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Public Private Partnership (PPP) Contract for Sustainable Road Infrastructure in Iraq

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Abstract: ***This study provides most suitable criteria and sub- criteria for successful PPP of sustainable road infrastructure in Iraq. Method of Study content , Identification OF Criteria and Sub - Criteria of the main components include (PPP's contract, sustainable road infrastructure, risks management and Allocation in the PPP's road projects) by Literature review ,then field survey included, Selection of Survey Respondents, questionnaire preparation, data collecting, Statistical analysis, and results evaluation .The questionnaire included 43Criteria Divided into 363 of sub Criteria .through the analysis of the data collection the research found that 174 from the 363 sub criteria have the highest RII so they can be used to support the successful of the PPP of sustainable road infrastructure in Iraq.***

Keywords: PPP's Contract, Sustainable, Toll roads, Infrastructure, Risk.

1. Introduction

Iraq suffers from weakness and poorly developed of infrastructure sectors in general and particularly in road sector. The lack of medium- and long-term strategy, low funding levels, institutional weaknesses and environmental damage due to continuing conflicts contribute in weak road infrastructure, which is the most influential sector in investment development. Lack of enough funds to cover all needs for Infrastructure Projects in Iraq to match international standards ,make the PPP contract "A partnership between the public sector and the private sector to deliver a project or a service traditionally provided by the public sector and allows each sector to do what it does best SO Risks are borne by those best able to manage them" [4] be the best way to improve infrastructure services .The adoption of this type of contract helps in the development of sustainable roads through the criteria adopted in the evaluation of contracts in terms of value for money and access to risk identification and allocation, and also enables the differentiation between the bidders through the criteria of sustainability and criteria for the successful partnership contracts reached Through field study and statistical analysis.

2. Sustainable Road Infrastructure

a road which must to satisfy lifecycle functional requirements of societal development as well as economic growth while offer enhancement to the natural environment ,in addition reduce consumption of natural resources. The sustainability characteristics of a highway project must be evaluated and considered for implementation over its lifecycle, from conception, construction, operations, finally maintenance [3].

3. Public–Private Partnerships (PPP'S) Contract in Road Infrastructure

The expression "public–private partnership" characterizes a range of potential relationships between public and private structures in the context of infrastructure and other services [1]. (PPPs) take a wide scope of forms changing in the extent of participation of, in addition the risk taken by the private sector. The figure (1) depicts the vision of PPP agreements [13]. There are different forms PPP contracts that deliver the five components of a typical infrastructure project (Design, Construction,-Service Operation, Ongoing Maintenance and Finance). They have been classified according to the different typical roles that the partners play, as presented in figure (2) [12]. A number of forms of PPP that can be used IN development of National Highways [7]:

- Build, Operate and Transfer (BOT) Toll (from Project to Private Sector).
- Build, Operate and Transfer (BOT) Annuity (from Public to Private Sector).
- Operations, Maintenance and Transfer (OMT).
- Special Purpose Vehicle (SPV) for Port Connectivity Projects.
- Through the field study, the type (BOT Toll) is preferred by government agencies in Iraq.

3.1Toll road

It is a public or private road for which a charge is appreciated for passage. It is implemented to help recover the cost of road construction and maintenance [6] Toll roads have existed for at least the last 2,700 years, as tolls had to be paid by travelers using the Susa–Babylon highway under the regime of Ashurbanipal, who reigned in the 7th century BC [10]

