Abstract
Since the first loan in 1981 used for the Chinese universities project, the World Bank’s cumulative lending amount to China as of 2007 fiscal year was close to US$42.2 billion for a total of 284 development projects. The World Bank projects in China have great impact on piloting reforms and supporting institutional development. This research analyzes project portfolio of World Bank projects in China. Data has been mainly collected from the World Bank’s archives, project monitoring reports, and published reports. This research develops two major strategic models are being developed: (1) the program management of transportation, urban development, rural development, and energy projects; (2) the portfolio management of the four sectors. The models proposed by this project will help connect the World Bank projects to the national goals. The results of this project suggest that these same portfolio management concepts could possibly also be applied to other projects.

Keywords: Project Portfolio Management

The Five Themes of Country Partnership Strategy
Given China’s financial circumstances and its appropriate development program, the Bank Group aims to be a client-driven knowledge institution that uses lending and other operations to pilot reforms and to support institutional development. The Country Assistance Strategy has been also called the Country Partnership Strategy. This Country Partnership Strategy (CPS) focuses on five thematic areas of engagement that build on the Bank Group’s international expertise while maximizing the creation and dissemination of knowledge of China’s development processes inside and outside China. In particular, the Bank Group aims to help (China Country Management Unit, 2006):

• **Pillar 1**
Integrate China into the world economy, by deepening its participation in multilateral economic institutions, reducing internal and external barriers to trade and investment, and contributing to its overseas development efforts.

• **Pillar 2**
Reduce poverty, inequality, and social exclusion, through promoting balanced urbanization, sustaining rural livelihoods, and expanding access to basic social and infrastructure services, particularly in the rural areas.

• **Pillar 3**
Manage resource scarcity and environmental challenges, through reducing air pollution, conserving water resources, and optimizing energy use (partly through pricing reforms), improving land administration and management, and observing international environmental conventions.

• **Pillar 4**
Deepen financial intermediation, by expanding access to financial services (especially among SMEs), developing the capital markets, managing systemic risks, and maintaining financial stability.

• **Pillar 5**
Improve public and market institutions, by improving firm competitiveness, reforming public sector units, and rationalizing intergovernmental fiscal relations.

In general, Bank Group interventions will aim to complete standard-setting model projects or transactions that promote innovation, create demonstration effects, and achieve best practices. The World Bank with credit worthiness is AAA-rated. AAA credit rating tells a lender or investor that the probability of the subject being able not to pay back a loan is almost zero.

The World Bank AAA will remain a large part of the program, supporting in particular Pillars 1, 4, and 5, where opportunities for lending and investment are limited. IBRD lending—which will also aim explicitly at learning—will support Pillars 2 and 3 and, to a modest extent, 4. Over the CPS period, it is expected that the Bank Group’s overall exposure to China will remain sExhibit or grow slowly. IBRD lending is expected to range over US$1.0 billion to US$1.5 billion a year.
The key risks to the Bank Group’s development effectiveness in China are stagnation in the reform
The Country Assistance Strategy Completion Report (CASCR) reviewed all 135 progress benchmarks from the 2003 CAS and provided a written assessment of progress made toward each benchmark, describing the World Bank contributions as well as key lessons learned. This resulted in a very detailed document with limited usefulness in providing an overall assessment of the World Bank’s performance.

To increase the utility of the CASCR, the 2003 CAS objectives have been rearranged according to the thematic structure of the new CPS. Exhibit 8 depicts the 2003 CAS sub-objectives mapped to the new CPS themes, with activities from objective 1 in the 2003 CAS divided into three parts corresponding to new CPS pillars 1, 4, and 5: integrating China into the global economy, reforming the financial sector, and strengthening institutions.

