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Report No: ICR00005398

IMPLEMENTATION COMPLETION AND RESULTS REPORT

ON

IBRD LOAN 76560 IN THE AMOUNT OF USD270 million
and
IBRD LOAN 79820 IN THE AMOUNT OF USD330 million

FOR TOTAL AMOUNT OF USD600
TO THE

Arab Republic of Egypt

FOR THE

Egypt National Railways Restructuring Project

Transport Global Practice
Middle East And North Africa Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective December 31, 2020})

Currency Unit =	Egyptian Pounds
EGP 15.730 =	USD 1

FISCAL YEAR
July 1 - June 30

Regional Vice President:	Ferid Belhaj
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ABBREVIATIONS AND ACRONYMS

AC	Air-Conditioned
ADM	Accountability and Decision Making
AF	Additional Financing
AM	Aide-Memoire
DO	Development Objective
EGP	Egyptian pound
ENR	Egyptian National Railways
ENRRP	Egyptian National Railways Restructuring Project
ETCS	European Train Control System
FY	Fiscal year
GDP	Gross Domestic Product
GC	Generalized Costs
IBRD	International Bank for Reconstruction and Development
ICR	Implementation Completion and Results
IDA	International Development Association
IP	Implementation Progress
IPF	Investment Project Financing
ISR	Implementation Status and Results Report
M&E	Monitoring and Evaluation
MoTs	Ministers of Transport
MTR	Mid-Term Review
NPV	Net present value
OECD	Organization for Economic Cooperation and Development
PAD	Project Appraisal Document
PDO	Project Development Objective
PMU	Project Management Unit
PSO	Public Service Obligation
RISE	Railway Improvement and Safety for Egypt
TF	Trust Fund
USD	US dollars
WBG	World Bank Group

TABLE OF CONTENTS

DATA SHEET

BASIC INFORMATION

Product Information

Project ID	Project Name
P101103	Egypt National Railways Restructuring Project
Country	**Financing Instrument**
Egypt, Arab Republic of	Investment Project Financing
Original EA Category	**Revised EA Category**
Partial Assessment (B)	Partial Assessment (B)

Organizations

Borrower	Implementing Agency
Arab Republic of Egypt	Egyptian National Railways

Project Development Objective (PDO)

Original PDO

The objective of the proposed Egypt National Railways Restructuring Project (ENRRP) is to assist the Government in improving the reliability, efficiency and safety of the railways' services through signaling and track renewal investments by the Egyptian National Railways (ENR) and the modernization of its management and operating practices in order to enhance the railways' sector responsiveness to economic and social needs and to strengthen the financial viability of the Project Implementing Entity.

Revised PDO

The objective of the Project is to improve the reliability, efficiency and safety of the railways’ services on targeted sectionsofthe rail network.

FINANCING

	Original Amount (US$)	Revised Amount (US$)	Actual Disbursed (US$)
World Bank Financing			
IBRD-76560	270,000,000	270,000,000	261,570,849
IBRD-79820	330,000,000	280,000,000	252,282,059
Total	**600,000,000**	**550,000,000**	**513,852,908**
Non-World Bank Financing			
Borrower/Recipient	35,000,000	35,000,000	35,000,000
Total	**35,000,000**	**35,000,000**	**35,000,000**
Total Project Cost	**635,000,000**	**585,000,000**	**548,852,907**

KEY DATES

Approval	Effectiveness	MTR Review	Original Closing	Actual Closing
17-Mar-2009	24-Jun-2010	07-Dec-2013	30-Sep-2015	31-Dec-2020

RESTRUCTURING AND/OR ADDITIONAL FINANCING

Date(s)	Amount Disbursed (US$M)	Key Revisions
25-Jun-2014	41.64	Change in Project Development Objectives Change in Results Framework Change in Components and Cost Change in Loan Closing Date(s) Reallocation between Disbursement Categories Change in Procurement
21-Dec-2017	166.04	Change in Loan Closing Date(s) Reallocation between Disbursement Categories Change in Disbursements Arrangements Change in Safeguard Policies Triggered Change in Implementation Schedule
22-Sep-2020	387.39	Reallocation between Disbursement Categories

KEY RATINGS

Outcome	Bank Performance	M&E Quality
Moderately Unsatisfactory	Moderately Unsatisfactory	Negligible

RATINGS OF PROJECT PERFORMANCE IN ISRs

No.	Date ISR Archived	DO Rating	IP Rating	Actual Disbursements (US$M)
01	15-Jun-2009	Moderately Satisfactory	Moderately Satisfactory	.76
02	16-Dec-2009	Moderately Satisfactory	Moderately Satisfactory	.76
03	25-Apr-2010	Moderately Satisfactory	Moderately Satisfactory	.76
04	12-Nov-2010	Satisfactory	Moderately Satisfactory	.76
05	11-Feb-2011	Satisfactory	Moderately Satisfactory	.76
06	28-May-2011	Satisfactory	Moderately Satisfactory	.76
07	22-Nov-2011	Moderately Satisfactory	Moderately Satisfactory	7.62
08	12-Jun-2012	Moderately Satisfactory	Moderately Satisfactory	7.62
09	23-Dec-2012	Moderately Satisfactory	Moderately Satisfactory	7.62
10	25-Jun-2013	Moderately Satisfactory	Moderately Satisfactory	11.03
11	25-Dec-2013	Moderately Satisfactory	Moderately Unsatisfactory	30.85
12	15-Jun-2014	Moderately Satisfactory	Moderately Unsatisfactory	42.40
13	01-Oct-2014	Moderately Satisfactory	Moderately Satisfactory	58.01
14	19-Mar-2015	Moderately Satisfactory	Moderately Satisfactory	85.88
15	01-Oct-2015	Moderately Satisfactory	Moderately Satisfactory	114.15
16	12-Jan-2016	Moderately Satisfactory	Moderately Satisfactory	128.77
17	24-Sep-2016	Moderately Satisfactory	Moderately Satisfactory	142.82
18	25-Jan-2017	Moderately Satisfactory	Moderately Satisfactory	155.11
19	08-Jun-2017	Moderately Satisfactory	Moderately Satisfactory	161.07
20	04-Dec-2017	Moderately Satisfactory	Moderately Satisfactory	166.79

21	05-Jun-2018	Moderately Satisfactory	Moderately Satisfactory	192.37
22	30-Dec-2018	Moderately Satisfactory	Moderately Unsatisfactory	229.00
23	20-Jun-2019	Moderately Satisfactory	Moderately Unsatisfactory	259.33
24	27-Nov-2019	Moderately Satisfactory	Moderately Satisfactory	313.27
25	17-Jun-2020	Moderately Satisfactory	Moderately Satisfactory	368.94
26	24-Feb-2021	Moderately Satisfactory	Moderately Satisfactory	500.87

SECTORS AND THEMES

Sectors

Major Sector/Sector	(%)
Transportation	**100**
Railways	100

Themes

Major Theme/ Theme (Level 2)/ Theme (Level 3)	(%)
Economic Policy	**33**
Trade	33
Trade Facilitation	33
Private Sector Development	**22**
Jobs	22
Job Creation	22
Urban and Rural Development	**44**
Urban Development	22
Urban Infrastructure and Service Delivery	22
Rural Development	22
Rural Infrastructure and service delivery	22

ADM STAFF		
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I. PROJECT CONTEXT AND DEVELOPMENT OBJECTIVES

A. CONTEXT AT APPRAISAL

Context

1. **At project appraisal in 2009, Egypt's economy was growing.** Economic growth had averaged around 7 percent in fiscal year (FY) 2007, up from 5 percent since FY2004, and unemployment was 8.8 percent. The poverty rate decreased from 23.4 percent in 2005 to 18.9 percent in 2008. Inflation and the social impacts of high prices were a challenge for the Egyptian government; in August 2008, the Consumer Price Index was 25.6 percent, and the food inflation rate was 30.9 percent, the highest levels in 19 years. The government was committed to economic liberalization. A 30 percent increase in salaries for civil servants, who accounted for 30 percent of the workforce, had been approved; the private sector had been asked to increase wages. The Egyptian economy was expected to slow because of the 2008 global financial crisis, so the government was elaborating a set of policies to mitigate its effects.[1]

2. **The political and security situation deteriorated in Egypt less than six months after the project's effectiveness.** It should be emphasized that the deterioration affected the project's implementation - details can be found in the section: "Rationale for Changes and Their Implication on the Original Theory of Change."

3. **The railway network is essential to ensure connectivity between the different regions of Egypt**, social inclusion, economy, and trade and hence economic development. The poorest segments of the population rely on trains for mobility, especially the Upper Egypt lines, where fares are highly subsidized and therefore relatively low. Trains also serve the middle and upper classes, who pay extra fees for better quality of service such as larger seats, air conditioning, and more room. At appraisal, the network was 5,085 km long, 60 percent of which was in the Nile Delta and along the Nile Valley. Railway services reached most of the Egyptian population. According to the World Bank Group (WBG), in 2014, the Egypt National Railway (ENR) was one of the highest traffic density railways in the world; in 2011 it carried almost half the passenger traffic of the French railways on a network one-sixth the size.[2] The ENR Restructuring Project (ENRRP) was appraised at the end of 2008, and the WBG Board approved it on March 17, 2009.