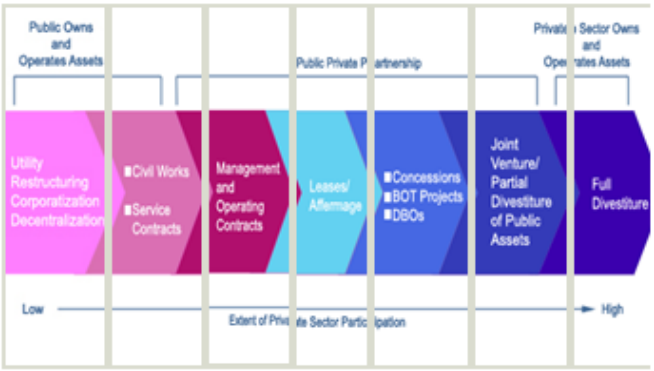
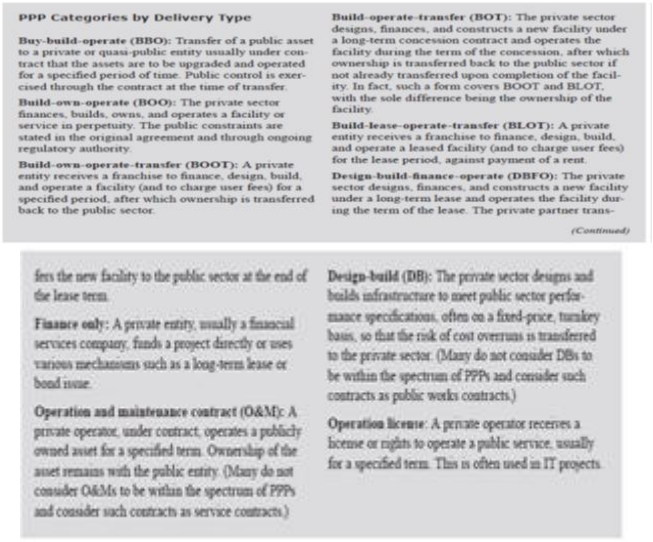


Figure 1: vision of PPP agreements [13]



PPP Categories by Delivery Type

Buy-build-operate (BBO): Transfer of a public asset to a private or quasi-public entity usually under contract that the assets are to be upgraded and operated for a specified period of time. Public control is exercised through the contract at the time of transfer.

Build-own-operate (BOO): The private sector finances, builds, owns, and operates a facility or service in perpetuity. The public constraints are stated in the original agreement and through ongoing regulatory authority.

Build-own-operate-transfer (BOOT): A private entity receives a franchise to finance, design, build, and operate a facility (and to charge user fees) for a specified period, after which ownership is transferred back to the public sector.

Build-operate-transfer (BOT): The private sector designs, finances, and constructs a new facility under a long-term concession contract and operates the facility during the term of the concession, after which ownership is transferred back to the public sector if not already transferred upon completion of the facility. In fact, such a form covers BOOT and BLOT, with the sole difference being the ownership of the facility.

Build-lease-operate-transfer (BLOT): A private entity receives a franchise to finance, design, build, and operate a leased facility (and to charge user fees) for the lease period, against payment of a rent.

Design-build-finance-operate (DBFO): The private sector designs, finances, and constructs a new facility under a long-term lease and operates the facility during the term of the lease. The private partner trans-

(Continued)

fers the new facility to the public sector at the end of the lease term.

Finance only: A private entity, usually a financial services company, funds a project directly or uses various mechanisms such as a long-term lease or bond issue.

Operation and maintenance contract (O&M): A private operator, under contract, operates a publicly owned asset for a specified term. Ownership of the asset remains with the public entity. (Many do not consider O&Ms to be within the spectrum of PPPs and consider such contracts as service contracts.)

Design-build (DB): The private sector designs and builds infrastructure to meet public sector performance specifications, often on a fixed-price, turnkey basis, so that the risk of cost overruns is transferred to the private sector. (Many do not consider DBs to be within the spectrum of PPPs and consider such contracts as public works contracts.)

