



Infrastructure in Greece

Funding the future

March 2018

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The investment gap in Greek infrastructure is around

1.5pp
of GDP

Executive Summary

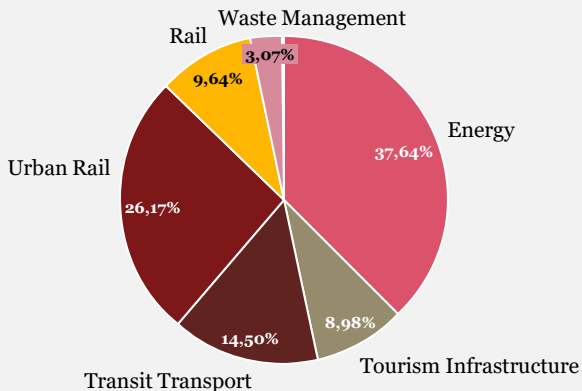
Funding the future

- According to OECD, global infrastructure needs* are expected to reach around \$ 87trln by 2030
- Greece is ranked 24th among the E.U. countries in terms of infrastructure quality, along with systematic low infrastructure quality countries, mostly in Eastern and Southern Europe
- In Greece, infrastructure investments were affected by the deep economic recession. The infrastructure investment gap is between 0.8 pp of GDP (against the European average) or 1.5 pp of GDP (against historical performance) translating into on average 1.1% of GDP or € 2bn spending per year
- Infrastructure investments have an economic multiplier of 1.8x** which can boost demand in construction and other sectors
- The infrastructure backlog has grown significantly during the crisis. The value of 75 projects, which are in progress or upcoming is around € 18.7bn, of these 21% refer to energy projects, while 36% are rail and motorway projects
- The investment pipeline has slightly decreased comparing to the stability of the past three years. The pipeline of projects in progress has been reduced in 2017 as a number of projects have been completed
- Between 2014-2017, 25 of the infrastructure projects have been completed mainly motorways
- Announced tourist infrastructure and waste management projects (the latter are financed through PPPs), estimated at 10% of total pipeline budget, are important to improving the quality of life
- Traditional funding sources, such as loan facilities and the Public Investment Program are limited, shifting the financing focus to the private sector.
- Historically, private funding in Greece was limited to about 15% of total budget, while public sector financing (State and EU) accounted for around 40%
- PPPs and Project Bonds could provide a significantly higher private sector participation in infrastructure funding, having as prerequisites the improvement of the business environment and lower levels of political uncertainty

March 2018

€ 18.7bn total remaining budget

Infrastructure backlog and budget of upcoming projects



Source: Press, PwC calculations

*excluding telecoms and social infrastructure
**for every Euro spent on infrastructure, GDP is further increased by € 0.8 (IMF Working paper "The welfare multiplier of Public Infrastructure Investment, 2016)

Sustainable Development Goals

17 SDGs focusing mainly on 6 investment areas addressing poverty and universal development

In 2015, 193 UN Member States adopted the Sustainable Development Goals (SDGs) to be achieved by 2030 in order to build sustainable economic growth



Infrastructure
PwC

Investment areas

- 1. Health**
- 2. Education**
- 3. Social Protection**
- 4. Food Security and Sustainable Agriculture**
- 5. Infrastructure**
- 6. Ecosystem Services**

In the long-term, infrastructure investment can jolt economic growth by increasing the potential supply capacity of an economy

- 
- 1. Energy access and low-carbon energy infrastructure**
 - 2. Water and Sanitation**
 - 3. Transport infrastructure**
 - 4. Telecommunications infrastructure**

Infrastructure investment

Definition of infrastructure

- *“Infrastructure is the system of public works in a country, state or region, including roads, utility lines and public buildings”*

OECD

- *“Infrastructure is “the basic framework for delivering energy, transport, water & sanitation and information & communication technology (ICT) services to people affecting directly or indirectly their lives”*

World Bank



In the study, we have included projects with regards to **transport** (airport, ports, roads & rail), **energy** (electricity, oil & gas) as well as **water & sewage**, whilst ICT and Social Infrastructure (e.g. Hospitals, Schools, Public Buildings, Sport Structures and Green Areas) have been excluded

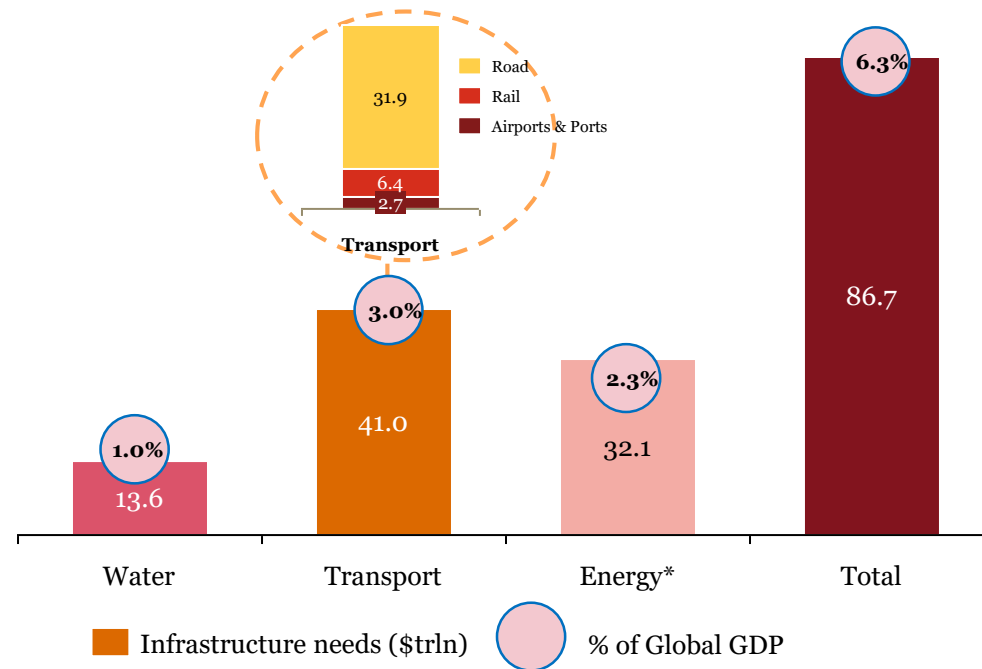


Information & Communications Technology, according to the World Bank, refers to physical telecommunications systems and networks (cellar, broadcast, cable, satellite, postal) and the services that utilize them (internet, voice, mail, radio, and television)

According to OECD, global infrastructure will absorb around \$ 87trln of investment by 2030

In the period 2017-2030, **6.3% of global GDP** needs to be invested in water infrastructure, road & rail transportation, airports and ports, energy

Traditional funding sources are no longer enough to cover the rapid increase in infrastructure projects, which are expected to reach \$ 6.6trln annually by 2030



Source: OECD

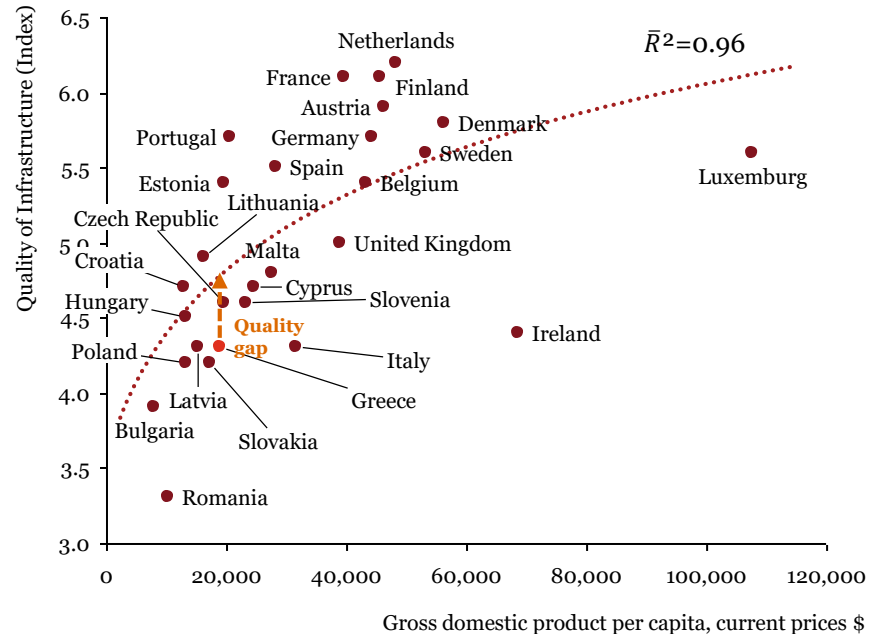
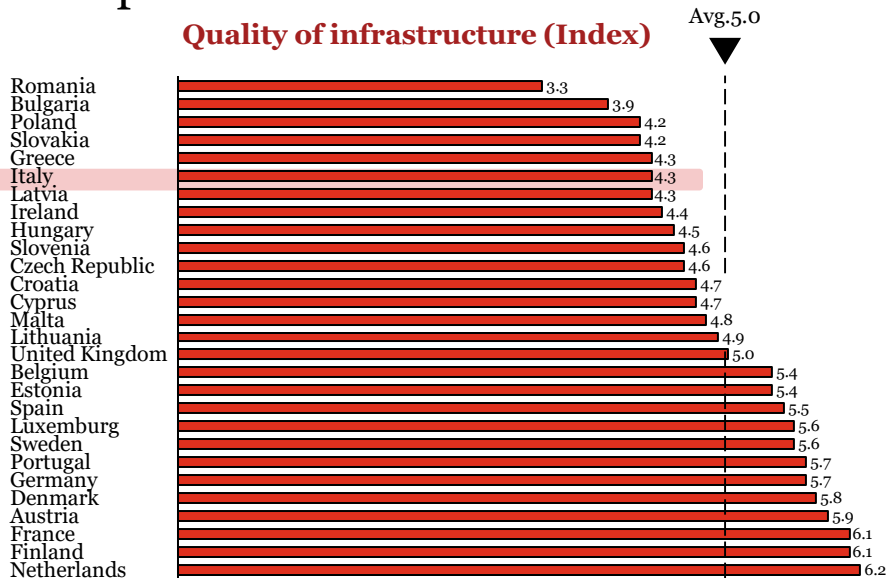
*Energy includes Power and electricity T&D, Energy demand/efficiency and oil and gas supply
 The OECD estimates include additional capital costs of 29% in the energy sector, related to the decarbonisation of the power sector and to the grid extension for the electrification of end-use sectors (e.g. transport); and investment in energy efficiency in the transport, industry and buildings sectors



