

# INFRASTRUCTURE: A KEY ASSET CATEGORY FOR THE CLIMATE

What exactly do we mean by 'infrastructure'?

Why does the success of the energy transition depend on such assets?

To what extent should climate risks be better incorporated into infrastructure portfolio management?

What follows is a general overview that Carbone 4 has put together of this asset category and the issues that link it to climate change.

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# TABLE OF CONTENTS

INTRODUCTION	3
KEY MESSAGES	4
<b>1 A NEW AND VERY DYNAMIC ASSET CATEGORY</b>	5
<b>2 INFRASTRUCTURE: ASSETS AT THE HEART OF CLIMATE CHANGE-RELATED ISSUES</b>	9
<b>3 WHAT CAN INVESTORS AND MANAGERS DO?</b>	15
CONCLUSION	16



# INTRODUCTION

Infrastructure is a very hot topic at the moment; from the privatisation of Aéroport de Paris to the €20bn 10-year high-speed broadband plan, not forgetting record capital campaigns from French firm Ardian and Swedish firm EQT, **there is certainly no shortage of opportunity, or of enthusiasm concerning investors.**

Something else that has been in the news recently is the tragic collapse of the bridge in Genoa - a reminder of the critical importance of maintaining current infrastructure in good condition as vital organs that help keep our economy alive.

**Infrastructure also plays a key role in the issues associated with the climate transition.** It might enable our economy to develop, **but infrastructure also results in the generation of emissions that contribute to climate imbalance, which can in turn lead to such physical assets being exposed to increased risks.**

Conversely, an ambitious emissions reduction policy could disrupt the long-term stable and predictable returns on which the success of this asset category relies upon.

**How should infrastructure investors and managers be interpreting all of these challenges and opportunities?**

**It might enable our economy to develop, but infrastructure also results in the generation of emissions that contribute to climate imbalance, which can in turn lead to such physical assets being exposed to increased risks.**

# SUMMARY

## KEY TAKEAWAYS

### TWO MAJOR CHALLENGES FOR INFRASTRUCTURE INVESTORS & MANAGERS

Infrastructure plays a special role in the fight against climate change and there are **two priorities** that infrastructure investors and managers must address:

→ Immediately embark upon an **investment path** that makes it possible to **stay within the Paris Agreement carbon budget**. This is what is known as a **2°C/1.5°C compatible pathway**.

→ **Integrating climate risk management practices**, whether transitional or physical.

### 2°C COMPATIBLE PORTFOLIO: FINDING THE RIGHT BALANCE

Identifying a 2°C/1.5°C compatible pathway is not the same as a portfolio consisting of **100% renewable production assets**. Whilst the latter are, of course, vital to the success of the energy transition, the other issue here relates to investment in **energy efficiency** and the **accelerated transformation of assets that are currently highly carbon-dependent**, such as motorways, buildings and airports.

This being the case, airports and motorways, for example, could be included in these '2°C compatible' infrastructure portfolios provided that their individual climate performance and their weighting within the portfolio (as a % of the euros invested) are **compatible with the carbon budget, meaning that they limit global warming to +1.5 or 2°C**. It is very unlikely, for example, that a portfolio with 30% airport investments (as a % of the euros invested by the fund) will be compatible with the carbon budget and the 2°C global warming limit.

### RISK MANAGEMENT: INCORPORATING CLIMATE CHANGE INTO THE INVESTMENT PROCESS AS A WHOLE

Infrastructure portfolios are exposed to a **high risk of stranded assets** as a result of both the climate transition and accelerated climate change consequences.



The strategy adopted by investors and asset managers must be implemented on a number of levels if these risks are to be minimised as much as possible:

- **When defining the investment strategy** and choosing new assets
- **Throughout the entire period for which the asset is held** in order to encourage its transformation towards a low-carbon economy and achieve the following:
  - a level of **climate performance** that is compatible with the Paris Agreement (focusing notably on the 3 main pillars, namely sobriety, energy efficiency and the integration of low-carbon energy sources)
  - a level of **resilience** that is compatible with the climate conditions of the future (concrete designed to withstand heatwaves, resilience to increasingly bad weather, etc.).