4. **The financial sustainability of ENR became a matter of deep concern to the government of Egypt** in the 1990s and early 2000s, particularly the effect of the sector on the national budget. From 2000 to 2007, ENR accumulated a deficit of Egyptian pounds (EGP) 6.53 billion (equivalent to USD1.15 billion),

[1] Source: PAD, Report 46694-EG, 2009.
[2] Source: Aide-Memoire, supervision mission, June 2014.

almost as much as its cumulative revenue (EGP7.24 billion).[3] The situation created a vicious circle; because of its financial condition, ENR could not finance the necessary maintenance of its assets and rolling stock and repay investment loans from national and foreign banks, and the situation kept deteriorating. In FY2001, ENR reached a record 66 billion passenger-km, but because of first-class fare increases and introduction of an insurance levy, traffic density decreased to 39 billion passenger-km in FY2002, before recovering and stabilizing. Passenger transport accounted for 67 percent of traffic revenue in FY2007. At appraisal, ENR's market share was about 40 percent of the total public passenger transport market.[4]

5. **The financial performance of the railway sector in Egypt was unsatisfactory primarily because of the high share of passenger services**, continuous deterioration of the quality of the transport services provided, and acute safety problems. Passenger trains represented more than 90 percent of ENR railway traffic; freight traffic accounted for significantly less than the expected market share. In contrast, passenger traffic on other railway networks in the region was between 30 percent and 40 percent.[5] ENR was more focused on technical matters than customer service.

6. **A series of serious rail accidents provided a stark reminder of the need for urgent attention** to passenger and pedestrian safety and restoration of customer confidence in the rail network. In 2002, fire swept through an overcrowded train traveling from Cairo to Luxor, killing more than 370 people. The driver was not immediately aware of the fire because of the lack of means of communication between the locomotive and the carriages.[6] In 2006, a collision between two commuter trains in Qalyub, in the north of Cairo, killed more than 50 people,[7] and in 2009, a collision in Al-Ayyat killed at least 15 people.[8] Overall deterioration of railway assets and lack of a culture of safety is the main reasons for safety problems. The infrastructure is old, and the safety equipment is obsolete, which present ongoing risks for the high traffic density of passenger and freight. The recurrent crashes led the government to enhance the performance of the railway.

7. **The government started a large program called the Renaissance Program to modernize the railway sector.**[9] Program goals included addressing the increasing number of fatalities and modernizing the railway infrastructure, a national economic asset. Policy recommendations from the WBG and an international consulting firm from 2006 to 2008 informed this program.[10] Considering the high traffic

[3] Source: Memorandum and Recommendation of the President of the IBRD to the Executive Directors on a proposed loan to the Arab Republic of Egypt for the Egyptian National Railway Restructuring Project, February 2009.
[4] Source: PAD, Report 46694-EG, 2009.
[5] Source: PAD, Report 46694-EG, 2009.
[6] Source: The Guardian, “370 die in Egypt’s speeding inferno,” Feb. 20, 2002.
[7] Source: The Guardian, “Egyptian train crash kills 51,” Aug. 21, 2006.
[8] Source: CNN, “Train collision kills at least 15 in Egypt,” October 25, 2009..
[9] Source: Management Letter, June 27, 2006.
[10] Source: PAD, Report 46694-EG, 2009.

density on the railway network and reliability, efficiency, and safety challenges, it was necessary to modernize the signaling system with state-of-the-art technology and to update some sections of the track. It was also necessary to engage in a broader policy dialog to provide holistic support to ENR and the government to enable structural transformation of the railway sector; ENR could not be transformed with technical solutions alone. The government aimed to implement the plan over 3 to 5 years and make ENR profitable starting in FY2010.[11] The government invested EGP5 billion.[12] From early 2008, ENR was reorganized along strategic business lines and modernized its working methods with the support of experts from the Italian National Railways.

8. **The government requested USD270 million from the WBG for the railway sector in 2006.** The main objectives of the ENRRP, according to the Project Appraisal Document (PAD), were to enhance the railways' sector responsiveness to economic and social needs and to strengthen the financial viability of the Project Implementing Entity."[13] The government's request was in line with the WBG Country Assistance Strategy for FY2006 to FY2009, which aimed to expand the supply and increase the efficiency of infrastructure services (Country Assistance Strategy outcome 2.2).[14] A USD757,895 grant from the Japan Policy and Human Resources Development Program (TF057785) supporting project preparation was approved in 2007 to prepare the studies necessary for the ENRRP. The U.S. Agency for International Development and the Italian Cooperation agency were involved in dialogue with the government on railway services. A twinning program between ENR and the Italian Railways started in 2008 for a duration of 5 years. Eleven Italian experts spent 5 years in Cairo assisting the ENR managers.[15] At appraisal, the WBG transport team had an ongoing dialog but no active lending operation with the Ministry of Transport.[16]

Theory of Change (Results Chain)

9. **The desired change was a profound transformation of Egypt's railway sector** by improving safety and operational performance. Thus, the project's objectives were focused on increasing the reliability, efficiency, and safety of railway services.

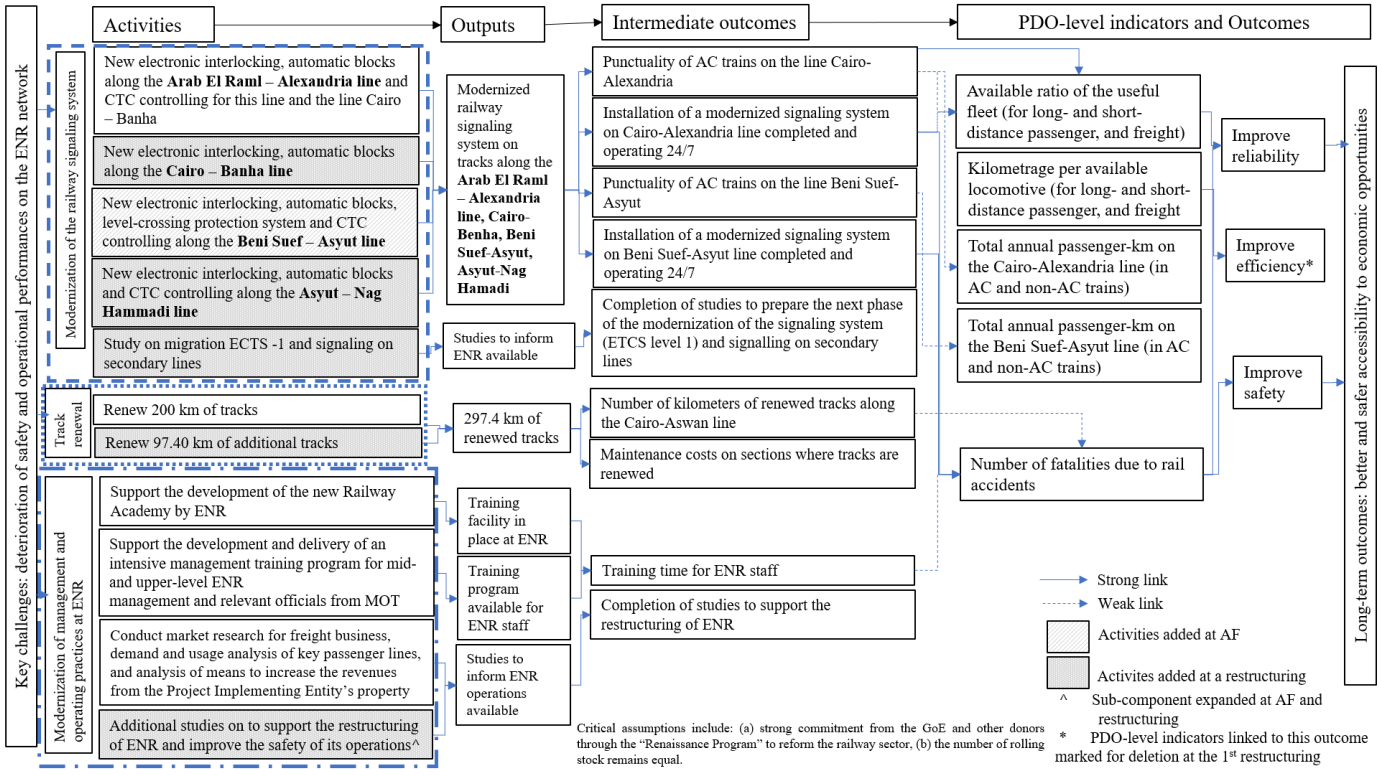
10. **Additional financing approved in 2010 increased the original project scope by enabling the signaling system on an additional section to be modernized;** the reasoning is thus similar for both loans. The project's scope was further expanded through the 2014 and 2017 project restructurings;

[11] Source: PAD, Report 46694-EG, 2009.
[12] Source: Additional financing Project Paper, Nov. 12, 2020. Report No: 57022-EG.
[13] Source: PAD, Report 46694-EG, 2009.
[14] Source: WBG. Country Assistance Strategy for the Arab Republic of Egypt for the period FU06-FY09, May 20, 2005. Report No. 32190-EG.
[15] Key managers of the ENR who benefited from the Italian cooperation program were the Chairman, Operation Vice Chairman, Long- and Short-Distance Vice Chairman, Freight Vice Chairman, Permanent Way Vice Chairman, Human Resources Directorate.
[16] The transport team worked at that time on the Cairo Airport Development Project – TB2 (P101201), but the Ministry of Civil Aviation managed this project.

unexpected savings resulting from the bidding processes enabled the signaling system to be modernized on an additional section, more kilometers of tracks to be upgraded, and additional studies to be conducted. New activities included through additional financing and restructurings are in the grey boxes in figure 1. Annex 8 presents a map with the original and effective scopes of the ENRRP. The project has suffered from political instability, detailed in Section III.B.

11. **Informed by the objectives of the Renaissance Program and complementary analysis, the ENRRP aimed to improve the reliability, safety, and efficiency of targeted sectors of the rail network.** Project interventions were anchored in two complementary areas: one focusing on technical modernization of the railway infrastructure (component 1: signaling modernization; component 2: track upgrade) and the other focusing on equally important aspects of organizational modernization (component 3: staff and management training, technical assistance). The theory of change presented below includes the activities, intermediate outcomes, and project development objective (PDO)-level indicators at closing (figure 1). The discussion of the project's achievements (Section II.B. Achievement of PDOs) builds on additional data.

