Infrastructure in Greece

Funding the future

March 2017
**Content overview**

1. Executive summary
2. Infrastructure investment
3. Greek infrastructure projects pipeline
4. Funding of Greek infrastructure projects
5. Conclusion

The investment gap in Greek infrastructure is around 1.4pp of GDP
Executive Summary

Funding the future

- According to OECD, global infrastructure needs* are expected to increase along the years to around $41 trillion by 2030
- In Greece, the 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 1.4 pp of GDP (against historical performance) translating into 1.1% or €2.2bn new spending per year
- Infrastructure investments have an economic multiplier of 1.8x** which can boost demand of other sectors. The construction sector will be enhanced creating new employment opportunities on a regular basis, attracting foreign investors and improving economic growth
- Greece is ranked 26th among the E.U. countries in terms of infrastructure quality, along with systematic low infrastructure quality countries, mostly in Southern Europe
- Greek infrastructure backlog has grown enormously during the crisis. The value of 69 projects, which are in progress or upcoming is amounting to €21.4bln – 42% accounting for energy projects, while 46% coming from rail and motorway projects
- Announced tourist infrastructure and waste management projects (latter are financed through PPPs), estimated at 13% of total pipeline budget, are key to development and improvement of quality of life
- Between 2014-2017 (February) 16 of the infrastructure projects have been completed
- Traditional funding sources, such as loan facilities and Public Investments Program are becoming less sustainable over the years, 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, adding a low risk element in institutional financiers’ portfolios, having as prerequisite the business environment improvement and lower levels of political uncertainty

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

**Sustainable Development Goals**
17 SDGs focusing mainly on 6 investment areas addressing poverty and universal development

### 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

Source: Transforming our world: the 2030 Agenda for Sustainable Development, UN, 2015
Source: Investment Needs to Achieve the Sustainable Development Goals, UN, 2015
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 $41trln of investments by 2030

In the period 2016-2030, **2.8% of global GDP** needs to be invested in water infrastructure, road & rail transportation, airports and ports, energy

Traditional funding sources are no longer sustainable to cover the rapid increase in infrastructure projects, which - according to OECD - are expected to reach $2.9trln annually by 2030


March 2017
There is a 1.4pp of GDP investment gap in Greek infrastructure

Infrastructure in Greece has been severely affected by the deep recession. Total value of infrastructure projects has decreased between 2006 and 2016 by c. 77%, 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 2.5% and the European average of 1.9% of GDP.

The erosion of infrastructure investment from 2006 to 2016 resulted in a €62bn cumulative shortage.

According to ELSTAT, the number of employees* directly related to infrastructure amounted to around 540k in 2016 (15% of total employees) posting a significant decline of 41% compared to 2009. All employees directly and indirectly related to infrastructure projects amount to 1.4m.

The backlog of both in progress and planned infrastructure projects is estimated at around €21.4bn up to 2022 or c. €3.6bn on an annual basis.

Infrastructure investments in Greece have an economic multiplier of around 1.8x**, which can boost demand of other sectors and lead Greek economy to growth.

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***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”)

March 2017
Quality of infrastructure

Greece is ranked 26th among the EU countries in terms of quality of infrastructure, revealing also a quality gap.

There are two statistically distinct levels of infrastructure quality, whose difference is not explained by the level of GDP.

The differences in infrastructure quality between Western and Northern European countries (excluding Italy), 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 2000-2016 corresponded to only 19.4% of GDP, lower than all E.U. countries, undermining country’s upcoming infrastructure quality.

Gross Fixed Capital Formation in Infrastructure / GDP (Avg. 2000-2016)


March 2017
Summary

- There is a **substantial need for infrastructure investment globally** for the next 14 years, estimated at $2.9trln per annum or 2.8% of global GDP.

- The **average annual level of infrastructure investment** in Greece between 2009 and 2016 stands at €2.2bln, 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 1.4pp of GDP** (against historical performance), which translates into 1.1% of GDP or about €2bln per year.

- The **quality of infrastructure** in Greece is **substantially inferior** to Western and Northern European countries. Greece is ranked 26th in E.U. classification demonstrating a systematic quality deficit.