# A NEW AND VERY DYNAMIC ASSET CATEGORY

## INFRASTRUCTURE: VITAL ASSETS AND SERVICES ON WHICH A SOCIETY'S ECONOMIC PRODUCTIVITY DEPENDS

The term 'infrastructure', which first appeared in the late 1880s, refers to **the basic physical systems on which a business or country is built**. These systems, which have a long lifespan and require significant investment, are vital to a country's productive activity.

## THE DIFFERENT TYPES OF INFRASTRUCTURE

Whilst there is no truly exhaustive common list of assets that might be considered as infrastructure, certain assets are unanimously considered to fall into the infrastructure category, and these can be divided into 5 sub-categories (see *diagram*)

The definition of infrastructure can be used broadly. Some classification systems might also include ore and metal production assets, whilst others will include defence and security-related assets or even agricultural land.

## THE GROWING PRESENCE OF PRIVATE INVESTMENTS

Traditionally the domain of public authorities, it is becoming increasingly common these days for infrastructure projects to be funded by private sources.

There is, in fact, a growing need for infrastructure funding, and this need cannot be met using public resources alone. This need has resulted in the development of the famous **Public-Private Partnerships** (PPP) and **concession** systems or **public companies** over the course of recent decades.

Industrial players are generally interested in this type of contract because it provides them with access to **captive markets** (for example, thanks to a PPP agreement for a stadium, a player in the building and public works industry would be able to build the stadium themselves).

**Infrastructure tends to require significant investment and is vital to a country's economic development and prosperity**



**Energy** : production, transport and distribution of electricity, gas or oil, renewable or not.



**Social** : hospitals, schools, stadiums, public buildings (courthouse...)



**Telecommunications** : servers, optical fibre, communication towers



**Utilities** : distribution and treatment of waste and water



**Transport** : ports, highways, airports, bridges, rail network, tunnels, parking...

## INFRASTRUCTURE: AN ASSET CATEGORY IN ITS OWN RIGHT

Institutional investors, however, are also interested in this type of asset because it gives them **access to recurring long-term cash flows, not to mention a good level of diversification**, which is why infrastructure emerged as an asset category, initially in Australia, in the 1990s, and more recently in Europe.

Infrastructure is a **'hybrid' category** as it combines some of the characteristics of different asset categories. Just like bonds, for example, infrastructure offers **predictable long-term returns**. It is also conducive to leveraging capital investment and private equity and shares a distinctive feature with property in terms of investing in physical assets.

According to Vincent Levita, **"infrastructure funds provide not only a competitive funding solution for such projects but also the characteristics that many institutional investors are looking for and are no longer able to find in traditional asset categories, or even, really, in alternative asset categories."**

Indeed, infrastructure funds offer the following benefits:

- a **long-term** duration and investment horizon,
- a **real return** (with an IRR of between 10 and 20%) and **inflation protection** (the services that end-users pay for often include clauses relating to the level of inflation),
- **diversification** and a weak correlation with financial markets,
- an **illiquidity premium** with a relatively low capital risk."

## INFRASTRUCTURE AS AN ASSET CATEGORY: A BROAD DEFINITION...

**All assets that fall within the broader definition of infrastructure** (a physical asset with a clearly defined purpose that generates stable cash flows based on price and volume projections that can be made based on a natural or statutory monopoly with strong barriers to entry and little potential direct competition) **can be included in an infrastructure portfolio.**