Figure 1. Theory of Change



Note: PDO-level indicators linked to "efficiency" and market for deletion at 2014 Restructuring were the following: "Public Service Obligation paid to ENR," and "Freight carried by ENR" (see Table 1 and Table 3 below).

12. **The relevance of the project's results framework is discussed in the monitoring and evaluation (M&E) section**.

Project Development Objectives (PDOs)

13. **The PDO in the loan agreement was** "**to assist the Borrower in improving the reliability, efficiency and safety of the railways' services** through signaling and track renewal investments by the Project Implementing Entity and the modernization of its management and operating practices in order to enhance the railways' sector responsiveness to economic and social needs and to strengthen the financial viability of the Project Implementing Entity."[17] The PDO is the same for the additional financing; there are minor discrepancies between the PAD and the loan agreement.[18] The PDO statement contained three separate development objectives for the project: to improve the reliability, efficiency, and safety of the railways' services.

Key Expected Outcomes and Outcome Indicators

14. **The project had three clear development objectives** (table 1), each associated with at least one outcome indicator.

Table 1. Project Development Objective (PDO)-Level Results Indicators at Appraisal

PDO "Assist the Borrower in improving the…"	Outcome indicators	Unit of measure
(a) reliability,	**Rate of utilization of ENR assets** (a1) Available ratio of the useful fleet: long-distance passenger (a2) Available ratio of the useful fleet: short-distance passenger (a3) Available ratio of the useful fleet: freight	Number (%)
	(a4) Kilometrage per available locomotive: long-distance passenger (a5) Kilometrage per available locomotive: short-distance passenger (a6) Kilometrage per available locomotive: freight	Total km (000s)
	Long distance passenger traffic on Cairo–Alexandria (a7) Total annual passenger-km in air-conditioned trains (a8) Total annual passenger-km in non-air-conditioned long-distance trains	Total annual passenger-km (million)
(b) efficiency, and	**Public service obligation paid** (b1) Total amount of public service obligation paid by government to ENR	Egyptian pounds million

[17] Loan Agreement, conformed copy, loan number 7656-EG, August 2, 2009, page 5, section "Schedule 1." According to Operations Policy and Country Services guidance, the PDO should be limited to the part highlighted in bold. The PDO is copied in full because changes in the PDO affect the part of the PDO after "through" (see below, section "B. Significant changes during implementation").

[18] The wording of the PDO differs between the project appraisal document and the loan agreement. The project appraisal document refers to "Borrower", whereas the loan agreement refers to "Government," and "Project Implementing Entity" in the loan agreement is replaced by "ENR" in the project appraisal document.

	Freight traffic (b2) Total annual net-ton-km of freight traffic	Million
(c) safety of railways services.	(c1) Number of fatalities due to railway accidents on ENR network: typical accidents [caused by a railway malfunction or railway staff human error] (c2) Number of fatalities due to railway accidents on ENR network: non-typical accidents [other accidents involving railways]	Average number of accidents

Source: PAD, Report 46694-EG, 2009 (Annex 3, p.41-43). Note: ENR, Egyptian National Railways.

Components

15. At appraisal, the preparation team structured the project around three components (table 2):

(1) Signaling modernization (USD202 million: USD197 million International Bank for Reconstruction and Development (IBRD), USD5 million counterpart financing)
(2) Track renewal (USD80 million: USD60 million IBRD, USD20 million counterpart financing)
(3) Modernization of management and operating practices (USD10 million counterpart financing)

Table 2. Project Components and Financing in Loan Agreement

Component	Description	Financing at Appraisal* (USD million)		
		IBRD	Government of Egypt	Total
Component 1: Signaling modernization	Modernize signaling system along Arab El Raml–Alexandria line and install computerized central traffic control system	197	5	**202**
Component 2: Track renewal	Renew 200 km of track along Cairo–Aswan line (149 km on four sections of track) and Benha–Port Said line (51 km on two sections of track)	60	20	**80**
Component 3: Modernization of management and operating practices**	Support development and delivery of intensive management training program for mid- and upper level of project implementing entity management and relevant officials from Ministry of Transport; technical training program and curriculum at new railway academy (Wardan Institute); and market research for development of freight business, demand and usage analysis of key passenger lines, and analysis of how to increase revenues from project implementing entity property***	0	10	**10**
Contingencies		13	0	**13**
	Total project cost at appraisal	270	35	**305**

Sources: PAD, Report 46694-EG, 2009 (Annex 4, p. 44, Annex 5, p. 49); conformed copy loan agreement. Refer to Annex 3 for actual costs. * All activities are calculated in this table, including supervision work. ** As stated in the PAD, government rules "prohibit loan financing for technical assistance or training" (p.46), so no International Bank for Reconstruction and Development (IBRD) funds are allocated to this component. *** This description conforms to the confirmed copy of the loan agreement. The wording used to describe this component slightly differs in the PAD. Activities stated in the PAD are: support the railway and transport academy, support the reengagement of ENR with international railways bodies, support modernization of managerial and operational practices, business development objectives (p. 47).

16. **Although the project structure remained stable over the project's lifetime,** the scope of these components has been modified during implementation, as explained in section B below.

B. SIGNIFICANT CHANGES DURING IMPLEMENTATION (IF APPLICABLE)

Revised PDOs and Outcome Targets

17. **The PDO was amended through a level 1 project restructuring in 2014.**[19] As explained in the restructuring paper, the amended PDO deletes mention of the "railways' sector responsiveness to economic and social needs" and the "financial viability of the Project Implementing Entity."[20] The amended PDO was the following: "The project's objective is to improve the reliability, efficiency, and safety of the railways' services on targeted sections of the rail network."

18. **Baselines and targets of most PDO-level indicators were revised as part of the additional financing in 2010.** For most PDO-level indicators linked to reliability, baselines were lowered, and targets were revised. Targets for the PDO-level indicators related to efficiency were reduced (by half for indicator (b2) in table 1).

Revised PDO Indicators

19. **The results framework was adjusted twice over the lifetime of the project (in 2010 and 2014) (table 3):**
    (i) At additional financing in 2010, indicators (a7) and (a8) in table 1 were duplicated to reflect the additional scope on the Beni Suef–Asyut line, and two PDO-level indicators were introduced for the Beni Suef–Asyut line: total annual passenger-km in air conditioned long-distance trains and total annual passenger-km in non-air conditioned long-distance trains;
    (ii) In 2014, two PDO-level indicators (indicators b1 and b2 in table 1) were dropped to reflect the project's adjustments, and PDO-level indicators (c1) and (c2) in table 1 were merged into a single indicator called "Average number of fatalities due to railway accidents on the ENR network measured as the total annual number of victims on ENR network per one million passenger-km." This indicator weights the number of accidents by the volume of traffic, which was not done with the previous indicators on crashes.

[19] Details on the project's three restructurings are available below, in the section "Other changes."
[20] Source: Report No: RES13265, June 12, 2014.

Table 3. History of Outcome Indicators

PDO **"Assist the borrower[a] in improving the…"**	Outcome indicators	History of outcome indicator
(a) reliability,	**Rate of utilization of ENR assets** (a1) Available ratio of the useful fleet: long-distance passenger	Original indicator
	(a2) Available ratio of the useful fleet: short-distance passenger	Original indicator
	(a3) Available ratio of the useful fleet: freight	Original indicator
	(a4) Kilometrage per available locomotive: long-distance passenger	Original indicator
	(a5) Kilometrage per available locomotive: short-distance passenger	Original indicator
	(a6) Kilometrage per available locomotive: freight	Original indicator
	Long-distance passenger traffic on Cairo–Alexandria (a7) Total annual passenger-km in air-conditioned trains	Original indicator
	(a8) Total annual passenger-km in non-air-conditioned long-distance trains	Original indicator
	Long-distance passenger traffic on Beni Suef-Asyut (a9) Total annual passenger-km in air-conditioned trains	Added in 2010 at additional financing
	(a10) Total annual passenger-km in non-air-conditioned long-distance trains	
(b) efficiency, and	**Public service obligation paid** (b1) Total public service obligation paid by government to ENR	Dropped at 2014 restructuring
	Freight traffic (b2) Total annual net-ton-km of freight traffic	
(c) safety of railways services.	(c1) Number of fatalities due to railway accidents on ENR network: typical accidents	Merged at 2014 restructuring
	(c2) Number of fatalities due to railway accidents on ENR network: nontypical accidents	

Sources: PAD, Report 46694-EG, 2009; additional financing project paper; restructuring papers. Some "original indicators" were modified over the project's lifetime, for example, the baselines and targets were revised (see Annex 1).
a. The word "Government" is used in the PAD.
Note: ENR, Egyptian National Railways.

Revised Components

20. Components were adjusted in one additional financing and in two restructurings to adapt to increased project scope and ambition:

(i) On December 6, 2009, the government requested additional financing for the second phase of the railway project (modernization of the signaling system in Beni Suef, Menya, and Asyut). In 2010, additional financing of USD330 million[21] was allocated to modernize the signaling system between Beni Suef and Asyut.[22] The additional financing was approved on December 14, 2010, and signed on September 23, 2011, and became effective on March 28, 2012. The original closing date for the additional financing was March 31, 2017. As explained in the loan agreement, this additional financing expands components 1 and 3 of the original loan,[23] introduces a subcomponent[24] (subcomponent 1-2 in table 3) for modernization of the signaling system on the Beni Suef–Asyut line, and includes additional activities to support modernization of ENR's managerial and operational practices.[25]

(ii) In 2014, a two-stage bidding process for signaling modernization on the Arab El Raml–Cairo line in accordance with WBG procedures led to savings of USD35 million.[26] Savings resulted from an open international competitive bidding and satisfactory procurement process. The first restructuring allocated these funds among the three components of the project.[27]

(iii) In 2017, a second bidding process for the Beni Suef–Asyut line led to additional cost savings. Although the second restructuring did not formally introduce changes into the components, an additional signaling modernization contract was signed, leading to a de facto expansion of component 1.