- **The need for infrastructure investments in Greece in terms of both capacity expansion and quality improvement is evident**.
Greek infrastructure projects pipeline

There are 69 infrastructure projects in the pipeline for completion by 2022 totaling €21.4bln

Between 2014 and February 2017, 16 infrastructure projects were completed with a total investment of €2bln

Most of energy and rail projects are in progress, motorways are about to be delivered, while waste management and tourist product are still in initial development stage

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

Between 2014 and 2017, 16 infrastructure projects were completed totaling € 2bln

**Budget of completed projects (2014-2017*)**
- 67% Infrastructure
- 18% Energy Projects
- 6% Rail Projects
- 6% Tourist product upgrading
- 3% Motorway Projects
- 3% Water & Sewage

**Number of completed projects**
- 2014: 2
- 2015: 4
- 2016: 7
- 2017 (Feb): 3

*Moreas Motorway* was the largest project completed since 2014 having a total budget of € 1bln (2016 completion date)

*Moreas Motorway: Korinthos-Tripoli-Sparti and Lefktro-Sparti*

Source: Press, PwC calculations

Infrastructure
PwC
Project pipeline in Greece
There are 69 infrastructure projects in the pipeline for completion by 2022 with a remaining investment requirements of €21.4bln

64% of the remaining budget represents projects which have already commenced

25% of the infrastructure projects, with a remaining budget of around €2.9bln, are estimated to be delivered in 2017

The completion dates of 28 projects, with remaining value €9bln, are unknown

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Source: Press, PwC calculations

*Infrastructure projects backlog and total budget of upcoming projects

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Pipeline budget* breakdown

Source: Press, PwC calculations

**Source: Press, PwC calculations**

**Source: Press, PwC calculations**
**Project pipeline in Greece**

From a total of 69 projects that will be delivered until 2022, 30 refer to Roads and Ports, 10 to Rail and 10 to Waste Management.

- **Energy** includes 15 projects (42% of total pipeline budget) consisting mainly of projects in oil & gas and electricity.
- **31% of the remaining budget** includes **rail projects (10 projects)**, while **15% (13 projects)** are **motorways**.

*Infrastructures backlog and total budget of upcoming projects*

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**Source:** Press, PwC calculations

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**Total remaining budget**

- **Urban Rail:** 24.00%
- **Transportation:** 41.86%
- **Waste Management:** 14.57%
- **Rail:** 6.75%
- **Energy:** 3.92%
- **Tourism Infrastructure:** 8.90%

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**Subsector & project budget**

- **Transportation**
  - **Urban Rail:** 30 projects, €1.5 bn
  - **Rail:** 10 projects, €1.4 bn
  - **Transit Transport:** 4 projects

- **Energy**
  - **Energy:** 5 projects, €5.1 bn
  - **Oil and Natural Gas:** 7 projects, €3.0 bn
  - **Hydroelectric/Wind:** 3 projects, €3.1 bn

- **Water & Waste Management**
  - **Waste Management:** 9 projects, €0.8 bn
  - **Water Supply:** 1 project, €0.03 bn

*Source: Press, PwC calculations*

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### Source: PwC calculations

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**Infrastructure**

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**Number of projects**

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**Total Budget (€bn)**

- **Transportation**
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**Source:** Press, PwC calculations

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*Infrastructure backlog and total budget of upcoming projects*

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**March 2017**

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**PwC**
Energy projects
Geographical distribution

- **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 bln m³ per annum

- **Ptolemaida V Power Plant**: New single lignite power plant of 660 MW and 140 MW for district heating (PPC)

- **Attica – Crete Interconnector** (or/and Peloponnese – Crete): 310 km underwater electric cable connecting Crete with mainland with a capacity of 1,000 MW

- **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 6,1 bln m³ per year

- **Aegean LNG**: Floating storage (170k m³ LNG capacity) and processing terminal (annual sent-out capacity of 3-5bln m³) at Kavala Bay

March 2017
Energy projects
Energy accounts for around € 9bln of investments

- 67% of the number of energy projects account to energy interconnections (TAP, IGB, LNGs), while the remaining 33% to other energy projects (Wind parks, Power plants)

- The remaining pipeline budget accounts to half of the energy interconnections (€ 4.3bn) and half to other energy projects (€ 4.7bn)

- Most of the energy projects are planned to be delivered within 2018

- The average budget of energy projects amounts to €599mn per project

- More than half of the energy projects have not yet started accounting mainly to energy interconnections