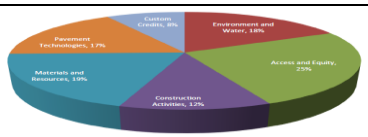
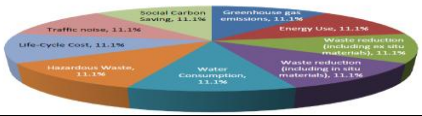
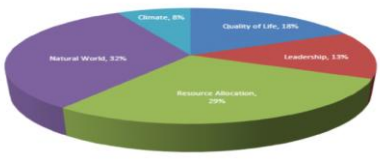
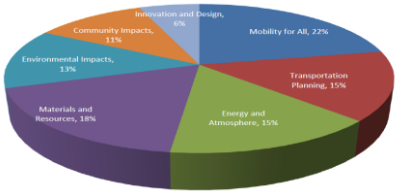
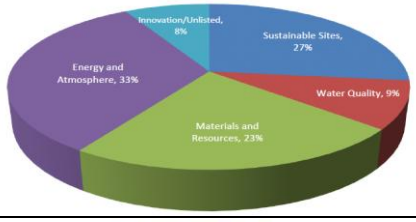
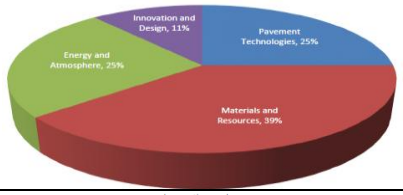
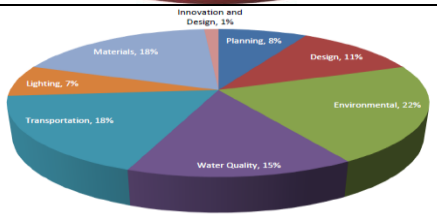
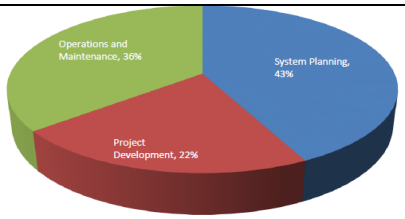
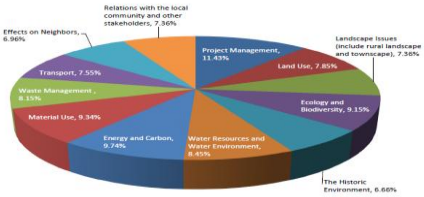
Operation license: A private operator receives a license or rights to operate a public service, usually for a specified term. This is often used in IT projects.

Figure 2: PPP forms by Delivery Type [12]

4. Rating System for Sustainable Road Infrastructure

Sustainability rating system is basically a list of sustainability best practices with a related common metric, usually points, which is used to quantify each best practice in a common unit. [5], major rating systems with percentage of total credit points allocated per category include in table (1):

Table 1: rating systems with percentage of total credit points allocated per category

Rating system	Category & credit points
Green Roads [8]	
2BE2ST-In-Highways [11]	
Envision [8]	
Green Guide for Roads [11]	
Green LITES [11]	
Green Pave [11]	
I-LAST [11]	
INVEST [11]	
CEEQUAL [11]	

5. Identifying and Sharing of Risks associated with PPP in road infrastructure

PPP includes several of risks, the project risks are allocated to the sector that is the better equipped to manage the risks in most cost effectively [9]. The major risks related with PPP projects could be described in table (2)

Table 2: The major risks associated with PPP in road projects (researcher based on resources [7], [14])

Risk type/ allocation	Description
Feasibility / Organizational Risk/ Public sector	This may relate to the selection of the right type of PPP arrangement suitable for the project. Unless the Public sector has considered different alternatives for implementing the project and selected the most appropriate set up, the project may not succeed in the long run.
Condition Precedent Risks/ Private	The public sector partner will have to fulfill several conditions precedent to enable the private sector partner to start work on the

sector	project, including making available the required land and assets etc., and environmental and other statutory clearances.
Construction Risk/ Private sector	The concessionaire is required to commence construction works when the financial close is achieved or earlier date that the parties may determine by mutual consent. The concessionaire shall not be entitled to seek compensation for any prior commencement and shall do it solely at his own risk.
O & M Risk/ Private sector	Concessionaire to operate and maintain the project facility (includes road and road infrastructure as specified in the concession agreement). Failure to repair and rectify any defect or deficiency within specified period shall be considered as breach of responsibility.
Financial Risk/ Private sector	The concessionaire shall at its cost; expenses and risk make such financing arrangement as would be necessary to finance the cost of the project and to meet project requirements and other obligations under the agreement, in a timely manner.
Traffic Risk/ Private sector	The MCA (Model Concession Agreement) provides for increase or decrease of the concession period in the event the actual traffic falls short or exceeds the target traffic.
Force Majeure Risk/ Public sector	Force Majeure shall mean occurrence of any or all of Non-Political Event(s), Indirect Political Event(s) and Political Event(s).

