

EMPLOYMENT RESEARCH BRIEF

EMPLOYMENT IMPACT OF INFRASTRUCTURE INVESTMENTS IN EGYPT

This country brief provides insights into the various employment outcomes of European Investment Bank (EIB)-financed investment projects in the infrastructure sector in Egypt. The study focused on the sectors of energy and environment. In the environment sector, the Egyptian Pollution Abatement Project II was studied, while the study examined the Giza North Power Generation Plant project and Egyptian Power Transmission Project in the energy sector.

Infrastructure Development

Over the past five decades, infrastructure in Egypt has experienced a remarkable improvement. This has undoubtedly supported the relatively strong economic growth performance of the country, as well as contributed to the progress in social and economic wellbeing of its citizens. Lately, however, a slowdown, or even a decline, in some areas of infrastructure, particularly power generation and transportation was witnessed. This decline, associated with a reduction in capital expenditures in Egypt in the past decade, triggers alarm that the country might have reached an unsustainable low level of infrastructure investment.

Egypt's **Energy and Electricity Sector Infrastructure** is characterized by a fast growing demand, driven by overall economic growth, development of energy intensive industries, and the increasing use of electrical appliances, especially air-conditioners. The high growth in demand has put a significant pressure on the supply side, and resulted in significant rotating blackouts especially in the summer. Attempting to overcome the significant gap between electricity supply and demand, the Government of Egypt has undertaken several measures to increase the supply and curb the demand. These include increased investment in new power plants, increasing electricity and fuel prices, and increased development and investment in renewable energy projects toward meeting the target of having 20% of the electricity generated from renewable resources.

Environmental Management and Pollution Prevention in Egypt is undoubtedly faced by a number of environmental challenges linked to acute water scarcity, declining water quality, land degradation, increasing pollution, and untreated urban and hazardous waste disposal, just to name a few.

In this respect, sound management of natural resources, together with a continuous improvement of the protection of the environment, has become an integral part of the development process agenda in the country. The Ministry of State for Environmental Affairs and its executive agency, the Egyptian Environmental Affairs Agency (EEAA), are actively working on the integration of the environmental dimension into national policies, plans, and lines of action, with an immediate focus on the reduction of pollution and the conservation of Egypt's natural resources.

Construction Activity

Overview of potential and challenges

The construction industry in Egypt has emerged as one of the main pillars of Egyptian economy. According to the Ministry of Planning, direct construction activities in Egypt accounted for 4.6% of the country's GDP¹ in 2013. The indirect contribution of the sector, which includes equipment supply, production, and transportation, however, exceeded 16% of the GDP² in 2014. Nevertheless, the sector's growth was affected by the financial crisis of 2007/2008, which was followed by the instability triggered by the 2011 uprising events in Egypt.

Investment in electricity infrastructure and housing is expected to stimulate growth in the construction sector. Egypt has put an aggressive plan to reduce the gap between electricity supply and demand that will result in the construction of new power stations³. The construction sector also benefits from the availability of semi-skilled and unskilled labour at low cost, the availability of natural resources, inputs and raw materials, and the availability of supporting industries.

Technical and skilled labour remain a challenge in terms of quality and quantity as the construction sector lacks sufficient skilled workforce especially in high-tech new construction areas such as green energy. A good share of sector's workers also faces unstable work conditions driven by seasonality of work, which is gradually affecting the sector's attractiveness to workers. This instability is also reducing the interest among workers to invest in training and skill development.

¹ General Authority for Investment and Free Zones, 2013. Snapshot of the Egyptian Economy - November 2013.

² Meeting with the Contractors Federation representatives on September 10th, 2014.

³ UK Trade and Investment, 2012. Construction Opportunities in Egypt.

Projects Under Study

Giza North Power Generation Plant Project (GNPGP)

The project initially consisted of the construction, commissioning, and operation of a 1,500-MW combined cycle gas turbine (CCGT) power plant at Giza North near Cairo. The power plant originally included two 750-MW modules, each module consisting of two 250-MW gas turbines (with an electricity generator for each turbine), two multi-pressure heat-recovery steam generators, and a 250-MW steam turbine driving an electricity generator. Step-up transformers and a switchyard were also included in the project, with a number of other auxiliary systems.

At a later stage, the scope of the project was expanded to the construction of: (i) a third CCGT increasing the total capacity to 2,250 MW; (ii) a 105-km gas pipeline to ensure sufficient supply of natural gas to the expanded power plant; and (iii) two single circuit transmission lines connecting the plant to the grid, each with a length of approximately 25 km.



Giza North Power Generation Plant Project

The project commenced in 2010 and was expected to complete by 2015 with a total estimated cost of USD 2.2 billion. The main components of the project were implemented by the Cairo Electricity Production Company (CEPC). The transmission line was implemented by the Egyptian Electricity Transmission Company (EETC), and the construction of the natural gas pipeline was implemented by the regional gas supply company.