Source: Press, PwC calculations
Rail projects
Geographical distribution

- Construction of Metro in Thessaloniki and extension to Kalamaria (14.3km) serving 315k passengers per day
- 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
- The new Metro Line 4 in Athens with 33km length (30 new stations) is expected to serve around 500k passengers daily, especially at densely populated areas (Kipseli, Pagrati, Zografou)
- The construction of the first phase of Thrissio Pedio rail hub has been delivered and the second phase is in progress estimated to be delivered by 2017. The rail hub constitutes one of the largest commercial railway projects in Europe and the largest in the Balkans
- Tram extension from N. Faliro to Piraeus (5.3km) will have a daily capacity of 100k passengers

- Construction of double rail tracks and upgrading of signaling and electrification of the main OSE network will improve customer service and time of travel rendering rail an efficient alternative for long distance travel
**Rail projects**

Rail projects amount to €6.6bln, with 79% coming from urban rail projects

**Estimated Completion year (cumulative)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>4</td>
</tr>
<tr>
<td>2018</td>
<td>6</td>
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<tr>
<td>2019</td>
<td>7</td>
</tr>
<tr>
<td>2020</td>
<td>8</td>
</tr>
<tr>
<td>2021</td>
<td>8</td>
</tr>
<tr>
<td>2022</td>
<td>9</td>
</tr>
<tr>
<td>N/A</td>
<td>1</td>
</tr>
</tbody>
</table>

*Source: Press, PwC calculations*

- All of the rail projects have already started except from the electrification in the Volos – Larissa railway
- 4 rail projects with remaining budget of €1.4bn are planned to be delivered during 2017
- 30% of the rail projects account to urban rail interconnections (Attiko Metro, Tram, Metro Thessalonikis), while the remaining 70% to rail projects of Ergose
- **Attiko Metro** new extension lines (line 3 to Piraeus and line 4) are the largest urban rail projects, with a total budget of €4bn
- The average budget of rail projects amounts to €712mn per project
Greece, on average, reports a delay in the delivery of major motorway projects of 16 months.

**Egnatia Odos vertical Axes** will connect the main part of Egnatia Motorway with Albania, Bulgaria and FYROM.

**Ionia Odos** will connect and serve 3 main ports (Patra, Astakos, Igoumenitsa) and 3 airports (Araksos, Aktio, Ioannina), while also connecting Western Greece with the rest of the country.

The relative cost of construction of major motorways per klm is estimated at €5.2mln/km, while the respective European average stands at €11.6mln/km (Infrastructure Journal, 2010).

The Aegean Motorway is about to be delivered, consisting of 230klm of renovated motorway and 25 klm of new road building, including 3 twin tunnels and 20 bridges.

**Average delays in road investment projects**

<table>
<thead>
<tr>
<th>Country</th>
<th>Number of months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greece</td>
<td>16</td>
</tr>
<tr>
<td>Spain</td>
<td>11</td>
</tr>
<tr>
<td>Germany</td>
<td>7</td>
</tr>
<tr>
<td>Poland</td>
<td>3</td>
</tr>
</tbody>
</table>

Source: ECA, Are EU Cohesion Policy funds well spent on roads? (2013), PwC analysis.
Motorway projects
Major motorways investment pipeline is about € 3.1bln

- All of the motorway projects have already started except from Salamina underwater tunnel which is planned to begin within 2019
- Most of the major motorway projects in Greece are estimated to be delivered in 2017 if no other delay takes place, namely:
  1. Aegean motorway
  2. Ionia Odos
  3. Olympia Odos
  4. Nea Odos
  5. Regional road Katerini
  6. Regional road Thessaloniki – Doirani
  7. Regional Road Fokianos - Kyparisssi
- The average budget for motorway projects amounts to €591mn per project
- The total motorway kilometers of planned and in progress projects in Greece amount to 1,605klm, of which 60% has already been constructed
- The average investment in motorway projects reaches € 4.8 per klm

Estimated Completion year (cumulative)
Number of projects

<table>
<thead>
<tr>
<th>Year</th>
<th>Planned</th>
<th>In progress</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>2018</td>
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<tr>
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<tr>
<td>2022</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>N/A</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Source: Press, PwC calculations
Greece is a significant global tourist destination, attracting 24.8mln arrivals in 2016, ranking 15th in global rankings and 9th in Europe.

Despite the rise in tourist arrivals, the revenue per tourist is declining implying the lower spending from inbound tourists.

