

# Public Private Partnership's Growth Empirics in India's Infrastructure Development

Nagesha G<sup>1</sup> and K Gayithri<sup>2</sup>

## Abstract

*Public Private Partnerships (PPP) have now emerged as an alternative to the traditional mode of infrastructure provision both in India and rest of the world due to its proven potential to solve infrastructure inadequacies faster and cost-effectively. The paper analyses trends and patterns of various infrastructure sectors and regional distribution of PPPs at global, national and sub-national levels to identify to what extent PPPs have been able to curb infrastructure deficit. The growth empirics reveal that there has been a sharp increase in the number of PPP projects, and that these have contributed immensely to enhance regional and sectoral infrastructure availability. In addition, the paper has observed that PPP projects under the national highway category are way ahead in time and cost efficiency as compared to the non-PPP projects. However, these projects have tended to concentrate in certain sectors and regions, both globally and in the Indian context despite the incentives currently available to these endeavors. The present paper explores the possible reasons for this uneven growth in India. Probable reasons for this uneven growth factors like differences in political will across national and sub-national governments in promotion of infrastructure PPP policies and lack of effective functioning of governments' various infrastructure executive departments including PPP nodal agencies for identifying, executing, coordinating various departments and in promotion of policies for hassle free and quick implementation and to redress the various differences. Financial assurances to the concessionaires on their investments, availability of land and other incentives like tax incentives, capital grant (Viability gap funding) and coordination by users and nature of project risks, degree of private sector risk management capacity are some the other important factors.*

**Key words:** Infrastructure, Public Private Partnerships (PPPs)/PPIs, growth of PPPs, cost and time efficiency.

## 1. Introduction

The growing infrastructure inadequacies and the governmental constraints to meet the required investments have resulted in the emergence of alternative modes of financing infrastructure. Public Private Partnership (PPP) is one such alternative model that has gained popularity both among the developed and developing countries since late 1980s. Infrastructure, as is well documented in literature, is a growth catalyst and has proven positive impact on the growth of national income. One such estimate reveals that an adequate infrastructure base helps in the annual GDP growth to the tune of 1-2% (Research Republic LLP, 2008). Many studies have argued that the provision of quality and efficient social and economic infrastructure services is crucial to realizing the full potential of the developing economies.

Infrastructure provision has been traditionally in the public domain due to factors like huge initial fixed costs, long gestation period and public good nature of services. The historical predominance

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of governments in infrastructure development has led to natural monopoly, and governments have been, of late, unable to provide adequate resources for all infrastructure development needs owing to hard budget constraints. The growing fiscal distress among nations and the resultant introduction of rule based fiscal deficit correction mechanisms have further contributed to paucity of funds for infrastructure development. Traditional mode of infrastructure development is also constrained by factors such as technical, managerial inefficiencies & lack of strong political will.

Inadequate infrastructure investments results in increasing infrastructure deficit and thereby hampers growth, which is major risk developing economies cannot afford to take. An important emerging strategy to address infrastructure deficit is to work with the private sector to finance, design, build, maintain and operate infrastructure projects through public-private partnerships (PPPs).

PPPs have rapidly grown in importance both in the developed and developing economies in the recent past. PPPs are expected to be efficient options of infrastructure provisioning as they combine in it the advantages of harnessing private sector technological, managerial efficiency and allocative<sup>3</sup> efficiency advantage of the government sector. A major expected advantage of the PPPs is efficiency gain both with regard to time and cost of infrastructure projects. Historically, infrastructure projects run by the government have experienced huge time and cost overrun and PPPs are expected to mitigate these disadvantages. While these advantages are theoretical propositions, there is a need to empirically verify to ascertain the extent of efficiency gained. The present paper addresses the above issue by analysing trends and patterns of PPPs at global, national and sub national levels.

Remainder of this paper is organized as follows: the issues of infrastructure importance in the growth of the economy are discussed in section 2; a brief international Private Participation in Infrastructure<sup>4</sup> (PPI) growth empirics is presented in section 3; the growth empirics on the PPPs in Indian infrastructure are discussed in section 4; efficiency of PPPs are analyzed in the penultimate section, followed in the last section by a discussion on some implications based on both international and Indian PPPs growth.

## **2. Infrastructure and Economic Development**

The existing literature highlights how most infrastructure investments can positively influence the growth of an economy either through minimization of costs or maximization of revenue, or both. Appropriate infrastructure aids in increasing the productive efficiency of industries through reducing transaction cost<sup>5</sup>; besides such types of investments can increase employment both directly and indirectly (Alleman, 2002). Rao (1980) observes that an adequate infrastructure base can keep the economic machine in continuous motion while enabling an optimal utilization of natural resources.

Rank of infrastructure index of the country is positively related to its global competitive index. It is empirically revealed from the world economic forum report that the global competitive rank of developed economies and newly industrialized countries of Asia is much higher than that of the

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<sup>3</sup> Allocative efficiency- in the present context refers to transfer of funds to other core sectors where the social benefits are much higher.

<sup>4</sup> PPI and PPPs are synonymous to each other.

<sup>5</sup> Transaction cost in this case includes transportation cost and maintenance cost. Adequate infrastructure reduces the congestion, saves fuel and travel time and vehicle operation cost too.

developing and emerging Asian countries' average. The infrastructure score of developed nations is as high as 5.85 as compared to 3.84 of emerging economies. The Global Competitive Index (GCI) score of the former is much higher (5.5) than that of the later (4.11). GCI and infrastructure ranks of China are 29 and 46 respectively - higher than India at 49 and 76 respectively. This is due to high degree of infrastructure development in the developed countries compared to other countries (refer table 01 from the annexure).

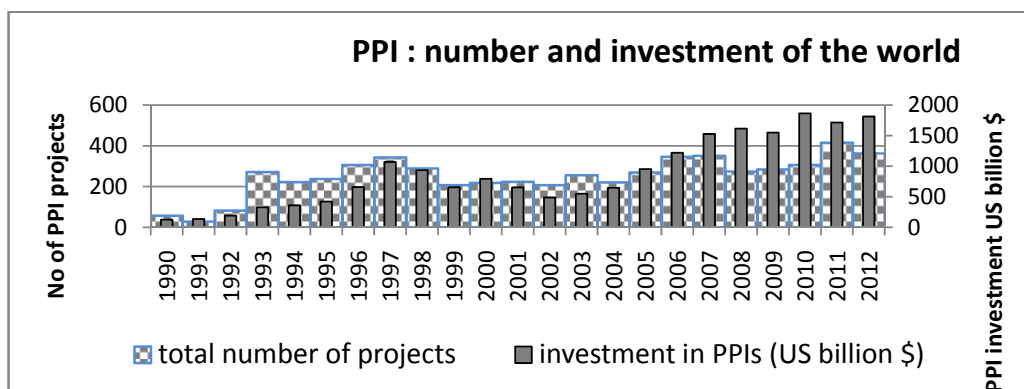
### **3. International Experiences in PPPs**

Dailami and Klein (1997) argue that the debt crisis of early 1980s in developing countries significantly restricted public borrowing, which tended to seriously restrict their ability to fund infrastructure investments. They argue that governments can attract private sector funds in infrastructure in two ways: First, through providing financial assistance in the form of grants or guaranties or cheap loans and, secondly addressing policy problem that protects the interest of private investors' concerns by ensuring macro-economic stability and sound regulatory setup to facilitate and ensure private sector investment in the infrastructure.