Quality of infrastructure

Greece is ranked 24th among the EU countries in terms of quality of infrastructure, revealing also a quality gap for the current level of GDP per capita

Quality of infrastructure (Index)

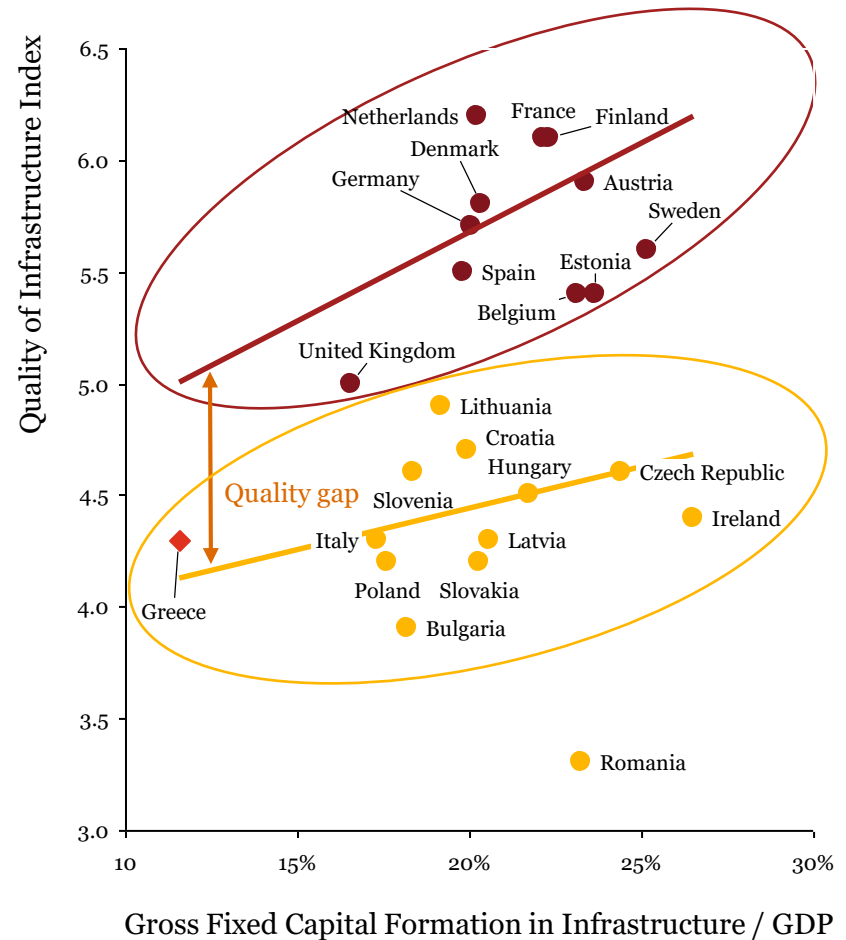


There are two statistically distinct levels of infrastructure quality, whose difference can't be explained by the level of GDP

The **differences in infrastructure quality** between Western and Northern European countries, compared to the Central and Eastern European countries, cannot be explained by the level of relative investment

Infrastructure investments, measured through the Gross Fixed Capital Formation (GFCF), appear to have a **different impact on infrastructure quality in each group**

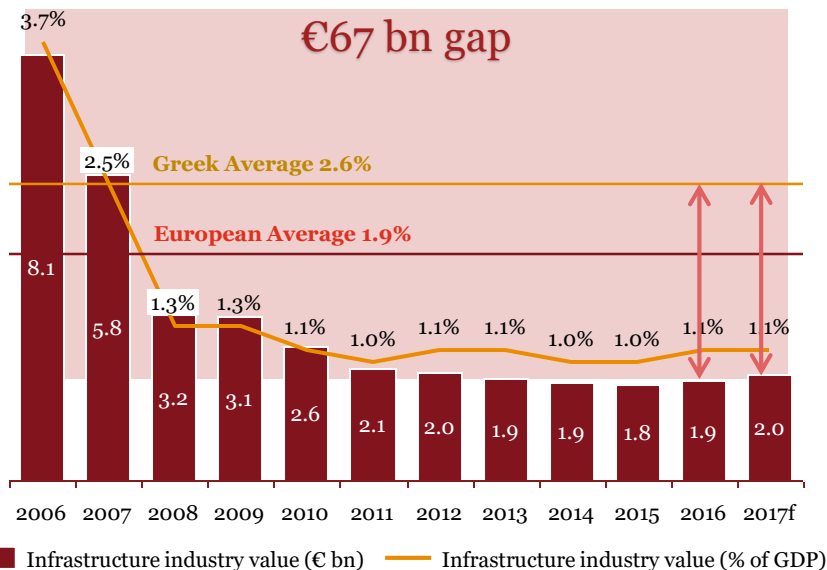
In **Greece**, the average infrastructure investments during 2000-2017 corresponded to only 19% of GDP, **third lowest among all E.U. countries**, undermining country's upcoming infrastructure quality



Source: World Economic Forum - The Global Competitiveness Report 2017-2018, BMI

There is an investment gap of 1.5pp of GDP (or € 2bn p.a.) in Greek infrastructure

Infrastructure investment***



Source: BMI International

BMI Infrastructure Investment includes: Transport Infrastructure (Roads, Bridges, Railways, Airports, Ports and Waterways) and Energy & Utilities (Power Plants, Transmission Grids, Oil & Gas, Pipelines and Water infrastructure)

Infrastructure in Greece has been severely affected by the deep recession. **Total value of infrastructure** projects has decreased between 2006 and 2017 by c. 75%, while its share in Greek GDP has fallen by 2.6pps in the same period

The current **rate of infrastructure investment** is around 1.1% of GDP, compared to the historical pre crisis average of 2.6% and the European average of 1.9% of GDP

The erosion of infrastructure investment from 2006 to 2017 resulted in a **€67bn cumulative shortage**

According to ELSTAT, the **number of employees* directly** related to infrastructure amounted to around 580k in 2017 (about 15% of total workforce) posting a significant decline of 37% compared to 2009. **Employees indirectly linked to infrastructure projects amount to 880k**

The **backlog** up to 2023 of both in progress and planned infrastructure projects is estimated at around **€18.7bn** or c. € 3.1bn on an annual basis

Infrastructure investments in Greece have an **economic multiplier of around 1.8x****, which boosts demand in other sectors

***Infrastructure Investment data is derived from GDP by output figures from ELSTAT. Specifically, it measures the output of the Infrastructure industry over the reported 12-month period in nominal values. As it is derived from GDP data, it is a measure of value added within the industry, hence it does not measure the nominal value of all inputs used in the infrastructure industry

*Direct sector employment: manufacturing, construction, water supply & waste management, electricity & gas supply
 Indirect sector employment: transportation & storage, real estate activities, wholesale, retail & repair of motor vehicles

**for every Euro spent on infrastructure, GDP is further increased by € 0.8 (IMF Working paper "The welfare multiplier of Public Infrastructure Investment, 2016)

Summary



- There is a **large need for further infrastructure investment globally** over the next 13 years, estimated at \$ 6.6trln per annum or 6.3% of global GDP
- The **average annual level of infrastructure investment** in Greece between 2009 and 2017 stands at € 2.15bn, 62% lower than the historical average of 2006-2008
- In Greece, the **infrastructure investment gap ranges between 0.8pp of GDP** (against the European average) **and 1.5pp of GDP** (against historical performance), which translates into 1.1% of GDP or about € 2bn per year
- The **quality of infrastructure** in Greece is **substantially inferior** than the level of wealth would predict
- There is a **statistically significant gap in the quality of infrastructure between western and mainly eastern European countries**. Greece is in the latter group
- **The need for infrastructure investments in Greece in terms of both capacity expansion and quality improvement is evident**





Greek infrastructure projects pipeline

There are 75 infrastructure projects in the pipeline for completion by 2023 totaling € 18.7bn

Between 2014 and December 2017, 25 infrastructure projects were **completed** with a **total spending of € 7.7bn**

Most of energy and motorway projects are in progress, 4 rail projects are about to be delivered, while **tourist product projects** are still **in initial development stage**

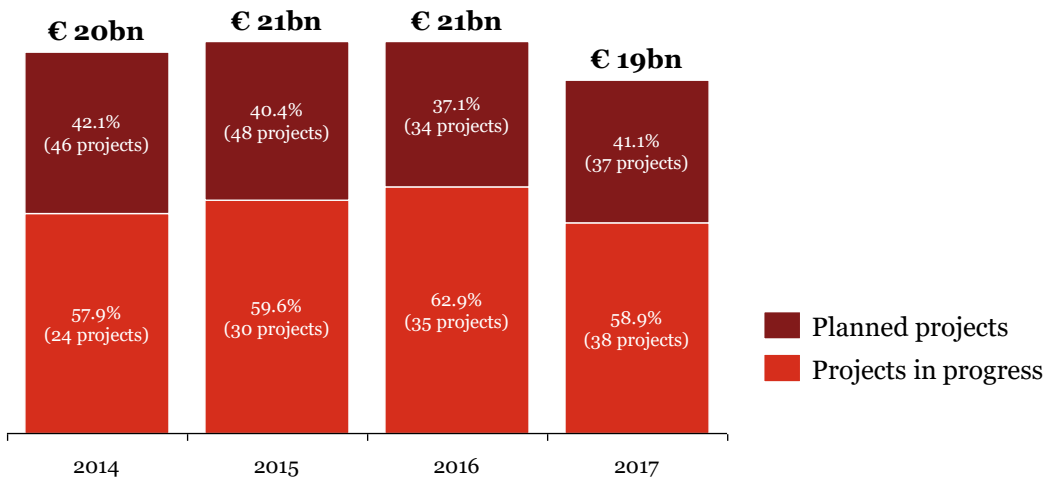
Rail, energy and motorways require **higher investment per project**, compared to tourist infrastructure and waste management projects



The evolution of the infrastructure pipeline

Slightly lower infrastructure pipeline mainly due to completion of major motorway projects in 2017

Evolution of infrastructure pipeline
(2014-2017)



