

B. Incentive- and coordination-related issues

3. Failure to coordinate projects bringing together a large number and variety of stakeholders. These projects may require simultaneous investment in

several sectors and structured co-operation, for example between several suppliers or stakeholders across the entire value chain. This is the case for the IPCEI on hydrogen, one of the objectives of which is to ensure stakeholder coordination in and between the various markets concerned (see below).

4. Adjustment of relative prices needed to reduce uncertainty and/or lend credibility to political commitments so that visibility is given to the return on investment and investment and innovation are promoted. When externalities are not taken into account by private stakeholders (e.g. the societal cost of greenhouse gas emissions), government intervention is justified to adjust relative prices, which can be done in a number of ways, including through taxes, emissions trading schemes and public subsidies. **However, even if taxes or emissions trading are introduced, the level of uncertainty over the cost trajectory (e.g. carbon price, compliance with regulations) may remain high and lead to a risk of underinvestment:** in this case, market mechanisms may not be sufficient to trigger the necessary adjustments, as the return on low-carbon projects remains uncertain. **Complementary government intervention should therefore be capable of generating visibility and a knock-on effect from the public to the private sector.** Lastly, considerable government intervention in the form of subsidies can also lend credibility to political commitments among private stakeholders.

5. Addressing complex societal issues through innovation. Innovation policies are not merely instruments for remedying imperfect markets or reducing the risk of innovative investments, as they should also use innovation and economic development as tools to address the aforementioned major societal challenges, including the green transition, demographic changes and cybersecurity. An example for this kind of actions is government support for the development of the green hydrogen industry (see below) and the decarbonisation of industry.

C. Social benefits, regional specialisation and resilience

6. Agglomeration economies. Public policies can bring together research institutions, large businesses, SMEs and startups to create innovation clusters and promote knowledge transfer (e.g. through competitiveness clusters, *Pôles de compétitivité*). Membership in these clusters has been shown to lead to an increase of SME's R&D and employment¹².

¹⁰ Economic arguments supporting vertical intervention are expounded in the following papers: Mazzucato (2013, 2015, *ibid*); Mazzucato et al. (2019), "Challenge-Driven Innovation Policy: Towards a New Policy Toolkit", *Journal of Industry, Competition and Trade*, OECD (2022); Bloom, Van Reenen and Williams (2019), "A Toolkit of Policies to Promote Innovation", *Journal of Economic Perspectives*, vol. 33/3, pp. 163-184; Berlingieri, Blanchenay and Criscuolo (2017), "The great divergence(s)", *OECD Science, Technology and Industry Policy Papers*, no. 39; Larrue (2021), "The design and implementation of mission-oriented innovation policies: A new systemic policy approach to address societal challenges", *OECD Science, Technology and Industry Policy Papers*, no. 100.

¹¹ Fogelman et Didioui (2022), « Transformations et défis de la filière automobile », *Les Thémas de la DGE*, N°4.

¹² On average, when an SME joins a cluster or participates in a project supported by one, they incur over €50,000 in additional R&D expenditure. As for employment, it is reported that often two new jobs are created within SMEs once they join a cluster. Autant-Bernard (2018), *Impacts économiques et territoriaux des pôles de compétitivité selon les territoires*, final report (in French only).

7. Social benefits that can vary in nature¹³. Vertical intervention can seek to boost regional development (the percentage of industrial employment is 18.4% in “predominantly rural” areas, compared to 11.5% in the rest of France, i.e. “predominantly urban” areas)¹⁴ ; vertical intervention may also have a knock-on effect for employment across the entire value chain.

8. Enhancement of upstream local value chains. The productivity of upstream sectors affects downstream sectors, which could be grounds for government support, particularly if sectors face major resilience issues or rely on generic technologies. The EU, given its current dependency on imports of electronic chips and semiconductors, has decided to step up the manufacture of these upstream products that are needed to produce many finished technology products. The European Chips Act was adopted to secure the supply of EU downstream industries. In this context, a new first-of-a-kind electronic chip factory will be built in France by GlobalFoundries and STMicroelectronics. In addition, mining company Imerys will start producing lithium from a deposit in France in 2028, which will cover over a quarter of the needs of the future gigafactories in France.