The upgrade of Greece as a global tourist destination includes:

- The upgrade and construction of regional airports to support the increase of tourist arrivals which is expected in the following years.
- The current announced investments of €309mln in infrastructure and equipment of Thessaloniki Port Authority (TPA), part of the new 25-year masterplan.
- 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
Geographical distribution

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Revenue from Tourism (non-residents) (€bn)</th>
<th>Total Revenue/Tourist arrivals (€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>746</td>
<td>11</td>
</tr>
<tr>
<td>2006</td>
<td>746</td>
<td>11</td>
</tr>
<tr>
<td>2007</td>
<td>700</td>
<td>11</td>
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<td>2008</td>
<td>730</td>
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<td>2012</td>
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<td>2013</td>
<td>678</td>
<td>13</td>
</tr>
<tr>
<td>2014</td>
<td>608</td>
<td>14</td>
</tr>
<tr>
<td>2015</td>
<td>599</td>
<td>14</td>
</tr>
</tbody>
</table>

Source: Bank of Greece
Tourist infrastructure projects
For the upgrading of the tourist product around €1.9bln have been scheduled

- 76% of the tourist infrastructure projects are not even planned except from Kasteli airport which is planned to be completed by 2022
- 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)
- Kasteli airport accounts for 45% of the remaining budget of tourist infrastructure and will begin in 2017
- The average budget of tourist infrastructure projects amounts to €95mn per project

Source: Press, PwC calculations
On December 2014, the European Court of Justice concluded to a €10mln fine for 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 warns Greece with an additional €14mln for each six-month period of delay.

Since 2013, 10 Waste Management projects out of 14 have been announced, budgeted for €839mln, while the remaining 4 (in Attica) have been recently postponed. During 2015, the postponement of all PPP waste management projects was announced, which will be managed by local authorities.

In 2014, Greece landfilled 81% of its municipal waste, compared to 28% of the EU average.

**Municipal waste treatment**

- Switzerland: 33% Recycled, 21% Composted, 46% Incinerated
- Belgium: 34% Recycled, 18% Composted, 54% Incinerated
- Denmark: 28% Recycled, 21% Composted, 51% Incinerated
- Germany: 24% Recycled, 27% Composted, 48% Incinerated
- Netherlands: 34% Recycled, 16% Composted, 50% Incinerated
- Sweden: 33% Recycled, 16% Composted, 50% Incinerated
- Austria: 26% Recycled, 32% Composted, 40% Incinerated
- France: 22% Recycled, 17% Composted, 35% Incinerated
- United Kingdom: 28% Recycled, 18% Composted, 38% Incinerated
- Italy: 28% Recycled, 18% Composted, 38% Incinerated
- Ireland: 28% Recycled, 18% Composted, 38% Incinerated
- Portugal: 28% Recycled, 18% Composted, 38% Incinerated
- Poland: 28% Recycled, 18% Composted, 38% Incinerated
- Spain: 28% Recycled, 18% Composted, 38% Incinerated
- Greece: 16% Recycled, 12% Composted, 76% Incinerated
- Hungary: 25% Recycled, 12% Composted, 63% Incinerated
- Lithuania: 21% Recycled, 9% Composted, 70% Incinerated
- Cyprus: 21% Recycled, 9% Composted, 70% Incinerated
- Croatia: 16% Recycled, 4% Composted, 81% Incinerated
- Malta: 8% Recycled, 2% Composted, 90% Incinerated
- Latvia: 8% Recycled, 2% Composted, 90% Incinerated

**Source:** Eurostat 2016, Data for 2014

**Waste Management Geographical distribution**

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- In 2014, Greece landfilled 81% of its municipal waste, compared to 28% of the EU average.
Waste management projects
Waste management projects need about €0.8bln up to 2022

The majority of Waste Management projects are 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 tourist infrastructure projects amounts to €86mn per project.

- Only 2 waste management projects have already started and are expected to be delivered in 2017 and 2019:
  1. Center of sewage treatment in Koropi
  2. Water pipeline in Aegina
Summary

- The value of 69 infrastructure projects in progress or planned, expected to be completed by 2022, is standing at €21.4bln.
- For 26% of the projects completion dates are not known.
- Moreas Motorway* was the largest project completed since 2014 having a total budget of €1bln (2016 completion date).
- Projects in progress account for 64% of estimated investment.
- The transport and energy sectors account for almost 88% 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 key for growth and upgrade of life quality.