Source: PwC calculations

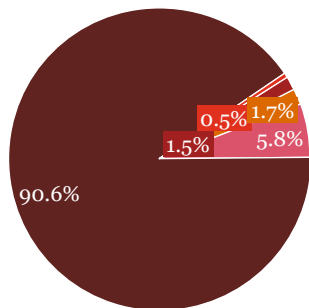
From 2014 to 2016 the work in progress investment remained fairly stable although in 2017 project pipeline dropped due to completion of a number of projects



Completed projects

Between 2014 and 2017, 25 infrastructure projects were completed totaling € 7.7bn

Budget of completed projects (2014-2017)

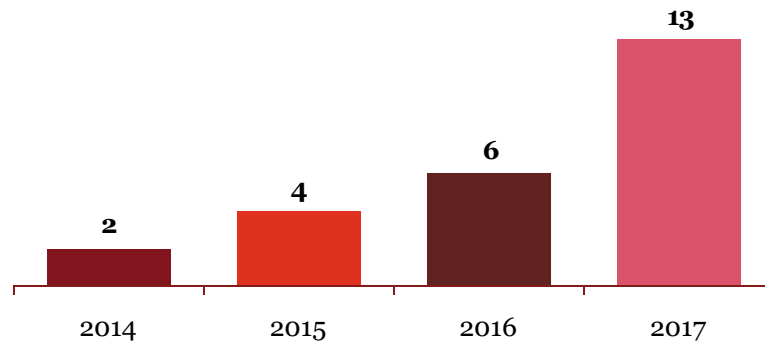


- Energy Projects
- Rail Projects
- Water & Sewage
- Tourist product upgrading
- Motorway Projects

Source: Press, PwC calculations

Infrastructure
PwC

Number of completed projects



Source: Press, PwC calculations

Olympia Odos Motorway* was the largest project completed since 2014 having a total budget of approximately € 1.5bn (2017 completion date)

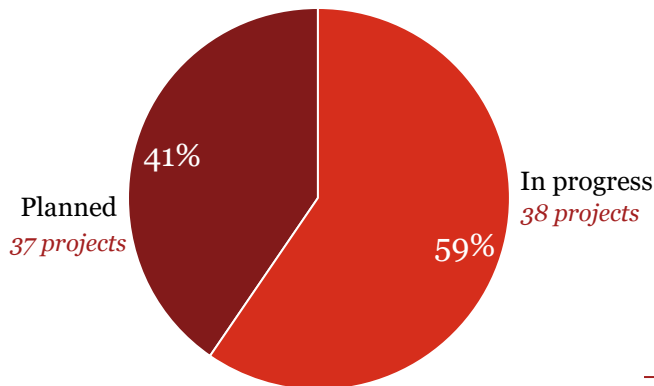
*Olympia Odos Motorway: Athens - Patras)



Investment pipeline in Greece

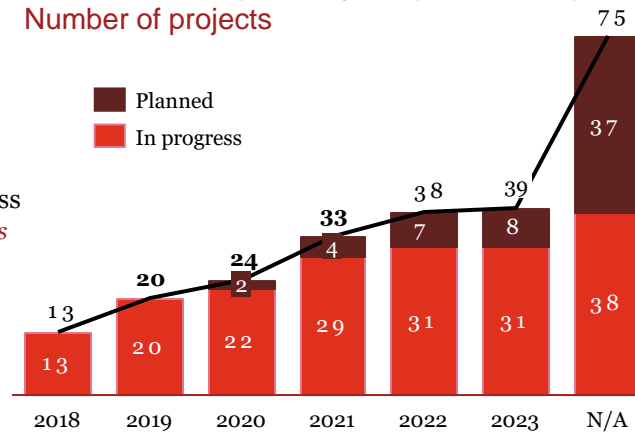
There are 75 infrastructure projects in progress and in the pipeline for completion by 2023 with a remaining spending requirements of €18.7bn

Pipeline budget* breakdown



Source: Press, PwC calculations

Estimated Completion year (cumulative)
Number of projects



Source: Press, PwC calculations

59% of the remaining budget represents projects have already commenced

17% of the projects, with a remaining budget of around €1bn, are estimated to be delivered in 2018

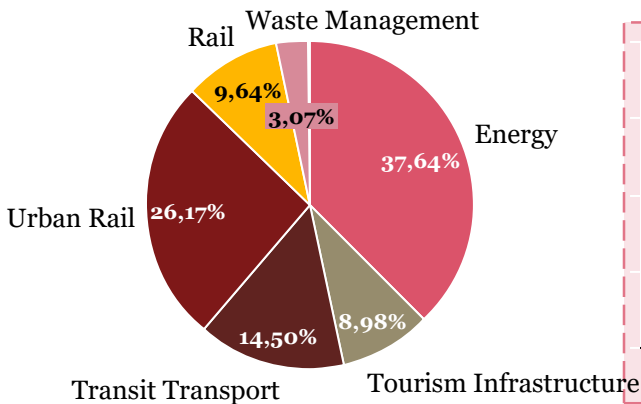
The completion dates of 36 projects, with a remaining budget €9.2bn, are unknown



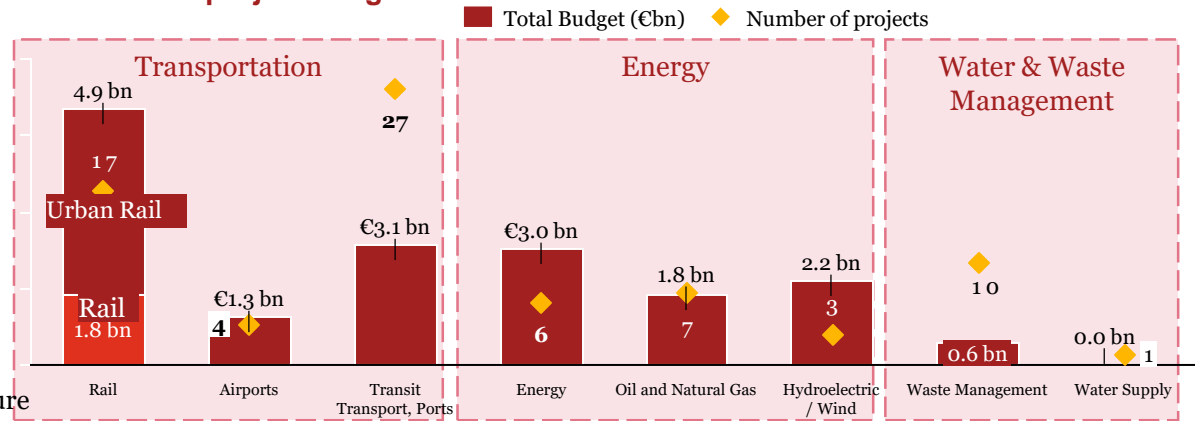
Infrastructure in Greece

From a total of 75 infrastructure projects that will be delivered until 2023, 27 refer to Roads and Ports, 17 to Rail and 10 to Waste Management

Total remaining budget*



Subsector & project budget



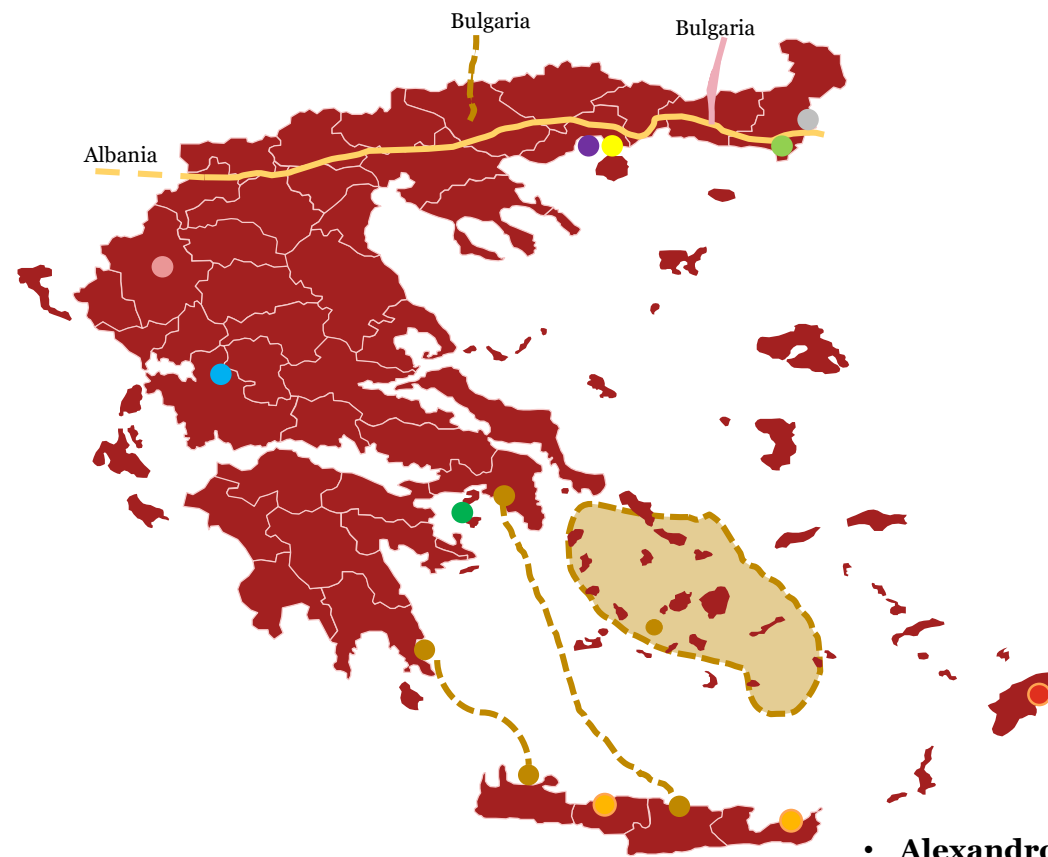
*Infrastructure backlog and total budget of upcoming projects
Source: Press, PwC calculations














Source: Press, PwC calculations

- There are **16 Energy** projects (38% of total pipeline budget) mainly in oil & gas and electricity
- **36% of the remaining budget** covers **rail projects (17 projects)**, while **14% (10 projects) motorways**

Energy projects

Geographical distribution



-  TAP
 -  Electricity Interconnectors of Cyclades
 -  IGB
 -  Revithoussa Islands 3rd LNG Tank Storage
 -  Alexandroupoli Independent Natural Gas System
 -  Electricity Interconnectors
 -  Ptolemaida V Power Plant (lignite fired)
 -  Amfilohia Hydro-pumped storage
 -  Gas Compressor Station (Kipoi)
 -  Rhodes Power Plants
 -  Kavala LNG
 -  Kavala storage facility (Underground Storage facility)
 -  Siteia and Rethymno Hybrid Stations
- Infrastructure
PwC