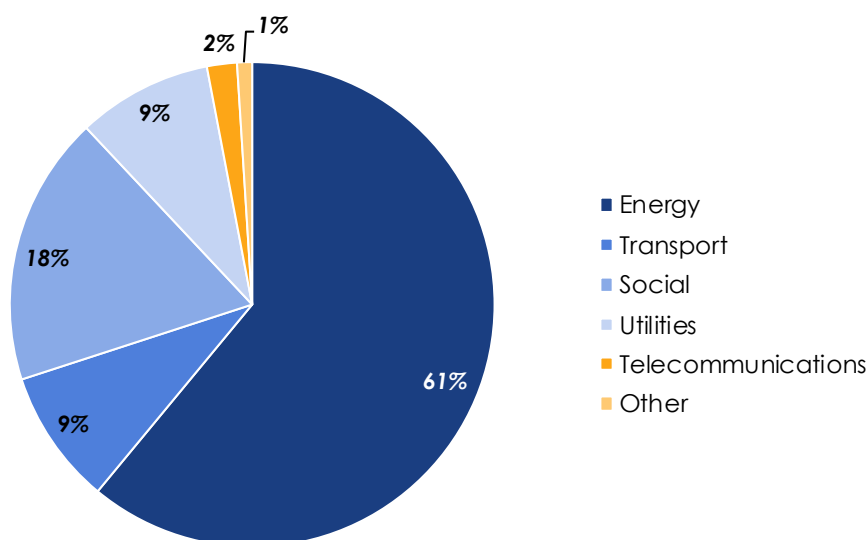
This being the case, it is perfectly possible to see fleets of vehicles, load shedding units and even agricultural assets featuring alongside traditional assets in portfolios since such assets are managed as infrastructure.



Just like bonds, **infrastructure** offers **predictable long-term returns**. It is also conducive to **leveraging** capital investment and private equity and shares a distinctive feature with property in terms of investing in **physical assets**.

## ... BUT A VERY STABLE SECTORAL ALLOCATION OF INVESTMENT

In practice, however, infrastructure funds primarily invest in the sort of shared infrastructure defined above (Source: Preqin Infrastructure Online):



*Number of deals per asset type in 2017*

## EXPONENTIAL GROWTH...

Investor's appetite is demonstrated by the fact that the amounts generated by infrastructure funds **increased fourfold in the space of 10 years**, from \$100bn in 2007 to \$418bn in 2017, with the volume of assets under private management doubling over the same period.

Furthermore, this trend is gaining momentum, notably in Europe and **particularly in France**, where infrastructure funds are breaking **capital campaign records** on a regular basis. The amount of capital raised by French funds, for example, tripled between 2017 and 2018 (€4.2bn as opposed to €12.1bn), meaning that the sector has some \$23bn in dry powder (amounts that have been raised but not yet invested by asset managers) that will be invested over the coming years.

**French players are therefore establishing themselves as true global leaders.**





Growth in the amounts invested by  
unlisted portfolio managers over the  
2007-2017 period:

*In infrastructure:*



*In other asset  
categories:*



The Ardian fund caused something of a sensation in late January 2019 by raising Europe's largest infrastructure fund, valued at €6 billion. The last vehicle, created in 2016, failed to exceed 2.65 billion.

American fund GIP and Canadian firm Brookfield, meanwhile, are about to raise funds valued at over \$20 billion.

French players are  
establishing themselves as  
true global leaders.

## ... THAT REQUIRES A MORE DISCIPLINED APPROACH TO CLIMATE RISKS

The fact that the sector is attracting such enthusiasm, in comparison with France's commitments to neutrality, is forcing the sector to assess and consequently reduce any aspects that might have a negative impact on climate change. **The huge volume of dry powder available and the intense competition surrounding assets to acquire, however, tends to push prices up**, thus making it **all the more important** to have **a well-honed business model** and strict and thorough **transition and physical risk management practices** in order to avoid a loss resulting from any political, economical or climate-related surprises in the medium term.



# INFRASTRUCTURE: ASSETS AT THE HEART OF CLIMATE CHANGE-RELATED ISSUES

## HEADING TOWARDS AN UNPRECEDENTED CLIMATE CRISIS

It is essential, first and foremost, that we bear in mind the unprecedented scale and nature of the anthropogenic **climate change** we are facing today.

In fact, we would have to go back 3 million years to find an atmospheric **concentration of CO<sub>2</sub>** as high as it is today (Potsdam Institute for Climate Impact Research).