Egyptian Power Transmission Project

The project consisted of the design, construction, and operation of (10) transmission lines, (1) underground cable, (10) substations, and (22) additional transformers. It comprised a multi-component investment program for transmission infrastructure in the Egyptian 220-500 kV transmission network.

The project commenced in 2010, and it was scheduled for completion in 2014. It was noted that part of the works, however, were still under implementation during the period of the assessment. The project was implemented by EETC at a total cost of USD 700 million.



Egyptian Power Transmission Project

Environmental Pollution Abatement Project (EPAP-II)

EPAP-II supports public and private industries to implement industry-related pollution abatement projects through appropriate funding mechanisms, in terms of pollution abatement credit allocation and repayment discipline in the governorates of Cairo and Alexandria⁴. The five-years EPAP-II was approved with a total budget of around \$185 million.



Sample EPAP-II Project in the Printing Industry

Different types of projects are implemented under EPAP-II including i) De-dusting projects, ii) Installation of wastewater treatment plants, iii) Fuel switching projects, iv) Process modification projects, and v) Projects related to the work environment, including health and safety. Four representative case studies were selected and analysed in close coordination with the EPAP-II project team. These four projects are:

- Installation of industrial wastewater treatment plant at Abu Qair Fertilizers Company,
- Solvent recovery in the paper industry at Retrographia,
- Utilization of alternative fuel at Arab Cement Factory,
- Neuman mills rehabilitation at Abu Zabat Fertilizers.

Approach and Methodology

Two research methods were employed to quantify the employment impact of EIB infrastructure investments in Egypt. The first method examined specific case studies of projects funded by EIB. It aimed to answer the below four questions about direct employment through structured interviews, site visits, and document review.

⁴ World Bank, 2006. Project Appraisal Document on a Proposed Loan In the Amount of \$20 Million to the Arab Republic of Egypt for a Second Pollution Abatement Project.

1. How many direct jobs are created during construction, operation, and maintenance?
2. Who gets the jobs?
3. What kinds of jobs are created?
4. Do the jobs go where they are most needed?

The second method was a macroeconomic study that used a multiplier analysis based on accounting frameworks such as the latest Input-Output table and Social Accounting Matrix. The macroeconomic study was used to capture direct, indirect and induced effects on production, income and employment. (Findings using the macroeconomic study approach can be found under the section direct, indirect, and induced impacts of the projects).

Employment analysis

Labour market synopsis

The Egyptian economy witnessed almost a decade of economic growth and prosperity before the global financial and economic crisis, reaching a growth rate of 7.2% in 2007/08. The aftermath of the financial crisis significantly affected economic growth and employment. The uprising events of 2011 added additional elements of economic uncertainty and further reduced job opportunities created by the economy. Consequently, unemployment rates stood at 12% in 2011. Seeking employment for the first time was considerably hard for males, and even harder for females. In fact, only around 75% of new graduate males were able to secure jobs within 5 years after their graduation, while for females, less than 25% of new graduates were able to secure employment within 15 years after their graduation⁵.

Box 1: Unemployment in Egypt, 2011

Unemployment rate: 12%

Males, Females: 8.9 %, 22.7%

Unemployment among youth: 29.7%:

Males, Females: 22.5 %, 53.2%

Source: The Central Agency for Public Mobilization and Statistics (CADMAS), 2011

The construction sector's actors anticipate positive growth driven by the increasing demand on housing and public sector investment in key infrastructure projects. This includes transportation, energy generation, and energy transmission. Given that public sector agencies in Egypt promote the use of labour-intensive techniques, especially in the housing sub-sector, employment potential of these investments could be high.

Impact of projects on the job market (Direct employment using the case study approach)

Direct employment generated by **Giza North Power Generation Plant Project** was quantified using a sample of

four lots. According to data obtained from the contractors, the total resulting employment of the four lots, and the project management services for the construction phase was found to be nearly 4,879 person-years. Additionally, 220 employees will be needed for operation and maintenance once the construction is completed resulting in nearly 5,500 person-years over an operation period of 25 years.

The employment breakdown of the Giza North power generation plant project is shown in the table below. More than one third of the jobs went to the unskilled labour, followed by the skilled labour and technicians at 20% and 19%, respectively. The majority of employees in those categories were found to have a relatively modest educational attainment, mostly a high school degree.