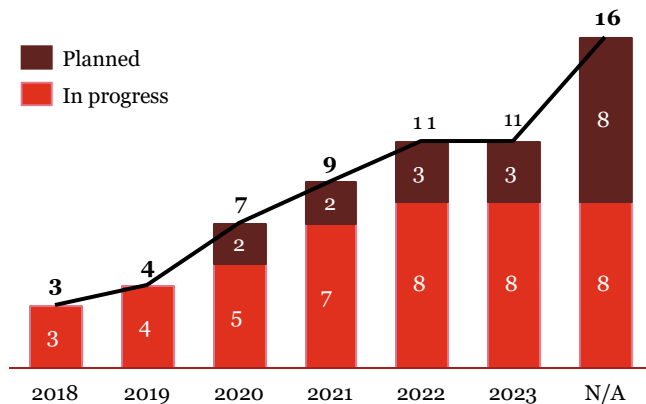
- **Alexandroupoli Independent Natural Gas System:** New offshore LNG with 28 km length of subsea and onshore pipeline (4 km onshore and 24 km offshore), with storage capacity of 170k m³ and pumping capacity of 6,1bcm per year
- **Kavala LNG:** Floating storage (170k m³ LNG capacity) and processing terminal (annual sent-out capacity of 3-5bcm) at Kavala Bay
- **Trans-Adriatic Pipeline** of 878 km in total will supply Europe with natural gas from Azerbaijan through Greece, Albania and Italy, with a capacity of 20 bn m³ per annum
- **Ptolemaida V Power Plant:** New single lignite power plant of 660 MW and 140 MW for district heating (PPC)
- **Attica – Crete and Attica-Peloponnese – Crete Interconnectors:** 310 km underwater electric cable connecting Crete with mainland with a capacity of 1,000 MW and 400MW respectively
- **IGB:** Natural gas pipeline of 182km length will connect the Greek and Bulgarian existing networks, with daily transport capacity of approximately 3-5bcm per year



Energy projects

Energy amounts to around € 7bn of spending

Estimated Completion year (cumulative)
Number of projects



Source: Press, PwC calculations

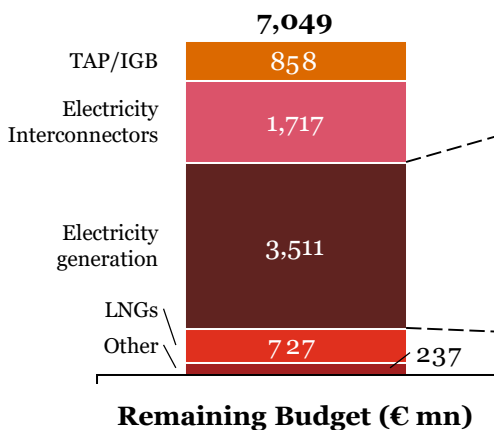
- 68.8% of the number of energy projects are **interconnections** (TAP, IGB, LNGs), while the remaining 31.2% refer to **electricity generation** (Wind parks, Power plants)
- The **cost per MW installed** reaches **€1,3mn**
- **Half of the total energy projects have not yet started**
- Half of the remaining budget is earmarked for energy interconnections and the other half for electricity generation



Energy projects

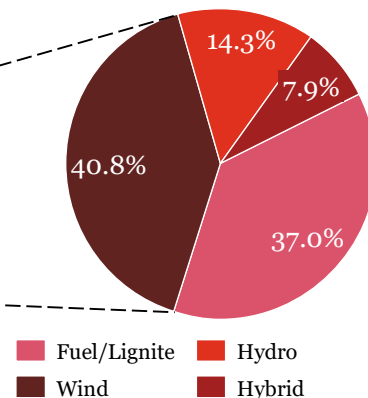
Electricity generation projects account for half of the remaining budget

Energy projects
Remaining budget 2017 (€ bn)



Source: Press, PwC calculations

Electricity generation sources
% of remaining budget 2017

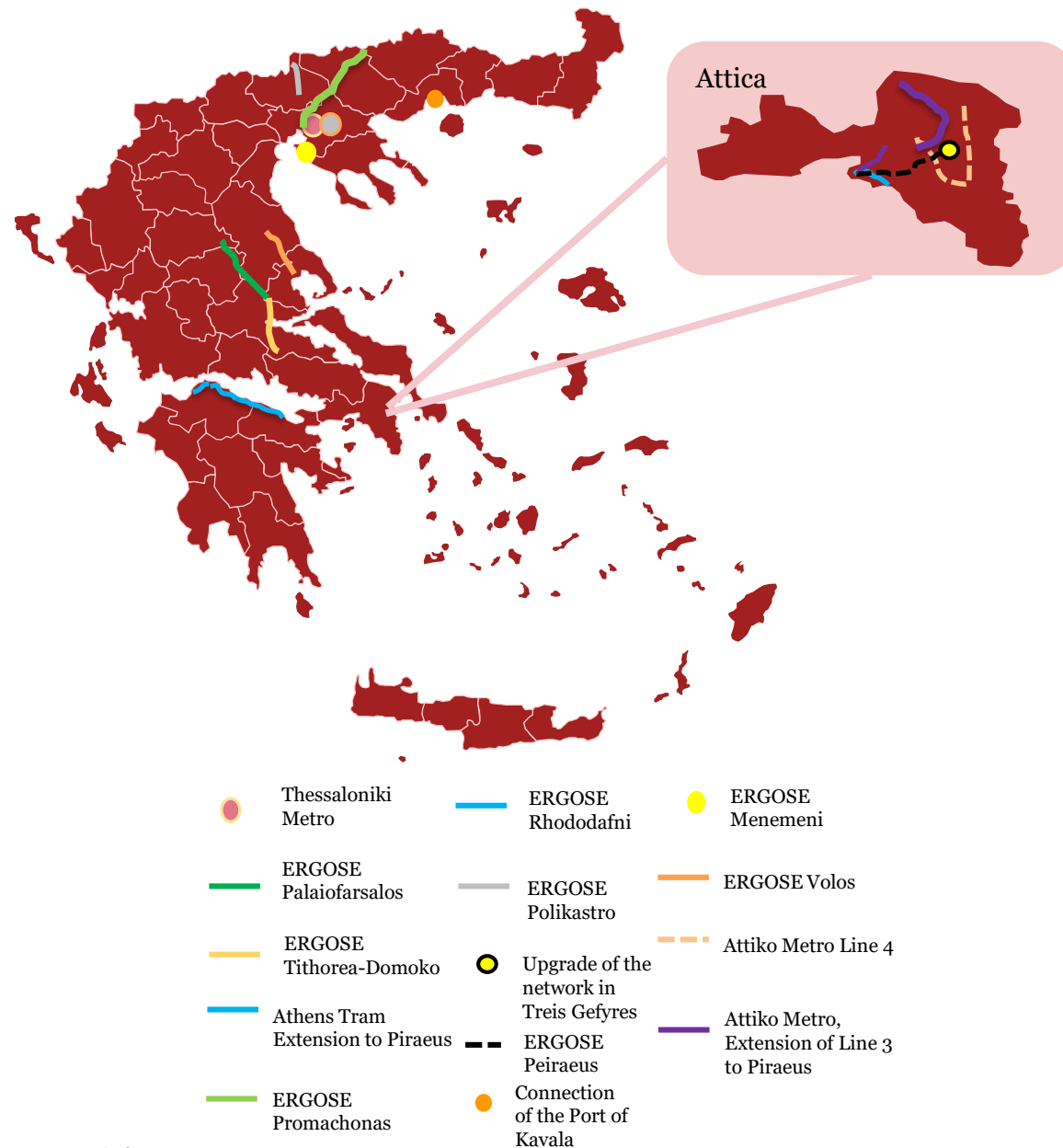


Source: Press, PwC calculations

- The two electricity interconnectors connecting **Crete to the mainland** as well as the one between **Greece and Bulgaria** take up **about 19% of the remaining budget**
- About 63% of the total remaining budget of scheduled electricity generation projects refers to projects that use **renewable energy sources**
- The majority of the upcoming electricity generation projects are focused around **wind power plants**

Rail projects

Geographical distribution



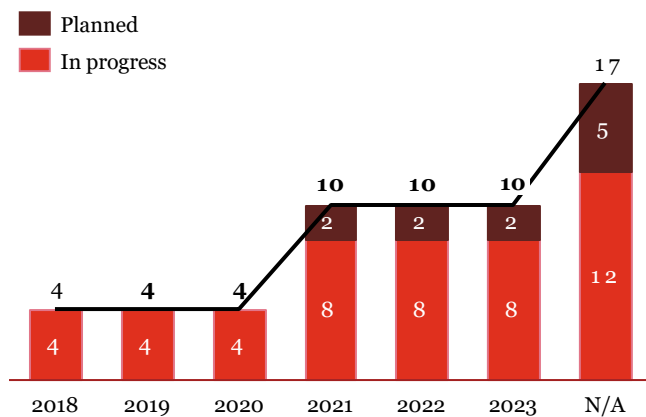
- Construction of **Metro in Thessaloniki** and extension to Kalamaria (14.3km) serving 315k passengers per day
- The new **Metro Line 4** in Athens with 33km length (31 new stations) is expected to serve around **500k passengers** daily, especially at densely populated areas (Kipseli, Pagrati, Zografou)
- Extension of **Athens metro to Piraeus** (6 new stations) **connecting the Athens International Airport with the Port of Piraeus** will increase current capacity to **123k passengers**
- **Tram extension from N. Faliro to Piraeus** (5.3km) will have a daily capacity of 100k passengers
- The construction of the first phase of **Thriassio Pedio** rail hub has been delivered and the second phase is in progress estimated to be delivered by 2018. The rail hub constitutes one **of the largest commercial railway projects in Europe and the largest in the Balkans**
- Construction of double rail tracks and upgrading of signaling and electrification of the main OSE network to **improve customer service** and **time of travel** rendering rail an efficient alternative for **long distance travel**