The anthropogenic phenomenon we are currently witnessing as a result of **greenhouse gas emissions generated by human activity** (caused primarily by burning oil, coal and gas) is therefore not only **very intense but also developing very rapidly**.

The last deglaciation of the Earth, which caused sea levels to rise over 100m and displaced ecosystems by some 20 degrees of latitude, was, in fact, the result of a natural warming of "only" 5°C over the course of 5,000 to 10,000 years. We could now be witnessing a warming of a similar magnitude, this time over the course of just a century or two...

**We are certainly dealing with a brutal phenomenon, one that is the first of its kind in the history of humanity and the consequences of which will wreak absolute havoc for human society.**

## TARGETING INVESTMENT AND MANAGING CLIMATE RISKS

Investors must take on board two major challenges:

- **guiding investment** in order to make a positive contribution to the energy transition
- **protecting themselves against climate risks**, both transition-related (those associated with the regulatory, technical and market developments we will see as we move towards a low-carbon economy) and physical (those associated with the accumulated consequences of climate change, such as global warming, changes in the precipitation pattern, heat waves, rising sea levels, etc.)

This dual challenge applies to all asset categories. **The challenges are, however, all the more significant where infrastructure is concerned owing to its very long lifespan and to the fact that the revenue it generates depends very much on its physical integrity.**

**The challenges are all the more significant where infrastructure is concerned owing to its lifespan and the fact that the revenue it generates depends on its physical integrity.**

## “EXISTING INFRASTRUCTURE ACCOUNTS FOR 95% OF THE CARBON BUDGET AVAILABLE IF WE ARE TO REMAIN WITHIN A LIMIT OF 2°C”

(International Energy Agency)

This observation leads to an extremely restrictive conclusion for the sector, namely that **introducing new carbon-dependent infrastructure today would automatically destroy our chances of meeting the 2°C target outlined in the Paris Agreement.**

With this in mind, meeting the corresponding targets for fighting climate change represents three consequences where infrastructure managers and investors are concerned:

**CONSEQUENCE #1:** Those assets that depend the most on greenhouse gas emissions will have to close prior to reaching their anticipated date of economic maturity.

Whilst we may have a few years before we exceed the 2°C threshold for global warming, the residual lifespan and activity level of existing infrastructure means that its emissions potential accounts for all of the emissions that we can still afford to generate (i.e. the carbon budget).

If new infrastructure were to result in this budget being exceeded, this would mean that achieving the objectives set by the Paris Agreement would necessarily result in **the emergence of stranded economic assets** (assets that are prematurely decommissioned as a result of the fight against climate change).

**Sticking to the budget will inevitably result in the closure of certain existing infrastructure assets if new projects that will generate their own emissions are to be created.**

The example of the French coal-fired power stations that are set to close by 2022 whilst others have recently been renovated with the aim of keeping them running until 2030 is an effective illustration of this phenomenon, which is likely to be magnified in the future.

**CONSEQUENCE #2:** Existing assets will have to significantly improve their carbon performance or change their business models.

Indeed, existing assets have an emissions potential attributed to them, but it is possible to change business models (switching from a basic model to a cutting-edge production model for a carbon asset), accelerate renovation and increase the scale thereof, and even decarbonise the use of existing infrastructure where possible (e.g. reducing the emissions per vehicle for a motorway).

Taking such factors into account in the investment strategy will also have an impact on negotiations regarding the acquisition of new assets.

**CONSEQUENCE #3:** It is important to invest in assets that contribute to the energy transition (renewables, energy efficiency, transition infrastructure, etc.)

Responsibility on the part of infrastructure project sponsors is therefore critical since all new assets that spring up will generate their own emissions for many years to come. With this in mind, compatibility with efforts to limit global warming to 2°C must play a central role when it comes to selecting investments.

The fact that the current ‘business as usual’ state of the world is not, by definition, compatible with this 2°C limitation means that we need to completely rethink current methods and ways of thinking in this sector.