Over the CPS period, IBRD lending is expected to range over $1.0–1.5 billion a year. Lending is likely to involve the preparation of 10 to 12 projects per annum, all on IBRD terms, supplemented in selected poverty, social sector, and energy projects. The agriculture, energy, transportation and urban environmental development sector’s projects are selected from the all projects over FY06-08.
Approach to evaluate 24-project World Bank Case Study. In order to determine the potential performance of the 24-project case study, a four-phase process flow-chart was developed. These four phases are depicted in Exhibit 9. Using this flowchart, the 24 World Bank projects studied in the project could be better analyzed. For a detailed description of each of the projects selected for this case study, from Basic Information of the World Bank’s Projects in China (2006-2010):
- Strategy phase
  China Government and World Bank present some ideas, opportunities and needs. Some initial project proposals are created based on these ideas, opportunities and needs. The projects that support the Country Partnership Strategy are entered into the project pool. The 24 projects selected for this case study are aligned with the CPS.
- Project ranking
  Each of the 24 projects was ranked. The actual projects selected in 2006 were ranked by their actual EIRR (A). The same list was ranked by potential EIRR (B). Both lists were constrained by the US$1.2 billion investment level. This limit produced an actual total project quantity of 9 for the actual 2006 projects (A) and a project quantity of 8 for the projects with the highest EIRR potential (B).
  “A” Projects ranked by 2006 actual within limited US$1.2 billion investment;
  “B” Projects ranked by EIRR within limited US$1.2 billion investment.
- Resource balancing phase by sector and project types
  Projects ranked by EIRR alone might yield the highest overall EIRR. However they may not represent a balanced portfolio by sector and project type. Using historical levels of investment by sector and a reasonable ratio of project types (demo, build and sustain), the project portfolio is further balanced. This step is taken to ensure that all key sectors are represented in the portfolio. Also, projects at different points in the project life cycle (demo, build and sustain) can ensure that there is a continuous flow of new and developing projects included in the investment stream.
- Combined prioritization by EIRR and with resource balancing (C)
  The projects with the optimal combination of EIRR and balanced resources by sector and project type represent the portfolio with a potential higher rate of overall return vs. the actual project in 2006. (Note: The definition of Economic IRR and the resource balancing weighting factors will be describe in the next section.)

Phase 1: Strategy Phase
The 24-project pool was selected for this case study based on its strategic alignment with the 3 key World Bank pillars in 4 key sectors. (See Exhibit 1 Sources: Project Appraisal Document of each project, www.Worldbank.org.) The definitions of the pillars are listed as follows:
- Pillar 1: Integrate China into the world economy;
- Pillar 2: Reduce poverty, inequality, and social exclusion;
- Pillar 3: Manage resource scarcity and environmental challenges;
- Pillar 4: Deepen financial intermediation
- Pillar 5: Improve public and market institutions.

Phase 2: Project Ranking
In China, the World Bank consistently focuses on lending for infrastructure. Infrastructure bottlenecks are identified as a major impediment to growth and macro-stability, as well as to market integration. But these projects financed in infrastructure have often not performance well financially. The difference between project economic value and financial value - The project economic values of both inputs and outputs differ from their financial values because of market distortions created either by the government or by the private sector. Tariffs, export taxes and subsidies, excise and sales taxes, production subsidies, and quantitative...
restrictions are common distortions created by governments. Monopolies are a market phenomenon that can be created by either government or the private sector. Some market distortions are created by the public nature of the good or service. The values to society of common public services, such as clean water, transportation, road services, and electricity, are often significantly greater than the financial prices people are required to pay for them. (Pedro Belli, 2001, p. 46)

The Economic Internal Rate of Return (EIRR) calculation, which is very similar to the formula used to find the net present value, can be calculated using Formula 1.1 based on the cash flow described in Exhibit 10. Using Formula1.1, the value of “i” must be solved for the interest rate. The resulting value of “i” is EIRR.

