APPENDIX A

Data Analysis

Data Analysis Contents

1 Introduction

As part of the research for the reference tool, data was collected and analysed for a sample of PPP projects. Data collection was aimed to give insight into the prevalence of the contract management issues, any sector- or region-specific trends and the prevalence of underlying causes for any significant events. This section presents the results of the data collection.

The process for collecting data was to first create a Master Database of all PPP projects in economic infrastructure which reached financial close between 2005 and 2015 (inclusive). A random sample of 275 projects was selected, and data was collected on these projects based on desktop research with additional interviews carried out with project stakeholders where possible. 25 projects which had minimal data available were removed from the sample to give a sample database of 250 projects. This is described in further detail in the Methodology. It should be noted that there were a number of limitations to the data collection process, including:

- **Desktop research – publicly available information.** The availability of information varied significantly between regions. Governments in some regions make project information easily available online, including the PPP contracts themselves, while multi-national bodies such as development banks also publish information on the projects they are involved with. However, this is often not the case, especially in emerging markets such as India or China, and more so in earlier years. This challenge was to some extent overcome by contacting project stakeholders, but this also was not always possible. The results for each metric are therefore based only on the projects for which firm data was found.
- **Desktop research – accuracy of information.** In some cases, the accuracy of the information collected was clear, for example because it came from the original PPP contract. In other cases it was less clear, with news articles referring to events on a project but limited further information available. This was addressed as far as possible by cross-checking data against other sources as well as with project stakeholders.
- **Availability of project stakeholders.** It was not always possible to contact stakeholders on the projects for which data was being collected. Where it was possible to make contact with stakeholders, not all of them were willing to participate in the study. In many instances, key stakeholders with the relevant knowledge have left the project, which added to the challenges of data collection.
- **Commercial sensitivity.** Certain information was commercially sensitive, in particular relating to cost overruns and variations, ongoing disputes, as well as contract renegotiation. For this reason, even where we were able to talk with project stakeholders, they were often unwilling to share certain data. In addition, a number of stakeholders, in particular on the Project Company side, were also not willing to engage in any interviews due to confidentiality restrictions in the relevant PPP contract. In general, lenders were not willing to communicate any project specific information due to the confidentiality restrictions in their agreements with the Project Company.
- **Transparency and availability of data presents a challenge in some regions.** In regions where no reliable project data could be collected and particular challenges were faced when identifying the relevant stakeholders and engaging with them, the overall data collection in that particular region was reduced to a smaller number of projects than originally identified as a portion of the overall 250 sample of projects.

For these reasons, the data presented below is limited to those projects for which reliable information could be found. Each chart and table shows the number of projects on which data was available for that chart or table.

It should also be noted that only a single project in the sample has been handed back to the Procuring Authority. This means that the prevalence of events presented here (i.e. renegotiation, disputes, Significant Events, change of ownership and refinancing) is going to be lower than it would be if the projects studied had run for their full contract duration, as events such as renegotiation or disputes, for example, are likely to occur for some projects in the future.

2 Procuring Authority team data

Table 1: Prevalence of use of Contract Management Manual by region

Region	No. of Projects with data	No. of Projects with Contract Management Manual	% of Projects with Contract Management Manual
Africa	3	1	33%
ANZ	3	3	100%
East Asia	6	1	17%
Europe	35	12	34%
Latin America and the Caribbean	33	0	0%
MENA	7	1	14%
North America	5	4	80%
SE Asia	5	0	0%
South Asia	16	11	69%
TOTAL	**113**	**33**	**29%**

Our research shows that there is no set formula for the size and structure of the Procuring Authority team; it can vary from a couple of individuals up to over 50 depending on the complexity of the PPP contract and the type of involvement the Procuring Authority wishes to have. However, it is common for the team to be made up of only a small number of permanent staff (i.e. less than ten, and often less than five), and for external advisors and contractors to be used as necessary. A number of stakeholders interviewed perceived their teams as short staffed, but did not feel that the size of the team hampered effective contract management.

3 Renegotiation data

3.1 Prevalence of renegotiation

The prevalence of renegotiation across the entire dataset is shown below in Figures 1 and 2. Figure 1 shows the prevalence of renegotiation in any individual year after financial close (for example 7% of projects had a renegotiation in the third year after financial close). Figure 2 shows the prevalence of renegotiation up to that point in time (for example 20% of projects experienced a renegotiation within the first four years after financial close). It should be noted that the number of projects on which this information is based reduces for later years. This is because, in order to calculate the prevalence of an event in a certain year, we can only assess projects which have been running for at least that length of time.

It should also be noted that all the projects in this study are ongoing, and may have renegotiations in the future. This data will therefore underrepresent the prevalence of these events.