**The New Climate Economy claimed, in 2015, that an additional \$1,000 billion of investment each year is necessary in order to finance the energy efficiency and low-carbon infrastructure and annual divestment in fossil fuels of up to \$400bn every year is needed.**

## A RESPONSIBILITY SHARED BY ALL OF THE PLAYERS INVOLVED

Whilst naturally greenfield project sponsors are concerned by how to achieve climate targets, **brownfield managers are, in fact, equally concerned.**

Indeed, one of the roles that brownfield investors play within the financial ecosystem is to enable other players, and notably project sponsors, to sell assets with a view to freeing up cash that can then be invested in new developments.

**Taking into account changes in the costs and revenues associated with complying with the Paris Agreement, brownfield investors will naturally increase their requirements when it comes to purchasing carbon-dependent assets.**

If a clear indication of this is detected, project sponsors may be less inclined to develop carbon-intensive assets if they know that they will have difficulty selling them at the desired price.

This being the case, the solution will require action for all stakeholders involved. Investors must therefore adopt a responsible approach to climate change as part of their mandates, which should, at the very least, include **analysing the compatibility of the investment strategy with limiting global warming to 2°C.**

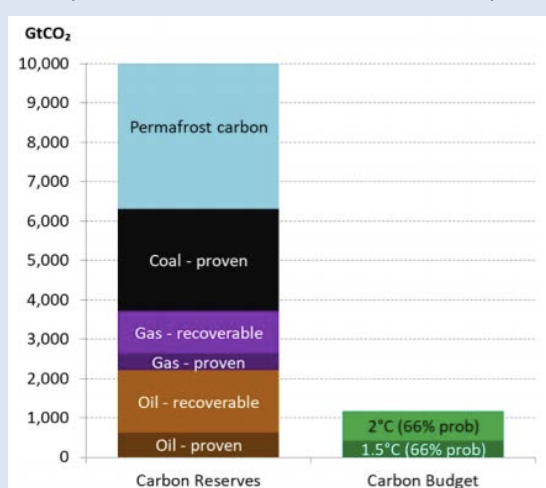
## THE FIGHT TO AVOID STRANDED ASSETS

As previously mentioned, complying with the Paris Agreement whilst at the same time having an emissions potential that exceeds the carbon budget available will unavoidably lead to the emergence of stranded assets. That said, if emissions are not limited, the latter will inevitably emerge as consequences of a rapid rate of global warming, which will in turn lead to increasing levels of damage where physical assets, such as networks, ports, power stations, etc., included in infrastructure asset portfolios are concerned.

**Stranded assets can therefore come about as a result of both transition risks and physical risks.**

Ultimately, whilst some assets will 'suddenly' need to be shut down, a very large number of assets will experience a loss in value or profitability as a result of climate risks. What we are dealing with here is a continuum of risk with financial consequences that will vary in severity depending on the asset in question.

**Carbon budget v. Fossil fuel reserves**  
(source: CRO Forum – The heat is on)



Staying within the carbon budget will clearly result in the emergence of stranded assets where fossil fuel reserves and assets that depend on them (shopping centres, motorways, ports, etc.) are concerned

**The wait-and-see approach which involves not committing to taking any outright action to reduce emissions for fear that it might affect the profitability of certain assets is a short-term vision. Indeed, the latter results in a certain irreversible deterioration in the profitability of other assets in the long term owing to the increased presence of physical risks.**



## LET'S LOOK AT A PRIME EXAMPLE: AIRPORTS

There is one case in particular that demonstrates this notion of stranded assets in practical terms, namely airports.