Infrastructure had been provided by the public sector till early 1980s both in the developed and developing countries. Later, the global economic reforms and certain limitations such as massive financial requirements, rapidly increasing government debt and infrastructure deficit, technical competency, risk management of public sector in the provision of these services paved the way for the private sector participation in various infrastructure facilities. The rapid expansion of infrastructure provision has commenced in the late 1990s through various modes. Among them, Public Private Partnership (PPP) model has now emerged as one of the strategies to remove infrastructure bottleneck both in the developed & developing economies.

Growth in the number of projects under the Private Sector Participation Initiatives (PPIs) in Infrastructure provision in the World has been very significant. There have been altogether 5506 projects initiated during the last two decades. The number has grown from 57 in 1990 to 362 in 2012; this is about 6.35 percent annual growth over the period. It is also interesting to observe (from the chart number 01) that the increase has not been uniform over the years; there was a spurt in growth between 1993 and 1997, after which it declined between 1998 till 2004 due to East Asian crisis, and this slowdown in the growth has continued, although it remained at a higher level than the initial years. There has been an increase ever since, with a marked decline post 2007, owing to global economic slowdown. The behavior of the PPIs seems largely in line with the general economic conditions of the day.

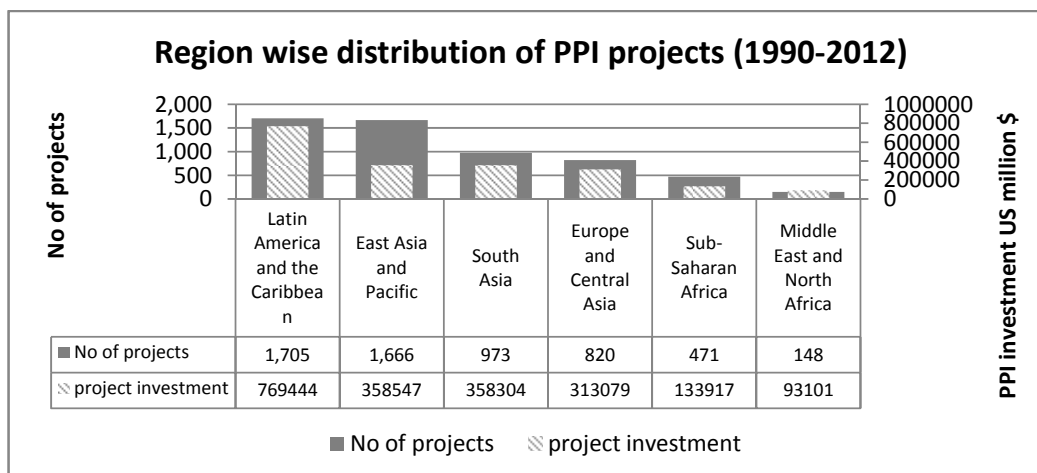
**Chart 1: Growth of PPIs in Infrastructure Projects in the World:**



**Source:** Compiled from Private Participation in Infrastructure (PPI) Database of the World Bank.

The total investment made in these projects during the above reference period was US \$ 1912980 million, which increased by around 14.29 times during 1990 to 2012, i.e. from US \$ 12684 million in 1990 to US \$181367 million in 2012 (refer table 2 from the annexure). In terms of the percentage distribution of total value of investment, telecom sector obtained the first position and accounted for 46 percent of the total invest, followed by energy sector with 37 percent, transport and water & sewerage sectors with 13 and 4 percent obtaining third and fourth position respectively.

**Chart 2: Regional Distribution of PPI Projects in the World**



**Source:** Compiled from Private Participation in Infrastructure (PPI) Database of the World Bank.

The paper further analyses region wise distribution of PPIs. An analysis of the investment in these projects during 1990-2012 reveals that Latin America and the Caribbean region are at the first position with 29 percent of total projects and 38 percent of total investment. East Asia and Pacific region are at the second position both in terms of number of projects as well as value of investment terms i.e. 29 & 18 % respectively. South Asia, Europe and Central Asia, and Sub Saharan Africa and

finally Middle East and North Africa are at III, IV, V and VI positions respectively both in terms of number of projects and in terms of investment (refer chart 2).

Among the individual countries, China with 1064 (29%) projects occupied the first position, followed by India and Brazil with 725 (19%) and 643 (17%) projects respectively occupying second and third positions in the World. With respect to the amount of investment in these PPI projects, Brazil with an investment of USD 401969 occupied the first position, followed by India with an investment of USD 306325 (22%) occupying the second position and China with USD 119330 at the IV position (refer table 3 from the annexure).

The above analysis reveals large scale concentration private sector participation in infrastructure projects both in number and investment value as also in terms of both sector and region. Telecommunication, energy and transport sectors account for a whopping 96 % of the total PPP investment. It would be very interesting to examine the factors responsible for such heavy concentration in certain sectors despite the wide ranging incentives and concessions announced for PPP participation across sectors. In terms of regional spread, three countries, namely China, India and Brazil account for 65 percent of the number of projects, while Brazil & India together accounts for 50 percent of the total investment. There may be a number of reasons behind these imbalances. Hammami (2006) finds factors like general government balances (Percent of GDP), money supply and inflation variables as negatively correlated with PPP investment; on the other side total debt, population, real GDP per capita, PPP experiences, Rule of law, Composite country risk factors as positively influencing PPP investment albeit to different degrees. In addition, the present paper explores other possible reasons for PPP investment through the wide range of discussions with experts and from the literature available on growth of PPPs. Political stability, government investment promotion policies, single window system for quick government clearances & approvals, transparency method of selecting the project developers through e-procurement/ competitive bidding, regular monitoring of the project (over the entire life span or the contract to meet the required needs of the developer on the one side and ensuring the assured quality of infrastructure services on the otherwise), availability of government nodal institutions with required experienced personnel, etc. are some of the important factors studied for this purpose.