9. Resilience and strategic autonomy. Government support may be justified to retain and, in the event of shocks, preserve the value added of an industry in France, especially given factors such as domestic gains in productivity, the ability to remain at or to push the technology frontier¹⁵ and skills development within strategic sectors. Ad hoc work should therefore be carried out to identify these sectors. Government support may also be warranted by geopolitical or diplomatic relations between countries, for example in the energy sector. In the wake of the COVID-19 pandemic, a call for projects entitled *(Re) localisations dans les secteurs critiques* ((Re)location of production in critical sectors) supported 477 winning projects in the sectors of healthcare, agri-food, electronics, key manufacturing inputs and telecommunications/5G. Thanks to this initiative, of the 30 medicines with strongly limited availability during the pandemic, 24 saw all or some of their manufacturing stages being relocated to France. The winning projects in the agri-food sector are expected to reduce France’s dependency on non-EU imports in the plant-based proteins segment by 5%.

b) To limit potential negative effects, targeted intervention policies should be based on rules for good governance¹⁶.

Before implementing a given policy instrument, it is crucial to clearly identify the economic justification for using a targeted policy instrument over a horizontal one, as well as the complementary policies that could determine its success, particularly in the field of training. Public authorities should ensure that they have sufficient information and expertise – including by consulting with independent and qualified experts – so that the most relevant projects are granted support, while avoiding a deadweight effect¹⁷. To minimise the risk of capture¹⁸ and information asymmetries¹⁹, the selection process should also be fair to all competitors, in particular so that the beneficiaries of measures and support are not solely large, established businesses given that disruptive innovation can also be produced by smaller, new businesses²⁰. Encouraging the private sector to engage in risk taking is also a way to enhance the quality of project selection.

The precautions taken during the project selection stage should be maintained throughout the entire lifetime of policies. On the one hand, unsuccessful projects should be swiftly abandoned. On the other hand, the relevance of the policies themselves or of their terms may change over time. Thus, support schemes should be monitored and assessed ex post in order to be able to adapt or to abandon them (and redirect the government funds) if they are deemed ineffective. This evaluation, as well as the collection of required data, should be arranged from the beginning, when the policy measures are implemented.

¹³ Rodrik et Sabel (2019), *Building a Good Jobs Economy*, working paper.

¹⁴ French General Commission for Regional Equality, “L’industrie dans les territoires français: après l’érosion, quel rebond?”, *Fiche d’analyse de l’Observatoire des territoires*, 2018 (in French only).

¹⁵ As French industry incurs 70% of business R&D expenditure, a strong industry can ensure being at the technology frontier.

¹⁶ Source: OECD (2022); Blanchard-Tirole Commission (2021).

¹⁷ A deadweight effect is in play when economic stakeholders not targeted by an incentive benefit from it, even though, if the incentive had not existed, they would have intended to act in the same way as it aimed to encourage.

¹⁸ The capture of a regulator is a situation in which a regulator loses its independence because of the influence exerted by a third party.

¹⁹ A situation in which economic agents operating in a market do not have equal access to all information.

²⁰ Schneider et Veugelers (2008), *On Young Innovative Companies: why they matter and how (not) to policy support them*, working paper 4-2008, Copenhagen Business School.

3. The vertical approach of French industrial policy is reflected in the France 2030 Plan

a) The France 2030 Plan's industrial strategies soundly address complex societal challenges

The 2021 launch of the France 2030 Plan bolstered targeted intervention in France in areas identified as strategic that require government impetus (see Box). This shift to more targeted government intervention serves to complement the horizontal support provided to industry – which still accounts for the bulk of aid provided to industry (70% to 75% depending on the scope used)²¹ – and to ensure the continuation of cross-cutting competition policies that have been in place for a decade: reduction of labour costs, €10bn of cuts in taxes on production under the France Relance Plan and the proposal in the 2023 Budget Bill to eliminate the contribution on business value added within two years.