Exhibit 3. 24-Project Pool Aligned with World Bank Pillars in key sectors

<table>
<thead>
<tr>
<th>Sector</th>
<th>Strategy</th>
<th>Pillar 1</th>
<th>Pillar 2</th>
<th>Pillar 3</th>
<th>Pillar 4</th>
<th>Pillar 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>Project 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Project 2</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Project 3</td>
<td>√</td>
<td>√</td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Project 4</td>
<td>√</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Energy</td>
<td>Project 5</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Project 6</td>
<td></td>
<td>√</td>
<td></td>
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<tr>
<td></td>
<td>Project 7</td>
<td></td>
<td></td>
<td>√</td>
<td></td>
<td></td>
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<tr>
<td>Transportation</td>
<td>Project 8</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Project 9</td>
<td>√</td>
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<td></td>
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<tr>
<td></td>
<td>Project 10</td>
<td></td>
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<td></td>
<td>√</td>
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<tr>
<td></td>
<td>Project 11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>√</td>
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<tr>
<td></td>
<td>Project 12</td>
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<td>Project 13</td>
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<td></td>
<td>Project 14</td>
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<td></td>
<td>Project 15</td>
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<tr>
<td>Urban Environment</td>
<td>Project 16</td>
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<tr>
<td></td>
<td>Project 17</td>
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<td>Project 18</td>
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<td>Project 19</td>
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<td>Project 20</td>
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<td>Project 21</td>
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<td>Project 22</td>
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<td></td>
<td>Project 23</td>
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<tr>
<td></td>
<td>Project 24</td>
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</tr>
</tbody>
</table>

where:
- Bi: Economic Benefit in year i;
- Ci: Economic Cost in year i;
- n: the number of years.

Exhibit 4. Project’s Cash Flow.

\[
0 = \sum_{i=1}^{n} \frac{(B_i - C_i)}{(1 + i)^n}
\]  

(1)

The process was:
1) The ranking of projects from the highest EIRR to the lowest;
2) The x-axis is the cumulative project costs;
3) The y-axis is the EIRR of projects from the highest to the lowest.

Exhibit 5. the World Bank’s Project Prioritization

Each of the 24 projects described in Appendix A was ranked using EIRR. Initially the actual projects
undertaken in 2006 were ranked by their actual EIRR. This rank yielded a return of 18.8% (See Formula 1.2). Then the same list of 24 projects was ranked by potential EIRR with a result of 26.6% EIRR. (See Exhibit 11 and Exhibit 3)

Not all 24 projects could be implemented because there is a US$1.2 billion investment limit imposed by the CPS. So, in 2006 only 9 of 24 projects could be implemented. If the projects ranked by highest potential EIRR were selected, 8 projects would have been selected.

Exhibit 6. 24 Projects Ranked by EIRR

<table>
<thead>
<tr>
<th>Project Name</th>
<th>EIRR %</th>
<th>WBLn %</th>
<th>Project Name</th>
<th>EIRR %</th>
<th>WBLn %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project 1</td>
<td>14.2</td>
<td>100%</td>
<td>Project 1</td>
<td>14.2</td>
<td>100%</td>
</tr>
<tr>
<td>Project 2</td>
<td>27.6</td>
<td>100%</td>
<td>Project 3</td>
<td>27.0</td>
<td>100%</td>
</tr>
<tr>
<td>Project 4</td>
<td>31.8</td>
<td>100%</td>
<td>Project 5</td>
<td>31.5</td>
<td>100%</td>
</tr>
<tr>
<td>Project 6</td>
<td>33.8</td>
<td>100%</td>
<td>Project 7</td>
<td>31.0</td>
<td>100%</td>
</tr>
<tr>
<td>Project 8</td>
<td>35.8</td>
<td>100%</td>
<td>Project 9</td>
<td>35.5</td>
<td>100%</td>
</tr>
<tr>
<td>Project 10</td>
<td>35.8</td>
<td>100%</td>
<td>Project 11</td>
<td>35.5</td>
<td>100%</td>
</tr>
<tr>
<td>Project 12</td>
<td>35.8</td>
<td>100%</td>
<td>Project 13</td>
<td>35.5</td>
<td>100%</td>
</tr>
<tr>
<td>Project 14</td>
<td>35.8</td>
<td>100%</td>
<td>Project 15</td>
<td>35.5</td>
<td>100%</td>
</tr>
<tr>
<td>Project 16</td>
<td>35.8</td>
<td>100%</td>
<td>Project 17</td>
<td>35.5</td>
<td>100%</td>
</tr>
<tr>
<td>Project 18</td>
<td>35.8</td>
<td>100%</td>
<td>Project 19</td>
<td>35.5</td>
<td>100%</td>
</tr>
<tr>
<td>Project 20</td>
<td>35.8</td>
<td>100%</td>
<td>Project 21</td>
<td>35.5</td>
<td>100%</td>
</tr>
<tr>
<td>Project 22</td>
<td>35.8</td>
<td>100%</td>
<td>Project 23</td>
<td>35.5</td>
<td>100%</td>
</tr>
<tr>
<td>Project 24</td>
<td>35.8</td>
<td>100%</td>
<td>Project 25</td>
<td>35.5</td>
<td>100%</td>
</tr>
<tr>
<td>Project 26</td>
<td>35.8</td>
<td>100%</td>
<td>Project 27</td>
<td>35.5</td>
<td>100%</td>
</tr>
<tr>
<td>Project 28</td>
<td>35.8</td>
<td>100%</td>
<td>Project 29</td>
<td>35.5</td>
<td>100%</td>
</tr>
<tr>
<td>Project 30</td>
<td>35.8</td>
<td>100%</td>
<td>Project 31</td>
<td>35.5</td>
<td>100%</td>
</tr>
<tr>
<td>Project 32</td>
<td>35.8</td>
<td>100%</td>
<td>Project 33</td>
<td>35.5</td>
<td>100%</td>
</tr>
</tbody>
</table>