#### **4. India's Experience with PPP Infrastructure Projects**

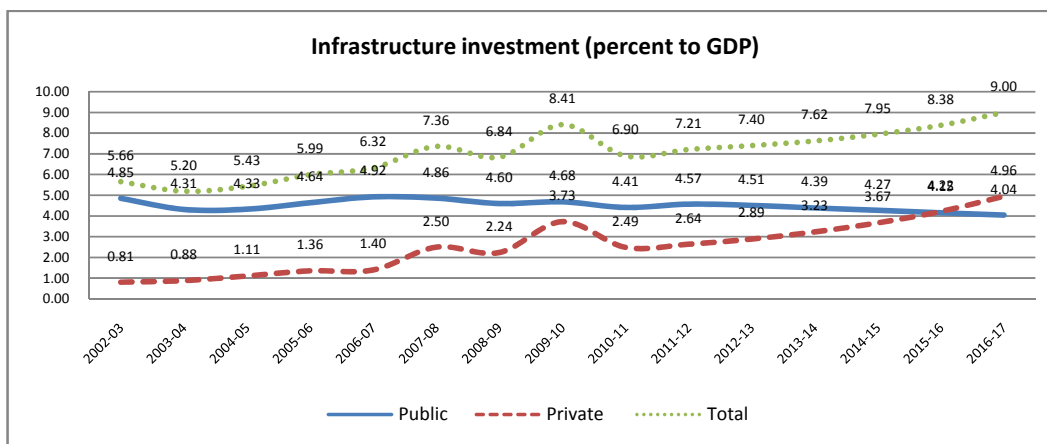
In India the gap between the demand and supply of infrastructure has been rapidly increasing mainly due to inadequate investment by governments both at the national and sub-national levels over time. This is further worsened by the present sky-rocketing infrastructure demand caused by globalization, urbanization & population growth. Till late 1990s, governments at both center and state levels had played a major role in the infrastructural development due to the historical government monopoly on infrastructure projects. Conventional methods of infrastructure provision denoted complete public sector provision which largely focused on social welfare aspect and thus offered the advantage of inclusive provision of infrastructure. However, India is currently under severe infrastructure inadequacy stress due to inadequate public investment, which has led to infrastructure bottlenecks in the process of India's development. In addition, there are issues such as time and cost overruns of the projects, poor maintenance, capital inadequacy, archaic labour laws and technological constraints which act as major

obstacles to this conventional method of provision of infrastructure services. The launching of economic reforms in the decade of nineties has created a conducive environment for private sector participation and to attract private capital towards infrastructure provision.

India's total infrastructure investment requirements are estimated to be about Rs.4000 to Rs.4500 billion (US \$ 115 to 130 billion) for the years1996-2000 and about Rs 7500 billion (US \$ 215 billion) for 2001-02 to 2005-06 (Rakesh Mohan, 1996). Further, Planning Commission estimated the infrastructure investment required for Eleventh Plan (2007-12) at US \$ 512 billion and the Twelfth plan (2012-17) at US \$ 1000 billion. This accounted for 8 to 9 percent of GDP per annum.

Government has announced several measures including PPP policies to promote PPPs in the country both at the central and state levels, some of which are listed in the following. The PPP cells have been set up both at central and state levels are expected to streamline the various infrastructure projects. Government has also instituted a separate corporation, i.e. India Infrastructure Finance Corporation limited (IIFCL) for innovative and cost effective provision of financial support. Government has also announced a Viability gap funding (VGF) scheme for economically unviable but socially desirable projects. High powered committees like Cabinet Committee on Infrastructure (CCI) and Public Private Partnership Appraisal Committee (PPPAC) have been constituted for quick decision making and project approvals and further fortify the growth of PPPs in the country. Making available model concession agreements for hassle free transparent long term contracts, publishing of various sector wise standard documents of the planning commission, etc. form part of this government initiative. The rapid growth in the private sector investment from a mere 20 percent of the total infrastructure investment in the 10<sup>th</sup> plan (2002-07) to 30<sup>6</sup> percent in the eleventh plan (2007-12) provides evidence for the positive response of the private sector. This is further expected to increase to 50 percent of total infrastructure investment in the twelfth plan (2012-17).

**Chart 3: Infrastructure Investment as Percent of GDP**



**Note:** 1) Figures are as percentage of GDP. 2) Investment for 2002 to 2011-12 represents realized investment. 3) \*\* 2012-17 figures are planning commission projections

**Source:** compiled from various plan documents, GOI

<sup>6</sup> 12<sup>th</sup> plan document, page 87 volume 1, Planning commission, GOI

Infrastructure investment already realized (as percent of GDP) for the period 2002 to 2017 is presented in chart 03. The investment in infrastructure in the country before this period was an extremely a small sum. Later, due to Private sector Participation in this sector, investment increased slowly during 1999 to 2003-04, and continued to increase due the favorable initiatives taken by government. Even though, the growth in infrastructure investment has been positively increasing the increase is less than 9 percent per annum that is required to harvest the full potential resources and to achieve high sustainable GDP growth. To achieve this target of 9 percent<sup>7</sup> (per annum) infrastructure investment, government must streamline the various policy initiatives appropriately to motivate the unwilling private sector players to invest in the development of infrastructure.

The volume of infrastructure investment has gradually increased due to increased investment by private players, while public sector investment has remained stagnant over the entire decade, and is expected to decline from 4.85 in 2002 to 4.04 percent of GDP by 2016. Further, the increase in private sector investment is expected to surpass public sector investment by the end of the 12<sup>th</sup> plan. In spite the increased private sector investment, the total of both private and public sector realized investment upto 2011-12 was inadequate to cater to the required infrastructure needs, which was 9 percent of GDP<sup>8</sup>. In the event the Planning commission's projected figures for the present plan is realized, then India's infra investment will reach 9 percent of the total by 2016-17.

There is however a need to review the present policies of the government both at the central and state level to further augment infra investment and reach the desired 8-9 percent<sup>9</sup> annual investment. There are also evidences to show that many projects are stalled in pipeline/ construction stage due to delayed government clearances relating to environment, forest, wildlife, railways etc. Project implementation is further delayed on account of delay in private land acquisition for the projects. There is also lack of independent separate sector specific regulators in sectors like national highways. Government should address these issues on priority basis to streamline private sector participation of infrastructure.

#### **4.1. Growth of PPPs in India**

To allow a systematic understanding and analysis of the growth empirics of PPPs in India the paper classifies them into central and state sector PPPs, which are further classified based on the stage of project existence such as completed, under implementation and under pipeline projects.