Rail projects

Rail projects amount to € 6.7bn, with 73% coming from urban rail projects

Estimated Completion year (cumulative)
Number of projects



Source: Press, PwC calculations

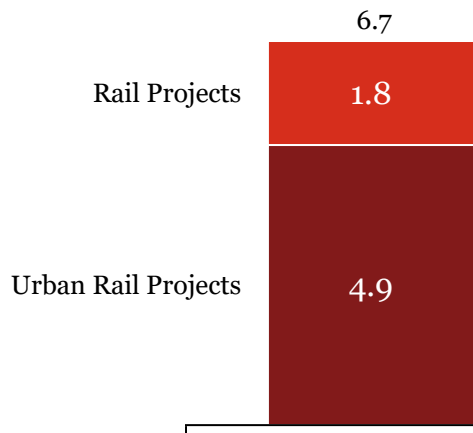
- 35% of the rail projects account to **urban rail interconnections** (Attiko Metro, Tram, Metro Thessaloniki), while the remaining 65% to **rail projects**
- More than half of the rail projects **have already started with further Attiko Metro and Thessaloniki Metro extensions and some Ergose upgrades in planning**
- **The average investment in railway projects** is estimated at **€ 6mn/km**, while the respective **investment in urban railways** stands at **€ 104.4mn/km**
- The percentage of **electrified lines in Greece reaches only 23%** compared to the **European average of 52%** (International Union of Railways, 2016). However, Greece is making progress in **implementing electrified lines** by converting and adding **about 264km of electrified lines in the national network**
- **4 rail projects** with remaining budget of €390mn are planned to be delivered within 2018



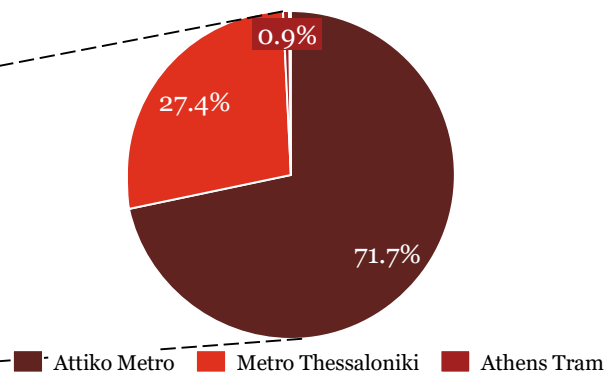
Rail projects

Although urban rail interconnections account for far less of the projects in the pipeline, they absorb larger part of the total remaining budget

Rail projects and Urban Rail projects
Remaining budget breakdown (€ bn)



Urban Rail projects
Remaining budget breakdown (€ bn)



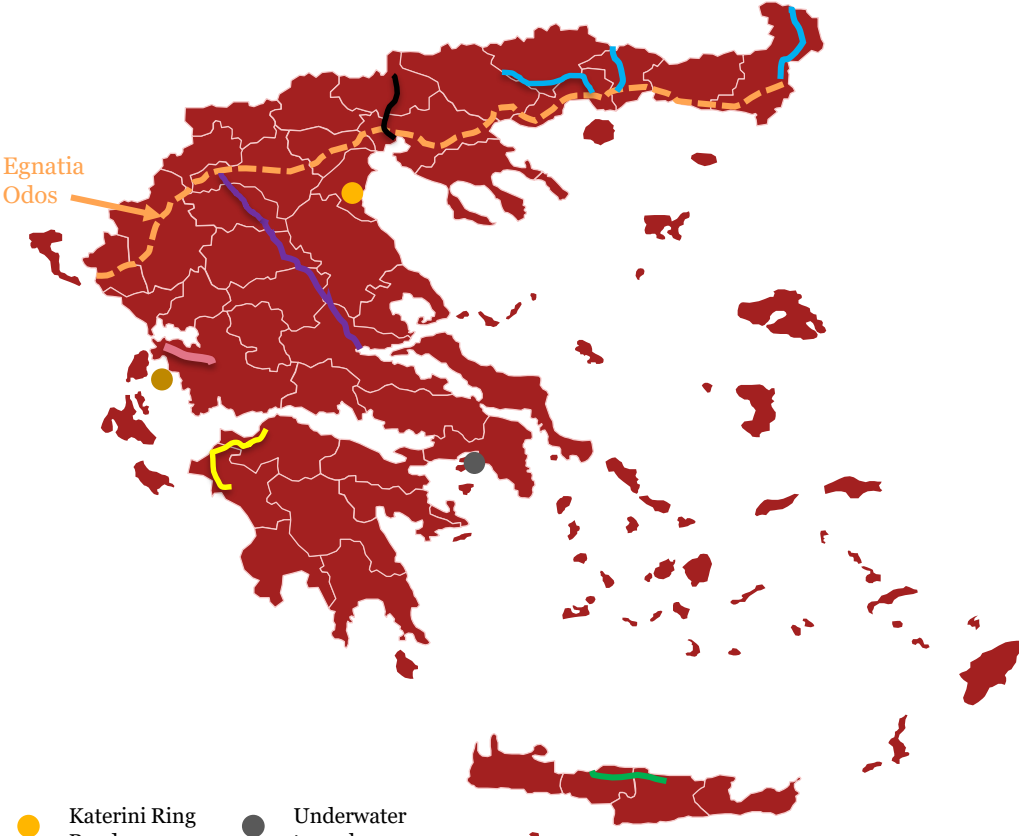
Source: Press, PwC calculations
Infrastructure
PwC

Source: Press, PwC calculations

- 27% of the remaining budget accounts to rail projects, while the remaining 73% to urban rail
- Attiko Metro's new lines and extensions are the largest urban rail projects, with a total budget of € 3.4bn taking up about 65% of the remaining budget of the urban rail projects

Motorway projects

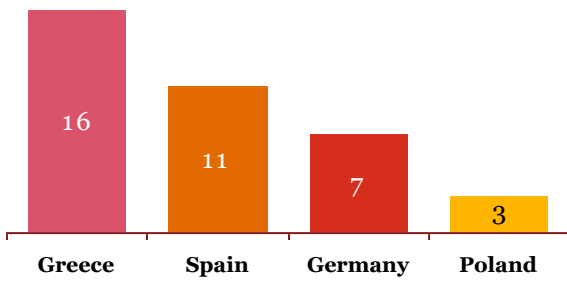
Geographical distribution



- Katerini Ring Road
- Vertical axes of Egnatia Odos
- Crete Northern Highway
- Vertical axis of Ionia Odos Aktio-Amvrakia
- Thessaloniki – Doirani Road Axis
- Underwater tunnel
- Widening Channel of Leukada
- Motorway E65
- Patras-Pyrgos Motorway

- **Egnatia Odos vertical Axes** will connect the main part of Egnatia Odos with **Bulgaria** and **Serres with Drama and Kavala**
- **Ionia Odos side Axis**, with a length of 48.5km will connect **Aktio to Amvrakia**
- **The relative cost of construction of major motorways per km** is estimated at **€6.4mn/km**, while the respective European average stands at **€11.6mn/km** (Infrastructure Journal, 2010)
- The **Central Greece Motorway** (part of E65 Motorway) is under construction with a total length of 175km and will connect **Lamia, Karditsa and Trikala with Egnatia Odos**.
- The **Patras-Pyrgos Motorway** is a physical extension of Olympia Odos with a total length of 75 km and **will establish a better connection between the two cities**

Average delays in road investment projects
Number of months from planned completion



source: ECA, Are EU Cohesion Policy funds well spent on roads? (2013), PwC analysis

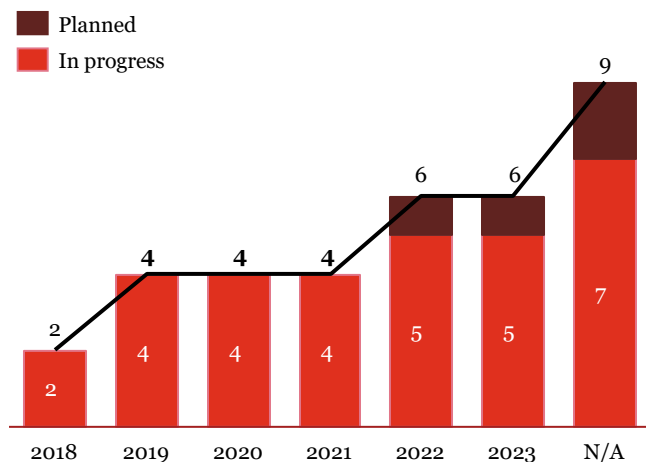


Motorway projects

Major motorways investment pipeline is about € 2.7bn

Estimated Completion year (cumulative)

Number of projects



Source: Press, PwC calculations

- **All of the motorway projects have already started** except from Salamina underwater tunnel and the Patras-Pyrgos Motorway
- The newest major motorway project that was announced in 2017 was the **Patras-Pyrgos Motorway**, with a total length of 75km. **Its construction is expected to start within 2018 and the projected delivery date is 2022**
- The total motorway kilometers of planned and in progress projects in Greece amount to 463km, **of which only 22% has already been constructed**
- The average cost of motorway construction in Greece **is € 7.5mn per km**



Motorway projects

During 2017, 6 motorway projects were completed in Greece with the largest one being Olympia Odos