*Moreas Motorway: Korinthos-Tripoli-Sparti and Lefktro-Sparti)
Funding of Greek infrastructure projects
Flow of funding
Public investment has been declining globally

3.9%

Drop in European public funds for infrastructure investments

Public investments (2009-2018e)
General Government Gross Fixed Capital Formation (% of GDP)

Source: Ameco
**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 11% in 2016
- The available public resources for investment in 2016 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
- Private funding through concessions (PPPs) *is the key to increase infrastructure investments*

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**Public Investment Program**

Greece

- Infrastructure
- PwC

March 2017

Source: Ministry of Finance
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 tunnels in Lefkada and 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 financiers’ portfolios.
**EU funding of infrastructure projects in Greece (2014-2020)**

Over €1.3bln of Cohesion Policy funds will be invested in transport and environmental projects in Greece

- **€377mln** for urban public transport systems in Athens and the region of Attica
- **€730mln** for the extension of the metro in Thessaloniki, in Central Macedonia
- **€50mln** for sustainable mobility in the Peloponnese peninsula, in the South of Greece
- **€38mln** for better collection and treatment of waste in Attica
- **€92mln** for better transport connectivity in the North of Greece

*Source: European Commission*
NSRF 2014-2020 – € 8.2bln of available infrastructure funding

Budget per Area/Fund

- €20.4 bln

Budget for each action (€mln)

- Climate Change Adaption & Risk Prevention
  - EU Contribution: €209
  - National Contribution: €1.277
- Competitiveness of SMEs
  - EU Contribution: €539
  - National Contribution: €2.523
- Discontinued Measures
  - EU Contribution: €62
  - National Contribution: €6.8 bln
- Educational & Vocational Training
  - EU Contribution: €3
  - National Contribution: €1.307
- Efficient Public Administration
  - EU Contribution: €362
  - National Contribution: €281
- Environment Protection & Resource Efficiency
  - EU Contribution: €82
  - National Contribution: €831
- Information & Communication Technologies
  - EU Contribution: €230
  - National Contribution: €851
- Low –Carbon Economy
  - EU Contribution: €230
  - National Contribution: €500
- Network Infrastructures in Transport and Energy
  - EU Contribution: €602
  - National Contribution: €2.499
- Research & Innovation
  - EU Contribution: €292
  - National Contribution: €1.161
- Social Inclusion
  - EU Contribution: €326
  - National Contribution: €1.468
- Sustainable & Quality Employment
  - EU Contribution: €466
  - National Contribution: €1.823
- Technical Assistance
  - EU Contribution: €162
  - National Contribution: €611

Source: European Commission

- The total available funds from the new NSRF amount to €20.4bln, of which €6.8bln are for infrastructure projects.
- The infrastructure projects to be funded relate mainly to:
  - Transportation and energy infrastructure
  - Environmental protection
- The National contribution in the action on infrastructure area could reach €1.4bln.
Challenges meeting infrastructure financing needs

Key Factors in Infrastructure Financing Gap

- Projects poorly executed and not well maintained
- Lack of adequate project planning
- User-charges below project costs
- Weak pipeline of viable projects
- High political and economic risks
- Legal barriers and lack of protection on investments
- Government lack borrowing & funding capacity
- Domestic financial markets not robust – no secondary markets
Private funding is necessary for the smooth evolution of the projects, but will remain limited until the business environment improves and political uncertainty decreases.

**Additional infrastructure needs**
- Infrastructure demand is expanding to keep up with the growing economic activity and development needs.
- Additional costs of making infrastructure resilient to climate change and less harmful to the environment and improve in general its quality.

**The State cannot fund the infrastructure projects**
- Constrained public budget renders the State unable to fund future infrastructure projects.
- PPPs require in most cases direct public funding.
- The new NSRF has committed resources for the funding of infrastructure.

**Banks are under liquidity and credit pressure**
- Greek banks with compressed balance sheets all the time do not have the capability of credit support of a large infrastructure investments program.
- Long term funding limits bank liquidity and hence appetite for project finance.