Figure 1: Prevalence of renegotiation in each year after financial close

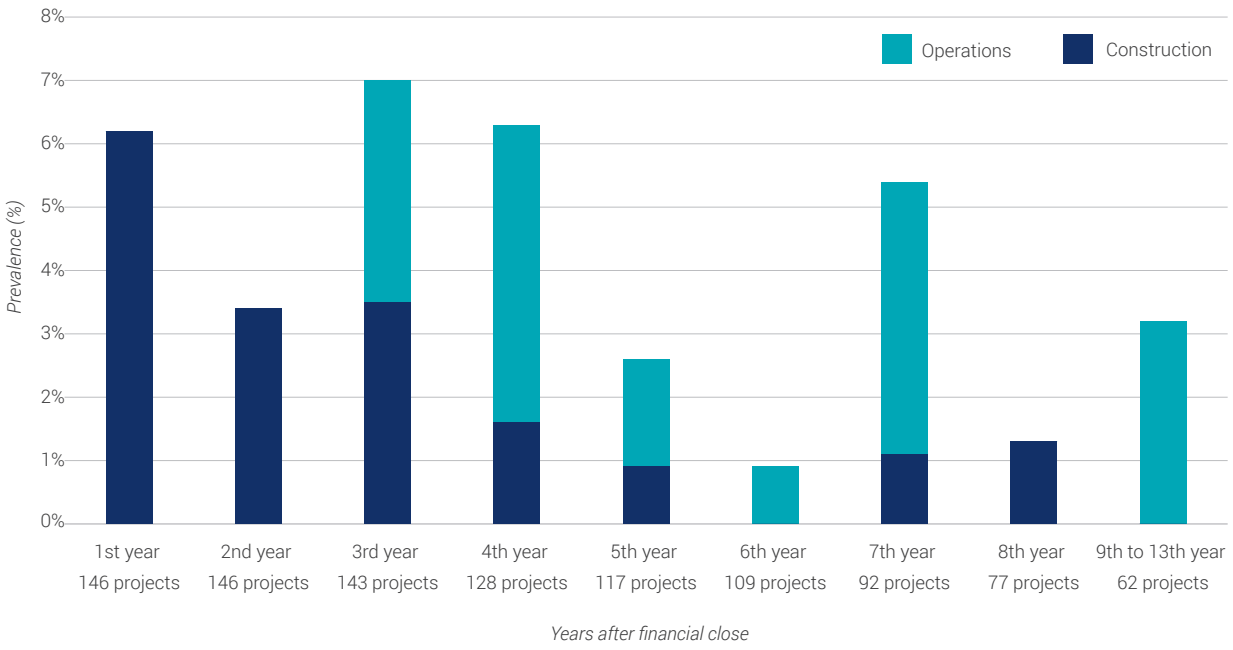


Figure 2: Prevalence of renegotiation, by year N after financial close

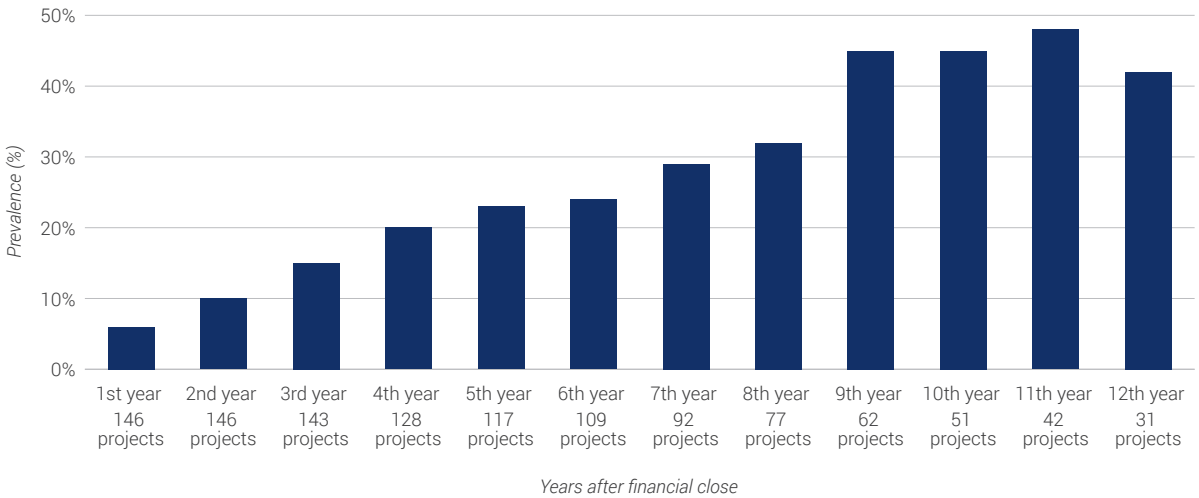


Figure 3: Prevalence of renegotiation by region, based on 146 projects

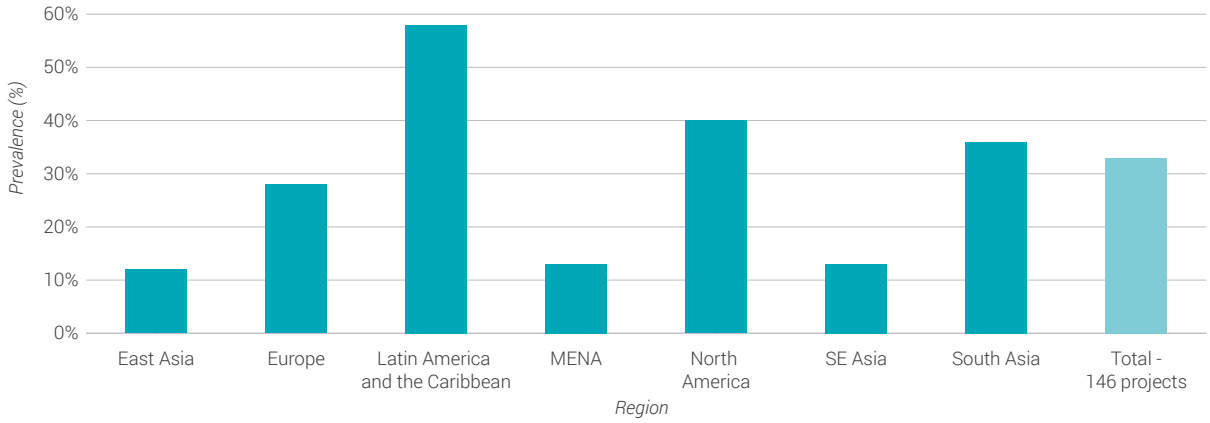
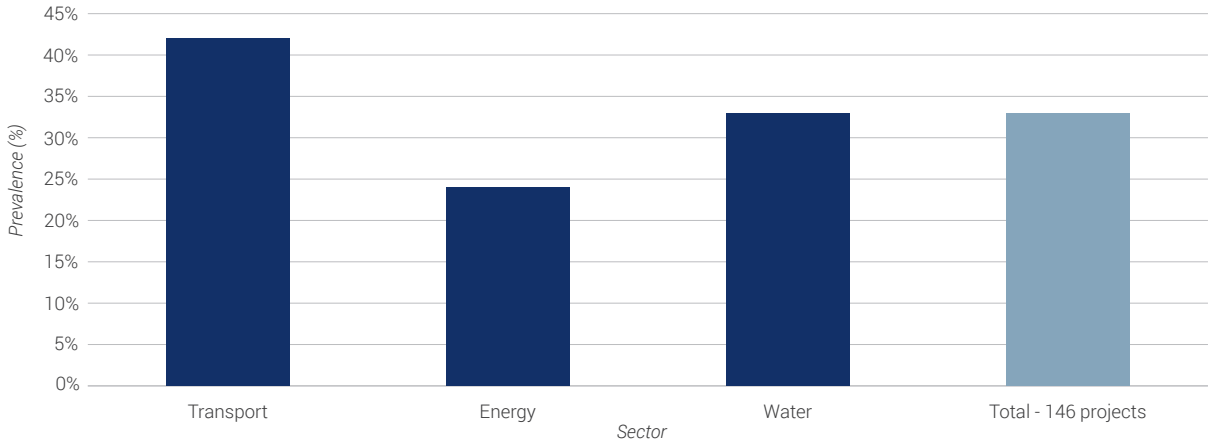


Figure 4: Prevalence of renegotiation by sector, based on 146 projects



In total, our study found 48 examples of renegotiation out of the 146 projects for which this data was available, which is an incidence of 33%. This included 12 in Europe, 25 in Latin America, five in India and single examples in the other regions. The prevalence of renegotiation in Latin America is partly due to the approach taken in that region with 'rebalancing'. This approach blurs the distinction between renegotiation and adjustments, which was not distinctly picked up in the data collection process. Consequently, for the purpose of this data analysis, the study results do not differentiate between renegotiation and rebalancing in Latin America.