The France 2030 Plan has adopted its own principles on government intervention based on high risk-taking in terms of the timeframes of the return on investment, the emergence and profitability of the project, the incentivising quality of the aid (i.e. funding projects which could not have been undertaken without government support), the transformative impact and the creation of economic, environmental and social value for society as a whole.

€8.4bn have been committed under the France 2030 Plan one year after its launch²². About 60% of the beneficiary businesses are SMEs. Since its launch, the France 2030 Plan has helped develop innovative SMEs, particularly startups, and currently finances many disruptive innovation projects led by emerging players.

In practice, the most industry-oriented of the cross-cutting objectives and drivers of the France 2030 Plan fully reflect the justifications identified in the economic analysis framework of the vertical industrial policy set out above (see tables on next page).

- Most of these objectives and drivers consist of using innovation and economic development as tools to address major societal challenges, such as the decarbonisation of the economy (nuclear, hydrogen and decarbonisation of industry objectives), the consequences of artificial intelligence development (digital technologies driver), the low-carbon mobility of the future (hybrid and electric vehicles, low-carbon aviation objectives) and healthcare issues (healthcare objective). Half of the appropriations in the France 2030 Plan are assigned to green transition.

²¹ France Stratégie (2020), *Industrial policies in France*.

²² As at 30 September 2022.

Encadré - The France 2030 Plan at a glance

France 2030 is a five-year, €54bn investment plan which was announced on the 12th of October 2021 by President Macron (including appropriations from the fourth Invest for the Future Programme (PIA)). The France 2030 Plan results from a broad consultation of stakeholders and sets out to address societal challenges, with a focus on the production of low-carbon energy, the decarbonisation of industry and transport, healthy and sustainable food, healthcare and digital sovereignty, among other issues.

Appropriations under the France 2030 Plan are allocated among ten societal objectives and six cross-cutting drivers (excluding Regional France 2030). These funds serve to support strategies addressing the challenges of economic and societal transition. This government support covers the entire value chain, from basic research to innovation and industrialisation.

These strategies include priorities such as the production of innovative nuclear reactors with improved waste management, the production of clean hydrogen and renewable energy, the decarbonisation of industry, the manufacture of biomedicines and space research. The projects associated with each strategy are proposed via calls for projects or calls for expression of interest. When the selection process has concluded, financial support is provided in the form of subsidies, equity or repayable advances.

€7.25bn are allocated to cross-cutting support measures for innovative businesses and their initial industrial deployment.

- With 50% of appropriations earmarked for emerging players, the France 2030 Plan is a government initiative focused on startups and other businesses innovating in emerging markets. The plan aims to avoid inefficiently directing the bulk of support to established stakeholders.

Achieving the bold environmental goals set by France and the EU²³ requires the introduction of new regulatory measures, the implementation or ramp-up of which can be protracted. Government support may be justified by such regulatory uncertainty (e.g. emerging markets for recycled materials) – surrounding, for example, the decarbonisation of industry and the extended producer responsibility (EPR) sectors (for raw material recycling) – and the need to coordinate numerous stakeholders and markets (e.g. hydrogen, healthcare).

²³ For example, in the area of greenhouse gas emissions pricing, the creation of the Carbon Border Adjustment Mechanism and the expansion of the EU Emissions Trading System to include the building and transport sectors are under negotiation in EU institutions; emissions allowance prices have been low for a long time, providing little incentive for businesses to decarbonise.

Table: France 2030 Plan, one year on

Drivers/Objectives	France 2030 Plan drivers and objectives	Total support (€bn)	Winning projects
Driver 1	Secure access to raw materials.	0.1	90
Driver 2	Secure access to strategic components, such as electronic, robotic and smart machine components.	0.1	13
Driver 3	Harness secure and sovereign digital technologies.	0.6	282
Driver 4	Foster talent by building the training and educational programmes of tomorrow.	0.5	219
Driver 5	Disruptive venture capital, industrial startups and faster growth.	3.4	547
Driver 6	Excellence of our Higher Education, Research and Innovation ecosystems.	1.7	61
Driver 7	Regional France 2030.	0.4	-
Objective 1	Equip France by 2030 with small modular reactors which are more innovative and manage waste better.	0.1	63
Objective 2	Make France a leading player in clean hydrogen and develop cutting-edge renewable technologies .	0.1	38
Objective 4	Manufacture in France, by 2030, some two million hybrid and electric vehicles.	0.4	157
Objective 6	Innovate for a healthy, sustainable and traceable food supply.	0.1	34
Objective 7	Manufacture in France at least 20 biomedicines for treating cancer and chronic diseases, and develop and manufacture innovative medical devices.	0.8	179
Objective 8	Restore France as the world's top producer of cultural and creative content.	0.0	66
Objective 9	Play our part in the new space age.	0.1	12
Objective 10	Invest in deep-sea exploration.	0.0	1
Overall total		8.4	1 752