**The private sector, the major pylon of funding**
- Project bond (PB) issuance can cover part of the funding gap.
- Concessions (PPP), which do not require state contribution or can be replaced by the new NSRF.
Conclusions

- Global infrastructure investment is expected to reach $2.9trln per annum in the period to 2030 or 2.8% of global GDP.
- In Greece, infrastructure investment as a percentage of GDP shrank from 3.7% in 2006 to 1.1% in 2016, a cumulative €62bln shortage, severely affected 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.
- The number of planned and in progress infrastructure projects has significantly increased during the crisis— with total value of €21.4bln by 2022.
- Between 2014-2017 (February) 16 of the infrastructure projects were completed, with Moreas being the largest one (€1bn).
- From a total of 69 projects that will be delivered within the next 5 years, 34 refer to Motorways, Ports and Airports, 15 to Energy, 10 to Rail and 10 to Water Supply and Waste Management.
- The available State funding for infrastructure projects in 2016 is, in nominal terms, back to pre-2002 levels.
- The growing need for infrastructure spending, combined with the constrained capacity of state funding and the limitations of the Greek banks call for new funding tools.
- The challenges in order to meet infrastructure needs are the project costs, the cost of recovery, the public financing and the barriers to private investments.
- It is vital to revitalize infrastructure project investment through the effective use of the new NSRF, the creation of incentives for private sector participation (concessions), as well as the gradual increase of state funding.
- Private funding (PPPs and Project Bonds) will remain limited until the business environment improves and the political uncertainty decreases.
Appendix 1 – Infrastructure projects* in Greece

- 11 Energy projects
- 10 Rail projects
- 11 Motorway projects
- 12 Tourist infrastructure projects
- 10 Waste management projects

* Some projects have been grouped together and thus projects depicted at the tables do not add up to 69 projects.
## Energy accounts for around € 9bln of investments

<table>
<thead>
<tr>
<th>No</th>
<th>Interconnection Projects</th>
<th>Remaining Budget (€mln)</th>
<th>Start Date</th>
<th>Completion Date*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TAP (Trans - Adriatic Pipeline)</td>
<td>1,500</td>
<td>2016</td>
<td>2020</td>
</tr>
<tr>
<td>2</td>
<td><strong>Electricity Interconnectors</strong> (Attica-Crete, Cyclades, Maritsa East (BG) - Nea Santa (GR))</td>
<td>1,394</td>
<td>N/A</td>
<td>2022</td>
</tr>
<tr>
<td>3</td>
<td>LNGs (Alexandroupolis LNG, Kavala LNG)</td>
<td>615</td>
<td>N/A</td>
<td>2019</td>
</tr>
<tr>
<td>4</td>
<td><strong>Kavala storage facility</strong> (Underground Storage facility)</td>
<td>400</td>
<td>N/A</td>
<td>2018</td>
</tr>
<tr>
<td>5</td>
<td>IGB (GR-BG Natural Gas pipeline)</td>
<td>252</td>
<td>2016</td>
<td>2018</td>
</tr>
<tr>
<td>6</td>
<td>Revythoussa Islands 3rd LNG Tank Storage</td>
<td>98</td>
<td>2014</td>
<td>2017</td>
</tr>
<tr>
<td>7</td>
<td>Gas Compressor Station (Kipoi)</td>
<td>37</td>
<td>2017</td>
<td>2019</td>
</tr>
<tr>
<td></td>
<td><strong>Total Budget</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total Budget</strong></td>
<td><strong>4,296</strong></td>
<td></td>
<td></td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>No</th>
<th>Energy Projects</th>
<th>Remaining Budget (€mln)</th>
<th>Start Date</th>
<th>Completion Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Ptolemaida 5 Power Plant</strong> (lignite fired)</td>
<td>1,394</td>
<td>2015</td>
<td>2021</td>
</tr>
<tr>
<td>2</td>
<td><strong>Wind power plants</strong> (Crete Wind Park with Hydro-pumped storage, Rodopi)</td>
<td>2,580</td>
<td>2019</td>
<td>N/A</td>
</tr>
<tr>
<td>3</td>
<td>Amfilohia Hydro-pumped storage</td>
<td>502</td>
<td>2017</td>
<td>N/A</td>
</tr>
<tr>
<td>4</td>
<td>Rhodes Power Plants</td>
<td>189</td>
<td>2015</td>
<td>2017</td>
</tr>
<tr>
<td></td>
<td><strong>Total Budget</strong></td>
<td><strong>4,665</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Commissioning date

Source: Press, PwC calculations

Infrastructure

PwC

March 2017
### Rail projects amount to € 6.6bln, with 79% accounted for by urban rail projects