It should be noted that the prevalence of renegotiation results is heavily influenced by the timeframe that was selected for this research (i.e. reaching financial close between 2005 and 2015).

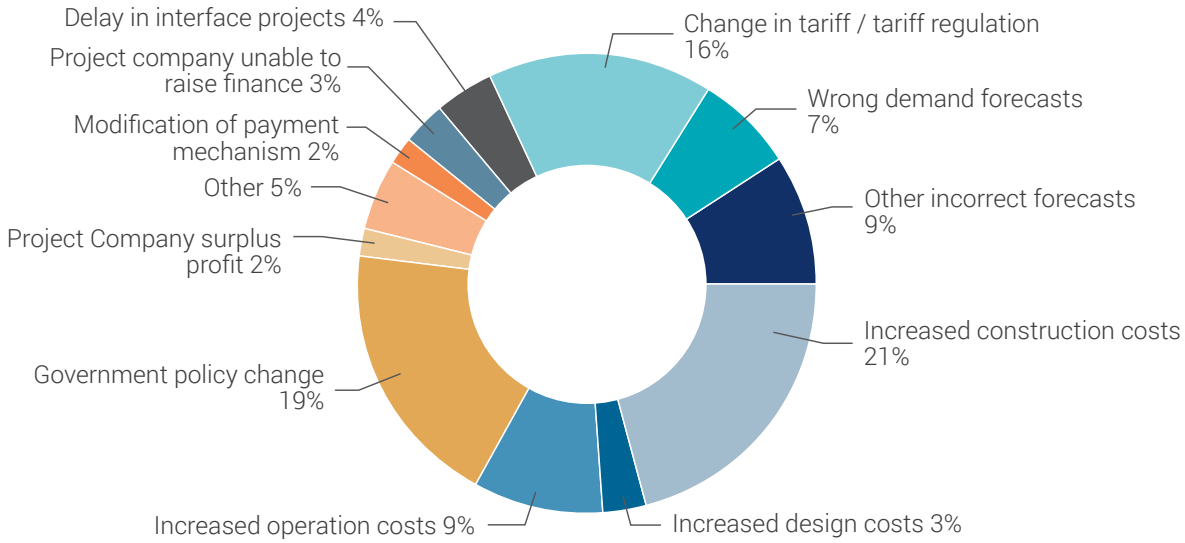
While all projects in the sample have been running for at least two years, this reduces for each year after, and only 50 projects have been in progress for over eight years. The influence of this is clear in Figure 2, showing the prevalence of renegotiation, by year N after financial close. While only 33% of projects experienced renegotiation in the entire sample, the data indicates that almost 20% of the ongoing PPPs had experienced renegotiation by their fourth year after financial close, and 45% of PPPs by their tenth year after financial close. This suggests that the true prevalence of renegotiation is likely to be higher due to the timescales involved, noting also that renegotiation prevalence does not appear to increase substantially after year nine. The timescales also means that any potential handback issues are not captured in the data.

Had the same set of projects been used for each year after financial close, Figure 2 would have been cumulative. A different set of projects is used for each year (year N) after financial close as not all of the projects have reached year N at the time of completing this study. The prevalence drops off in later years due to the different set of projects.

A large number of renegotiations took place between two and four years after financial close. Out study suggests that, it takes some time for issues or challenges to arise on a project before a renegotiation is initiated. The existing literature suggests that there can be a tendency in some jurisdictions to sign a PPP contract and renegotiate very soon after. Figure 1 shows that renegotiation is more likely in year one than in year two, although given the small number of occurrences involved it is not possible to draw any strong conclusions.

3.2 Causes for renegotiation

Figure 5: Cause of renegotiation, based on 48 projects that experienced renegotiation



The causes of renegotiation in our study were varied. In 17 cases it was due to increased costs (two during design, 10 during construction and five during the operational phase). Although increased construction costs and increased operation costs are termed as causes of renegotiation, in reality they were the consequences of an underlying cause which has not been identified during the study. The underlying cause which led to increased construction or operation costs is, at times, related to the Procuring Authority's breach of, or non-compliance with, its contractual obligations (e.g. failure to complete land acquisition, grant site access, secure third party approvals, etc.). Another 18 were due to a change in regulation or policy change, split evenly between regulation and policy changes. Four were due to incorrect demand forecasts, including the Queen Alia International Airport Expansion Case Study, where the actual volumes were higher than predicted. The remaining instances were due to external factors, such as delays in gaining access to worksites.

The party initiating the renegotiation was split evenly between the Project Company and the Procuring Authority, however we have to be careful drawing any conclusions from this outcome. In some cases a renegotiation was needed due to external changes. For example, on the Perpignan Figueras High Speed Rail Link project between France and Spain, the non-PPP rail project connecting the rail PPP to Barcelona was delayed. In other situations, only one party was been interested in engaging in a renegotiation, such as the Sao Paulo Metro Line project, where the Procuring Authority initiated the renegotiation due to delays in the construction phase.

Table 2: Outcome of renegotiation by region, based on 146 projects

Region	Increase in tariff	Decrease in tariff	Change in investment obligation	Change in contract period	Scope change: operat'n	Scope change: constr'n	Other
East Asia		1					
Europe	5	2		3	4	3	3
Latin America	5	7	6	10	2	6	5
MENA						1	
North America	2		1	1			
SE Asia	1						

The most common outcome of the renegotiations in this study was a change in tariff, and there were 13 examples of an increased tariff, mostly in the projects in Europe and Latin America. There were another 10 examples of a decrease in tariff, however six of these eight were in Brazil and another was a similar unilateral reduction in feed-in tariff on a project in Romania. The other contract change was in Portugal where the payment mechanism changed entirely.

A change in scope occurred 10 times in the construction phase and six times in the operations phase. The construction scope changes ranged from reductions in scope on the Baixo Highway in Portugal, to changes in tunnelling works due to ground conditions on projects in Brazil and the Netherlands, to the large increase in investment in the Queen Alia International Airport Expansion Case Study.

It was also common for the contract duration to be extended as a form of compensation for the Project Company. For example, the PR-22 highways in the USA was extended by 10 years. Where the contract duration was extended to account for construction delays, the extension period was much shorter, generally one to two years.

There were eight instances of renegotiation with other results, such as a change to the construction schedule in Brazil, an increased government contribution in Greece and a new project site in Mexico.