- Government support is also justified in the areas such as space, electronic components (developing battery manufacturing capability) and digital technologies (e.g. cloud computing technology), due to the need to **create a competitive environment in sectors dominated by foreign companies**.

- **Social benefits**, particularly those stemming from agglomeration effects, seem especially strong for transport equipment-related objectives. Government support is additionally warranted as a way **to enhance upstream local value chains** for objectives

such as nuclear and hydrogen (stimulating competitiveness), the decarbonisation of industry, health-care, secure raw materials, electronic components and digital technologies, combined to the need for addressing resilience issues and strengthening strategic autonomy.

Tables: Market imperfections and underlying economic justifications for the industrial objectives and drivers included in the France 2030 Plan

Table: France 2030 Plan industrial objectives

	Nuclear	Hydrogen	Decarbonisation of industry	Hybrid and electric vehicles	Low-carbon aviation	Healthcare	Space
Sectoral structure of the economy:							
1. Industrial catch-up and/or development of new industries.		✓				✓	✓
2. Emergence of competition in sectors dominated by a few foreign firms.							✓
Incentive- and coordination-related issues:							
3. Coordination failures.		✓		✓	✓	✓	✓
4. Adjustment of relative prices needed to reduce uncertainty and/or lend credibility to commitments.	✓	✓	✓	✓	✓	✓	
5. Addressing complex societal challenges through innovation.	✓	✓	✓	✓	✓	✓	✓
Social benefits, regional specialisation and resilience:							
6. Agglomeration economies.				✓	✓		
7. Social benefits.			✓	✓	✓		
8. Enhancement of upstream local value chains .	✓	✓	✓			✓	
9. Resilience and strategic autonomy.	✓	✓				✓	✓

Table: France 2030 Plan industrial drivers

	Secure raw materials	Electronic components	Digital technologies	Startups and industrialisation of innovation
Sectoral structure of the economy:				
1. Industrial catch-up and/or development of new industries.	✓	✓	✓	
2. Emergence of competition in sectors dominated by a few foreign firms.		✓	✓	
Incentive- and coordination-related issues:				
3. Coordination failures.	✓			✓
4. Adjustment of relative prices needed to reduce uncertainty and/or lend credibility to commitments.	✓			
5. Addressing complex societal challenges through innovation.	✓			✓
Social benefits, regional specialisation and resilience:				
6. Agglomeration economies.				
7. Social benefits.			✓	✓
8. Enhancement of upstream local value chains.	✓	✓	✓	
9. Resilience and strategic autonomy.	✓	✓	✓	

Source: Directorate General for Enterprise (DGE). .

Four strategic priorities warranting special government support are elaborated on below:

Hydrogen

The France 2030 Plan objective “Make France a leading player in clean hydrogen and develop cutting-edge renewable technologies” involves achieving a production capacity of 6.5 GWh of clean hydrogen made from electrolysis. The vast majority of hydrogen today is made from fossil fuels (e.g. coal, natural gas and oil) using processes that emit large amounts of greenhouse gases. But hydrogen can also be produced from electrolysis using low-carbon (nuclear) or renewable sources of electricity. This type of hydrogen is referred to as “clean” since neither its production nor its use result in greenhouse gas emissions. Adopting clean hydrogen will reduce emissions, especially those generated by industry and heavy-duty transport (public transport and goods transport). Already entitled with €2bn under the Recovery Plan, the strategy of developing clean hydrogen will be pursued until 2030 with total government support of €9bn.