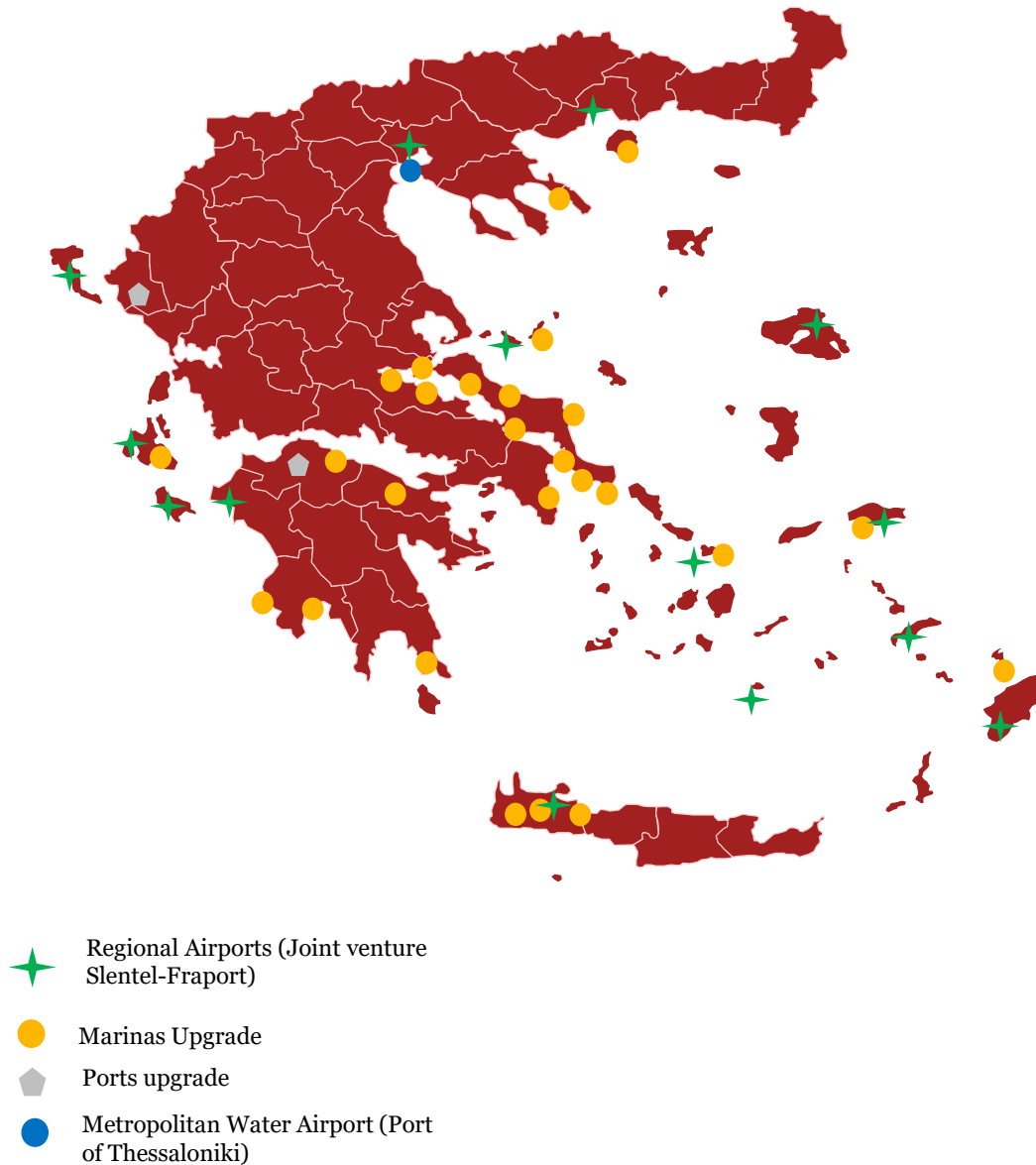
		No.	Project Name	Total Budget (€mn)	Length (in km)	€mn/km*	Years to complete
Regional Roads	Motorways	1	Aegean Motorway	1,300	230	5.6	10
		2	Ionia Odos	1,180	196	6.0	7
		3	Olympia Odos	1,487	205	7.2	9
			Subtotal	3,967	631	6.36	
		4	Fokianos-Kyparissi	15.4	20	0.7	4
		5	Thessaloniki-Kassandra	78.5	17	4.6	7
		6	Platygiali-Agios Dimitrios	15.0	6	2.4	7
			Subtotal	109	43	3.77	
			Grand Total	4,076	674	5.07	7.3

* Weighted average

Source: Press, PwC calculations

- The **total budget** of the completed motorway projects **amounted to €4.1bn**. A total **631km in motorway length** has been constructed
- The **average cost** of the projects was around **€ 5mn/km** and it took **7.3 years on average to complete**

Tourist infrastructure Geographical distribution



- Greece is a significant global tourist destination, attracting 28mn arrivals in 2016, ranking 15th in global rankings and 9th in Europe
- Despite being a global tourist attraction, the tourist infrastructure quality in Greece is of low quality
- The upgrade of Greece as a global tourist destination includes:
 - The upgrade of the 14 regional airports acquired by the Slentel-Fraport joint venture and the second wave of airport privatizations as well as the construction of new regional airports to support the increase of tourist arrivals which is expected in the following years
 - Upgrading vital ports to serve as transit terminals and facilitate interconnection with neighbor countries
 - Upgrading and building key marina hubs (Alimos, Kalamaria, Chios, Crete, Glyfada, Zakynthos & Katakolo, Patra, Pylos and Rhodes & Kos) to meet the increasing demand in marine tourism

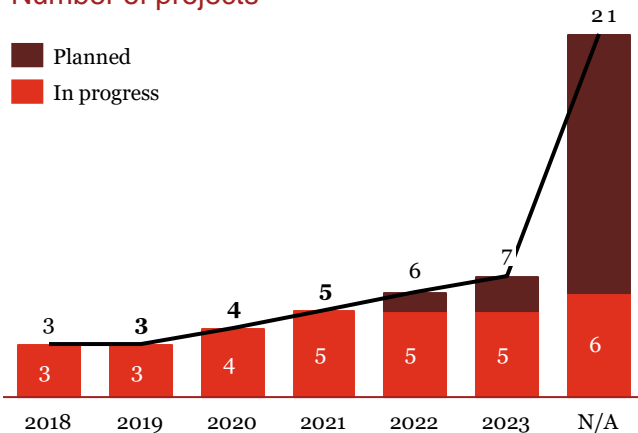


Tourist infrastructure projects

For the upgrading of the tourist product around € 1.7bn have been scheduled

Estimated Completion year (cumulative)

Number of projects



Source: Press, PwC calculations

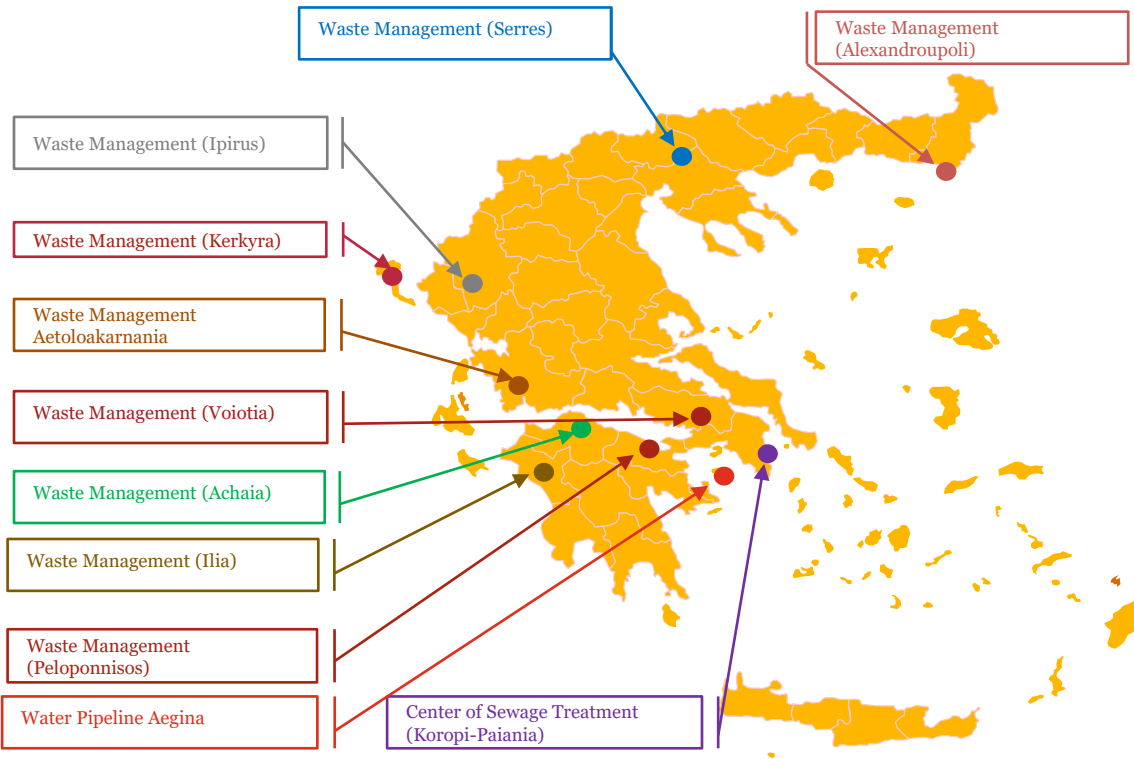
Infrastructure
PwC

- **62% of the tourist infrastructure projects are not even fully planned** except from the new dock at the Port of Thessaloniki and Kasteli airport which are scheduled to be completed by 2022 and 2023 respectively
- The **average budget** of tourist infrastructure projects amounts to **€94.3mn per project**
- There is no information on the construction of the key marinas (Katakolo & Zakynthos, Alimos hub, Glyfada hub, Patra hub, Chios hub, Crete hub, Pylos hub and Aretsou Kalamarias hub) except for the marina of Symi

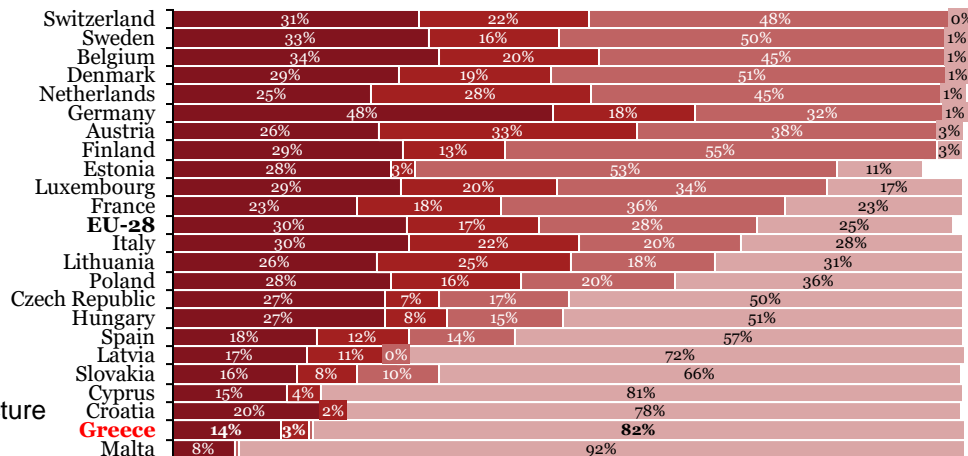
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Waste Management Geographical distribution

- On December 2014, the European Court of Justice issued a €10mn fine to Greece for uncontrolled waste disposal sites and landfill use, in contrast to the EC Waste Directive. In addition, the court requires immediate implementation of the relevant policies and an additional €14mn fine for each six-month period of delay
- Since 2013, 15 Waste Management projects have been announced, budgeted for €1.7bn, out of which only 2 have been completed and the remaining being either postponed or delayed. During 2015, the postponement of all PPP waste management projects was announced,