Table 1: Employment Breakdown of Giza North Power Generation Project

Position	Employment Breakdown (%)	Education Level	Average Salary *
Project Managers & Engineers	14%	U: 100%	5,000
Technicians	19%	U: 3% C: 20% H: 77%	450
Skilled Labour	20%	H: 95%	400
Unskilled Labour	36%	H: 85%	250
Security Guard	5%	S: 15%	300
Administrative	6%	U: 15% C: 20% S: 65%	350

U: University Degree, C: Community College, H: high school degree,

S: 10-12 years of schooling, D: Less than 10 years of schooling

*USD per month

Most of the employed were adult males, who were hired for the entire duration of the project. An estimated 40% of employment contracts were permanent (for the project duration), and 60% were temporary contracts (casual/daily).

Employment data for the three lots, in addition to the project management unit for the **Egyptian Power Transmission Project**, were analysed to quantify the direct employment generated by the project. This resulted in total employment of 150 person-years for construction, and an additional 420 person-years for operation and maintenance of the three lots. Applying the above figures to the entire scope of the project, which included a total of ten substations and 10 transmission lines of similar sizes; resulted in total direct employment during the construction of 1,550 person-years. Additionally, about 4,000 person years will be required for the operation and maintenance of the project over its estimated life span of 25 years.

The employment breakdown of the Egyptian Power Transmission Project is shown in the table below. Nearly half of the jobs were for unskilled labour, followed by technicians, with relatively modest educational attainment of community college or less. Most of the employed were adult males who were hired for the entire duration of the project.

⁵ Economic and Social Impact of the Financial and Economic Crisis on Egypt, ILO, 2009

Table 2: Employment Breakdown of the Egyptian Power Transmission Project

Position	Employment Breakdown (%)	Education Level	Average Salary*
Project Managers & Engineers	11%	U: 100%	2,625
Technicians	19%	U: 5% C: 56% H: 39%	600
Skilled Labour	10%	H: 90%	650
Unskilled Labour	48%	H: 10%	300
Security Guard	7%	S: 90%	300
Administrative	5%	U: 40% C: 10% S: 50%	350

U: University Degree, C: Community College, H: high school degree, S: 10-12 years of schooling, D: Less than 10 years of schooling
*USD per month

The total resulting employment from the **Environmental Abatement Project (EPAP-II)** was quantified based on four representative sub-projects selected for detailed evaluation, as mentioned earlier. The overall direct employment resulting from the construction, engineering supervision, and project management services of the four sub-projects amounted to nearly 178 person-years.

In order to estimate the employment generation from the EPAP-II project as a whole, the findings above were extrapolated. This resulted in an overall direct employment of nearly 3,000 person-years, with the sub-projects involving alternative fuels generating the largest employment effects. The operation and maintenance employment was marked at 525 permanent positions.

The direct employment generated by EPAP-II was relatively smaller than the energy projects. This is mainly attributed to the smaller investment value, and the fact that most of the sub-projects entailed the supply and installation of pollution prevention technologies imported from abroad. This required less manpower, which was mainly utilized for the installation of such technologies. However, a good portion of such works was accomplished utilizing equipment.

In terms of the employment profile, it was also noted that the distribution of the various labour categories varies significantly depending on the nature of the sub-project. Solvent recovery sub-projects, for instance, required a significant input from specialized technicians during the installation of ready-made equipment components. The wastewater treatment components, on the other hand, required more engineering skills. The biggest single labour categories hired in alternative fuels projects, were skilled and semi-skilled labour, while a high share of unskilled labour was concentrated in sub-projects including rehabilitation of processes and process modification.

Given that the construction of most of the sub-projects was of short-term nature, most manual labour were hired by the implementing contractors on daily-basis. Technicians, on the other hand, were permanent employees of the contractors.

Direct, indirect and induced impact of projects (results of the macroeconomic study)

The tables below show the total employment and output effects of the projects including the direct, indirect, and induced impacts. Overall, the projects evaluated were found to have a positive impact on employment and output. Indirect and induced effects were considerable, and higher than the direct impact, especially in the energy sector. This is indicative of large inter-linkages between the different economic sectors in Egypt.

Table 3: Direct, Indirect and Induced Effects of the Giza North Power Plant

Project	Output	Employment
	LE mn	Job Opportunity
Giza North Power Plant (LE15.6 billion)	13,852	67,107
T1 (Indirect effects multiplier)*	3.11	4.97
T2 (Indirect + Induced effects multiplier)**	3.77	5.97

* T1 is type I Leontief multiplier. $T1 = \text{Sum}(\text{direct} + \text{indirect}) / \text{direct}$.

**T2 is type II Leontief multiplier. $T2 = \text{Sum}(\text{direct} + \text{indirect} + \text{induced}) / \text{direct}$.

The indirect impact of the **Giza North Power Generation Plant** project on output is much higher than its direct impact. This was driven by the large backward and forward linkages between the public utilities sector and the construction sector. As for the induced impact on output, it was relatively marginal when compared to the direct and indirect impact of the project. This was triggered by the relatively low salaries paid to the workers in the construction sector.