21. Table 4 details how each project's components were amended over the project's lifetime.

[21] According to the loan agreement, negotiated draft, loan 7982-EG, November 1, 2010, this amount is divided into two categories: goods and projects for an amount of USD329,175,000 and front-end fee for an amount of USD825,000. The project paper of the additional financing indicates that the borrower funded USD10 million, for a total amount of USD340 million.
[22] Office memorandum additional financing P117356, March 18, 2010; Report 57022-EG on November 12, 2010.
[23] Loan Agreement, negotiated draft, loan 7982-EG, November 1, 2010.
[24] The additional financing uses the wording "Sub-Component," but other documents refer to this activity as a "Component." If the name changes, planned activities do not.
[25] Loan Agreement, negotiated draft, loan 7982-EG, November 1, 2010; Restructuring paper: RES13265.
[26] WBG procedures. Guidelines: Procurement under IBRD Loans and IDA Credits, 2004 revised 2006.
[27] The section below ("Other changes") details the full scope of each restructuring.

Table 4. Component Activities at Appraisal and Closing

Component and activities at appraisal	Description of changes over project lifetime
Component 1: Signaling modernization Original activities included - modernizing signaling system along Arab El Raml–Alexandria line - installing computerized central traffic control system for Arab El-Raml–Alexandra and Cairo–Banha sections	Revision of scope during restructuring in 2014: Contract signing for modernization of signaling system on Cairo–Alexandria line led to USD35 million savings. Financing of studies on migration to signaling systems (in particular the European Train Control System level 1) and signaling for secondary lines were included in this component. After restructuring in 2017, project description in part A.1 of schedule 1 of original loan and additional financing loan was modified to introduce signaling system modernization along the Cairo–Banha section (of the Cairo–Alexandria line) and the Asyut–Sohag–Nag Hamady line,[28] leading to expansion of scope of component 1.
Subcomponent 1-2: signalization modernization from Beni Suef to Asyut	Subcomponent added at additional financing. This sub-component was merged in component 1 after restructuring in 2017.
Component 2: Track renewal Original scope included renewal of 200 km of track	With budget savings from Cairo–Alexandria line procurement process, this component was expanded by about 60 km of additional track renewal work during the first restructuring. At closing, 297.4 km of track was renewed.
Component 3: Modernization of management and operating practices Original activities included - intensive management training program for mid- and upper-level staff - technical training program and curriculum at new railway academy (Wardan Institute) - market research for development of freight business, demand and usage analysis of key passenger lines, and analysis of how to increase revenues from project implementing entity's property	The additional financing and the 2014 restructuring expanded this component to include additional studies on: - modernization of railway maintenance practices - improvement of project implementing entity's operational rules and procedures - improvement and strengthening of project management capacities of relevant staff of project implementing entity - increasing financial planning and financial management capacity within project implementing entity - restructuring ENR and increasing safety of its operations, such as elaboration of new railway law - preparation of safety management system for ENR operations - formulation of infrastructure pricing methodology and development of structure of public service obligation contract between the state and ENR for loss-making passenger services

Sources: Loan agreement Original loan; loan agreement additional financing; Restructuring papers: RES13265, RES21189, second amendment to the loan agreement (December 27, 2017).

22. Costs for each project's component at closing are summarized in Annex 3. Regarding the project's costs, it is to be noted that an unwithdrawn amount from the IBRD 79820 loan of USD 50 million was partially canceled in June 2021.

Other Changes

23. The project was restructured three times over its lifetime (table 5).

Table 5. Project Restructurings and Rationales and Changes Introduced

Restruc-turing #	Description of the restructuring	Reasons and changes introduced	% disbursed at that time	
			IBRD-76560 *	IBRD-79820 **
1	Level 1 restructuring discussed by government following its request to reallocate funds and the mid-term review. Restructuring approved on **June 25, 2014** (Report number: RES13265)	The PDO related to the financial sustainability of ENR cannot be achieved for reasons beyond ENR's control, namely the consequences of the Arab Spring: the government reduced its contribution to the PSO, wages increased, and the context was not favorable to raising fares. References to the PSOs are deleted. Therefore, this restructuring amends the PDO and the PDO-level indicators to reflect these changes. Intermediate results indicators are added to reflect the project's scope changes through the additional financing and the savings. Also, at the request of the government in October 2013, this restructuring aims to reallocate the USD35 million savings that resulted from a lower-than-estimated contract amount for the signaling modernization of the Cairo-Alexandria line. The original project components are amended; the savings will be used to finance the following activities: **(i)** *under Component 1*: additional studies for USD7.5 million; **(ii)** *under Component 2*: finance about 60 km of additional track renewal on the Cairo–Aswan line for USD26 million; **(iii)** *under Component 3*: studies in the amount of US$ 1.5 million to support restructuring of ENR and improve the safety of ENR's operation through by elaborating a new railway law, the preparation of a safety management system, formulation of an infrastructure pricing methodology and the development of the structure of the PSO contract between the state and ENR for passenger services. Procurement of consulting services was added to select	15	0

[28] See Letter from the WBG to H.E. Dr. Sahar Nasr on December 27, 2017, subject: "Re: Egypt National Railways Restructuring Project (Loan number 7656-EG) Second Amendment to the Loan Agreement" and Letter from the WBG to H.E. Dr. Sahar Nasr on December 27, 2017, subject: "Re: additional financing for the Egypt National Railways Restructuring Project (Loan Number 7982-EG) Second Amendment to the Loan Agreement."

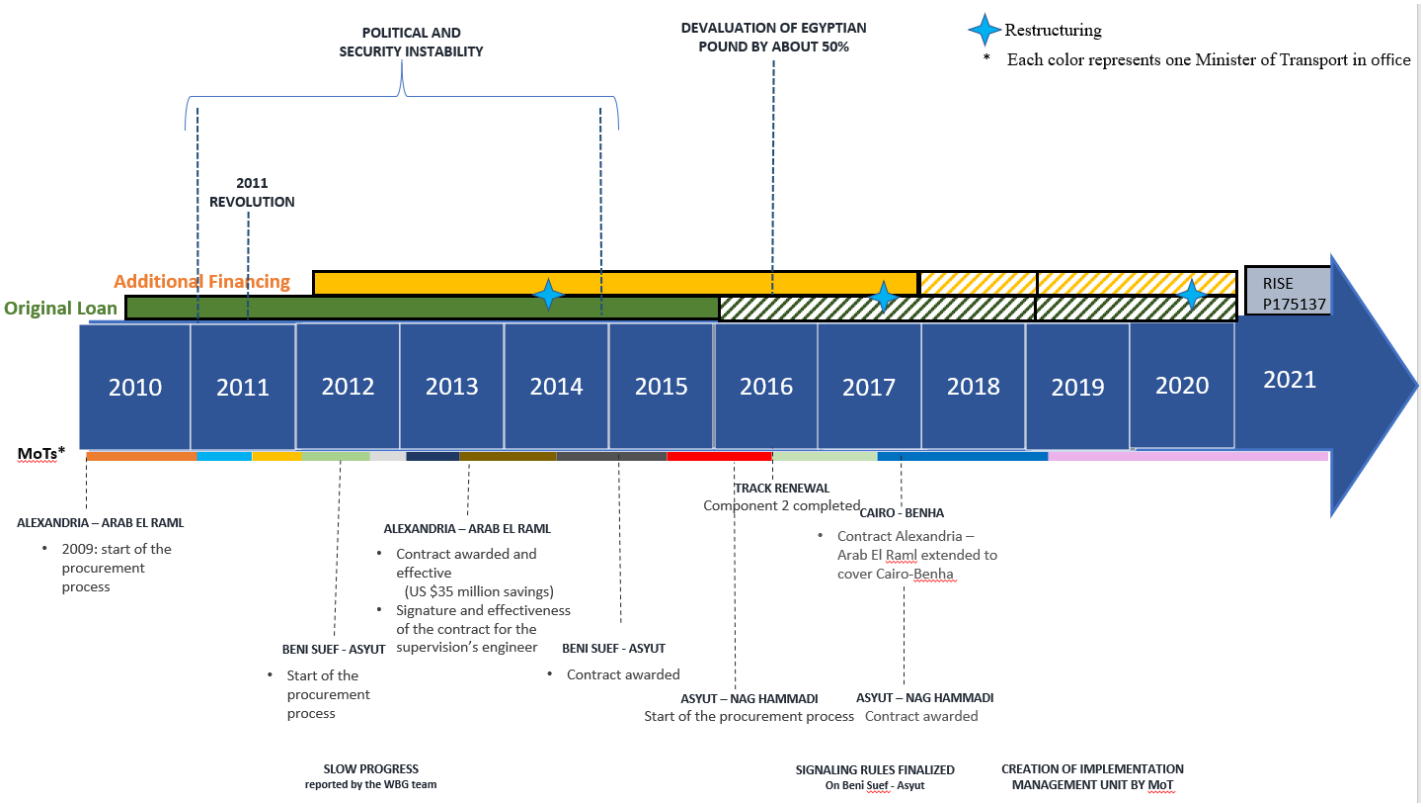
	#	consultants for the additional studies. The closing date of both loans was extended (see above), and the disbursement estimates were updated. The parent loan (7656-EG) was extended from September 30, 2015, to January 31, 2019, and the additional financing (7982-EG) was extended from March 31, 2017 to January 31, 2019.[a]		
2	Level 2 restructuring at the request of the government of Egypt through a formal letter dated July 17, 2017. Restructuring approved on **December 21, 2017** (Report number: RES21189)[b]	This restructuring modifies the original loan and the additional financing: 1. Changes in disbursement estimates and implementation schedule to reflect the new work scope (see point 2); 2. A successful bidding process saved the project about USD180 million, which will finance the modernization of the signaling system on the Cairo–Banha section and on the Asyut–Sohag–Nag Hamady line; 3. Trigger Operational Policy/Bank Procedure 4.12 on Involuntary Resettlement as a precautionary measure; 4. Extend project closing date (see above). This restructuring modifies two aspects of the original loan (IBRD-76560) on two aspects: 5. Change disbursement arrangements to allow use of project funds to finance value-added tax 6. Reallocate funds between categories of expenditures Closing dates of both loans were extended from January 31, 2019, to December 31, 2020.[c]	57	4
3	Level 2 restructuring approved on **September 22, 2020** (Report number: RES433374)	This restructuring aims to reallocate funds to disbursement category (6), consultant services to retain the project supervision consultant, who has a time-based contract.	81	51