Municipal waste treatment

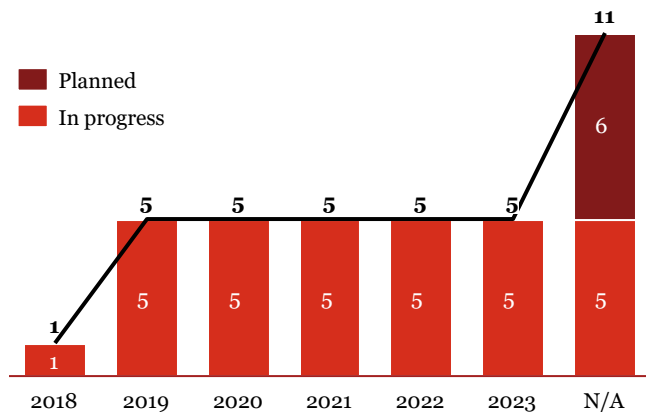




Waste management projects

Waste management projects need about € 0.6bn up to 2023

Estimated Completion year (cumulative)
Number of projects



Source: Press, PwC calculations

- Within 2017, **progress was made in waste management projects as 3 PPPs were signed** for waste management projects **in Serres, Voiotia and Epirus** and **2 more PPPs are expected to be signed in 2018 (Ilia and Peloponissos)**
- However, **4 Waste Management projects remain frozen**, despite the EU Court decision in September 2016 fining Greece with **a € 10m fine and another € 30k per day for not complying with the EU regulation on uncontrolled waste disposal sites and landfill use**
- The **average budget** of waste management projects amounts to **€62mn per project**
- Only **1 waste management project is expected to be delivered in 2018** (Center of sewage treatment in Koropi) and the rest of the projects that have already started **are projected to be delivered in 2019**

Summary



- The value of **75 infrastructure projects** in progress or planned, expected to be completed by 2023, is standing at € 18.7bn
- **25 projects were completed in 2017.** Amongst them, **Olympia Odos*** was the largest project with a total budget of € 1.5bn
- **Projects in progress** account for **59%** of estimated investment
- For 48% of the projects, completion dates are not known
- The **transport and energy** sectors account for almost 87% of the pipeline of all projects and the smooth evolution of those investments will have a very positive impact in economy
- **Investments** in tourism product upgrade (9%), as well as waste management and water supply investments (4%) are **important for growth and the upgrade of life quality**



Funding of Greek infrastructure projects



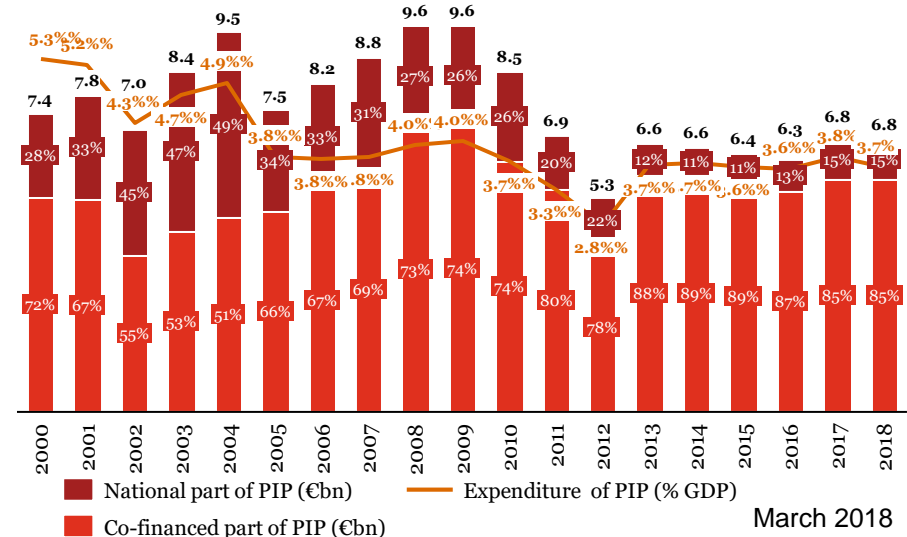


Public funding in Greece

The Public Investment Program (PIP) has gone back to 2002 levels with no indication of imminent growth

- The **funding rate of infrastructure** through the Budget declined from 30%-45% since 2008 to 15% in 2017
- The Greek government announced in the new budget that the national part of PIP will be increased by €250mn
- The available public resources for investment in 2017 are comparable, in nominal value, to those of 2002
- Under the new NSRF (ESPA), the funds for infrastructure projects are limited, while priority has been given to the motorways and large “frozen” projects

Public Investment Program
Greece





Funding Greek infrastructure projects

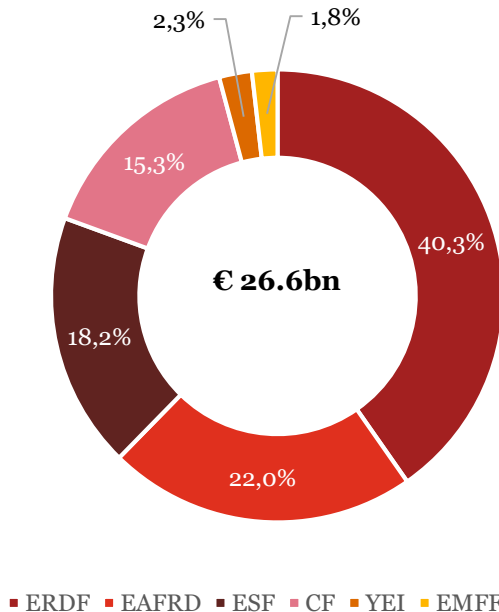
Sources of Funding

- **Public (~40%):** Historically the State's contribution to major projects accounts to 15% - 20% while the remaining is financed from EU funds. Moreover about 25% of concessionary funding for the major motorways comes from toll revenues
- **Private funding (~10%-15%):** Private funding in terms of direct equity historically amounted to below 15% of the total project budget
- **EIB and Banks (~40%-45%):** EIB's contribution is limited to 50% of the total project cost. EIB works with other banks, either co-financing projects or by issuing guaranties. Greek Banks have announced the financing of infrastructure projects by € 3bn (including Kasteli Airport, Regional Airports, Underwater tunnel in Salamina)

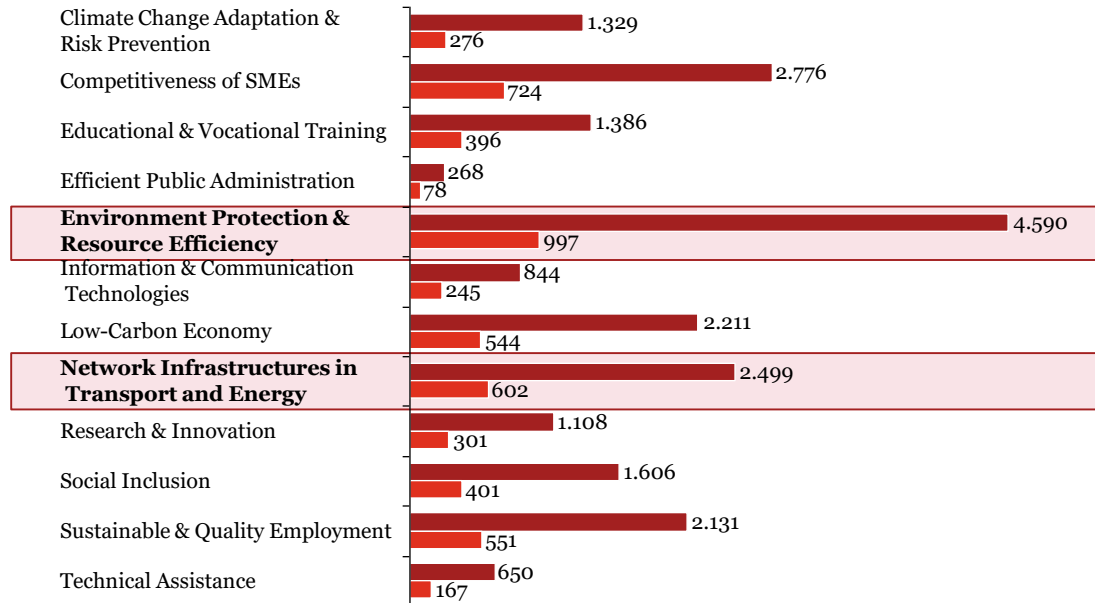
Public Private Partnerships (PPPs): PPPs and Project Bonds could provide a significantly higher private sector participation in infrastructure funding adding a low risk element in institutional investors' portfolios

NSRF 2014-2020 – € 8.7bn of available infrastructure funding

Budget per Area/Fund



Budget for each action (€mln)



Source: European Commission

- The total available funds from the new NSRF amount to **€ 26.6bn**, of which **€ 7.1bn** are EU and **€ 1.6bn** are national contribution
- Major infrastructure projects funded by the cohesion policy include:
 - **€ 511mn** for urban public transport systems in Athens and the region of Attica
 - **€ 1.5bn** for the extension of the metro in Thessaloniki, in Central Macedonia
 - **€ 123mn** for the upgrade of road networks in the northern Greece and Crete