4 Disputes data

4.1 Prevalence and characteristics of disputes

Table 3: Disputes related to KPIs and performance monitoring

Region	No. of Projects with identified causes of dispute	No. of projects with disputes related to KPI or performance monitoring	% of projects with disputes related to KPIs
Africa	1	0	0%
ANZ	2	0	0%
East Asia	0	0	N/A
Europe	10	3	10%
Latin America and the Caribbean	9	1	11%
MENA	0	0	N/A
North America	1	0	0%
SE Asia	1	1	100%
South Asia	6	1	17%
TOTAL	**30**	**6**	**20%**

Figure 6: Prevalence of disputes by region, based on 165 projects

Figure 7: Prevalence of disputes in each year after financial close

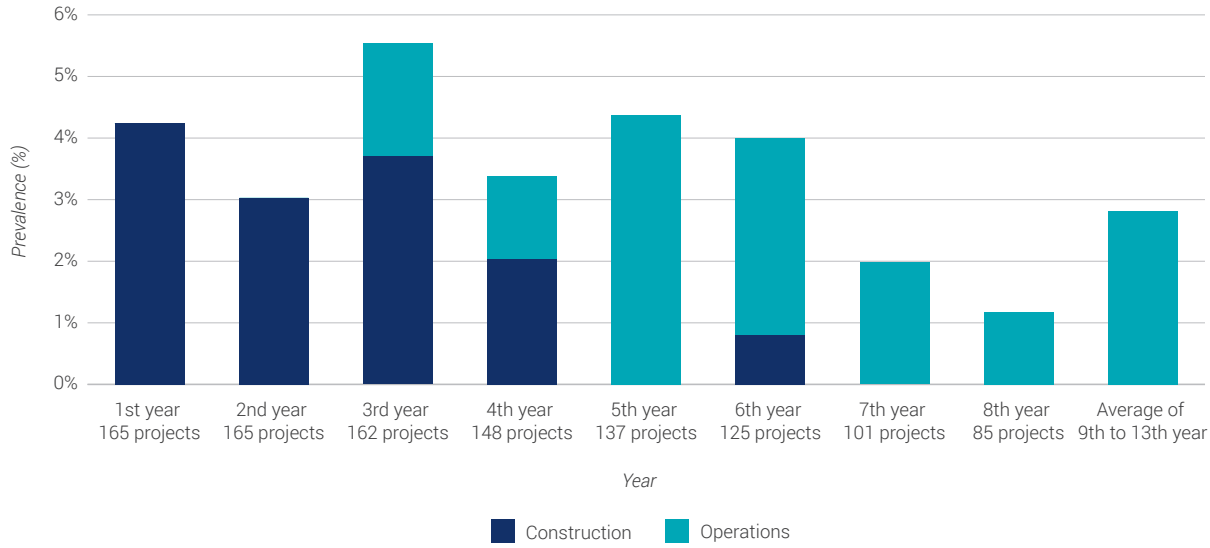


Figure 8: Prevalence of disputes, by year N after financial close

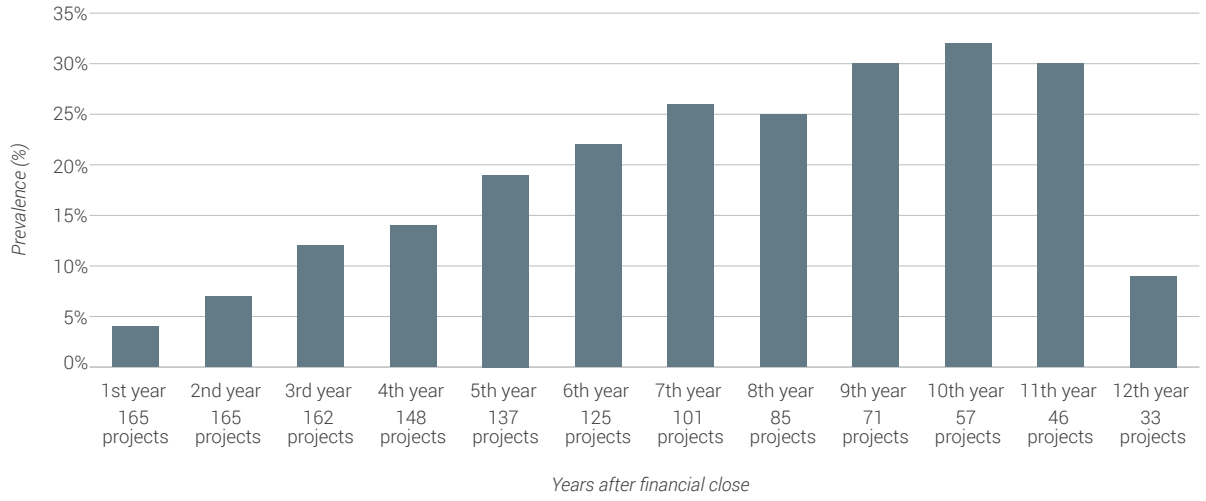


Table 4: Breakdown of party issuing dispute notice

Region	Projects with data available	Served by Both	Served by PA	Served by ProjCo
Africa	1	1	0	0
ANZ	2	0	0	2
East Asia	0	0	0	0
Europe	11	0	2	9
Latin America and the Caribbean	7	0	3	4
MENA	0	0	0	0
North America	1	0	0	1
SE Asia	1	0	1	0
South Asia	6	1	2	3
Total	**29**	**2**	**8**	**19**

Figure 9: Causes of disputes, based on 30 projects that experienced disputes and causes are available, noting that some projects have multiple causes