6. Successful criteria of PPP's contract

The main PPP's contract Successful criteria are presented in figure 3.

Figure 3: PPP's contract criteria (researcher based on [2])

7. The Practical Survey

The practical Survey distributed in two phases, as follows:

1) Open questionnaire phase: through personal interviews with experts.
2) Closed questionnaire phase: through questionnaire form.

7.1 Open questionnaire phase:

Researchers carried out a personal interviews with experts and different specialists who have an experience in road projects such as engineers, Legal advisers, administrators and economists, So that the researcher can know the Commonplace with PPP's Procurement in road infrastructure in the institutions and companies specialized in road works and Their opinion about the Private sector contribution in the development of road infrastructure .The other purpose of interviews ,To verify the Comprehensive of the criteria and their relevance to the Iraqi road sector

7.2 Closed questionnaire phase

Questionnaire has been prepared, then distributed to the engineers, specialists and Academics working in both of public and privet sectors to find out the relative importance index of the criteria that should be applied in sustainable road infrastructure projects that implement through PPP system The preparation of the questionnaire was based on the literature reviews, and the opinion of experts .The questionnaire included three fundamental components ,each component Consists of main criteria as presented in table (3) .Through the questionnaire an assessment of the importance priorities where selected by Survey Respondents according to a Likert scale ranging from 1 to 5(5 = the criterion is a very importance , to 1 = the criterion is few importance).

Table 3: Fundamental components of PPP contract in sustainable road infrastructure

No,	Criteria
	First component: The PPP's contract , include twelve main criteria and 66 sub-criteria
1	Project is Viable criteria
2	PPP is marketable criteria
3	PPP is fiscally responsible criteria
4	Increase the scheme to generate economies of scale criteria
5	Design Innovation criteria
6	Managerial criteria
7	Financial Criteria
8	Technical Criteria
9	Reduce Capital Costs criteria
10	Lower costs through economies of scale criteria
11	Increase effectiveness criteria
12	Safety, Health and Environmental Criteria
	Second component: Sustainable road infrastructure component, include thirteen main criteria and 164 sub-criteria
1	Planning criteria
2	Project Requirements (PR) criteria
3	Design criteria
4	Environment criteria
5	Water Reduce impervious area criteria
5	Storm water treatment Criteria

7	Transportation Planning Criteria
8	Materials and Resources Criteria
9	Construction Activities criteria
11	Pavement Technologies criteria
12	Reduced Electrical Consumption & Atmosphere criteria
13	Stray Light Reduction criteria
14	Community Impacts criteria
	Third component: Allocation and management the risks in the PPP's road projects component, include eighteen main criteria and 134 sub-criteria
1	Feasibility Approvals and consents with State responsibility criteria
2	Detailed Design approvals criteria
3	Working (Construction) Drawings Delay in final approval of detailed design criteria
4	Design fault criteria
5	Site Risk criteria
6	Construction Risk Criteria
7	Force Majeure Criteria
8	Revenue Risk Criteria
9	O&M Risk criteria
10	Performance Risk criteria
11	Other market criteria
12	Political Risk criteria
13	Default Risk criteria
14	Strategic Risk criteria
15	Financial risk criteria
16	Commercial Risk criteria
17	Collection enforcement risk criteria
18	Project completion risks criteria

7.3Statistical Analysis

The data collected was analyzed, (364) sub criteria were considered for ranking by the Relative Importance Index (RII) method, by using equation below:

$$RII = \sum_{k=0}^{n}(X1 * S1 + X2 * S2 + X3 * S3 + \cdots Xn * Sn\ 3)/(A * N)$$

Where:
RII= the Relative Importance Index
S = weights given to each factor by the respondents and will ranges from 1 to 5 where '1' is less significant and '5' is extremely significant.
X= frequency of each rating for each factor or option
N=total number of responses for that factor or option
A = highest weight (i.e. 5 in this case)

In statistics, the factors that can be taken must get RII greater than 60% and exclusion of others that got less than 60%, however for the purposes of this study, researcher will take the first ranking sub-criteria Which amounted to (174) sub criteria, because the researcher believes that is the most important and reality of road infrastructure in Iraq, and also reduce time-consuming.