Persistent efforts by the governments both at the Centre and States have resulted in formation of 945 PPP projects<sup>10</sup> with an investment of Rs. 687299 crore. . Of the 945 projects, 308 projects with an investment of Rs 286064 crore (42 percent) belong to central sector, which includes National highways, major ports, airports and railways. The remaining 637 projects, with an investment of Rs

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<sup>7</sup> 11<sup>th</sup> plan ; Planning commission ; Government of India

<sup>8</sup> Rakesh Mohan committee,1996

<sup>9</sup> Mohan Rakesh (1996)

<sup>10</sup> Compendium of PPPs; Government of India (both central and state sector together). (available Latest, as on December 2009)

398235 crore (58 percent) are state sector projects like roads (state highways, district roads), ports, airports, railways, power, urban infrastructure, etc. The current trend reveals that the state sector projects constitute a larger share both in terms of number of projects and value of investment. Of the total, 945 PPPs (67.41 percent) projects costing 58.20 percent of investment fall under the state sector PPPs and the remaining 35.59 percent of projects costing 41.80 percent of total investment fall under the central sector (refer table 4&5 from the annexure).

### **Central sector PPPs in India**

India's central sector PPPs are concentrated in transportation infrastructure, such as national highways, ports, airports and railways. National highways alone accounted for 60 percent of projects with 43 percent of total investment. In these projects, predominantly Build Operate Transfer (BOT) toll/ annuity and recently, Design Build Finance Operate Transfer (DBFOT) models are used.

In BOT toll model, the private concessionaire builds the road, operates by their own equity and debt capital and recovers the investment with assured return through toll revenue and transfer the asset to the NHAI after the concession period. BOT annuity is similar in all respects to BOT with the exception that the toll revenue concessionaire gets annuity<sup>11</sup>. In DBFOT model, in addition to the BOT model responsibilities, concessionaire takes the additional responsibility of designing the road/ bridge/ elevated structure. In case the respective project's traffic is insufficient to recover the expected investment, then government provides capital grant called Viability gap funding to the maximum of 40 percent of total project cost. Further, in the stretches near to metros or other roads where the traffic is very high, government demands the private bidders to pay premium<sup>12</sup>.

In the four airport sector PPPs, two projects are greenfield<sup>13</sup> projects, which include Bangalore and Hyderabad international airports and two brownfield<sup>14</sup> projects, i.e. modernization of New Delhi, Mumbai international airports. As of now, all these four projects are in the operation mode.

All the respective government departments/project assigning agencies like National Highway Authority of India (NHAI), Airport Authority of India and others have followed transparent method of national/international bidding criteria to choose the private concessionaire for all the PPP projects.

The 308 central sector PPP projects together accounted for an investment of Rs. 286064 crore, i.e. 32.59 percent of the total. Of this, 184 NH projects constitute 60 percent of the total with 46 percent of investment, and ranks highest in the list, followed by 54 Railway projects with an investment of 33 percent of the total, coming second. Sixty-five major projects with 12 percent of total investment come third and 5 Airport projects with an 8 percent of investment come fourth. (refer chart 04).

Further, it is important to recognize that these central sector PPPs are in different stages of execution such as operation/completion, implementation and pipeline. Number of projects in pipe-line stage is relatively high in the listed total.

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<sup>11</sup> Annuity refers to the bi –annual (once in 6 months) payments by the government to concessionaire through budgetary sources.

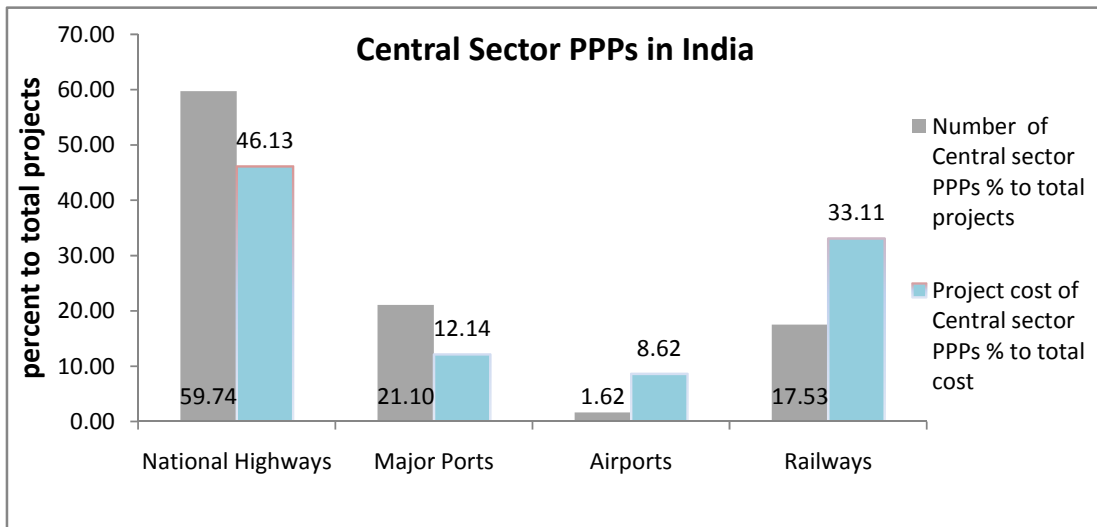
<sup>12</sup> Premium or negative VGF refers to concessionaire pays to the government due to the expected toll revenue is higher than the cost of construction and operation and maintenance cost.

<sup>13</sup> Greenfield projects refer to construction of new projects.

<sup>14</sup> Brownfield refer to modernization or expansion of already existing projects.



**Chart 4: Central Sector PPPs (Percentage to total central sector projects)**

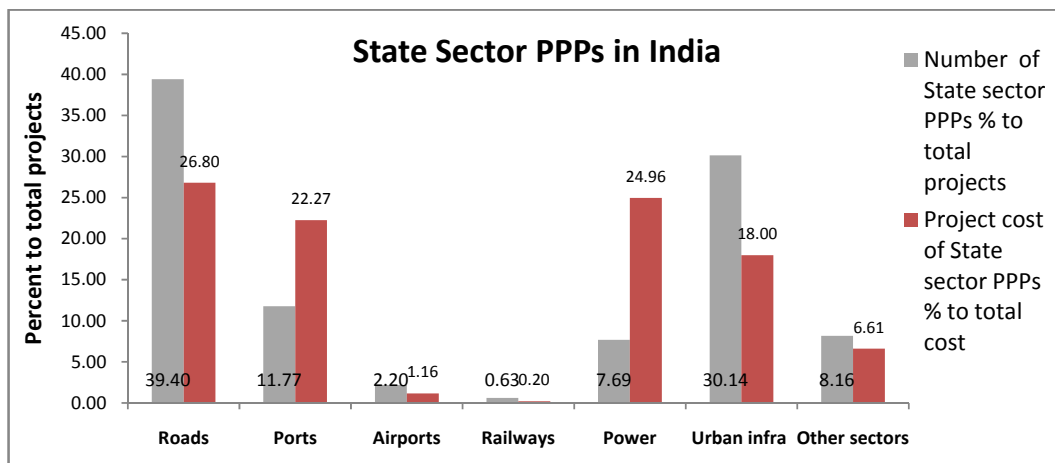


Source: compiled from compendium of PPPs in India, Ministry of finance, GOI

### State Sector PPPs in India

State sector PPPs in India constitute the projects that are developed through state government infrastructure and other departments, and include broadly seven sectors such as roads i.e. state highways and major district roads, ports, airports, power, urban infrastructure which includes importantly solid waste management, sewerage and lastly the 'others sector', which includes education, health infrastructure and agriculture infrastructure projects (refer chart 05).