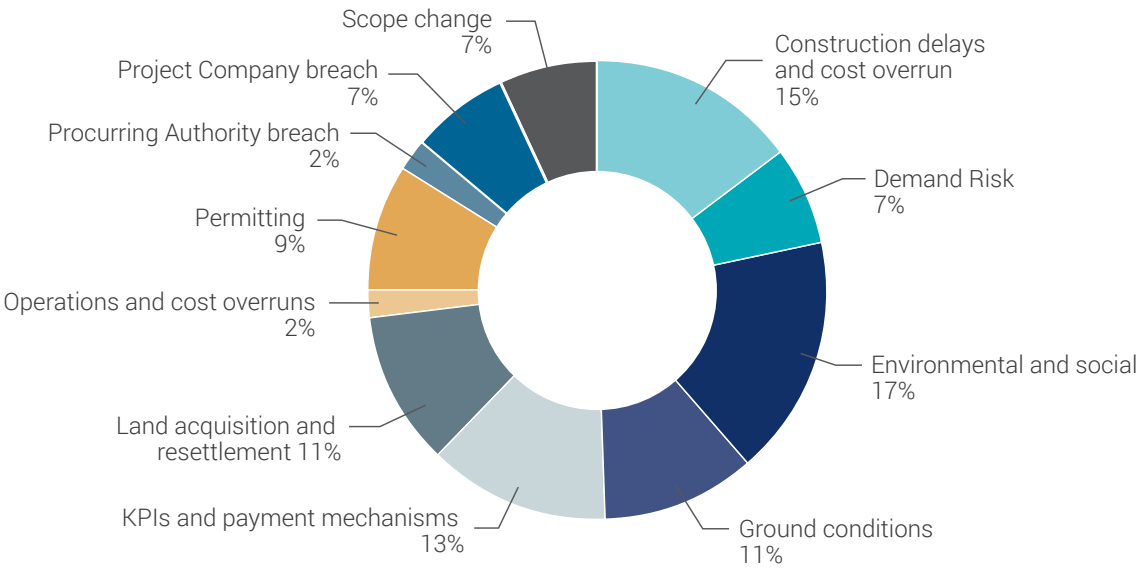
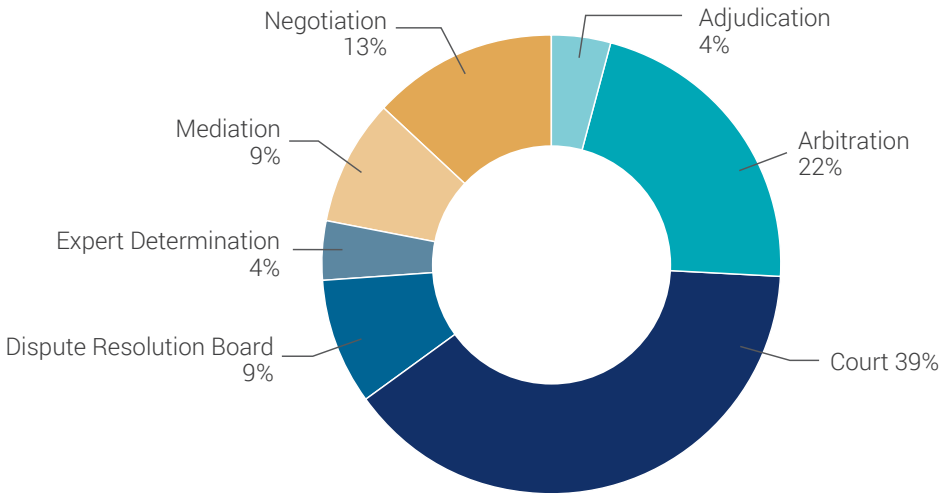


Figure 10: Methods used to resolve disputes, based on 28 projects with resolved disputes



Contractual disputes are quite common in PPPs during both construction and operational periods. Our research found that a formal notice of dispute was issued by one of the contracting parties on 42 projects out of 165 PPPs studied for which dispute data was available, which is a prevalence of 25%.

While all projects in the sample have been running for at least two years, this reduces for each year after, and only 50 projects have been in progress for over eight years. The influence of this is clear in Figure 8, showing the prevalence of disputes, by year N after financial close. While a formal notice of dispute was only issued on 25% of projects in the entire sample, the data indicates that almost 15% of the ongoing PPPs had experienced a dispute by their fourth year after financial close, and over 30% of PPPs by their tenth year after financial close. This suggests that the true prevalence of disputes is likely to be higher due to the timescales involved.

Had the same set of projects been used for each year after financial close, Figure 8 would have been cumulative. A different set of projects is used for each year (year N) after financial close, as not all of the projects have reached year N at the time of completing this study. The prevalence therefore drops off in later years due to the different set of projects being included.

On average these occurred 4.2 years after financial close, and there was an approximately even split between disputes during the construction and operational phases. 28 disputes have been resolved at the time of writing, out of the 42 projects that had a dispute. The time taken to resolve the dispute was generally within one year, however there were a small number of disputes which took three to four years to resolve.

There was a very large variation in the causes of disputes in our sample. When the dispute notice was issued by the Project Company, the most common reason was an increase in costs for which the Project Company was seeking compensation. This occurred due to unexpected ground conditions, higher than expected maintenance costs of existing infrastructure, and a single dispute regarding the level of payment for a change in scope. There were also disputes relating to revenue forecasts, with either disagreements on how to calculate the payment to the Project Company, or the Project Company arguing that the actions of the Procuring Authority led to reduced demand.

Interviews with stakeholders on several projects studied and our general discussions with key players in the PPP markets do show that disputes often occur due to ambiguous contract drafting, misunderstandings of the intent of risks transferred and the further risks associated with the differing interpretation of complex bespoke terms.

Where the dispute notice was issued by the Procuring Authority the most common reason was the ongoing failure of the Project Company to meet operational requirements, whereas any dispute during construction is typically driven by the Project Company. There were five examples of the Procuring Authority issuing the dispute notice during the operation and maintenance phase, with two relating to road quality and the remaining relating to a failure to provide the investment required and quality outcomes. The other common cause of dispute was delays in the construction phase, which occurred four times.

The other category of disputes which appeared were those which had an underlying cause in actions by a third party. This includes interventions by an environmental regulator, or ongoing protests by local populations. These are worthwhile noting as a reminder that external events have the potential to cause problems if they're not handled well.

The method used to resolve disputes varied across the sample, with methods such as negotiation used in 13% of the cases. There was a high number of disputes solved by going to court, which is partly due to the fact that in some jurisdictions it is not common to have a series of dispute resolution options. For example, in Spain the right to interpret the contract generally sits with the Procuring Authority, and if the Project Company disagrees with the Procuring Authority then it has no option but to go to court. In one project studied, this occurred twice, with the court deciding in the Procuring Authority's favour both times. Additionally, resolution methods such as mediation and negotiation are more private and therefore less likely to be picked up by our data collection process.

4.2 Dispute resolution mechanisms

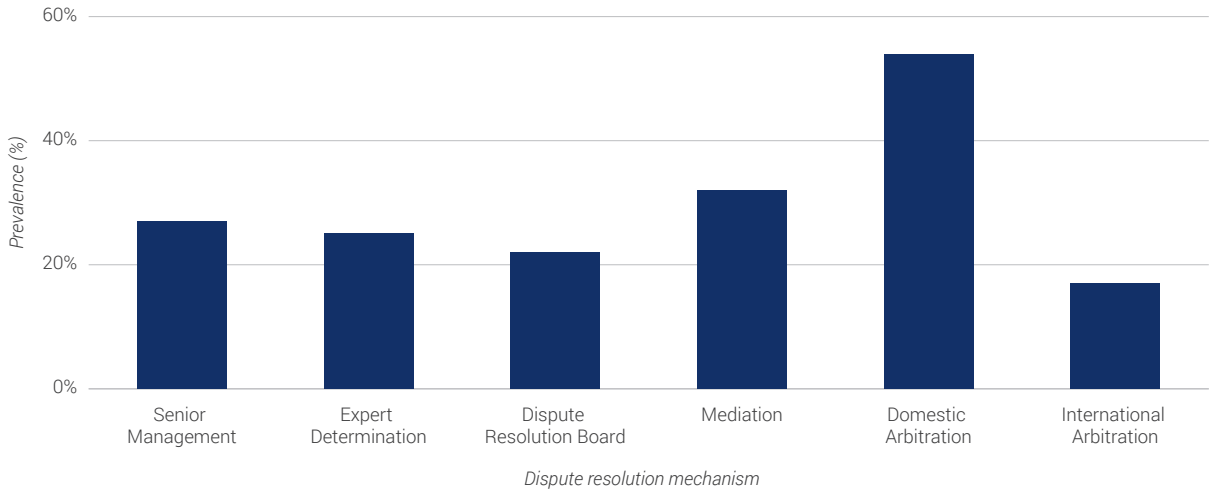
Contract data was found for 115 projects in our sample, and of those approximately 68% included a sequence of dispute resolution mechanisms. The prevalence of each individual mechanism is shown below in Figure 11, domestic arbitration is the clear standout, appearing in over half of contracts, suggesting that it is a common feature across the world.