Table 4: Direct, Indirect and Induced Effects of the Egyptian Power Transmission Project

Project	Output	Employment
	LE mn	Job Opportunity
Power Station Sousse C (LE 4,956 million)	1,017	3,473
T1 (Indirect effects multiplier)*	2.85	4.19
T2 (Indirect + Induced effects multiplier)**	3.37	5.32

* T1 is type I Leontief multiplier. $T1 = \text{Sum}(\text{direct} + \text{indirect}) / \text{direct}$.

**T2 is type II Leontief multiplier. $T2 = \text{Sum}(\text{direct} + \text{indirect} + \text{induced}) / \text{direct}$.

Table 5: Direct, Indirect and Induced Effects of the Environmental Pollution Abatement Project (EPAP-II)

Project	Output	Employment
	LE mn	Job Opportunity
EPAP-II (LE1,062 million)	1,850	6,132
T1 (Indirect effects multiplier)*	2.94	4.18
T2 (Indirect + Induced effects multiplier)**	3.46	5.32

* T1 is type I Leontief multiplier. $T1 = \text{Sum}(\text{direct} + \text{indirect}) / \text{direct}$.

**T2 is type II Leontief multiplier. $T2 = \text{Sum}(\text{direct} + \text{indirect} + \text{induced}) / \text{direct}$.

The indirect impact of the **Egyptian Transmission Power** project on employment was found to be significantly higher than the estimated direct impact, and mounted to nearly 2,080 extra jobs.

Similar patterns were observed for the **EPAP-II project**. The indirect impact of the project on employment notably exceeded the estimated direct impact, and amounted to 3,672 extra jobs. The induced impact was also anticipated to generate nearly 1,308 jobs in other sectors. While a total of 6,132 job opportunities could be created in the economy as a result of the investment in this project, it was found that males and older people, in both rural and urban regions across Egypt, would dominate the majority of the jobs created.

Concluding remarks

- The construction sector remains a major employer in Egypt. Although it benefits from a large pool of skilled and unskilled labour at a low cost, it lacks sufficient skilled workforce especially in high-tech areas such as green energy.
- The construction sector is expected to grow as a result of the demand for housing in addition to government investment in infrastructure including power generation and transportation.
- The evaluation of the two energy projects indicates that investment in energy generation and transmission creates significant job opportunities during the construction phase. Operation and maintenance of these facilities further create substantial permanent job opportunities. Unskilled and skilled labour account for more than 50% of total direct employment created by investment in energy.
- There are strong backward linkages between the construction of energy generation and transmission facilities, and other economic sectors in Egypt. These linkages result in significant indirect effects in output and employment.
- Investment in measures reducing pollution also results in job creation. The use of alternative fuel in the cement industry, for example, creates permanent jobs in operation. Indirect and induced employment and output effects are also substantial.

Way Forward

Practical recommendations that can enhance the employment impact in the sectors (or sub-sector)

- Addressing skill gaps in infrastructure investment could improve the outcomes of the construction sector. This could be done by revisiting the technical and vocational education and training (TVET) framework and offering. In collaboration with the contractors, demand-driven and competence-based vocational and technical training programs could be designed and delivered.

- Designing and implementing a certification program for unskilled and semi-skilled positions could support the development of the workers. It could also increase the attractiveness of the sector to graduates.
- Improving project management approaches, could reduce delays in construction; thus, support the sector's recovery and its employment potential.
- Investment in pollution preventions measures, especially interventions that create permanent jobs for operation, could support the economic growth and create additional job opportunities through induced effects. Expanding the use of alternative fuel, mainly domestic waste, in cement factories is a good example of such pollution prevention measure.

Key ILO resources

1. Employment Impact Assessment of Infrastructure in three Mediterranean Partner Countries. Final Report – Egypt, February, 2015.
2. Employment Impact of EIB Infrastructure Investments in the Mediterranean Partner Countries- Egypt Study. September 2015.
3. ILO Data Guide for Infrastructure Employment Impact Assessment, 2016.
4. Economic and Social Impact of the Financial and Economic Crisis on Egypt, ILO, 2009.

Other Resources

1. Egypt Economic Report, Bank Audi Research Group Department, Barakat et al., 2014.
2. General Authority for Investment and Free Zones, Snapshot of the Egyptian Economy, 2013.
3. The Central Agency for Public Mobilization and Statistics (CAPMAS), www.capmas.gov.eg , 2014.
4. UK Trade and Investment Construction Opportunities in Egypt , 2012.
5. Project Appraisal Document a Second Pollution Abatement Project. World Bank, 2006.

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For more information on links between infrastructure investment and employment creation, visit the website of the Employment Intensive Investment Programme:

<http://www.ilo.org/global/topics/employment-intensive-investment/lang--en/index.htm>