<table>
<thead>
<tr>
<th>No</th>
<th>Projects</th>
<th>Details</th>
<th>Remaining Budget (Cmln)</th>
<th>Start Date</th>
<th>Completion Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Attiko Metro</td>
<td>Extension of Line 3 to Piraeus &amp; New Line 4</td>
<td>3,531</td>
<td>2012</td>
<td>2020</td>
</tr>
<tr>
<td>2</td>
<td>Thessaloniki Metro</td>
<td>Base line &amp; Extension to Kalamaria</td>
<td>1,570</td>
<td>2006</td>
<td>2020</td>
</tr>
<tr>
<td>3</td>
<td>Athens Tram</td>
<td>Extension to Piraeus</td>
<td>37</td>
<td>2013</td>
<td>2017</td>
</tr>
<tr>
<td></td>
<td><strong>Grand Total</strong></td>
<td></td>
<td><strong>5,138</strong></td>
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<table>
<thead>
<tr>
<th>No</th>
<th>Projects</th>
<th>Details</th>
<th>Remaining Budget (Cmln)</th>
<th>Start Date</th>
<th>Completion Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ergose Rododafni</td>
<td>Kiato-Rododafni &amp; Rododafni-Psathopyrgos</td>
<td>920</td>
<td>2006</td>
<td>2017</td>
</tr>
<tr>
<td>2</td>
<td>Ergose Tithorea</td>
<td>Tithorea- Domoko</td>
<td>348</td>
<td>2013</td>
<td>2017</td>
</tr>
<tr>
<td>3</td>
<td>Ergose Thriassio Pedio</td>
<td>Thriassio Pedio Rail hub</td>
<td>63</td>
<td>2013</td>
<td>2017</td>
</tr>
<tr>
<td>4</td>
<td>Ergose Palaiofarsala</td>
<td>Palaiofarsalos – Kalambaka</td>
<td>42</td>
<td>2016</td>
<td>2019</td>
</tr>
<tr>
<td>5</td>
<td>Ergose Volos</td>
<td>Volos – Larissa (elevtrification of railways)</td>
<td>40</td>
<td>2017</td>
<td>2019</td>
</tr>
<tr>
<td>6</td>
<td>Ergose Polikastro</td>
<td>Polikastro – Idomeni</td>
<td>11</td>
<td>2016</td>
<td>2018</td>
</tr>
<tr>
<td>7</td>
<td>Ergose Menemeni</td>
<td>Agia Paraskevi- Menemeni Thessaloniki</td>
<td>20</td>
<td>2016</td>
<td>2018</td>
</tr>
<tr>
<td></td>
<td><strong>Grand Total</strong></td>
<td></td>
<td><strong>1,445</strong></td>
<td></td>
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</tr>
</tbody>
</table>

*Source: Press, PwC calculations*
**Major motorways investment pipeline is about € 3.1bln**

<table>
<thead>
<tr>
<th>No</th>
<th>Projects</th>
<th>Details</th>
<th>Total Klm</th>
<th>Total Budget (€ mln)</th>
<th>Remaining Budget (€ mln)</th>
<th>Start Date</th>
<th>Estimation Completion Date</th>
<th>Average Investme nt/ km</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Olympia Odos</td>
<td>Korinthos-Patra -Pyrgos &amp; Kalo Nero-Tsakona</td>
<td>232</td>
<td>1,487</td>
<td>576</td>
<td>2008</td>
<td>2017</td>
<td>6.4</td>
</tr>
<tr>
<td>2</td>
<td>E65 Motorway</td>
<td>Lamia-Xyniada, Xyniada-Trikala, Trikala-Egnatia</td>
<td>175</td>
<td>1,435</td>
<td>287</td>
<td>2008</td>
<td>N/A</td>
<td>8.2</td>
</tr>
<tr>
<td>3</td>
<td>Ionia Odos</td>
<td>Main road, Vertical axes</td>
<td>245</td>
<td>1,345</td>
<td>260</td>
<td>2010</td>
<td>2017</td>
<td>5.5</td>
</tr>
<tr>
<td>4</td>
<td>Aegean Motorway</td>
<td>Raches Fthiotidas-Klidi Imathias</td>
<td>230</td>
<td>1,300</td>
<td>59</td>
<td>2007</td>
<td>2017</td>
<td>5.7</td>
</tr>
<tr>
<td>5</td>
<td>Egnatia Odos</td>
<td>Vertical Axes</td>
<td>486</td>
<td>1,059</td>
<td>957</td>
<td>2011</td>
<td>N/A*</td>
<td>2.2</td>
</tr>
<tr>
<td>6</td>
<td>Underwater Tunnels</td>
<td>Salamina</td>
<td>5</td>
<td>350</td>
<td>350</td>
<td>2019</td>
<td>N/A</td>
<td>71.4</td>
</tr>
<tr>
<td>8</td>
<td>Flyover</td>
<td>Thessaloniki</td>
<td>5</td>
<td>205</td>
<td>181</td>
<td>2013</td>
<td>2018</td>
<td>41.0</td>
</tr>
<tr>
<td>9</td>
<td>Nea Odos</td>
<td>Metamorfosi-Skarfeia</td>
<td>173</td>
<td>200</td>
<td>200</td>
<td>2007</td>
<td>2017</td>
<td>1.2</td>
</tr>
<tr>
<td>11</td>
<td>Widening Channel</td>
<td>Lefkada</td>
<td>6</td>
<td>22</td>
<td>20</td>
<td>2013</td>
<td>2018</td>
<td>3.7</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>1,605</td>
<td>7,677</td>
<td>3,119</td>
<td></td>
<td></td>
<td>4.8</td>
</tr>
</tbody>
</table>