By 2030, the government’s backing of the manufacture of key components of hydrogen vehicles (including projects from Faurecia, Plastic Omnium, Symbio, Michelin, Hyvia, as well as a hydrogen tank factory in Bavans and a fuel cell manufacturing plant near Lyon) is expected to have the following impact on the European automotive market:

- French stakeholders will hold 15% to 20% of market share in the fuel cell segment, in a market valued at over €10bn;
- French stakeholders will hold 35% of market share in the hydrogen tank segment, compared with 1% to 2% currently.

This France 2030 Plan objective fully meets several of the criteria for evaluating the need for government support.

- In addition to addressing the societal challenge of the green transition, hydrogen is a new industry at the technology frontier with a high level of information asymmetry stemming from technical uncertainty (lack of standards) and related financial risk. To develop the hydrogen offering, aid must be provided for R&D as well as for industrialisation and deployment.

- The adoption of clean hydrogen by a large number of industrial sectors and by heavy-duty transport will also enhance business competitiveness in these sectors and ensure greater energy autonomy for the country.

- Lastly, the hydrogen production technology market requires a high degree of coordination to deploy production and distribution infrastructure: the availability of electrolyzers must be guaranteed

upstream of the value chain; the fuel cell and mobile storage markets have to be coordinated with the manufacture of hydrogen vehicles and hydrogen refuelling infrastructure. Within these various markets (production, fuel cells, use), the cooperation commitments included in the IPCEI on hydrogen will avoid contingency issues, such as those related to component suppliers upstream of the chain (membranes, layers, electrodes, composite material distributors) rendering services to manufacturers of electrolyzers, fuel cells, tanks and vehicles. A coordinated approach will also ensure the availability of the raw materials used in these technologies, particularly nickel, cobalt, iridium and platinum, the supply of which could peter out in the future, as only a small number of countries supply them. Finally, coordinating the approach to innovation and scaling technologies will also avoid redundancy of efforts in national innovation ecosystems and limit development inefficiencies and delays in adopting technologies, which could leave the door open to non-European players. **The IPCEI on hydrogen will ultimately bring together a range of stakeholders to address the coordination deficit at EU level.**

Healthcare

Healthcare is a major societal challenge which is currently undergoing significant transformation, particularly thanks to the development of preventive medicine and disruptive innovations such as biotechnologies, two areas in which France lags behind despite its numerous eminent players and world-class educational and academic research ecosystem. In 2017, four out of ten new medicines were biomedicines and by 2024, the share of biologics in the global pharmaceutical market is expected to grow from 17% to 32%²⁴. Biotherapy research has uncertain outcomes, requires massive investment (high fixed costs) and can face coordination issues between the different academic structures and businesses involved. eHealth, which relies primarily on digital tools, should accelerate the transition from a curative to a preventive approach to health and improve the coordination of treatment for patients.

Sovereignty regarding health data which is particularly sensitive, requires new eHealth solutions which will minimise the dependency of the latter on non-EU law and platforms.

The France 2030 Plan provides government support to these two areas, i.e. biotherapies and preventive medicine/eHealth, to foster the development of their associated technologies in France. The objectives are focused on manufacturing 20 biomedicines in France in 2030 (funding of €2.3bn) and facili-

²⁴ EvaluatePharma (2019), *World Preview 2019, Outlook to 2024*.

tating the emergence of digital medical devices and innovative eHealth solutions (€650m). In parallel, France is undertaking a bold strategy of reinvesting heavily in the area of medical devices (€400m) and preparing itself for infectious disease threats and crises, as well as CBRN risks (€750m). There is also ongoing support for the domestic production of intermediates and active pharmaceutical ingredients, the vast majority of which are manufactured outside Europe, in order to ensure France's autonomy and to secure supply to players downstream of the pharmaceutical value chains.