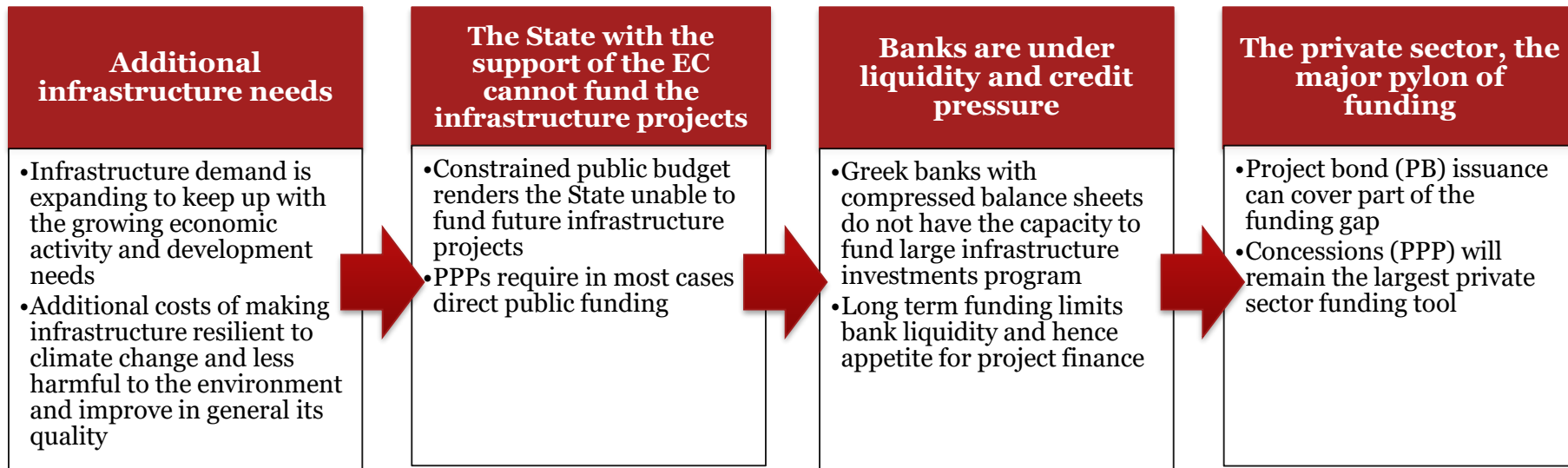
Challenges in meeting infrastructure needs

Key Factors
contributing to
the Financing
Gap for
Infrastructure

1. **Slow process of political consensus** in infrastructure planning
2. **Projects poorly planned** and not well managed
3. **Legal delays** in preparing for execution which leads to **delivery delays**
4. **Frequent disputes** between the state and the concessionaires or contractors
5. **User-charges below project costs**
6. **State contribution** below required levels
7. **Risk distribution** between the state and the contractor/concessionaire may change in the course of the project



Private funding is necessary for smooth evolution of the project development, but it will remain limited until the business environment improves and political uncertainty decreases



Conclusions

- Global infrastructure investment is expected to reach \$6.6trln per annum in the period to 2030 or 6.3% of global GDP
- In **Greece, infrastructure investment** as a percentage of GDP shrank from **3.7%** in 2006 to **1.1% in 2017**, a cumulative **€67bn** shortage, created by the deep recession and consequent budgetary constraints
- Infrastructure investments are vital for the Greek economy, having a high **economic multiplier (ca. 1.8x)** which can boost consumption and investment in other sectors
- Between 2014-2017, 25 of the infrastructure projects were completed, with Olympia Odos being the largest one (€ 1.5bn)
- The number of planned and in progress infrastructure projects are not decreasing during the crisis. In 2017 their total cost until 2023 is estimated at **€ 18.7bn**
- **€ 7bn** of the remaining budget refers to **Energy projects**, while **€ 6.7bn to Railways** and **€ 2.7bn to Motorways**. **Tourist infrastructure and Waste management projects** account for a small part of the remaining budget taking up only about **€ 1.7bn and €0.6bn respectively**
- The available State funding for infrastructure projects in 2017 is, in nominal terms, back to pre-2002 levels
- The growing **need for infrastructure spending**, combined with the **limited capacity of state funding and the balance sheet constraints of the Greek banks** call for new sources of funding
- The main factors contributing to the financing gap for infrastructure are **poor planning, slow process of political consensus and delays**
- Direct **private funding** will remain limited until the business environment improves and the political uncertainty decreases but PPPs will remain the main private funding platform

Appendix 1 – Infrastructure projects in Greece*

- 
- 12** *Energy projects*
 - 14** *Rail projects*
 - 8** *Motorway projects*
 - 12** *Tourist infrastructure projects*
 - 11** *Waste management projects*

* Some projects have been grouped together and thus projects depicted at the tables do not add up to 75 projects

Energy accounts for around € 7bn of investments

No	Interconnection Projects	Capacity (MW)	Remaining Budget (€mn)	Start Date	Completion Date*
1	TAP (Trans - Adriatic Pipeline)	N/A	630	2016	2020
2	Electricity Interconnectors (Euroasia Interconnector, Crete - Peloponnese - Attika, Cyclades, Maritsa East (BG) - Nea Santa (GR))	4.070	1.717	2018 2014 2014 N/A	2022 2022 2021 2020
3	LNGs (Alexandroupolis LNG, Kavala LNG)	N/A	615	N/A	N/A
4	Kavala storage facility (Undeground Storage facility)	N/A	200	N/A	N/A
5	IGB (GR-BG Natural Gas pipeline)	N/A	228	2016	2018
6	Revythoussa Islands 3rd LNG Tank Storage	N/A	112	2014	2018
7	Gas Compressor Station (Kipoi)	N/A	37	2017	2019
Total Budget			3.538		

No	Power Generation	Capacity (MW)	Remaining Budget (€mn)	Start Date	Completion Date
1	Ptolemaida 5 Power Plant (lignite fired)	660	1.260	2015	2021
2	Wind Parks	1.323	1.434	N/A	N/A
3	Amfilochia Hydro-pumped storage	680	502	N/A	N/A
4	Rhodes Power Plants	114	38	2015	2018
5	Hybrid Stations in Siteia and Rethymno	139	277	N/A	N/A
Total Budget			3.511		

*Commissioning date

Source: Press, PwC calculations

Rail projects amount to € 6.7bn, with 73% coming from urban rail projects

No	Upcoming Projects	Details	Remaining Budget (€mn)	Start Date	Completion Date
1	Attiko Metro	Extension of Line 3 to Piraeus , New Line 4 , Line 4 Extension to Perissos and Lykovrisi	3.515	2012	N/A
2	Thessaloniki Metro	Main line & Extensions to Kordelio and Kalamaria	1.343	2006	2021
3	Athens Tram	Extension to Piraeus	43	2013	2018
Grand Total			4.901		

No	Upcoming Projects	Details	Remaining Budget (€mn)	Start Date	Completion Date
1	Ergose Rhododafni	Kiato-Rhododafni, Rhododafni-Psathopyrgos, Psathopyrgos-Patras and electrification of railways	722	2006 2018	2020 N/A
2	Ergose Tithorea	Tithorea- Domoko	291	2013	2018
3	Ergose Thriassio Pedio	Thriassio Pedio Rail hub	46	2013	2018
4	Ergose Palaiofarsalos Electrification	Palaiofarsalos - Kalambaka (electrification of railways)	48	2016	N/A
5	Ergose Volos Electrification	Volos – Larissa (electrification of railways)	60	2018	2021
6	Ergose Polikastro	Polikastro - Idomeni	60	2007	2021
7	Ergose Menemeni	Agia Paraskevi- Menemeni Thessaloniki	10	2016	2018
8	Ergose Piraeus - Athens - Treis Gefyres Electrification	Ergose: Upgrade of the network in Treis Gefyres and electrification of the Peiraeus-Athens-Treis Gefyres	155	2015	2024
9	Ergose Port of Kavala	Connection of the Port of Kavala to the existing Thessaloniki-Alexandroupoli line	250	2005	N/A
10	Ergose Central Macedonia	Upgrade of the network in Central Macedonia	35	2018	2021
11	Ergose Promachonas	Upgrade of existing line Thessaloniki-Promachonas	120	N/A	N/A
Grand Total			1.797		

Major motorways investment pipeline is about € 2.7bn

No	Upcoming Projects	Details	Total Klm	Total Budget (€ mn)	Remaining Budget (€ mn)	Start Date	Estimation Completion Date	Average investment/km
1	Crete Northern highway	Gournes -Chersonissos and Panormos-Exantis	19	119	92	2009	2019	6,3
2	E65 Motorway (Lamia-Egnatia)	Lamia - Xyniada and Trikala – Egnatia	96	1.435	908	2008	2022	14,9
3	Egnatia Odos	Vertical axes of Ardanio-Ormenio & Mandra-Psathades (2018), Serres-Drama-Kavala (N/A), Xanthi-Echinos (2020)	173	908	803	2011	N/A	5,3
4	Ionia Odos	Aktion-Amvrakia Vertical Axis	49	165	95	2010	N/A	3,4
5	Regional roads	Ring road of Katerini, Thessaloniki-Doirani	41	139	98	2013 2011	2018 2019	3,4
6	Underwater tunnel Salaminas	Underwater connection between Salamina and Perama	5	350	350	2019	N/A	71,4
7	Widening channel in Lefkada	Lefkada	6	22	16	2013	2018	3,7
8	Patras-Pyrgos Motorway	Patras-Pyrgos	75	356	356	2018	2022	4,7
	Total		463	3.495	2.716			7,5

Source: Press, PwC calculations

For the upgrading of the tourist product around € 1.7bn have been scheduled

No	Projects	Remaining Budget (€mn)	Start Date	Completion Date
1	Kasteli Airport in Heraklion	850	2018	2023
2	Regional Aiports	330	2017	2021
3	OLTH (upgrade of sixth harbor)	220	2018	2022
4	Igoumenitsa Port upgrade	59	2008	2020
5	Macedonia Airport upgrade	71	2005	2018
6	Ioannina Airport upgrade and new terminal	17	2010	2018
7	Port of Patras upgrade	75	2012	N/A
8	Key marinas	43	2003 N/A	2018 N/A
9	Luxury marinas (Mykonos, Argostoli)	9	N/A	N/A
10	Upgrading/ Maintenance in 49 Regional Ports	4	N/A	N/A
11	Layrio Mega Yacht	4	N/A	N/A
12	Metropolitan Water Airport (Port of Thessaloniki)	0,4	N/A	N/A
	Total Budget	1.682		

Source: Press, PwC calculations

Waste management projects need about € 0.6bn up to 2023

No	Projects	Remaining Budget (€mn)	Start Date	Completion Date
1	Waste management (Alexandroupoli)	20	N/A	N/A
2	Waste Management (Peloponissos)	158	N/A	N/A
3	Waste management (Achaia)	128	N/A	N/A
4	Waste management (Epirus)	53	N/A	2019
5	Center of Sewage Treatment (Koropi - Paiania)	19	2013	2018
6	Waste management (Aitolokarnania)	18	2018	N/A
7	Waste management (Kerkyra)	70	N/A	N/A
8	Waste management (Ilia)	39	N/A	N/A
9	Water Pipeline Aegina	19	2016	2019
10	Waste management (Serres)	36	2017	2019
11	Waste management (Voiotia)	16	N/A	2019
	Grand Total	575		

Source: Press, PwC calculations

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