Dispute Resolution Boards were present in slightly over 20% of contracts. Places such as India, Brazil and Europe tended to have this mechanism slightly more often than not, whereas it was far less common in North America and the Middle East. The breakdown by sector was similar to the overall breakdown.

A defined process to resolve disputes by senior management also appeared in approximately 27% of contracts. There were clear discrepancies between regions for this figure, with no projects in Latin America including this mechanism, while the majority of projects in North America did include it.

Mediation was present in 32% of the PPP contracts, and while it is slightly more common in India and less common in Latin America, there are no other particular trends. International arbitration was less common than expected, which may be a limitation in our data.

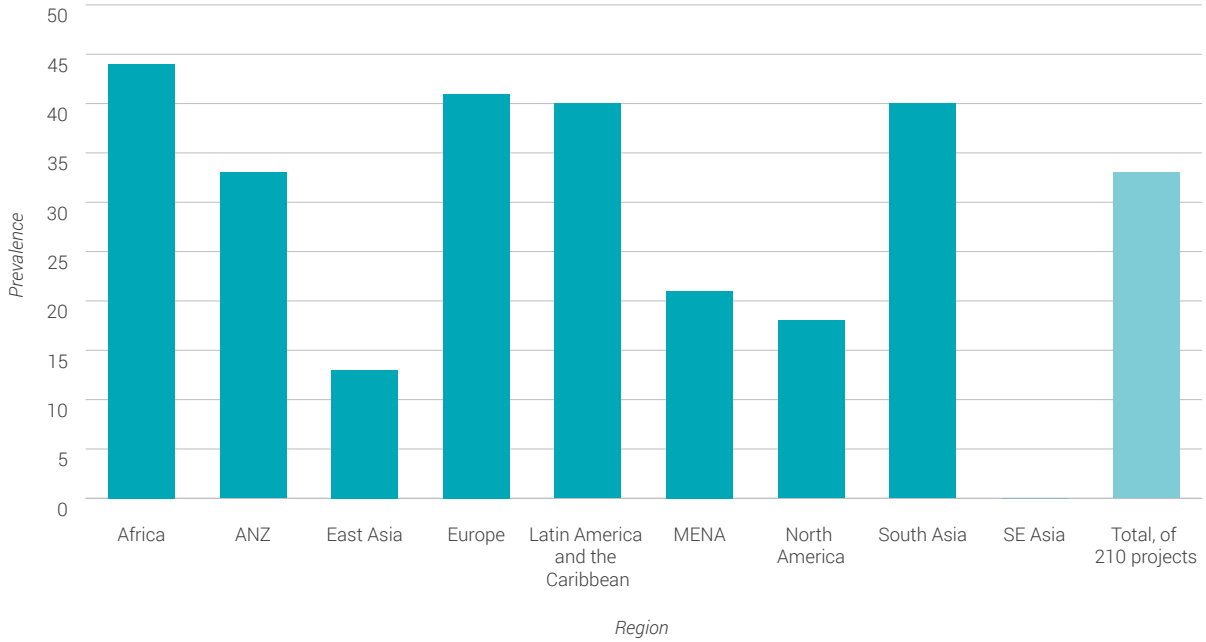
Figure 11: Prevalence of dispute resolution mechanisms explicitly defined in PPP contracts, based on 115 projects



5 Other Significant Events data

5.1 Overall data

Figure 12: Prevalence of Significant Events by region



For the purposes of this study, a range of events were classified as Significant Events. These were:

- Insolvency, either of the Project Company or a major contractor
- Change of the construction or operations contractor
- Step-in, either by Procuring Authority or Lenders
- Termination of the project, either by the Procuring Authority or Project Company
- Force Majeure events
- Material Adverse Government Actions (MAGA)
- Uninsurable events

The prevalence of these events is shown above. The key events are described in further detail below.

5.2 Force Majeure Events

Table 5: Prevalence of Force Majeure Events by region

Region	Projects with data available	Number of Force Majeure events	%
Africa	8	0	0%
ANZ	3	0	0%
East Asia	22	0	0%
Europe	45	4	9%
Latin America and the Caribbean	51	2	4%
MENA	14	2	14%
North America	10	0	0%
SE Asia	9	0	0%
South Asia	31	5	16%
Total	**193**	**13**	**7%**

Our study uncovered seven examples of force majeure in the projects researched. Two of these were related to events that were entirely external to the project; one project is located in Crimea, which was invaded by Russia, while the other one is in Egypt which experienced a revolution during the Arab Spring. Other events were classified as force majeure, however where not entirely unrelated to project risks. The Bajo Almanzora Desalination Plant in Spain experienced flooding which halted operation of the facility, and there is an ongoing dispute regarding whether this counts as a force majeure event. Workers strikes were the cause of three of the force majeure events; Navayuga Quazigund Expressway in India, Bahia Outfall water treatment plant in Brazil, and the Lazaro Cardenas Second Container Terminal in Mexico.

While it is not possible to draw many conclusions on the prevalence of force majeure events with so few examples, five of these events did take place in India, which suggests that PPP projects there do have a higher tendency to suffer from this issue, but may also be a reflection of the number of PPPs in our sample located in India. The Mahan Tori Power Plant had to reduce its operations after its coal allocation was removed by a Supreme Court ruling in 2014, while the Shrinagar Hydro Electric project suffered from flooding. The Procuring Authority on the Talcher II Transmission Line project was not granted the necessary authority to carry out its obligations, which was defined as force majeure. The events also lasted for a long time, with each example lasting for 3-4 years.