**Chart 5: State Sector PPPs**



Source: compiled from compendium of PPPs in India, Ministry of finance, GOI

In the State sector PPPs, in terms of number of projects, Roadways, Urban infrastructure and Ports are at 1st, 2<sup>nd</sup> and 3<sup>rd</sup> positions respectively, while the other sectors, i.e. power, domestic

Airports and Railways sectors are in fourth, fifth, sixth and seventh positions respectively. If we consider the criteria of total project cost, road projects get the first position. Power, ports and urban infrastructure and other sectors occupy second, third, fourth, fifth positions respectively. Expectedly, Airports and the Railways sector shares are very negligible in the State sector PPPs (refer chart 5).

Of the 637 state sector projects, 176 (27%) are completed, 209 (33%) under implementation and 252 (39%) under pipeline stage. In percentage terms, Road projects (251 in number - 26.56 percent of total) occupy the first position. Urban infrastructure projects (192 in number - 20.32 percent of total) occupy the second position. Port projects (75 in number- 9.4 percent of total), Power projects (49 in number - 5.19 percent of total), Airport projects (14 in number- 1.48 percent of total) and Railway projects (4 in number- 0.42 percent of total) occupy third, fourth, fifth, sixth and seventh positions respectively. (Refer table 6 & 7)

### **Provincial Distribution of Central Sector PPPs in India**

In the central sector, there are 308 PPP infrastructure projects with an estimated investment of Rs.2, 86,064 crore. These projects are at various stages such as completed and operation stage (65 in number – 28 percent of total), construction phase (67 in number – 28 percent of total), and under planning phase (106 in number – 45 percent of total). In regard to region- wise distribution of these projects, five states, i.e. Tamil Nadu, Andhra Pradesh, Maharashtra, Gujarat, and Karnataka accounted for fifty-two percent of all central sector PPPs. Among these, Tamilnadu accounted for the highest number of central sector PPPs i.e. 18 percent of total PPPs. Andhra Pradesh comes second with 9.8 percent of total projects. Maharashtra with 9 percent, Gujarat with 8.2 percent, and Karnataka with 7 percent of total PPPs stand at 3<sup>rd</sup> and 4<sup>th</sup> and 5<sup>th</sup> positions respectively. The remaining 17 states and UTs accounted for remaining forty- eight percent of total PPP projects.

Excepting Tamil Nadu, Andhra Pradesh, Maharashtra no other state has PPPs above the national average of 8.59 percent. i.e. 19 states and UTs have PPPs below the national average, and again distribution of projects is also not equally spaced. States like Himachal Pradesh, Jharkhand account for only 0.39 and 0.78 percent to total projects. Eight states, seven from North Eastern States (except Assam) and Uttarkhand do not have central PPPs at all. Out of the 6 Union territories, only one i.e. Pondicherry accounted to one project and the National Capital territory Delhi accounted for 6 projects or 2.34 percent of the total central sector PPPs (for details refer table 6 from the annexure).

### **Provincial Distribution of State Sector PPPs**

In the State Sector, there are around 637 PPP projects with an investment of Rs.3,98,235 crore, spread over seven sectors like Roads, Ports, Airports, Railways, Power, Urban infrastructure and others. Of this, 28 percent of the projects are in the operation phase; 32.8 and 39.56 percent respectively are in construction and planning phases.

Among States, Gujarat accounts for 20 percent of State PPPs, i.e.124 projects; Andhra Pradesh accounts for 15 percent, Maharashtra accounts for 8.64 percent and Rajasthan accounts for 8 percent of State PPPs. These four states together account for 50 percent of the total projects. The

States' average is 3.36 PPPs. The states of Assam, Bihar, Haryana, Jharkhand, Karnataka, Uttarkhand have below the States' average percentage of PPPs.

Himachal Pradesh, Jammu Kashmir, Goa, and the Seven North Eastern States have no State PPS at all. The only NE state with state PPPs is Assam. . Among the Union territories, Pondicherry and Chandigarh accounted for 3 projects each. National Capital territory of Delhi accounted to 6 PPP projects with 0.96 percent of total State PPPs (for details refer table 6 from the annexure).

The above analysis reveals that, regional allocation of both the Central and State Sector PPPs projects is highly skewed. The economically developed states corner a higher percent of PPPs than the other states. The skewed growth of infrastructure may result in high regional disparities in the growth across the states. . Further, there is a need to identify the factors responsible for the growth of PPPs both in the central and State Sector in India in order to answer the question of unequal distribution of PPP infrastructure Projects across states/regions.

## 5. Performance of PPPs

Efficiency is vital in the provision of public services, and it is considered as an element in determining value for money<sup>15</sup> both to the government and public; higher the efficiency, lower the post of operation and quality of service delivery, and vice provision and delivery, and vice versa. The economic lifecycle of the country is determined by the presence of adequate quality transportation system. The logic behind measuring efficiency of the national highway projects is to ascertain whether Public Private Partnerships (PPPs) are the cost effective and true alternative to the non-PPP national highway projects. Given that public infrastructure services need to be provided efficiently and huge amount of public resources are spent on them either in the form of financial or non-financial assistance, a cost-benefit analysis of PPs is essential. Hence, the present study attempts analyze performance of National Highway PPPs through their time and construction efficiency in the post- globalization period.

### 5.A. Time efficiency:

**Table 1A: Time overrun of National highway projects 1998-2012:**

<b>National highway projects by type of contracts</b>	<b>Average time overrun (in months)</b>
PPP (BOT/SPV/Annuity) funded 133 projects completed	15.44
Non-PPP projects (World bank, JBIC, NHAI, funded projects)	21.86

**Source:** author's estimation from NHAI database June 2013

Table (1A) reveals that average construction time overrun of national highway PPPs is less than that of non-PPP national highway projects i.e. 15 and 22 months respectively. Delay in construction of a project may result in escalation of project cost as a direct impact, and indirectly it adversely impacts the growth of the economy due to inadequate infrastructure services. As per the concession agreement and guidelines of government, private developers need to bear the additional financial burden if the delay is on the developers' side in PPP projects. Hence, the chances of

<sup>15</sup> Value for money in the present context is known as financial savings to the government and general public.

unnecessary delay in construction will disincentives the developers in PPP projects. Contrary to this, in the event of delay in construction cost in EPC projects, government bears the additional costs irrespective of reasons for delay.