8. Results

The researcher reached the most important sub-criteria which can be used in evaluating PPP contract in road infrastructure implementation as shown in the table (4) below:

Table 4: Ranking of criteria and sub criteria according to RII

No.	Criteria and sub- criteria	%
	First component: sub - criteria for the PPP's contract (39)	
	1)Project is Viable	
1	Economically viable based on expert judgment or an economic prefeasibility study	77.2
2	Technically feasible based on expert judgment or prefeasibility studies	74
3	Effective in meeting government objectives	73.2
4	legally feasible, based on expert judgment or preliminary legal analysis	72.4
5	Functions are optimally allocated between the private and public sectors maximizing incentives for performance, accountability, and the use available expertise	71.6
	2) PPP is marketable	
1	PPP is a viable "commercial project" the project's revenues (from users, the Government, or both) would cover costs and provide a rate of return sufficient for the private sector to consider the PPP	72.4
2	Market has sufficient capacity and desire (that there is sufficient market interest from qualified private parties)	72.4
	3) PPP is fiscally responsible	
1	Likely cost of Government support is consistent with fiscal priorities based on budget projections and pre-feasibility level estimates of the project's costs and revenues	67.2
2	Fiscal risk would not be destabilizing	62.4
	4) Increase the scheme to generate economies of scale	
1	Adding extra facilities/services which support for other customers	72
	5) Design Innovation	
1	Adding in 'higher technology' or including built in technology improve to save labour or reduce other ongoing costs	73.6
2	Redesigning the scheme in some way to make it more efficient and therefore have a lower charge	73.2
3	Using new building techniques through design team integration to provide lower maintenance and life cycle costs	71.6
	6) Managerial Criteria	
1	Project management skills	79.2
2	Constitution of the management, their qualification and experience	77.2
3	Leadership and allocation of responsibilities in the consortium	74
4	Working relationships among participants	72.8
5	Coordination system within the consortium	72
	7) Financial Criteria	
1	Right Financial Advice	78
2	Concession period	77.2
3	Financial Strength of the participants in the project company	76.8
4	Strong Financial commitments from Shareholders	72
5	Ability to address commercial risk (e.g.: supply and demand risks)	71.6
	8) Technical Criteria	
1	Qualifications and experiences of key design and construction personnel.	83.2
2	appropriate to design requirements	81.2
3	Efficiency of designers/sub designers	80.8
4	Efficiency Contractor/subcontractor	80.4
5	Design Standard	76
	9) Reduce Capital Costs	