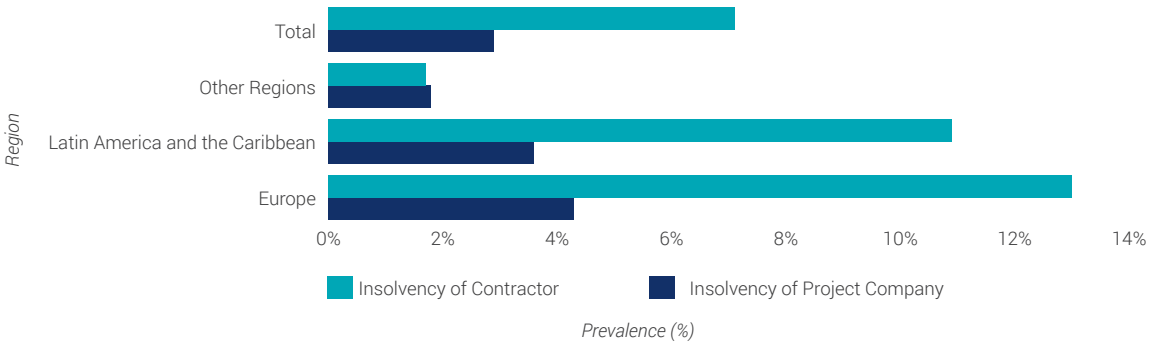
5.3 Material Adverse Government Action (MAGA) Events

Table 6: Prevalence of Material Adverse Government Action Events by region

Region	Projects with data available	MAGA Event	%	Causes
Africa	7	1	14%	
ANZ	3	1	33%	
East Asia	21	0	0%	
Europe	44	3	7%	Delays in adjacent projects
Halted by central government	51	2	4%	
Latin America and the Caribbean	48	1	2%	
MENA	14	0	0%	
North America	8	0	0%	
SE Asia	9	0	0%	
South Asia	27	1	4%	Delays in land acquisition
Total	**181**	**7**	**4%**	

5.4 Insolvency

Figure 13: Insolvency Events, based on 204 projects with data available



5.4.1 Project Company

Our study found only six examples in which insolvency of Project Company has occurred, spread across a number of regions and including the Perpignan Figueras Rail Link between France and Spain. In all instances, the Project Company was exposed to revenue risk and the projects were either in transport or energy generation.

5.4.2 Key Contractors

Our study shows 13 projects in which insolvency by either the construction or operations contractor or a major supplier to the Project Company has occurred. This includes seven examples of construction contractor insolvency, in the Netherlands, Germany, South Africa and Brazil, and Mexico.

Insolvency of construction contractors occurred on both availability based and demand based PPPs. Two equipment suppliers on UK waste projects went insolvent. In one case, the insolvency of the construction contractor was coupled with the insolvency of the Project Company, which eventually led to project termination.

There was one example of the insolvency of an equity investor. In case of the Port of Miami Tunnel Case Study, Babcock Brown (as equity investor) collapsed in the Global Financial Crisis in 2008, but was replaced with Meridiam (an infrastructure fund) before financial close.

5.5 Termination

Table 7: Breakdown of termination by party

Region	Termination by PA	Prevalence (%)	Termination by PC	Prevalence (%)
Europe	2	4%	0	0%
Latin America and the Caribbean	3	5%	2	4%
MENA	1	7%	0	0%
South Asia	4	10%	1	3%
Total	**10**	**5%**	**3**	**2%**

Table 7 shows that the Procuring Authority was more likely to terminate the project than the Project Company, however these are small numbers. Our study shows that four projects were terminated due to Procuring Authority default or voluntary termination. The reasons for Procuring Authority termination varied from a case of voluntary termination on a transport project, whicwh appeared to have failed a "public interest" test, an event of the Procuring Authority's default in Ukraine due to political reasons to two cases of Procuring Authority default due to its failure to provide land and a failure to provide coal on a thermal energy project. Most terminations occurred soon after financial close (within two years), before construction was complete or even started. This suggests there were problems with how the project was set up in the first place.

Where the Procuring Authority terminated the PPP contract, it was generally before it was in operations and after deciding that the project was not worth continuing. In the Prato-Signa link in Italy and Vengalem Kuttipuram highway in India this was after delays in beginning construction, while for the Aqaba Port in Jordan it was decided to expand existing facilities rather than build a new facility. For the Sao Paulo Metro Line project the contract was terminated (due to a failure by the Project Company to deliver construction on time) but a new PPP contract with another Project Company was signed soon after.

5.6 Other claims

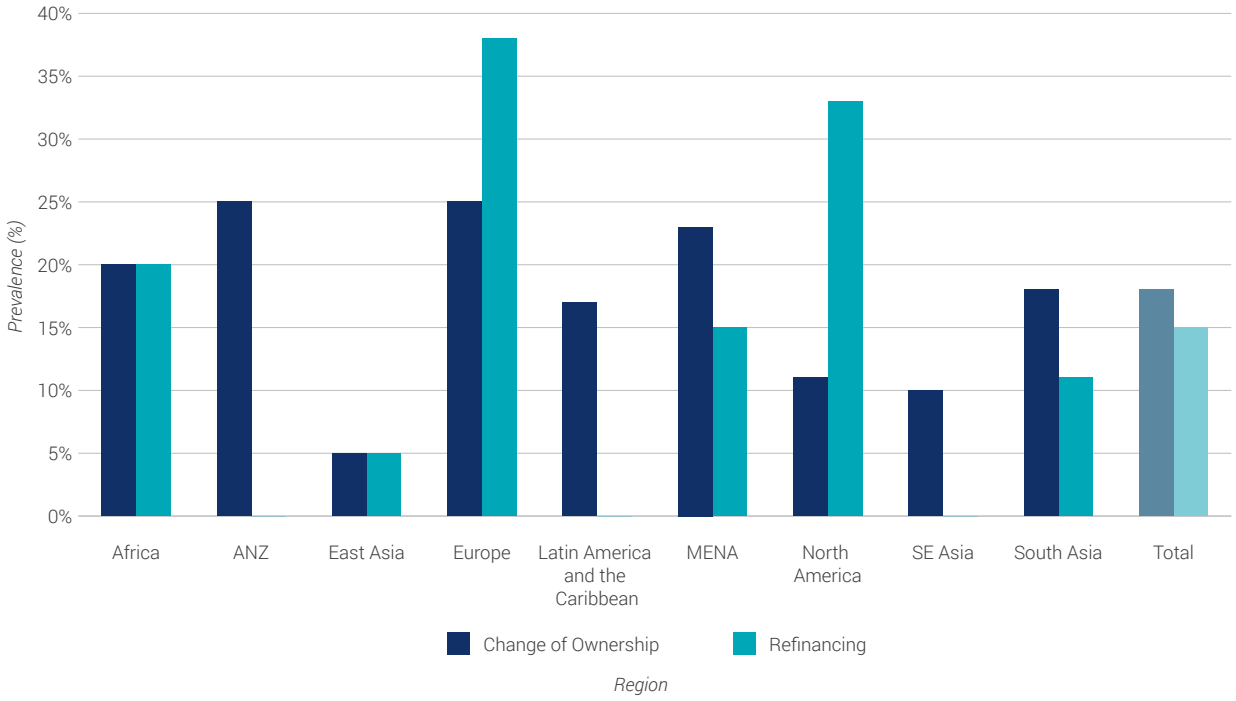
There were seven projects in our sample which had substantial construction phase scope changes where the cost was borne by the Procuring Authority. These were located across North America, Australia and Europe, and were all in the transport sector, however this may be a reflection of the greater availability of data in these regions. The values of these changes were high compared to the capital value of the project, with each example over USD $5m and one example valued at over USD $150 million. This again is likely to be reflective of the availability of information; small variations and changes were less likely to be picked up during our data collection process.