In addition to over findings, there are many studies<sup>16</sup> that have empirically proved that delay in construction time is less in PPPs compared to EPC projects. Based on that we aver that time efficiency is higher in PPPs than in non-PPPs/EPCs.

## 5.B. Cost efficiency

**Table 1B: Average cost of National highway projects**

SI.No.	Type of the project	No of Projects/DMUs/firms/ Developers	Average cost of projects (Rs. Crore)* (2004-05 prices)
1	PPP (annuity + toll )	239	2.20
1a	PPP annuity	51	2.78
1b	PPP BOT toll	188	2.05
2	EPC**	281	3.39
3 (1+2)	All projects	520	2.80

**Note:** \*values are in Rupees crores (adjusted to 2004-05 prices) for the length per lane kilometre (PLKM) \*\* To compare EPC projects with PPP projects, the present study adds O&M costs (Rs ten lakhs PLKM<sup>17</sup>) to the TPC of EPC.

**Source:** author's estimation using NHAI's database of projects over 1997-2013

Average cost of national highways is around Rs. 2.05 and Rs. 2.78 crore ( @ 2004-05 prices) per lane kilometre (PLKM) in PPP BOT toll and PPP BOT annuity projects respectively while in EPC projects, it is Rs. 3.39 crore PLKM. Therefore, a cost advantage is Rs. 1.19 crore per PLKM in PPP mode.

Further, in EPC projects, government need to finance the projects on a regular basis and take the complete responsibility of lifetime O &M, whereas normally in PPPs private developers shoulder the responsibility of financing. In addition, project risks of construction are shared between government and the developers in PPPs and life time O&M is completely managed by private sector. Further, returns on investment in PPPs (toll/annuity) depend on the pre-assured quality of service over the entire life time. Cost of debt finance to Governments is not included in the project cost of EPCs, and constitutes an additional burden to government. The above factors tend to create much value for money to the government and to the users in PPPs than EPC projects.

The probable reasons for fewer delays in construction and higher cost efficiency of PPP national highway projects are the innate<sup>18</sup> characteristics of PPP contracts; in PPP projects, the private sector partner provides access to finance, brings in suitable technology for the project and innovative

<sup>16</sup> Ramsingh (2010)

<sup>17</sup> As per the NHAI guidelines

<sup>18</sup> Inbuilt characteristics – 1) concessionaire will be paid only during operation period (with assured quality) hence there is an incentive for him to complete the construction quickly 2) he should maintain it over the long term concession period (contract period) and mention is made of this in the agreement - normally 20 to 30 years. This reduces the full life cycle costs relating both construction and operation.

approaches, ensures optimum project life time responsibility sharing, regular project operation & maintenance and x-efficiency<sup>19</sup> to provide sustainable and quality infrastructure services to customers.

## 6. Summing up

The present paper has made an attempt to analyze the trends and patterns of infrastructure PPPs at global, national and sub-national levels to find out how the emerging PPP model is a better alternative to traditional public sector investment in addressing the infrastructure investment deficit.

The study reveals two performance parameters of national highway projects. The first one is that the average 'construction-delay' in PPPs is less than in the EPC projects. Secondly, National highway PPP projects are cost effective compared to EPC projects.

Infrastructure financing and development models have gone through considerable changes across the globe since early 1990s. The conventional Public sector provisioning is increasingly giving way to public private partnerships in various forms. In recent years, there has been a substantial increase in the number of projects in PPP mode across the globe including India, and a significant amount of investment is also made. Energy sector has the highest number of projects in the international context though PPPs are largely concentrated in certain countries.

In regard to the growth and distribution of PPP projects in India, the study reveals that PPPs are found more in state infrastructure sectors than in the central infrastructure sector. However, both in the state and central sector, only a few infrastructure sub-sector projects are developed in the PPP mode, such as roadways, airport, urban infrastructure and Seaports. Projects under other sub-sectors like health, education, and rural infrastructure are not implemented through the PPPs.

The paper also has analyzed the sectoral and regional concentration of projects. Currently, the highest number of PPPs is in the transport sector and in number and size if investment National Highways takes the lion's share. In these projects, only a few PPP models such as BOT, BOOT- toll projects are generally seen. Also, regional concentration of projects has resulted in inter-state disparity in the allocation of PPPs. Few economically developed Indian States account for more than 50 % of PPPs. Many States have fewer PPPs than the National average both in terms of number of projects and total investment, and the states of Himachal Pradesh, Jammu Kashmir, Goa, and Seven North Eastern States besides (Assam excluded) do not have even single project under PPP. There are the intra-state disparities also: Some urban centers corner major shares of PPPs leaving rural areas to lag behind. Regional disparity in distribution of PPPs is widespread across the World. The factors responsible for the skewed sectoral and regional PPP distribution are worth exploring, in order to develop suitable policy framework to attract PPP investments in the sectors and regions that are currently facing serious dearth in investments. Since, infrastructure is a universal requirement for harnessing the development potential of a nation, albeit at different levels, there is an urgent need to address the infrastructure inadequacies, be it through the PPP medium or direct provision by the public sector.

The paper explores the possible reasons for the uneven growth of projects across the states and sectors in India. In all probability, differences in degree of support by governments and PPP nodal

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<sup>19</sup> X-efficiency- improvement in the efficiency due to increase in competition. Leibenstein (1966)

agencies to promote PPPs with respect to their regular assistance in projects initiation, execution and monitoring, degree of assurance of returns to the private concessionaires on their investment, incentives in the form of tax incentives, availability of capital grant (VGF), availability of land, quick necessary approvals and clearances from various government departments and support from the general public, etc. are some of the factors responsible for the uneven distribution of PPPs across states/regions in the country. However this need to be further explored in order to identify the reasons and seek remedial measures.

Further the paper finds that in India several PPPs are stalled at pipe line stage. Large number of projects will not cross this phase and some projects are stalled in construction phase even. Governments at the Centre and State levels need to strengthen the measures needed for quick transition of pipeline projects to implementation/completion stage.