This ranking of projects by actual and highest potential EIRR shows that there were potentially higher value projects in the portfolio that were not selected for implementation. For example out of 9 projects selected in 2006 and 8 projects with the highest EIRR potential, only 3 projects (#3, #4, and #15) were included in both lists.

Phase 3: Resource Balancing by Sector and Project Type

The World Bank projects in China are constrained by human resources, financial capacity, the World Bank’s limits on lending to China and the World Bank rational involvement. Also it is important that key sectors and project types are represented in the portfolio.

- Human Resources Constraint

The World Bank project managers consist of specialists from the different sectors. In a sector, the number of managers will not fluctuate quickly. The World Bank’s specialists must be trained for a long time. The project management offices need many specialists and consultants from China’s government sectors. These specialists in the project management office will monitor and execute the projects. The human resource capacity is a limiting factor for the number of projects that the organization can execute. China counterparts have often noted the importance of the heightened role of the World Bank’s country office in the dialogue and effectiveness of the assistance program. The presence in Beijing of the (decentralized) Country Director, growing numbers of highly skilled national staff, and some 20 international staff (some with long experience in China) has made it possible for the World Bank staff to inculcate China’s unique circumstances and collaborate with Chinese counterparts over extended periods. Often the World Bank’s more innovative work requires gestation and discussion for the government of China counterparts to understand and absorb the full implications, and frequent interactions between the World Bank and the government of China technical staff helps to facilitate this process.

- The Government of China Counterpart’s Ability Constraint

The World Bank’s loan to the project is often under 50% of the project total cost. China’s government sectors provide the remainder of the project investment. Due to the limitation of China’s national budget, the investment of government sectors in World Bank projects is fixed.

- The World Bank’s Limits on Lending to China

IBRD lending to China was increasingly constrained by the Bank’s limits on the share of its portfolio in a single country. As a result of this, IBRD lending, which had built up rapidly in the early 1990s to a peak of $3.3 billion in FY93, declined to below $1 billion by FY01. IBRD lending is expected to range over $1.0 billion to 1.5 billion a year. As discussed in section 5.6, the investment available for the 24 projects was US$1.2 billion.

- The World Bank Rationale for Involvement

The World Bank has made many important contributions, beyond filling local financing gaps, since it began engaging in the early 1980s, including upgrading technologies, introducing institutional reform and innovation, building human resource capacity, and supporting policy reform (including through support to the preparation of China’s 11th Five Year Program). The World Bank’s role in introducing international experience and expertise and as a provider of knowledge and innovation to catalyze reform is particularly valued. Respondents to the Client Survey indicated that the World Bank’s knowledge was its...
greatest value, followed by its financial resources and transfer of new project concepts. Not only is it important to invest in key sectors at an appropriate level and optimize resource availability, it is also important to have a continuous stream of projects at various points in execution. New, maturing and sustaining investments will ensure a continuous stream of new and enhanced project investments. For this research, 232 World Bank projects completed between 1983 and 2008 were divided into the three groups according to the projects’ objectives and how the projects were financed by the World Bank. These data are from the World Bank project information database.