Source: restructuring papers of the project, Aide-Memoire supervision mission December 2013; own calculation for the disbursement's percent at the time of the restructuring 3.
* Original loan.
** Additional financing.
a. Source: Report No: RES13265.
b. Although the data sheet for the restructuring paper (RES21189) states that it is a level 2 restructuring, the disclosable version of the Implementation Status Report ISR Sq. 26 refers to a level 1 restructuring in the section "Restructuring History."
c. Source: Report No: RES21189.
IBRD, International Bank for Reconstruction and Development; PSO, public service obligation; PDO, project development objective.

Rationale for Changes and Their Implication on the Original Theory of Change

24. Figure 2 is a chronology of key events over the project's lifetime.

Figure 2. Key Events over Project Lifetime



Note: The start of each loan in the chronology matches the effectiveness date.

25. The political and security situation deteriorated after project's effectiveness. As the Arab Spring spread across the region, protests in Egypt started on January 25, 2011, six months after project effectiveness. This impacted the project implementation plans. Protests continued several deaths and injuries were reported among protesters. After the resignation of President Moubarak, the Supreme Council of Armed Forces took control and held power until June 2012, when democratic elections were celebrated. The winner of the Presidency was the Muslim Brotherhood's Freedom and Justice Party candidate Muhammad Morsi. After a new law that concentrated power in the president and allowed him legal immunity, his policies were considered dictatorial by the opposition, and further protests emerged in November 2012. In July 2013, the military removed Morsi from power. An interim government drew up a new constitution, and after the 2014 elections, the ex-head of the Egyptian armed forces, Abdel Fattah el-Sisi, became president. However, terrorist acts continued in Egypt till the year 2017. During this period, the in-country economic activities declined. The Arab Spring movement, the demonstrations, and the embedded political instability strongly impacted the Egyptian economy. Growth declined, tourism and investments (relative to GDP) went down. Foreign firms left the country, and inflation,

fueled by currency deprecation, went up. All this created, during this period, an unattractive environment for business.

26. **Effective in March 2012, the additional financing expanded the scope of the project to enhance safety on additional ENR lines** by modernizing the signaling system on the Beni Suef–Asyut section. The additional financing was designed to expand activities planned under the original loan. The first two restructurings, in 2014 and 2017, expanded the scope of work of the ENRRP and support to the government and ENR. The expanded scope of work resulting from the first two restructurings was unexpected because it resulted from cost savings after the bidding processes. The goal of these changes was to improve safety on the main railway lines in Egypt. The map in Annex 8 outlines the three segments and the track renewal work included in the project. Although the work included in the scope of the ENRRP is not yet completed, the ENRRP laid the foundations for the Railway Improvement and Safety for Egypt (RISE) Project (P175137). As highlighted in figure 2, the RISE project, which the WBG approved in March 2021, will take over the remaining work and build on ENRRP to ensure migration to the non-proprietary European Train Control System (ETCS)-1.

27. **Egypt's main railway network runs parallel to the Nile**, crossing the country from north to south. The additional financing was signed 15 months after the effectiveness of the parent project, without any funds having yet been disbursed. The additional financing increased the project's scope by adding the Beni Suef–Asyut section. During parent loan preparation, ENR conducted studies to assess the technical and safeguard aspects of the Beni Suef–Asyut line, but the government did not submit a request to the WBG. The request was submitted shortly after the parent loan was approved, requiring additional financing in 2011.[29] From a geographical perspective, because economic activities and population are regularly distributed along a north-south line along the Nile, the whole line must be updated to increase the corridor's capacity and ensure better, safer transport conditions on the entire main railway network. A single bottleneck in the railway network could compromise the efficiency of the entire main railway network. The project also benefits from economy of scale, having all support functions already in place to supervise a section of the project.

28. **The project at appraisal, the additional financing, and the additional activities financed through the first two restructurings in 2014 and 2017 supported the original project's goals—**maximizing the project's impacts on reliability, efficiency, and safety on defined sections of the railway system.

29. **The project closing date was adapted several times to reflect external disruptions being the political and security instability, unforeseen events, and additional work** under components 1 and 2, which

[29] Source: additional financing Project Paper, Report No: 57022-EG.

eventually led to a project implementation timeframe of over 10 years:

(i) The Arab Spring delayed the procurement process (figure 2). The contractors and the supervision consultant reported impacts on their work because of lack of security, vandalism, and theft. Also, major firms left the country.

(ii) Unforeseen need to revamp safety and operating procedures and sequencing of projects for track renewal in stations led to additional delays.

(iii) Project scope increased: the original loan planned signaling system modernization of 165 km and track renewal of 200 km. The full scope of work covers signaling system modernization of 640 km (47 percent to 77 percent of work completed, depending on the line) and track renewal of 297.4 km (work fully completed).[30]

30. The goal of the third restructuring was to reallocate funds between disbursement categories to ensure that the project supervision consultant was retained.

II. OUTCOME

A. RELEVANCE OF PDOs

Assessment of Relevance of PDOs and Rating

31. At the time of appraisal, the government aimed to improve living standards, promote investment, reduce unemployment, contain inflation, and improve the performance of administrative entities.[31] The goal of the project is to modernize an asset. Once the project is completed, it will have transformed the rail sector. Therefore, the project was of high relevance for Egypt at appraisal and remains so at closing.

32. The relevance of the PDO is high. The PDOs are aligned with the current Egypt Country Partnership Framework, which focuses on improving governance, creating private sector jobs, and promoting social inclusion.[32] One of the key objectives under Country Partnership Framework focus area 2 is to provide opportunities for private sector job creation. The ENRRP supports private sector job creation by improving transport conditions, increasing accessibility to economic opportunities for workers, and increasing connectivity, thus improving trade conditions and goods flows. Country Partnership Framework objective 2.3 is to enhance capacity and safety in key transport infrastructure. The ENRRP

[30] Value from the Results Framework. There is a small discrepancy: for example, the Aide-Memoire for the supervision mission in May 2017 states 297.5 km of renewed track.
[31] Source: PAD, original loan.
[32] Source: Country Partnership Framework for the Arab Republic of Egypt for the period FY 2015-2019, November 20, 2015, Report No.: 94554-EG. The Egypt Country Partnership Framework for FY 2015-19 was approved in November 2015 and extended in 2019 for two additional years to 2021.

project remains highly relevant because the goal is to improve governance of the railway sector and support development of private operators and thus jobs. The ENRRP laid the foundations for the RISE project to provide safe, competitive railway services in Egypt.

33. **The PDOs align with the WBG's expanded Middle East and North Africa regional strategy's (March 2019) first pillar (renewing the social contract) and the WBG's twin goals to end extreme poverty and promote shared prosperity.** Reliable, safe, efficient transport services are prerequisites for economic growth, trade, and access to economic opportunities. This is particularly relevant in Egypt, where the poorest segments of the population use railway services. With 270 million passengers in FY2019, the railway contributes to social inclusion in Egypt.

B. ACHIEVEMENT OF PDOs (EFFICACY)

Assessment of Achievement of Each Objective/Outcome

34. **Efficacy is rated Modest.** Efficacy is assessed for the three (separate but interrelated) objectives based on the revised PDO: increase the reliability, efficiency, and safety of railway services. The project's scope expanded, and the operation was assessed based on the more ambitious outcome target, so a split rating is not applied.[33] The three main elements of the PDO remained the same and are the basis for the assessment of outcomes. The three revised PDOs will be assessed one after another using the project results framework and data obtained through interviews with the Project Management Unit (PMU), the WBG supervision team, external experts, and articles published in newspapers.

35. **Outcome 1: improve reliability of railway services.** The efficacy analysis of this outcome focused primarily on the related two intermediate indicators and understood "reliability" as "operational reliability."

36. **The linked PDO-level indicators related to the PDO of "reliability" are the rate of use of ENR assets and to the number of long-distance passengers on the project's lines**. These indicators are only slightly attributable to the project and depend on the government's implementation of the Renaissance Program. (See figure 1 and the discussion in the M&E design section.)[34]

37. **Reliability is a primary expectation that users and governments have of a transport infrastructure.**[35] Governments (and rail operators) have a direct interest in the reliability of a service to

[33] OPCS guidance. 2020. Implementation Completion and Results Report (ICR) for Investment Project Financing (IPF) Operations. OPS5.03-GUID.1.56.Effective: March 2, 2020.
[34] The indicators suggested in the PAD to measure the "reliability" are mostly indicators of efficiency, even if the issue of attribution remains.
[35] In the transport sector, "reliability" is used as a synonym for "predictability." The percentage of trains arriving within a defined time margin is the most common way to express reliability in the railway sector. Users expect service punctuality.

attract passengers.[36] Two intermediate outcome indicators monitor punctuality of air conditioned trains on the Cairo–Alexandria and Beni Suef–Asyut lines. Both indicators are a ratio based on the number of air-conditioned trains arriving within 15 minutes of their predicted arrival time divided by the total number of air-conditioned trains operating during the same period. None of these indicators reached their targets at the closing of the project, for the following reasons.