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## Annexure

**Table1: Ranking and Score of Global Competitiveness Index and Infrastructure Quality Assessment of Selected Countries in Asia (2009-10)**

Countries	GCI		Infrastructure	
	Rank	Score	Rank	Score
<b>Developed and Newly Industrialized Asia (Average)</b>		<b>5.25</b>		<b>5.85</b>
Hong Kong, China	11	5.22	2	6.54
Japan	8	5.37	13	5.83
Korea, Republic of (ROK)	19	5.00	17	5.60
Singapore	3	5.55	4	6.35
Taipei, China	12	5.20	16	5.60
<b>Developing and Emerging Asia (Average)</b>		<b>4.10</b>		<b>3.44</b>
Bangladesh	106	3.55	126	2.39
<b>India</b>	<b>49</b>	<b>4.30</b>	<b>76</b>	<b>3.41</b>
Indonesia	54	4.26	84	3.20
Malaysia	24	4.87	26	5.05
Nepal	125	3.34	131	2.03
Pakistan	101	3.58	89	3.06
Philippines	87	3.90	98	2.91
Peoples Republic of China (PRC)	29	4.74	46	4.31
Sri Lanka	79	4.01	64	3.88
Thailand	36	4.56	40	4.57
Viet Nam	75	4.03	94	3.00

**Source:** World Economic Forum (WEF) 2010

**Table 2: Sector Wise PPP Investment of the Developing World (in current US million \$)**

Year	Energy	Transport	Telecom	Water & Sewerage	Total
1990	592	7,615	4,477		12684
1991	992	3,015	9,451	75	13533
1992	8,691	3,632	6,518	284	19125
1993	12,413	4,589	9,153	6,629	32784
1994	13,904	6,761	13,925	1,346	35936
1995	19,579	7,874	12,885	1,813	42151
1996	28,052	15,617	20,905	1,304	65878
1997	43,819	18,731	34,470	9,966	106986
1998	28,634	15,189	47,147	2,327	93297
1999	19,859	7,393	31,937	6,364	65553
2000	24,457	8,099	39,592	7,211	79359
2001	15,779	7,960	39,645	1,856	65240
2002	12,938	4,416	29,799	1,546	48699
2003	20,639	7,604	25,174	1,503	54920
2004	12,953	5,647	41,264	4,646	64510
2005	19,031	18,731	55,040	2,483	95285
2006	26,441	31,983	60,964	2,599	121987
2007	50,239	29,584	69,510	3,426	152759
2008	55,578	25,901	77,234	2,861	161574
2009	71,815	21,618	59,493	1,997	154923
2010	79,397	30,506	74,224	2,353	186480
2011	72,568	35,944	60,229	2,626	171367
2012	76,763	48,201	52,367	4,036	1,81,367
Total investment	7,15,133	2,53,197	8,75,399	69,251	1912980
% to total	37.38	13.24	45.76	3.62	100.00
Average Sectoral investment	25%				

**Source:** Private Participation in Infrastructure (PPI) Database of the World Bank. 2013

**Table 3: Top 10 Countries by PPI Projects, 1990-2009**

Country	Project Count	Project investment (US\$ million)
China	1,064 (29)	1,19,330 (8)
India	725 (19)	3,06,325 (22)
Brazil	643 (17)	4,01,969 (28)
Russian Federation	337 (9)	1,27,101 (9)
Argentina	214 (6)	90,777 (6)
Mexico	204 (5)	1,14,855 (8)
Colombia	140 (4)	Not available
Turkey	138 (4)	86,088 (6)
Chile	134 (4)	Not available
Philippines	123 (3)	58,223 (4)
	3,722 (100)	

**Note:** values in the parenthesis are percent to total.

**Source:** compiled from World Bank PPI database, 2014



**Table 4: PPP Projects in Central and State Sector (as on December 2009)**

SI No	Sector	Completed Projects		Projects under Implementation		Projects in Pipeline		Total	
		No of Projects	Project Cost (Rs. in crore)	No of Projects	Project Cost (Rs. in crore)	No of Projects	Project Cost (Rs. in crore)	No of Projects	Project Cost (Rs. in crore)
(A) Central sector									
1	National Highways	39	13698	64	41911	81	76341	184	131950
2	Major Ports	23	5762	13	10509	29	18466	65	34737
3	Airports	3	5883	2	18777			5	24660
4	Railways			4	4717	50	90000	54	94717
	<b>Total (A)</b>	<b>65</b>	<b>25343</b>	<b>83</b>	<b>75914</b>	<b>160</b>	<b>18480</b>	<b>308</b>	<b>286064</b>
(B) State Sector									
1	Roads	96	6384	69	60865	86	39482	251	106731
2	Ports	20	19704	37	51549	18	17436	75	88689
3	Airports			1	500	13	4120	14	4620
4	Railways			1	500	3	312	4	812
5	Power	7	8971	8	28392	34	62032	49	99396
6	Urban Infrastructure	51	6105	74	19738	67	45838	192	71681
7	Other sectors	2	120	19	3663	31	22534	52	26307
	<b>Total (B)</b>	<b>176</b>	<b>41284</b>	<b>209</b>	<b>165197</b>	<b>252</b>	<b>19175</b>	<b>637</b>	<b>398235</b>
	<b>(C) Grand Total (A+B)</b>	<b>241</b>	<b>66627</b>	<b>292</b>	<b>241111</b>	<b>412</b>	<b>37656</b>	<b>945</b>	<b>684299</b>

Source: compiled from the Compendium of PPP projects, Ministry of Finance, GOI; 2010

**Table 5: Sector Wise Distribution of Infrastructure PPP Projects**

SI No	Sector	Completed Projects		Projects under Implementation		Projects in Pipeline		Total	
		No of Projects (% to total projects)	Project Cost (% to total)	No of Projects (% to total projects)	Project Cost (% to total)	No of Projects (% to total projects)	Project Cost (% to total)	No of Projects (% to total projects)	Project Cost (% to total)
(A) Central sector									
1	National Highways	16.18	20.56	21.92	17.38	19.66	20.27	19.47	19.28
2	Major Ports	9.54	8.65	4.45	4.36	7.04	4.90	6.88	5.08
3	Airports	1.24	8.83	0.68	7.79			0.53	3.60
4	Railways			1.37	1.96	12.14	23.90	5.71	13.84
	<b>Total (A)</b>	<b>26.97</b>	<b>38.04</b>	<b>28.42</b>	<b>31.49</b>	<b>38.83</b>	<b>49.08</b>	<b>32.59</b>	<b>41.80</b>
(B) State Sector									
1	Roads	39.83	9.58	23.63	25.24	20.87	10.48	26.56	15.60
2	Ports	8.30	29.57	12.67	21.38	4.37	4.63	7.94	12.96
3	Airports			0.34	0.21	3.16	1.09	1.48	0.68
4	Railways			0.34	0.21	0.73	0.08	0.42	0.12
5	Power	2.90	13.46	2.74	11.78	8.25	16.47	5.19	14.53
6	Urban Infrastructure	21.16	9.16	25.34	8.19	16.26	12.17	20.32	10.48
7	Other sectors	0.83	0.18	6.51	15.19	7.52	5.98	5.50	3.84
	<b>Total (B)</b>	<b>73.03</b>	<b>61.96</b>	<b>71.58</b>	<b>68.51</b>	<b>61.17</b>	<b>50.92</b>	<b>67.41</b>	<b>58.20</b>
	<b>(C) Grand Total (A+B)</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>