As the construction phase changes investigated were substantial, they were all associated with extensions of time, mostly for the entire portion of time delay. The majority of the changes were instigated soon after financial close, with six occurring within the first year.

There were less scope changes during the operations phase found in the study, and most were related directly to changes during the construction phase (i.e. the additional costs were due to different maintenance requirements).

6 Change of ownership and refinancing data

Figure 14: Change of ownership, based on 187 projects, and refinancing, based on 172 projects



6.1 Change of Ownership

There were 187 projects for which data was collected regarding a change of ownership, and this change occurred in 18% of those projects (where this change required Procuring Authority approval). A third of these occurred in Europe, with substantial numbers in India and Latin America. There was no apparent difference between sectors in likelihood of change in ownership.

It should be noted that data was not collected on the time at which changes in ownership or refinancing occurred. Additionally, the projects in question have not been handed back to the Procuring Authority, and many have not entered into operations. The prevalence of these two events would be higher for projects that have completed their entire contract term.

6.2 Refinancing

Approximately 15% of projects in this study had a refinancing of debt which required approval from the Procuring Authority. These figures were clearly dominated by Europe, where three quarters of these refinancings occurred, as would be expected given that it is a large and developed market. Almost all refinancings took place in the transport sector, however it is difficult to know whether this was a result of characteristics of that particular type of project or whether it is reflective of the data collection process undertaken. It may also be an indication that Procuring Authorities are more heavily involved in transport projects, with the energy sector encompassing arrangements such as Power Purchase Agreements where the Authority does not authorise refinancings.

7 Global and sample data

As part of the process of selecting projects which to investigate for this research, a Master Database of PPPs (Master Database) was created by combing existing databases available online. This was completed using the criteria that the projects were in economic infrastructure and reached financial close between 2005 and 2015. The process followed is described in the Methodology. Presented below is some analysis from the Master Database.

Table 8: Breakdown of master database by region and sector

Region	Energy	Transport	Waste	Water	Totals	%
Australia and New Zealand	0	32	1	4	**37**	**1.0%**
East Asia	281	100	73	42	**496**	**13.3%**
Europe	93	423	73	54	**643**	**17.2%**
Latin America & Caribbean	511	358	32	79	**980**	**26.2%**
Middle East, North Africa	140	68	3	38	**249**	**6.7%**
North America	2	117	3	6	**128**	**3.4%**
South East Asia	164	56	4	14	**238**	**6.4%**
South Asia	317	466	0	7	**790**	**21.1%**
Sub-Saharan Africa	114	57	0	4	**175**	**4.7%**
Totals (number)	**1622**	**1677**	**189**	**248**	**3736 (100%)**	
Totals (%)	**43.4%**	**44.9%**	**5.1%**	**6.6%**		

Table 9: Percentage of projects in each region

Region	Percentage of projects	Number of projects
Australia and New Zealand	1.0 %	37
East Asia	13.3 %	496
Europe	17.2 %	643
Latin America & Caribbean	26.2 %	980
Middle East, North Africa	6.7 %	249
North America	3.4 %	128
South East Asia	6.4 %	238
South Asia	21.1%	790
Sub-Saharan Africa	4.7 %	175
Total		**3736**

Table 10: Composition of master database by sector

Sector	Percentage of projects	Number of projects
Transport	44.9 %	1677
Energy	43.4 %	1622
Water	6.6 %	248
Waste	5.1 %	189
Total		**3736**

Table 11: Composition of master database by financial close date

Financial close (by period)*	Percentage of projects	Number of projects
Period 1	20.0%	747
Period 2	24.5%	914
Period 3	28.7%	1072
Period 4	26.8%	1003
Total		**3736**

**Periods were defined as:*

- *Period 1 – Jan 2005 to Sept 2007*
- *Period 2 – Oct 2007 to June 2010*
- *Period 3 – July 2010 to Mar 2013*
- *Period 4 – Apr 2013 to Dec 2015*

Figure 15: Capital value of projects in master database

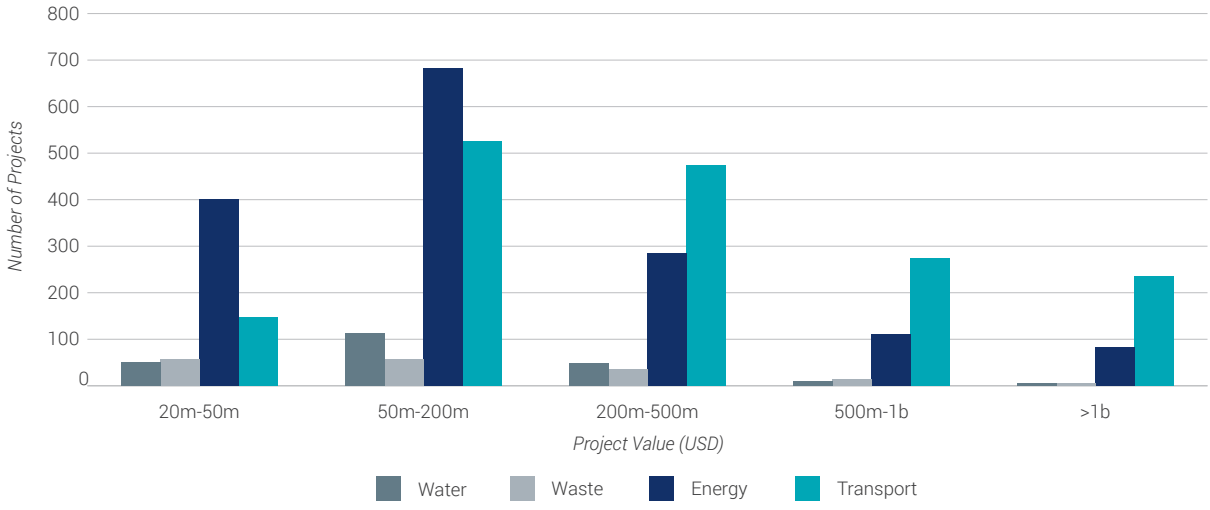


Figure 16: Capital value of projects in sample database