(i) The nature of the civil works undertaken for the ENRRP requires partially stopping the circulation of trains or reducing the speed or frequency of trains on the line under modernization. During the works, there is a high probability of delays, especially on an extremely dense network like the ENR network.[37]

(ii) Limited availability of coaches, social unrest, and nonadaptation of publicly disclosed timetables to reflect ongoing civil works explain that punctuality indicators did not reach their targets.[38]

(iii) The fact that signaling works on any of the lines included in the ENRRP were incomplete made it impossible to benefit from the advantages of a new signaling system, which will allow higher operating speeds along the whole line.

(iv) The relevance of indicators linked to punctuality is questionable: some interviews with some interviewees emphasize limitations on the accuracy of the data.

38. ENRRP aimed to increase reliability on the project's lines by installing a modern signaling system. The modernized signaling system was partially operating at closing (table 7), with the system installed on 300 km of 640 km, although the sections were discontinuous. ENR statistics measure punctuality on the entire line, so it is not possible to measure punctuality improvements that may have resulted from the ENRRP.[39]

39. The additional financing project paper refers to "operational reliability."[40] The expression “operational reliability” raises the question of the sources of transport unreliability.[41] The Organization for Economic Cooperation and Development study mentions unanticipated supply-related events, including "Mismanagement in infrastructure supply, which can also include inappropriate maintenance programs."[42] From the supply side, a network in good condition can increase reliability. From this

[36] OECD/ITF. 2009. Improving reliability on surface transport networks. Transport Research Centre. OECD/ITF, Paris, 165 p.
[37] Users’ perspectives can be useful to understand their perception of reliability, but because civil works that require stopping trains on railway lines is ongoing, the validity of such a survey would have been limited. Such survey, therefore, was not conducted.
[38] Sources: Interviews; ENRRP ISR, Sq. 8; borrower ICR, Section 15: “Evaluation of the borrower Performance during the preparation and implementation and lessons learned.”
[39] Sources: Email exchange with the PMU, the WBG supervision team, and borrower’s ICR.
[40] Report No: 57022-EG, page 1.
[41] Our hypothesis is that reducing the source of unreliability on the supply-side can increase the overall network's reliability.
[42] Source: p. 35 in: OECD/ITF. 2009. Improving reliability on surface transport networks. Transport Research Centre. OECD/ITF, Paris, 165 p.

perspective, track renewal activities (component 2) were successful because the project supported renovation of 297.4 km of track,[43] although the original scope included 200 km, and the revised target was 260 km.[44] Owing to defects on tracks, mainly because of lack of maintenance, the operational speed on these segments could be as low as 60 km per hour, instead of a theoretical speed of 120 km per hour. After track renewal, the operational speed was claimed to be 120 km per hour, contributing to operational reliability, higher speed, and shorter travel times.[45]

40. **Outcome 2: increase efficiency of railway services.** The original results framework links this PDO to two indicators (public service obligation (PSO) paid and total freight traffic, indicators (b1) and (b2) in table 1). These two PDO-level indicators were dropped at the first restructuring and were not formally replaced[46] because both indicators depend exclusively on the government's commitment and on the ENR for restructuring of the railway transport sector. ENRRP did not include any specific component to facilitate achievement of these two indicators. Efficiency will result from the modernized signaling system through greater capacity on the line, because the number of trains can increase by 80 percent once the signaling system is fully operational.[47]

41. **The PAD refers to "operational efficiency."** The PDO-level indicators monitoring available ratio of the useful fleet, kilometers per available locomotive, or number of passengers can be considered efficiency indicators. Three of these indicators exceed their targets (kilometrage per available locomotive: long-distance passenger; kilometrage per available locomotive: freight; and long-distance passenger traffic on Cairo–Alexandria line: total annual passenger-km in non-air conditioned long-distance trains (million)), although several exogeneous factors (e.g., strikes, pricing policies, coach availability, alternative means of transport available) influence the indicators on number of passengers.[48] Mileage per available locomotives is also an indicator that fleet size, for example, influences. Moreover, these indicators cannot be attributed to the project's activities alone.

42. **Effective maintenance of assets contributes to efficiency.[49]** ENRRP contributed to change the way ENR approaches maintenance. Interviews highlight that component 2 on track renewal introduced new

[43] Value from the Results Framework. There is a small discrepancy; for example, the Aide-Memoire for the supervision mission in May 2017 states 297.5 km of renewed tracks.
[44] It was possible to finance more kilometers of track renewal than planned because of cost savings (cf. Restructuring #1 in 2014, Report No: RES13265).
[45] Source: SALCEF & SYSTRA. 2016. Contract progress report. ENRRP. Execution of 200 km of track renewal work. Document shared with the ICR author by members of the project's supervision team.
[46] Source: Report No: RES13265, cf. section: "Revised PDO indicators" above, and Figure 2: "Theory of Change at Closing."
[47] Source: Railway Technology. 2015. Alstom to deliver signaling equipment for Egyptian Railway.
[48] Source: OECD/ITF. 2019. Efficiency in Railway Operations and Infrastructure Management. Roundtable Report. OECD/ITF, Paris, 117 p.
[49] Source: OECD/ITF. 2019. Efficiency in Railway Operations and Infrastructure Management. Roundtable Report. OECD/ITF, Paris, 117 p.

approaches based on mechanized works planned annually, depending on traffic intensity on each line, and on external contractors. During execution of component 2 of ENRRP, an average of 500 meters per day was renewed, which is a good average according to international standards. This was made possible by achieving high productivity and good planning of track renewal work. Moreover, maintenance costs on the renewed sections have decreased over the project's lifetime. The project thus helped increase efficiency on the ENR network.

43. **ENRRP helped increase efficiency defined in terms of financial performance.** Although the restructuring of ENR along business units was begun before ENRRP was initiated, the newly established structure was modified after the start of ENRRP. The project's aide-memoires show the ongoing dialog the WBG had with ENR on efficiency.[50] The WBG team worked closely with the Italian management team based at ENR headquarters to reorganize ENR along business units.[51] The former head of the Italian delegation stated in an interview that the supervision missions conducted by the World Bank Group teams were highly useful to support and push on the reform agenda. The six business units are now Short-Distance Passenger, Long-Distance Passenger, Freight, Infrastructure, Operations, and Fleet Maintenance. A vice chairman manages each business unit. All vice chairmen report directly to the chairman of ENR. Before ENRRP, ENR profits and losses were unknown. The organization around business units helped to increase efficiency by separating ENR activities. The system can still be improved; each business unit's operating costs have not been separated yet, although ENRRP enabled a discussion about the need to separate costs.[52]

44. **ENR also introduced the idea of management by results.** Managers at ENR are now evaluated annually with key performance indicators.[53] Although annual objectives may be unambitious, a culture of performance monitoring has been established at ENR.

45. **The ongoing dialog between the WBG and ENR increased efficiency defined in terms of human resources.** ENR significantly reduced its headcount, from 51,412 employees in 2009 to about 35,258 today, and staff quality improved. The rate of technicians working at ENR increased between 2009 and 2021 (table 6). Ongoing dialog between the WBG and ENR and close cooperation between the WBG, the Italian experts, and ENR enabled the restructuring in terms of human resources. ENR needed employees who could operate modernized assets and needed to adopt a business-oriented approach. ENRRP resulted

[50] Sources: Aide-Memoire, supervision mission, July 23-28, 2011; Aide-Memoire, Supervision mission, December 12-16, 2010.
[51] As stated in the Section: "Context," Italian experts based in Cairo had an ongoing dialog with the government of Egypt on the railway sector. The WBG transport team worked closely with members of an Italian delegation working at ENR as part of a secondee program.
[52] Sources: interviews conducted during the ICR preparation with WBG team members and the head of the Italian delegation who was based at ENR headquarters.
[53] Source: Aide-Memoire, Implementation Support Mission, April 28 – May 2, 2013.

in more training, with the ratio between the number of staff-days allocated for training during a year and the average number of management staff at ENR increasing from 2.1 at the beginning of ENRRP to 12.1 at the project's closing (see Annex 1, intermediate indicator for component 3. Average management training time).

Table 6. Evolution of the Employee Structure at Egyptian National Railways at Appraisal (2009) and Closing (2021) of ENRRP

Type of worker	2009		2021		Change
	#	%	#	%	%
Engineer	1,070	2	879	2	-18
Accountant	610	1	513	1	-16
Technician	22,042	43	20,749	59	-6
Craftsman	27,690	54	13,117	37	-53
Total	51,412	100	35,258	100	-31

Source: Project management unit, April 2021.

46. Outcome 3: increase safety of railway services.[54] The validity of the PDO-level indicator "Average number of fatalities due to railway accidents on the ENR network" is unclear (see discussion in M&E section). This implementation completion and results (ICR) report examines here other data related to safety.[55]

47. The ENRRP improved part of the signaling infrastructure. The ENRRP aimed to improve safety by implementing a modern signaling system that complies with the world's most advanced railway system safety standards. As the related intermediary indicators indicate,[56] the work has not been completed (see Annex 1), although the modernized signaling system is partially operating. Once the work is completed under the RISE project (figure 2), the signaling system will be operating along 640 km of the line (against the 165 km as originally planned in the ENRRP PAD).[57] Table 7 summarizes work completed for the three lines at closing.