The France 2030 Plan provides government support to these two areas, i.e. biotherapies and preventive medicine/eHealth, to foster the development of their associated technologies in France. The objectives are focused on manufacturing 20 biomedicines in France in 2030 (funding of €2.3bn) and facilitating the emergence of digital medical devices and innovative eHealth solutions (€650m). In parallel, France is undertaking a bold strategy of reinvesting heavily in the area of medical devices (€400m) and preparing itself for infectious disease threats and crises, as well as CBRN risks (€750m). There is also ongoing support for the domestic production of intermediates and active pharmaceutical ingredients, the vast majority of which are manufactured outside Europe, in order to ensure France's autonomy and to secure supply to players downstream of the pharmaceutical value chains.

A call for expression of interest launched for the "biotherapies" strategy has provided funding to the BioTICan (innovative biotherapies against cancer) project which aims to increase the manufacturing capacity of Séripharm (Le Mans) and expand its range of services in the production and analysis of monoclonal antibody conjugates. This project gives France a stake in a leading global company in this highly strategic and technological field. While monoclonal antibodies are antibodies made in cell cultures and used to treat specific diseases, antibody-drug conjugates (ADCs) can attach a chemotherapy molecule to an antibody that recognises cancer cells. Thus, chemotherapy is brought closer to its target.

Raw material recycling

If no bold policy moves are made, the rising global demand for raw materials over the last 20 years could not only jeopardise international climate goals but also make economies more vulnerable. **Government support in this area aims to assist in building a recycling value chain. Using less primary raw materials would bring about significant environmental gains and reduce France's dependency on foreign suppliers, while also encouraging the development of new domestic business activities.**

As a new, up-and-coming industry, the raw material recycling sector (plastics, metals, paper/cardboard,

fabric) will require government support so that it can be appropriately structured and reach critical mass. Government support is also needed in order to overcome the lack of visibility given to the sector in relation to the economic signals it receives (for instance, adjusting contributions to eco-organisations in waste management). Furthermore, government support is fully warranted given **the need for a high degree of coordination** in the various segments of the recycling sector, which covers a diverse range of players nationwide (recyclability of products on the market, end-of-life product collection, sorting and production of recycled raw materials and their incorporation into products) and a variety of materials (plastics, metals, paper/cardboard, fabric). Since primary raw materials are often more competitively priced than recycled materials, innovation has to be directed through government support so that recycled raw materials can meet the quality standards of the market (such as for plastics). As for rare-earth elements, which are essential for wind energy and e-mobility, France is reliant on non-European imports, especially those from China. Recycling should help increase the stock of rare earths available in France and **strengthen strategic autonomy**. Some of the France 2030 Plan objectives include the recycling of all plastics and the development of innovative low environmental impact materials (€500m), as well as ensuring the security of the supply chain for, and the refining and recycling of, critical metals (€1bn, of which 50% in equity).

The Scrap CO₂MET project should enable France to produce critical metals with a high level of quality and purity, essential for battery manufacturing, by recycling production scraps from gigafactories. Three companies – Mecaware, MTB Manufacturing and Verkor – have partnered for the initiative, alongside two university research labs, ICBMS (University Claude Bernard in Lyon) and LEPMI (University of Grenoble, University Savoie Mont Blanc, CNRS, INP). The innovative process is based on an eco-friendly technology which uses industrial carbon emissions and does not generate liquid effluents. With government support, this disruptive technology can be scaled up.

Digital technologies

Digital technologies are both a sector and a cross-cutting driver which can make other sectors of the French economy (industry, services, public service) more competitive. It is at the centre of major sovereignty-related issues. This France 2030 Plan driver covers a set of technologies (cloud computing, quantum computing, AI, cybersecurity and 5G) and different objectives regarding France's positioning: a strategy of fostering competition in cloud computing (a market overwhelmingly dominated by a few foreign firms²⁵); the need to increase France's strategic autonomy in cybersecurity and cloud computing technology; positioning itself on the technology frontier in order to bring about the

development of new quantum technology solutions.

This France 2030 Plan driver includes supply-side initiatives, such as facilitating the structuring of digital sectors characterized by a great number of players struggling to raise financing and reach a critical size (e.g. cybersecurity). **Government support for the digital sector acts also on the demand side and aims at promoting the adoption of these digital solutions**, particularly in agriculture, healthcare and industry. Other funding priorities of the plan include research, to ensure that France maintains its position at the forefront of these technologies for years to come, and training/education, so that these industries of the future have the talents they need to grow.