1) A “demo” project is the first or second project in a subsector. The projects with shared international experience have strongly influenced the Chinese government as a demonstration project;  
2) A “building” project is the third and fourth project in a subsector. The projects will extend and share the experiences of the original demo projects;  
3) A “sustaining” project comes after the fourth project in a subsector. The projects financed by the World Bank mainly aim to help their financial stability over time.

From 1982 to 1997, the percent of “demo” projects fell from 100% to 0%, and there were no “demo” projects in the three years period of 1997, 1998, and 1999. The percent of “building” projects stayed about 30%. The percent of “sustaining” projects was about 80% in 1998 and 1999. The World Bank only fills the financial gap of the government of China. But the World Bank as a provider of knowledge and innovation to catalyze reform was not displayed in 1998 and 1999. (See Exhibit 12) In these two years, the impact of the World Bank in China was reduced. With China’s economy rapidly increasing, the financing gap of the government of China is shrinking. The IDA loaned to China had been closed. As a result, some proposals suggested that the World Bank China Office should have been closed.

However, the World Bank’s strategy of CAS 2003-2006, has strengthened “demo” projects. Based on the historical data of the World Bank projects from 1982 to 2006, the ratio of demo, build and sustain projects is 18%, 27% and 54%, respectively. The percent of “demo” projects in the transportation sector is lowest, at 12%. The transportation sector projects focus on highway and railway projects; they mainly fill the financing gap of China transportation sector. (See Exhibit 13) Except for the transportation sector, the other sectors include about 20-22% of “demo” projects. Based on this analysis and for this case study, I have proposed an average ratio of project types as follows: 20% “demo”, 30% “building” and 50% “sustaining.”

Exhibit 7. the World Bank’s Project Type by the Years

Exhibit 8. the World Bank’s Project Type by the Sectors

So, for this project, to maintain an appropriately balanced portfolio by sector and project type, I have chosen investment by sector and a proposed percentage investment by project type to ensure a continuous stream of investment. This approach will help ensure that investments in key sectors and project types on an annul basis can be maintained.

For this project, I have proposed the use of resource balance percentage by sector and project type as follows:

Sector:
1. Agriculture (15%)
2. Energy (15%)
3. Transportation (20%)
4. Urban Environment (50%)

Project Type:
1. Demo (20%)
2. Build (30%)
3. Sustain (50%)

The World Bank Project Resources Balancing
The World Bank’s projects in China focus on four sectors (agriculture, energy, transportation, and urban environment development). The projects from the four sectors are analyzed according to the project aim. Based on the results of section 5.7.4 that used historical data for resource constraints, financial capacity, the World Bank’s limits on lending to China, and the World Bank’s rationale for involvement, I have recommended percentages of investment by sector and project type within the US$ 1.2 billion limit. These percentages are represented in Exhibit 9 and Exhibit 10.

Exhibit 9. Proposed World Bank Project Portfolio Model of Resources Balancing

<table>
<thead>
<tr>
<th>Item</th>
<th>Demo</th>
<th>Build</th>
<th>Sustain</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>15%</td>
<td>30</td>
<td>45</td>
<td>75</td>
</tr>
<tr>
<td>Energy</td>
<td>15%</td>
<td>30</td>
<td>45</td>
<td>75</td>
</tr>
<tr>
<td>Transportation</td>
<td>20%</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>Urban</td>
<td>50%</td>
<td>100</td>
<td>150</td>
<td>250</td>
</tr>
</tbody>
</table>

Exhibit 10. The World Bank Project Portfolio Model of Resources Balancing

The recommended percentage investments were then applied to the specific 24-project case study. The results are shown in Exhibit 11. This Exhibit also shows the projects with their relative EIRR and how they are divided by key sector.

Exhibit 11. 24 projects across key sectors

Exhibit 12 shows the 24 projects by sector and investment. The size of the bubbles represents the EIRR for the 24 projects in 2006.