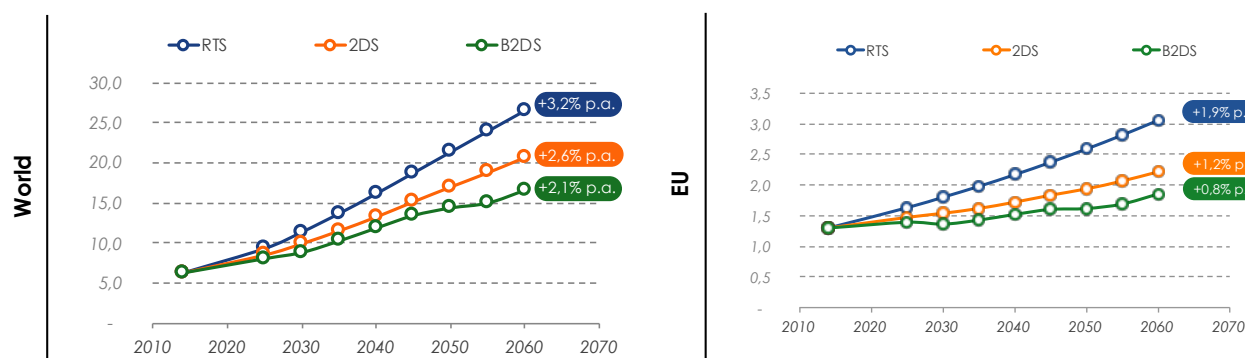
Airports are currently very highly prized assets among infrastructure funds, the privatisation of ADP being perhaps the most highly publicised example of this trend. The aviation industry undeniably boasts attractive levels of growth, with **global traffic doubling every 15 years**.

**But such assets could also be prime candidates to fall victim to the stranded asset phenomenon at some point in the future.** The aviation industry actually embodies many of the issues associated with climate change.

**Indeed, the savings made as a result of energy efficiency (around 1% a year according to the ICAO) and the potential for introducing biofuel replacements will be nowhere near sufficient to offset the 5% annual increase in traffic in order to be compatible with the Paris Agreement<sup>1</sup>.**

This being the case, it is vital that this growth in traffic levels also decrease if the industry's decarbonisation targets are to be met. The IEA's 2DS scenario compatible with limiting global warming to 2°C anticipates a circa 2.6% p.a. growth in traffic (1.2% p.a. in the EU), as opposed to the current rate of 4.7%. **With assumed energy efficiency savings twice as ambitious as those stated by the ICAO, and a (very) optimistic level of biofuel penetration to boot**, it could be argued that the levels of growth suggested by the IEA are, in fact, on the high side to ensure that industry practices can continue despite climate pressure.

Passenger Air traffic evolution according to the EIA scenarios (x10<sup>12</sup> passenger.km)



<sup>1</sup>In this respect, an airport is quite different from a motorway or a power grid in that, unlike cars and electricity, the 'object' itself, i.e. the aircraft, cannot be sufficiently decarbonised



## LET'S LOOK AT A PRIME EXAMPLE: AIRPORTS

**Consumers who are sensitive to environmental issues** have indeed taken the matter on board, with various initiatives, such as the **flygskam** (or 'shame of flying') initiative in Sweden, springing up in the most advanced of countries. The aforementioned initiative, which condemns choosing to fly over taking the train, is undoubtedly linked to **the 5% drop in the number of flights taken with Sweden's domestic airlines over the course of a year**. It is highly likely that this type of initiative could be extended, in some form or other, to other countries.

For background purposes, we should also add that kerosene is not currently taxed - a privilege that is difficult to sustain if you are claiming to be serious about wanting to limit climate change, and it is safe to say that the future of the aviation industry in this transitioning world will not be as bright as its recent past. **Le Monde echoed the European Commission's discussions concerning the taxation of kerosene** last May, indicating that things could be about to change.



the **flygskam** or 'shame of flying' initiative has already resulted in a 5% drop in the number of flights taken with Sweden's domestic airlines in a year.

## LET'S LOOK AT A PRIME EXAMPLE: AIRPORTS

Maintaining the status quo, however, would not necessarily be any better. Indeed, if we do not succeed in decarbonising the world, **the physical risks to which airports are exposed will be substantial.**

A recent study by Carbone 4 explored the impact of heat waves on airport activity (bearing in mind that these are not the only physical risks to which such assets are exposed (see extract below)).