1	Longer term materials that have lower replacement cycles such as high tech roofing	74
2	Tighter control over subcontractors who may take an equity stake in the project	73.6
	10) Lower costs through economies of scale	
1	Provision by large multidisciplinary specialist FM (Facilities management) providers	66.8
	11) Increase effectiveness	
1	Increasing the throughput to take advantage of positive combination between higher volumes of work and better outcomes for users	75.2
2	Changing the quality of the facility, or the incorporate technology, to make it better for users	71.2
	12) Safety, Health and Environmental	
1	Conformance to laws and regulations	75.6
2	Control of air and water pollution	73.6
3	Management safety accountability	71.6
4	Protection of items of cultural/archeological values	70.8
	Second component: sub-criteria for the sustainable road infrastructure(64)	
	1) Planning	
1	Use of ITS technologies (in addition to Responsive Traffic Signals) to improve mobility without adding capacity and/or improve the efficiency of transit systems	75.2
2	Design Speed & Consistency, To encourage selection of design speeds and speed consistency within and adjacent to the roadway	74.4
3	Support and enhance public health by investing in active transportation modes	73.2
4	Reduce the energy and fossil fuel consumption from the transportation sector and document it in the transportation planning process	72.4
5	Optimize the efficiency of the existing transportation system	71.6
	2)Project Requirements (PR)	
1	Have a roadside maintenance plan	77.6
2	Have a pavement management system	74
3	Lifecycle Cost Analysis (LCCA) : Perform LCCA for pavement section	72.4
4	Educational Outreach : Publicize sustainability information for project	71.2
5	Lifecycle Inventory (LCI) : Perform LCI of pavement section	70.4
	3) Design	
1	Adjust highway features using design flexibility	78.4
2	Incorporate locally produced or native materials	74.4
3	Reward exemplary performance. To give bonus credits to those who step beyond the minimum requirements for allotted credits	70.4
4	Bridge aesthetics	69.2
5	Visual enhancements	66.8
	4) Environment	
1	Environmental Management System , ISO 14001 certification for general contractor	76.4
2	Protect, Plant or Mitigate for Removal of Trees and Plant Communities (to improve carbon sequestration and enhance the visual and natural environment)	74.8
3	Minimize potential salt splash impacts through use of berms or vegetative screening	72.4
4	Incorporate traffic system management techniques to reduce existing noise levels	70.4
5	Provide sound insulation to public or non-profit institutional	65.6
	5) Reduce impervious area	
1	Shoulders constructed of permeable pavement	64.8
2	Replacement of paved bike paths with permeable pavement or permeable material	64.8
3	Replacement of paved median	60.8
	6) Storm water treatment	
1	Runoff Flow Control (Reduce runoff quantity)	73.2
2	Site Vegetation (Use native low/no water vegetation)	71.2
3	Storm water Cost Analysis (Conduct an LCCA for storm water elements)	70.8
4	Runoff Quality (Treat storm water to a higher level of quality)	69.6
5	Use of bio retention cells	68.8
	7) Transportation Planning	
1	Level of Service To encourage a provision of appropriate levels of mobility over the longer term	74
2	Allow reclaiming sub base granular material	73.2
3	Hazardous Material Minimization	72
4	Recycled Content	70.8
5	Locally Provided Material	70
	9) Construction Activities	
1	Quality Management System ISO 9001 certification for general contractor	77.6
2	Contractor Warranty , Warranty on the constructed pavement	74.8
3	Site Recycling Plan, Have a plan to divert waste from landfill	69.2
4	Paving Emissions Reduction	69.2
5	Environmental Training	68.4
	10) Reduced Electrical Consumption & Atmosphere	
1	Use of high efficiency traffic signals	79.2
2	Retrofit existing street lighting with high efficiency types	78.4
3	Use of high efficiency street lighting on new installations	76.8
4	Use of alternative energy source to power street lighting, warning signs, and remote Intelligent Transportation Systems	76.4
5	Replace signs with retro reflective signs(Retro reflective sheeting for road signs) to eliminate sign lighting	76
	11) Stray Light Reduction	
1	Retrofit existing roadway lighting fixtures using cut off or full cut	73.6
2	New roadway lighting using cut off or full cut off fixtures	70
	12) Community Impacts	
1	Traffic Noise Reduction, associated with motorized traffic	70.8
2	Noise Mitigation Plan, the reduction of noise levels associated with construction activities	70
3	Visual Elements	68
4	Light Pollution Reduction	67.6
	13) Operations and Maintenance OM	
1	Maintenance Management System	81.2
2	Highway Infrastructure Preservation and Maintenance	80.8
3	Bridge Management System, (BMS)	80.4
4	Reuse and Recycle of materials	78
5	Pavement Management System	77.2
	Third component: sub- criteria for allocation and management the risks in the PPP's road projects (71)	
	1) Feasibility Approvals and consents with State responsibility	
1	Feasibility Study should address issues that could	77.6