[54] See Annex 7 for more details on the safety elements in rail systems.
[55] This indicator reports the average number of fatalities from railway accidents on the ENR network, measured as total annual number of victims on ENR network per million passenger-km.
[56] The two related intermediate outcome indicators are "Installation of a modernized signaling system on Cairo-Alexandria line completed and operating 24/7" and "Installation of a modernized signaling system on Beni Suef-Asyut line completed and operating 24/7." There is no similar indicator for the Asyut–Nag Hammadi line. There is no PDO-level indicator directly associated with the physical progress of the signaling modernization work.
[57] Signaling systems consist of two parts, one on-board and one on the track (Annex 7). The ENRRP civil work is focused on modernizing the signaling system on the tracks, although completed studies under ENRRP on on-board elements (European Train Control System-1) lay the foundation for the RISE project.

Table 7. Work Achieved Under ENRRP at Closing and Financial Amount rolled-out to the Railway Improvement and Safety for Egypt project

Section				Alexandria–Arab El Raml (Thales)	Cairo–Benha (Thales)	Beni Suef–Asyut (Alstom)	Asyut–Nag Hammadi (Thales)	Total
Total project scope			Kilometers of mainline	165	45	250	180	640
			Number of signaling towers	10	9	15	17	51
			Number of stations	32	12	37	37	118
Track Renewal Works & Buildings	Finalized	Dec-20	Number of signaling towers	8	5	6	3	22
			Number of stations	29	8	13	7	57
	In Progress	Dec-20	Number of signaling towers	1	0	2	2	5
			Number of stations	2	0	3	5	10
	Not Started Yet	Dec-20	Number of signaling towers	1	4	7	12	24
			Number of stations	1	4	21	25	51
Signaling Works	Commissioned	Dec-20	Kilometers of mainline	114	25	75	17	223
			Number of signaling towers	7	4	6	2	18
	Currently under Commissioning	Dec-20	Kilometers of mainline	20	0	28	11	59
			Number of signaling towers	1	0	2	1	4
Financial data signaling contracts			Signaling contra's amount (USD million)	164.5		117.3	152	433.8
			% of work completed	77		66	47	
			Financial progress (%)	85		87	62	
			Amount to be financed under the RISE project (USD million)	28		17	62	107

Sources: ISR Sq. 26, Feb. 2021; AM Supervision mission December 2020.

48. **Safety improved on the sections now operated under electronic control.** Accidents related to ENR staff human error along the project's sections decreased, although the WBG project team reported two crashes after project closing on the lines modernized under the project where the upgraded signaling system was operating (see Section: "Risk to development outcome"). The ENRRP decreased the number of unsafe points of contact between trains and other means of transport; 91 of the 230 level crossings in the scope of the ENRRP project have been modernized.[58] Pictures of the modernized signaling system are included in Annex 7.

49. **Safety awareness of ENR staff increased.** The training of locomotive drivers improved with installation of a locomotive driving simulator, controlled by computers, at the Warden Institute, the ENR training center.[59] Training time plan, technical courses, and psychological tests are administered to technical staff, including drivers and assistant drivers.[60] In 2018 and during the first half of 2019, 9,995 individuals successfully completed a training plan for "safety critical job," and 2,116 successfully completed a training plan on "safety [certification] and licenses." [61] In addition, all ENR staff should sign a code of conduct regarding safety. Railway users were sensitized to safety with a series of videos financed by the WBG to support the ENRRP.[62] Safety licenses were approved in 2018.[63] The ministerial decision implementing safety licenses is effective but not published in the Official Gazette. An exchange with an Egyptian legal consultant confirmed that decrees are often not published, especially before the constitutional reform of 2019, but this does not affect their effectiveness. The introduction of safety licenses was acknowledged in the press.[64] As of May 2018, only 1,390 workers had a safety license.[65]

Justification of Overall Efficacy Rating

50. **By international standards, this was a technically complex project**. ENRRP is a mega-project. Implementing a new signaling system and a new way to operate introduced a revolution at ENR. Even if most indicators had not reached their targets at closing, ENR has an up-to-date signaling system on sections of its main railway lines. Continuous dialog between the WBG and ENR helped address systemic challenges. ENRRP supported modernization of ENR and its operations. In 2011, the government asked

[58] Source: data communicated by the PMU, February 2021. The borrower's ICR mentions a total of 197 level crossings. The PMU confirmed the typo in the borrower's ICR and confirms the total number of 230 level crossings within the ENRRP scope.
[59] Source: Aide-Memoire, supervision mission December 2015.
[60] Source: Presentation from the PMU shared with the ICR team by the WBG supervision team.
[61] Source: data gathered by the PMU and presented to the WBG team. Data shared by a WBG team member.
[62] Source: Management Letter, mission supervision March 2019.
[63] Ministerial Decision No. 9852. PowerPoint presentation from the PMU shared by the WBG supervision team.
[64] Egypt Today, "Railway Authority introduces new system to enhance rail safety," April 20, 2018.
[65] Source: PowerPoint presentation from the PMU shared by the WBG supervision team.

the Bank for more support to finance the ETCS-1.[66] ENRRP was the first WBG project with ENR and laid the foundation for further engagement.

51. **The project is likely to achieve its objective on reliability, efficiency, and safety once the modernized signaling system is fully operational along the three lines.** Modernization of the signaling system will be completed with the RISE project (P175137). The PDO of the RISE project is "to improve safety and service quality of the railway services along the Alexandria-Cairo-Nag Hammadi corridor."[67] ENRRP activities (completion of studies, ongoing modernization of the signaling system, track renewal) laid the foundation for the RISE project.

52. Based on the above analysis of the outcomes related to increasing the reliability, efficiency, and safety of railway services, taking into account the indicator achievements and additional evidence that substantiates the benefits of the project, without which railway services would be in a much worse condition, the **efficacy rating is modest**.

C. EFFICIENCY

Assessment of Efficiency and Rating

53. **Efficiency is rated Substantial.** An ex-post economic analysis of the project reproduced the original analysis (see Annex 4 for details). The economic rate of return for the original loan (Cairo–Alexandria segment) at appraisal was 16.1 percent, and that of additional financing in 2010 (Beni Suef–Asyut segment) was 24.8 percent. During the project, the scope increased significantly because the cost of the Cairo–Alexandria signaling contract and additional financing was lower than anticipated. The additional scope was signal modernization of Asyut–Nag Hammadi (180 km) and a 297.4-km track upgrade between Cairo and the Aswan High Dam, which were outside the scope of the ex-ante economic appraisals.

54. **The economic analysis at project completion was conducted using the same model** used in preparing the ex-ante economic appraisal for the Cairo–Alexandria, Beni Suef–Asyut, and Asyut–Nag Hammadi segments and the track upgrade works, accounting for project implementation and anticipated effects on railway transport demand, safety benefits, and road maintenance costs, among other things. For the Asyut–Nag Hammadi segment, the ex-post assessment assumed that traffic and safety performance were functions of segment length and ridership and prorated them accordingly. Regarding the track upgrade works, the benefit was savings in costs of maintaining the existing assets to enable the current level of railway operations, which increase over time.

[66] This request was postponed because the original loan was effective, and the additional financing was about to be signed, so funds could not be reallocated at that time (Source: electronic correspondence between the task team leader and the Ministry of Transport, from June 22, 2011, filled in WBDocs).
[67] Source: Report No.: PAD4192, Feb. 2021.

55. The spreadsheet models were run for the three segments individually, assuming an asset life of 25 years after project closing, with two scenarios for each section:

(i) the base case scenario, called "do minimum," with no construction but routine and periodic maintenance of the railway infrastructure to maintain the current level of railway operations

(ii) the "do something" scenario, which takes into account works completed, with actual costs and construction dates.

56. The main economic results in present value over the life of the project plus 25 years of asset life after project closing are presented in table 8. The analysis compared, year by year, costs and benefits of the "do minimum" and "do something" scenarios. The project closed on December 31, 2020, with signal modernization works still incomplete. Therefore, it was assumed that the works would be completed by the end of 2022, at which point economic benefits would start accruing. Economic costs were based on loan disbursements for each of the contracts until the end of 2020, assuming that disbursement would continue at a speed typical of these types of projects.

Table 8. Results of the Economic Analysis Performed at Project Closing

Segment	Benefit/Cost	Ex-post net present value (12% discount rate; USD million)	Ex-post economic internal rate of return (%)
Cairo–Alexandria signal modernization	1.04	5.3	12.3
Beni Suef–Asyut signal modernization	3.69	99.6	26.6
Asyut–Nag Hammadi signal modernization	2.89	75.0	24.6
Track renewal	5.73	185.9	19.2
Total*	2.50	365.8	18.3

*Ex-ante economic appraisals were conducted separately for the original loan and additional financing for the Cairo–Alexandria and Beni Suef–Asyut segments. Here the cash flows from the two assessments were aggregated to calculate the total ex-ante economic internal rate of return.

57. The increased scope and the length of implementation affected the project's efficiency. Procurement for the Cairo–Alexandria signaling works achieved savings, which were repurposed to support substantial additional scope, namely signal modernization for the Cairo–Benha segment and the Asyut–Nag Hammadi line and renewal of an additional 97.4 km of tracks, which increased the economic benefit. The project experienced delays, and works were underway at project closing. As a result, some contracts, such as the project supervision consultant, which are by unit costs, are expected to increase because of the longer implementation period. Accounting for these aspects, the ex-post economic analysis found that the economic internal rate of return of the entire project was 18.3 percent. Assuming a 12 percent discount rate, the net present value was USD365.8 million. As reference points, the cash flows estimated for ex-

ante economic appraisals were 16.1 percent for the Cairo–Alexandria segment and 24.8 percent for the Beni Suef–Asyut segment.