Exhibit 12. 24 projects by sector and investment

In addition to mapping the projects by sector, EIRR and investment, they also needed to be mapped by project type.

Exhibit 13 shows the 24 projects by project type and investment. The size of the bubbles represents the EIRR for the 24 projects in 2006.
The actual resource distribution of the 9 projects actually implemented in 2006 is shown in Exhibit 14. For the actual 9 projects in 2006 which fell within the US$1.2billion investment, the EIRR for each project is illustrated by the size of bubble for each key sector. (See Exhibit 15) If the proposed World Bank project portfolio model of the project resource balancing and prioritization is used (Exhibit 9), the 9 projects would yield better results shown in Exhibit 16 (A-case). In this case, the resource distribution of actual projects is reasonable and balanced.

**Exhibit 13.** 24 projects by project type and investment

**Exhibit 14**  Actual resource distribution of the actual projects implemented in 2006

The resource distribution for the 8 projects with the highest potential EIRR is shown in Exhibit 16. (B-case) ranked by EIRR in 2006 and within the US$1.2billion investment. The EIRR for each project is illustrated by the size of bubble for each key sector. (See Exhibit 17) If the proposed World Bank project portfolio model of the project resource balancing and prioritization is used, for the 8-B-case projects the results are further improved to 26.6% (Exhibit 18). However, in this case, the resource distribution of these 24-projects ranked by EIRR is not balance.

**Exhibit 15.** Actual projects in 2006 by sector

The resource distribution for the 8 projects with highest potential EIRR is (Case B) is shown in Exhibit 18. The highest EIRR potential projects in 2006 and within the US$1.2billion investment is also shown. The EIRR for each project is illustrated by the size of bubble for each key sector. (See Exhibit 17) If the World Bank project portfolio model of the project resource balancing and prioritization is used, the best case (Exhibit 9) results for these sample projects shown in Exhibit 11 would yield better results
as showing in Exhibit 18 and Exhibit 19. The resource distribution of potential projects is balance.

**Exhibit 18.** Resource distribution of the potential project

<table>
<thead>
<tr>
<th>Project Code</th>
<th>EIRR</th>
<th>Sector</th>
<th>Project Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project 1</td>
<td>10.5</td>
<td>Agriculture</td>
<td></td>
</tr>
<tr>
<td>Project 2</td>
<td>12.0</td>
<td>Energy</td>
<td></td>
</tr>
<tr>
<td>Project 3</td>
<td>15.0</td>
<td>Transportation</td>
<td></td>
</tr>
<tr>
<td>Project 4</td>
<td>18.0</td>
<td>Urban Environment</td>
<td></td>
</tr>
</tbody>
</table>

**Exhibit 19.** the potential projects by sector

**Phase 4: Combined Prioritization and Resources Balancing**

When the projects within the US$1.2 billion investment limit are ranked by EIRR and also subjected to resource balancing by sector and project type, the EIRR of the 8 highest potential projects over the actual 2006 projects show an aggregated EIRR improvement of 2.3% (Case C). (See Exhibit 20)

**Conclusion**

Using Project Portfolio Management (PPM) practices, the World Bank Country Partnership Strategy’s (CPS) projects can be prioritized and resources balanced based on the CPS investment and strategic objectives. The actual projects implemented in FY06 could have been adjusted to yield a higher EIRR if they had been prioritized and resource balanced. Curve C (Case C) shows the highest potential EIRR projects, if selected in FY06, with balanced resources and prioritization. The economic benefit in FY06 would have been US$267.8 million or US$ 35.8 million more than the actual projects implemented in FY06. The economic internal rate of return of the World Bank’s projects would have been increased by 2.3%. Since the value of these projects must be measured over the project and operational life cycle, it is important to evaluate the projects performance after being made operational. Project performance measurement can contribute to lessons-learned that can also positively impact future project selection. We suggest that project performance be measured at the breakeven point, because at that point, income and costs are equal.

**Exhibit 20** the Project Portfolio Management with Prioritization and Portfolio Balancing

**References**


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