	influence the success of a potential project and assess the advantages and disadvantages of each option so they can be ranked.	
2	Environmental approvals	74.4
3	Utilities e.g. water,	72.4
4	What is the width requirement of the corridor	71.6
5	Archaeological issues	70.4
	2) Detailed Design approvals	
1	Application for detailed building approvals from local or regional authority unless law retains Approvals for State	76.8
	3) Working (Construction) Drawings Delay in final approval of detailed design	
1	Changes in design and construction standards during the Construction Period	74
2	Drawings required for construction on site	72.4
	4) Design fault	
1	New travel demand tools	70.4
2	Technical Innovation) Noise-reducing asphalt, Water-saving pavement…etc.)	68.4
3	Errors in the tender specification	65.6
	5) Site Risk	
1	Site Security	74.4
2	Obtaining Ministerial or owner consent to use additional land	72.4
3	Access risks	72
4	Land acquisition within right of-way	71.6
5	Cultural/archaeological/heritage	71.6
	6) Construction Risk	
1	Quality assurance and quality control	76.8
2	Fit for purpose manuals, approvals and statutory certificates	79.2
3	Achieving Construction	77.2
4	Time and costs to satisfy commissioning	74.4
5	Delays caused by State	74
	7) Force Majeure	
1	Natural disaster, terrorism, war	81.6
2	Intensive or extended event leading to termination	73.6
3	Political Force Majeure	73.6
4	Social unrest problem	70
5	Uninsurable risks (throughout the concession)	66.8
	8) Revenue Risk	
1	Changes in taxes and tariffs	72.4
2	Volume risk	67.6
3	Contractual breaking by government-owned supported network	65.6
4	Underperformance caused by Utilities	64.8
5	Contractual breaking by private supplier	63.6
	9)O&M Risk	
1	Increased maintenance due to traffic volume	74.8
2	Incorrect estimates and cost overruns	72.4
3	Bad workmanship	71.6
4	Actual operating and maintenance costs higher than anticipated	70
5	Design deficiency	68
	10) Performance Risk	
1	Increased legal load limits	74
2	Meeting hand back standards	72.4
3	Overloaded Vehicles	70.8
4	Traffic accidents	68.8
5	Off road incidents	67.6
1	Inflation on Operation, Maintenance, Rehabilitation	78.8
2	Inflation on Construction Costs	69.6
3	Refinancing	69.6
4	Currency fluctuations	67.6
5	Costs of finance on change of requirements	66.8
	12) Political Risk	
1	Constraints on Foreign Investors after investment	74
2	Public sector budgeting cycles	70.4
3	Change in law , General , Special	69.6
4	Support from local/ state govt.	69.2
5	Termination of agreement by govt.	68.8
	13) Default Risk	
1	Termination	64.8
2	Combination of risks	62
3	Sponsor suitability risk	61.6
	14) Strategic Risk	
1	Change in Ownership of Concessionaire	71.2
2	Conflict of Interest Among Shareholders of Concessionaire	70
	15) Financial risk	
1	High cost of financing Risk	73.6
2	Inflation rate volatility	72.8
3	Interest rate volatility	70.8
4	Financial closure risk	68.8
5	Poor financial market	68.8
	16) Commercial Risk	
1	Alternative road capacity (competing facilities, development of adjacent roads)	71.6
2	Delay by govt. notification of toll	71.2
3	Slow economic	67.2
4	Non competing facility	66.8
5	Lack of demand	66.4
	17) Collection enforcement risk	
1	Legal disputes over authority to collect tolls	70.8
2	Enforcement of automated toll payments	69.6
	18) Project completion risks	
1	Defects in construction,	70
2	Quality shortfalls within construction consortium control or due to poor management in relation with subcontractors	70.8
3	Within public partner's control (technical specification in the tender)	70.8

Conclusion

The research concluded that:

1) In spite of PPP has been used widely used in the West & East of the world, but still in conceptual design stage in Iraq.
2) Obstacles to the use of PPP contract in general:
   - Political conditions which constitute the most important reasons for the departure of the private sector participation, especially for this system, which is characterized by a long period of time
   - Lack of payment culture versus traffic on highways in Iraq (toll road).
   - The delay in the issuance of partnership law yet, and the survival of the investment law as the only concept of partnership between the public and private sector.

Future Scope

1) Utilization the research results in the evaluation of the partnership contracts from the perspective of the two sectors and makes the projects more attractive to the private sector.

2) To raise awareness in the public sector institutions as well as for the people about the importance of partnership between the two sectors and the ability of toll road in providing comfort, safety and Reduce mobility time.
3) Tariff design and adjustment to fit traffic growth and serve the public and private sector

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