Source: computed from the Compendium of PPP projects, Ministry of Finance, GOI;2010

**Table 6: Central Sector PPPs in Terms of Investment (Rs crore) as on 2009**

SI No	States	A. completed projects	B. Projects under implementation stage	C. Projects under pipeline stage	Total projects (A+B+C)	% to total	States Ranks
1	Andhra Pradesh	4848 (9)	4489 (4)	7252 (12)	16589 (25)	8.64 (8.12)	3 (2)
2	Assam		340 (1)	3556 (4)	3896 (5)	2.03 (1.62)	15 (16)
3	Bihar		1918 (3)	6103 (5)	8021 (8)	4.18 (2.6)	10 (11)
4	Chhattisgarh	70 (1)	1078 (3)		1148 (4)	0.6 (1.3)	19 (18)
5	Delhi	710 (1)	11135 (3)	4252 (2)	16097 (6)	8.38 (1.95)	4 (14)
6	Goa		252 (1)	752 (3)	1004 (4)	0.52 (1.3)	20 (18)
7	Gujarat	3095 (9)	4182 (4)	5623 (8)	12900 (21)	6.72 (6.82)	6 (4)
8	Haryana	1125 (4)	2288 (1)	2157 (3)	5570 (8)	2.9 (2.6)	13 (11)
9	Himachal Pradesh			536 (1)	536 (1)	0.28 (.32)	21 (21)
10	Jammu and Kashmir			9211 (6)	9211 (6)	4.8 (1.95)	8 (14)
11	Jharkhand		625 (1)	1436 (1)	2061 (2)	1.07 (.65)	17 (20)
12	Karnataka	2887 (3)	2811 (7)	4734 (8)	10432 (18)	5.43 (5.84)	7 (5)
13	Kerala	1266 (3)	7991 (4)	5587 (7)	14844 (14)	7.73 (4.55)	5 (7)
14	Madhya Pradesh	518 (2)	2356 (5)	409 (1)	3283 (8)	1.71 (2.6)	16 (11)
15	Maharashtra	2762 (6)	17548 (11)	10972 (6)	31282 (23)	16.29 (7.47)	1 (3)
16	Orissa	88 (3)	1070 (2)	3707 (7)	4865 (12)	2.53 (3.9)	14 (9)
17	Punjab		1469 (4)	292 (1)	1761 (5)	0.92 (1.62)	18 (16)
18	Pondicherry		285 (1)		285 (1)	0.15 (.32)	22 (21)
19	Rajasthan	1395 (4)	795 (1)	5067 (5)	7257 (10)	3.78 (3.25)	11 (10)
20	Tamil Nadu	4125 (12)	8005 (16)	14412 (18)	26542 (46)	13.82 (14.94)	2 (1)
21	Uttar Pradesh	195 (1)	3750 (9)	4320 (4)	8265 (14)	4.3 (4.55)	9 (7)
22	West Bengal	1753 (7)		4428 (8)	6181 (15)	3.22 (4.87)	12 (6)
23	Not mentioned*		3217 (2)	90000 (50)	93217 (52)	32.68 (16.88)	
	Total	24837 (65)	75604 (83)	184806 (308)	285247 (100)		
	Mean	1774.07	3780.2	8800.29	12402.04		
	Average number of projects per state				11.64		

**Note:** 1. Values in the parenthesis are in terms number of projects  
2. \* projects (Railway etc) are not yet mentioned for the particular state;  
3. @While ranking the States item no 23 is not considered

**Source:** computed from the Compendium of PPP projects, Ministry of Finance, GOI;2010

**Table 7: State Sector PPPs in Terms of Investment (in Rs crore) as on 2009**

SI No	States	A. completed projects	B. Projects under implementation stage	C. Projects under pipeline stage	Total projects (A+B+C)	% to total	States ranks in terms of % to total investment
1	Andhra Pradesh	8887 (31)	20895 (23)	23797 (37)	53579 (91)	13.48 (14.56)	4 (2)
2	Assam	102 (1)	852 (5)	3783 (10)	4737 (16)	1.19 (2.56)	13 (13)
3	Bihar	4 (1)		6452 (10)	6456 (11)	1.62 (1.76)	10 (15)
4	Chandigarh	15 (1)	60 (1)	25 (1)	100 (3)	0.03 (.48)	21 (20)
5	Chhattisgarh	50 (3)	1578 (6)	1910 (14)	3538 (23)	0.89 (3.68)	14 (10)
6	Delhi	15 (1)	513 (5)		528 (6)	0.13 (.96)	18 (18)
7	Gujarat	25709 (37)	29701 (47)	43509 (40)	98919 (124)	24.9 (19.84)	2 (1)
8	Haryana	75 (4)	9725 (7)	1769 (3)	11569 (14)	2.91 (2.24)	6 (14)
9	Jharkhand		376 (3)	150 (2)	526 (5)	0.13 (.8)	19 (19)
10	Karnataka	67 (3)	289 (6)	130 (2)	486 (11)	0.12 (1.76)	20 (15)
11	Kerala	198 (6)	258 (9)	7625 (13)	8081 (28)	2.03 (4.48)	9 (7)
12	Madhya Pradesh	760 (11)	2890 (19)	1469 (13)	5119 (43)	1.29 (6.88)	12 (5)
13	Maharashtra	673(7)	22957 (25)	33057 (22)	56687 (54)	14.27 (8.64)	3 (3)
14	Orissa		6359 (7)	7330 (16)	13689 (23)	3.45 (3.68)	5 (10)
15	Punjab	531 (12)	744 (9)	8064 (18)	9339 (39)	2.35 (6.24)	7 (6)
16	Pondicherry	416 (1)		2785 (2)	3201 (3)	0.81 (.48)	15 (20)
17	Rajasthan	2033 (41)	6473 (7)	385 (3)	8891 (51)	2.24 (8.16)	8 (4)
18	Tamil Nadu	1319 (7)	2400 (8)	2009 (9)	5728 (24)	1.44 (3.84)	11 (9)
19	Uttarkhand			1672 (10)	1672 (10)	0.42 (.16)	17 (17)
20	Uttar Pradesh		57634 (7)	44917 (12)	102551 (19)	25.81 (3.04)	1 (12)
21	West Bengal	430 (9)	1415 (13)	97 (3)	1942 (25)	0.49 (4)	16 (8)
Total		41284 (176)	165119 (207)	190935 (240)	397338 (623)	100	-
Mean		1965.9	7862.81	9092.14	18920.86		

**Note:** Values in the parenthesis are in terms number of projects

**Source:** computed from the Compendium of PPP projects, Ministry of Finance, GOI;2010