*Source: Press, PwC calculations*  
*Sub-projects of Egnatia Odos include: Ardanio-Ormenio & Mandra-Psathades (2017), Serres-Drama-Kavala (N/A), Siatista-Kastoria-Chrystalopigi (2017), Xanthi-Echinos (2020), Thessaloniki-Serres Promachonas (2017)*  

March 2017
For the upgrading of the tourist product around €1.9bln have been scheduled

<table>
<thead>
<tr>
<th>No</th>
<th>Projects</th>
<th>Budget (Cmln)</th>
<th>Start Date</th>
<th>Completion Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kasteli Airport in Heraklion</td>
<td>850</td>
<td>2017</td>
<td>2022</td>
</tr>
<tr>
<td>2</td>
<td>Regional Airports</td>
<td>330</td>
<td>2017</td>
<td>2020</td>
</tr>
<tr>
<td>3</td>
<td>OLTH, infrastructure investment</td>
<td>220</td>
<td>2018</td>
<td>2022</td>
</tr>
<tr>
<td>4</td>
<td>Igoumenitsa Port upgrade</td>
<td>67</td>
<td>2008</td>
<td>2019</td>
</tr>
<tr>
<td>5</td>
<td>Macedonia Airport upgrade</td>
<td>300</td>
<td>2005</td>
<td>2018</td>
</tr>
<tr>
<td>6</td>
<td>Ioannina Airport upgrade and new terminal</td>
<td>20</td>
<td>2010</td>
<td>2017</td>
</tr>
<tr>
<td>7</td>
<td>Port of Patras upgrade</td>
<td>58</td>
<td>2012</td>
<td>2017</td>
</tr>
<tr>
<td>8</td>
<td>Key marinas</td>
<td>43</td>
<td>2003</td>
<td>N/A</td>
</tr>
<tr>
<td>9</td>
<td>Luxury marines (Mykonos, Argostoli)</td>
<td>9</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>10</td>
<td>Upgrading/ Maintenance in 49 Regional Ports</td>
<td>4</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>11</td>
<td>Lavrio Mega Yacht</td>
<td>4</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>12</td>
<td>Metropolitan Water Airport (Port of Thessaloniki)</td>
<td>0.4</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Total Budget</td>
<td><strong>1,905</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Press, PwC calculations
**Waste management projects need about € 0.8 bln up to 2022**

<table>
<thead>
<tr>
<th>No</th>
<th>Projects</th>
<th>Budget (€mln)</th>
<th>Start Date</th>
<th>Completion Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Waste management (Alexandroupoli)</td>
<td>145</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>2</td>
<td>Waste Management (Peloponissos)</td>
<td>160</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>3</td>
<td>Waste management (Achaia)</td>
<td>128</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>4</td>
<td>Waste management (Epirus)</td>
<td>45</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>5</td>
<td>Center of Sewage Treatment (Koropi-Paiania)</td>
<td>105</td>
<td>2013</td>
<td>2017</td>
</tr>
<tr>
<td>6</td>
<td>Waste management (Aetoloakarnania)</td>
<td>80</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>7</td>
<td>Waste management (Kerkyra)</td>
<td>70</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>8</td>
<td>Waste management (Ilia)</td>
<td>40</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>9</td>
<td>Water Pipeline Aegina</td>
<td>30</td>
<td>2016</td>
<td>2019</td>
</tr>
<tr>
<td>10</td>
<td>Waste management (Serres)</td>
<td>36</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td><strong>Grand Total</strong></td>
<td><strong>839</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Source: Press, PwC calculations*
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