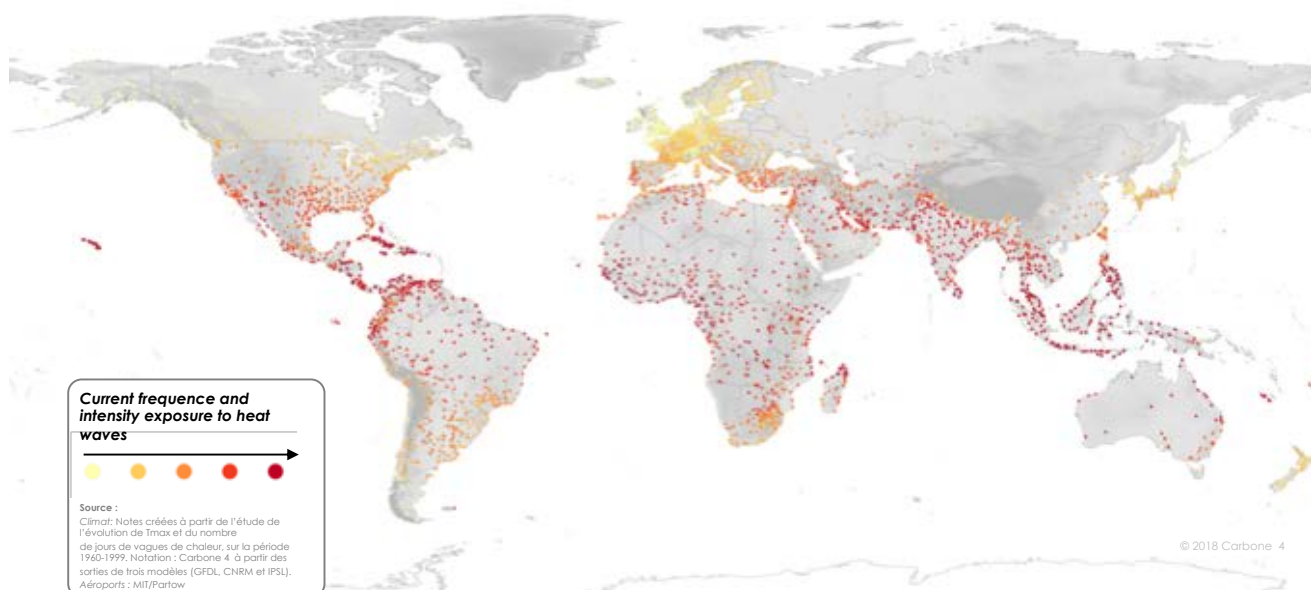
Of course, heat waves are not the only climate hazards that we need to look out for, either, **with 25% of the world's busiest airports actually located less than 10m above sea level** and traffic at Osaka airport having been disrupted for a number of days in September 2018 owing to a rise in the level of the Pacific Ocean.



*Kansai International Airport flooded following Typhoon Jebi (source: ladepeche.fr)*

This general picture obviously varies somewhat depending on the location of the airport and the volume of traffic it handles, but an infrastructure fund manager looking to limit their exposure to climate risks would have to pay particular attention to the threats to which airports are exposed in the medium term.

### AIRPORT EXPOSURE TO HEAT WAVES



# WHAT CAN INVESTORS AND MANAGERS DO?

## OUTLINE AN INVESTMENT PATH THAT IS COMPATIBLE WITH THE PARIS AGREEMENT

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It is vital that climate-related risks be taken into account at every stage of the management process in order to minimise exposure to such risks. **This primarily requires a good understanding of the issues at hand (notably through appropriate training), which is still rarely the case, and for technical resources devoted specifically to such matters to be incorporated.** It also requires proven **portfolio decarbonisation management methods corresponding to the problem at hand.**

## THE CLIMATE CHECK-LIST

In order to one day achieve a portfolio that is compatible with a 2°C pathway at global level the following steps must be taken:

→ **systematically perform a transition risk analysis and a physical risk analysis** for each **asset in the portfolio**;

→ do the same for **any potential new investments**;

→ For new investments, **select only assets whose use is not affected by a 2°C compatible pathway** (which requires global emissions to be cut by two-thirds in 30 years) and **that are not at risk** due to the physical consequences of future changes in the geographical areas in which they are located;