Thanks to the funding provided for these various strategies, particularly for major projects such as 5G test platforms for specific use cases, including in healthcare and industry, as well as for projects covering priority technology building blocks in cybersecurity and cloud computing technology, and for education programmes aimed at doubling the number of students in AI, the France 2030 Plan should make it possible to achieve bold objectives such as:

- doubling the market share of French cloud service providers;
- filing 600 6G patents;
- doubling the staff of cybersecurity firms;
- increasing the number of AI graduates per year by 2,000;
- passing the threshold of 2,000 algorithmic qubits.

b) To protect against risks associated with allocating targeted support, the France 2030 Plan's governance structure has drawn on best practices from relevant literature.

To achieve the goals of the France 2030 Plan, **a new governance structure drawn from best practices in the field (see above) has been set up to ensure the plan's implementation**. Ministerial steering committees oversee strategies, ensure consistency and set out strategic priorities of policy measures, and guarantee that they are appropriately coordinated with other regulations and public policy measures targeting skills and training/education, deployment support and public procurement. Independent experts, known as France 2030 ambassadors, provide their input on these strategic priorities.

The associated measures for the France 2030 Plan objectives and drivers are in line with the **fast-track strategies** from previous Invest for the Future Programmes (PIAs). These strategies were **designed**

based on recommendations from the 2020 Potier report²⁶ drawn up by a panel of experts, economists, academics and representatives of civil society and industry. The report provides a list of **technology-intensive emerging markets** in which France has the assets to acquire a leading position.

France 2030 Plan projects are selected **via a process with greater delegation to operators** (e.g. Bpifrance, the Environment and Energy Management Agency (ADEME), the National Research Agency (ANR)) which involves a **team of seasoned independent experts** from the scientific and business worlds, free of conflicts of interest. For each call for projects, after the relevant operator conducts an initial screening process, **the projects are pitched to a panel of independent experts** tasked with deciding which ones will receive government funding. This rigorous governance structure should make bold project choices possible while keeping windfall gains in check, by applying the principle of incentivisation (i.e. only the projects that could not be undertaken without support will be funded) during the pitch stage.

Furthermore, **the use of in itinere evaluations should facilitate applying "fail fast" principles when projects do not meet their objectives**, in keeping with an investment strategy involving high risk-taking. **In addition, the areas covered by the France 2030 Plan may change in line with new societal priorities and markets of the future. Lastly, the plan's ex ante and ex post evaluations** will be more robust. At the launch of a call for projects, measures are defined and assessed, impact indicators are collected for projects, such as their technological maturity level, the turnover they plan to generate, the number of jobs created and their contribution to decarbonising the country. For projects being granted government support above a certain threshold, a socio-economic assessment must be carried out before the project can begin. The increased robustness of ex ante evaluations is meant to facilitate the evaluation process when the project is underway and ex post. These three evaluation periods – **ex ante, in itinere and ex post** – for the France 2030 Plan are overseen by the Investments for the Future Supervisory Board (CSIA).

The support system for proposed and winning France 2030 Plan projects has been enhanced by its new governance structure. Devolved govern-

²⁵ Four American firms (Amazon, Microsoft, Google and IBM) hold two-thirds of the cloud market in Europe. US extraterritoriality seriously compromises French players' control on the access to their own sensitive data.

²⁶ Potier (2020), *Faire de la France une économie de rupture technologique*, (in French only), Ministry for the Economy and Finance, Ministry for Higher Education, Research and Innovation.

ment departments work together with regional governments, competitiveness clusters, development agencies and various local stakeholders to identify projects, advise project leaders on the next steps to take and assist them in their administrative procedures. They are also asked for input during

the design phase of calls for projects. Furthermore, **the French Tech ecosystem provides support programmes** for some of the France 2030 Plan's strategies (e.g. the Green20 programme and the industrial startup support service) in order to encourage emerging players to put forward projects.

Find out more

**Go to the "Études" (Studies) section of our website
www.entreprises.gouv.fr**