→ **examine and outline in detail how the carbon dependency of the assets** already in the portfolio and intended to be retained can be reduced;

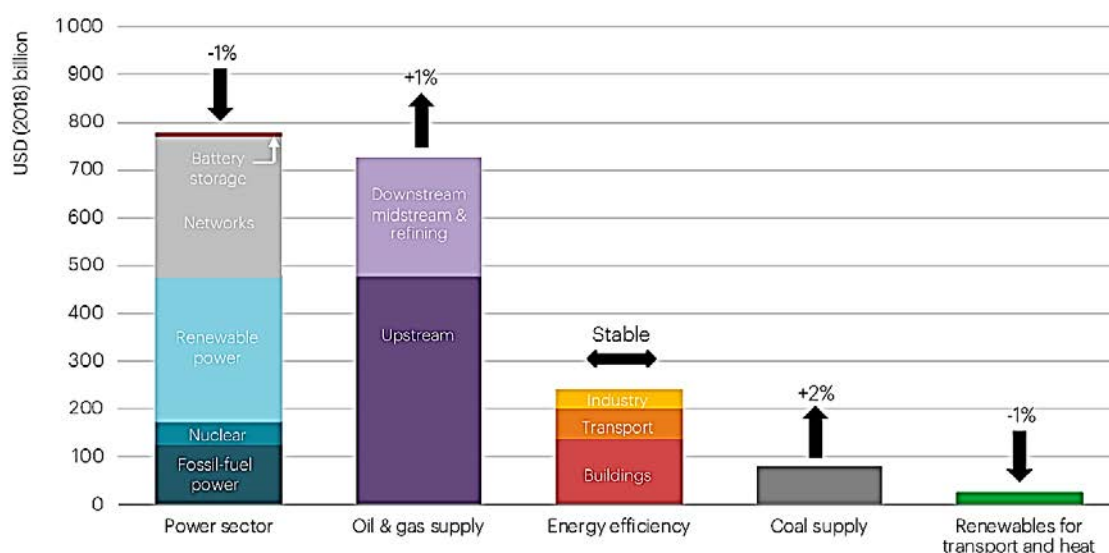
→ **determine whether**, in the case of the assets in question, **this dependency can be** sufficiently altered (which, unfortunately, will often not be the case);

→ **take the appropriate measures identified to reduce carbon dependency in those cases in which this is possible** (by encouraging a decrease in its usage by increasingly low-emission vehicles in the case of a motorway, or by increasing the proportion of biogas in a gas distribution network, for example).

# CONCLUSION

## THE NEED TO ACT QUICKLY

Global investment in oil, gas and coal was up very slightly in 2018 in relation to 2017, with investment in renewable sources experiencing a very slight decline.



GLOBAL INVESTMENT IN 2018 AND PROGRESSION IN RELATION TO 2017 (\$ BN)  
SOURCE: IEA

The 'boom' in investment in renewables is therefore just one (small) part of the story, and the recently published 2018 emissions report for the countries in the G20 (showing that emissions were up 1.7%) shows that the transition is unfortunately not yet at the pace it needs to reach in order to avoid a climate crisis (which would have massive consequences for the economy and its funders).

It is obviously vital that the public authorities be involved in creating a clear economic and regulatory framework, **but things will move that much more quickly if those investing in infrastructure have already started to seriously assess the risks and opportunities presented by the transition to a low-carbon economy** and accept the role that they must play in this general movement in society.

**Carbone 4 is firmly committed to working alongside the pioneers of this movement.**





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**Carbone 4** is the leading independent consulting firm specialized in low carbon strategy and climate change adaptation.

Driven by strong values of commitment, integrity and boldness, the Carbone 4 team is made up of 35 passionate and expert employees.

Our common goal since 2007: to guide our clients in understanding the emerging world. Constantly paying attention to weak signals, we use a systemic vision of the energy-climate constraint, while keeping in mind that the vital technical transformation needs to come with a change of mindset.

With a great attention to details and creativity, we work to turn our customers into leaders of the climate challenge.

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