58. The efficacy of the procurement process increased over the project's lifetime. Given the complexity of the work, in line with WBG procedures, ENRRP required a two-phase bidding procedure.[68] Table 9 highlights the duration of procurement processes decreases by almost 50 percent over the project's lifetime. Exogenous factors affected the first procurement process (figure 2). In interviews, staff of a railway operator in Europe suggested that 2 years for such a procurement process is not unusual. In France, for example, the code governing public procurement contracts requires at least 12 months for the procurement process. When time for exchanges with potential bidders is added, 2 years is an acceptable duration. This highlights ENRRP supported an efficiency gain at the institutional level. For Egypt the political and security instability, between 2011 and 2017, should also be factored when evaluating the procurement timeline and process.

Table 9. Procurement Duration for Each Awarded Contract

Railway line	Procurement process		Duration of procurement process
	Starting date	Contract award	
Alexandria–Arab El Raml	November 2009	August 2013	3 years, 8 months
Beni Suef–Asyut	May 2012	January 2015	2 years, 7 months
Asyut–Nag Hammadi	February 2016	December 2017	1 year, 9 months
Cairo–Benha	December 2017		(Extension of an existing contract)

Source: Data gathered by WBG supervision team.

59. Staff turnover was not a concern from the project's efficiency perspective. Four task team leaders, all based in Washington, D.C., oversaw the project. A former WBG staff member with specialization in railways who was hired as a consultant ensured continuity of supervision on technical aspects over the project's lifetime. The different stakeholders asked about this did not identify the number of task team leaders as a challenge for the project.

60. Based on the above discussion, given the savings resulting from successful bidding procedures, which allowed the scope of the project to be expanded and increased institutional efficiency, **the efficiency rating is substantial.**

[68] World Bank's Guidelines: Procurement under IBRD Loans and IDA Credits, dated May 2004 revised October 2006.

D. JUSTIFICATION OF OVERALL OUTCOME RATING

61. **The overall outcome rating is Moderately Unsatisfactory** based on a high rating for relevance, a modest rating for efficacy, and a substantial rating for efficiency.

62. **The project was a transformational mega-project for Egypt.** Its objectives remain highly relevant to the current development priorities of the government and the WBG. The nature of the project — updating an asset for Egypt—remains relevant to Egypt. The bidding processes were successful and led to savings. The ex-post economic analysis demonstrated the economic relevance of the project despite implementation delays. In short, ENRRP kept the modernization momentum going, increased ENR's ambitions by increasing the scope of the project through savings and laid the foundation for further engagement. As highlighted in figure 2, some of these delays were related to factors outside the control of the WBG, the government, or the implementing agency.

E. OTHER OUTCOMES AND IMPACTS (IF ANY)

Gender

63. **The project did not have a specific gender action**, because it supported both genders as part of the overall population. Women and men will benefit from improved railway services. Safe transport in general is important for women, to increase their mobility and their participation in economic activities. Women's associations participated in the public consultations organized for the environmental and social impact assessment in 2008.

Institutional Strengthening

64. **ENRRP strengthened ENR, particularly on procurement.** ENRRP involved procurement of complex turn-key contracts. We observe a learning effect, as the procurement processes' durations decreased over the project's lifetime. As highlighted in Section 2.C: "Efficiency," procurement speed increased over the project's lifetime, which supported capacity-building within ENR.

65. **ENRRP strengthened ENR safeguards.** Interviews highlighted that ENR now uses safeguard instruments in all projects, even those not financed by the WBG. ENRRP helped strengthen capacity-building at ENR and helped introduce best practices.

66. **ENRRP helped ENR become familiar with working with contractors.** During ENRRP, ENR contracted private companies to upgrade the tracks, which was new to ENR.

Mobilizing Private Sector Financing

67. **Policy dialogue engaged in through the ENRRP contributed to a friendlier legal environment for**

participation of the private sector in railway transport. [69] At the beginning of the project, the railway law dated from 1980.[70] Ongoing dialog between the WBG and the government through the ENRRP helped Parliament pass an amendment to the existing railway law that the President of Egypt signed in 2017 and is currently in force. The RISE project builds on the foundation that the ENRRP laid; the RISE project includes a performance-based condition to encourage public sector obligation and a multiyear infrastructure contract.[71]

Poverty Reduction and Shared Prosperity

68. ENRRP long-term objectives are to increase access to economic opportunities through safe, reliable railway service. ENRRP benefits in poverty reduction will be noticeable once the modernized signaling system is fully operational, but ENRRP has already contributed to local economic development through the railway tie plant (see next section).

Other Unintended Outcomes and Impacts

69. A benefit of the project is the construction in 2012 of a railway tie factory in Egypt. During implementation, it was found out that the ties produced domestically do not meet the quality standards for concrete ties under the contract. The contractor selected for the track renewal work had to develop a new, modern factory to produce concrete sleepers in Egypt. Construction of the factory delayed the track renewal works at the beginning of the contract but brought an important advantage for future track rehabilitation works. This factory was designed to produce high-quality ties for rehabilitation work on ENR's network.[72] It is possible the factory will close one day. However, interviews conducted as part of the ICR preparation and an online video that Salcef Group posted confirm that the factory is still operating.[73]

[69] Source: Railway Pro. "Egypt approves law enabling private sector involvement in railways," May 14, 2018. Available online: full link included in the bibliography; Egypt Today. "Private sector to operate Cairo-Alexandria railway line." May 13, 2018.
[70] Source: Aide-Memoire, Supervision mission, December 2013.
[71] Source: PAD RISE project, Report No: PAD4192.
[72] Source: Aide-Memoire, Supervision mission, February 12-16, 2012 and Aide-Memoire, supervision mission, June 2013.
[73] Source: Salcef Group. Video "Concrete Sleeper Production." 2017. The video description states that, in less than 3 years, Salcef "produced over 460,000 sleepers [railway ties] for the renewal of 290 km of tracks on different sections of the Cairo-Aswan line." Therefore, one can reasonably assume that the plant is linked to the ENRRP. Available online: *https://www.youtube.com/watch?v=VCgsecotQkA* [Retrieved April 30, 2021].

III. KEY FACTORS THAT AFFECTED IMPLEMENTATION AND OUTCOME

A. KEY FACTORS DURING PREPARATION

70. The following factors affected the project during the preparation phase:

71. The level of scrutiny was high during preparation. As explained above, the lack of safety of railway traffic was a concern for the government. A risk analysis conducted under the Transurb-Technirail study indicated that the Cairo–Alexandria corridor accounts for 53 percent of the total risk encountered on the ENR core network.[74] The WBG and the government wanted to address safety risks as quickly as possible. The WBG wrote for example:

> *We fully concur with the Government's willingness to expedite project preparation so that improvements in the quality and efficiency of railways services can be reaped as quickly as possible. Be assure that we will mobilize all required resources to ensure that the project is presented to the Board in the shortest possible time.* [75]

72. This was a high-risk, high-reward project. The project envisioned a considerable increase in terms of the safety and competitiveness of ENR. Several critical risks were identified in the PAD.[76] These risks were mostly linked to the reforms; one risk identified was, for example, "delays in implementing key elements of ENR's restructuring strategy." This is especially true because the original loan did not dedicate funds for component 3, so the WBG had little control over it. There is no mention in the PAD of the risks associated with the civil work components. The mitigation measures suggested in the PAD appear to be weak because it may be challenging to measure and monitor them.

B. KEY FACTORS DURING IMPLEMENTATION

Factors outside the control of the Bank, the government, or implementing agencies (changes in world markets and prices, unexpected and unforeseeable technical difficulties, natural disasters, war and civil disturbances)

73. The early years of project implementation (2011-2014) coincided with a period marked by political and security instability, associated with a high level of civil and regional instability, marked by the Egyptian Revolution in 2011 (figure 2). One of the consequences of this period is a high level of insurgency and a high level of insecurity. In many cases, protests organized on the railway lines completely interrupted railway traffic, which affected the project; interviews

[74] Source: Aide-Memoire, Technical mission, 2007.
[75] Source: Management Letter dated June 27, 2006 following an Identification mission, May-June 2006.
[76] Source: Report No: 46694-EG, Section: "Critical Risks and Possible Controversial Aspects", p. 12-14.

conducted during the ICR preparation highlighted that the administration was working in reduced functionality mode and that organizing field visits was challenging because of safety conditions in certain regions and contractor security requirements. Also, foreign firms who have the expertise in implementing complex railway projects, left the country.

74. **The closing year of the project coincided with the global COVID-19 pandemic,** although the pandemic had a limited impact on the project. Disbursements have been faster in 2021 than in 2020. The ENRRP was 38 percent complete in 2019 and 66.2 percent complete in 2020.[77]

Factors generally subject to government control (macroeconomic and sector policies, government commitment, governance and corruption, appointment of key staff, provision of counterpart funds, efficient administrative procedures)

75. **Project implementation coincided with a high level of political instability.** The ENRRP includes complex civil works, a change of culture in the ENR, and political sensitive reforms such as staff resizing, reducing ENR debt, and increasing ticket prices. These reforms require strong ownership and accountability. As highlighted in figure 2, there have been 12 ministers of transport in Egypt between 2010 and 2020.[78] Frequent changes at the Ministry of Transport limited ownership of the project at a high level.[79] To a broader extent, the lack of high-level ownership made it challenging for the ministry to consider reform proposals and convince ENR to undertake them.

76. **The Egyptian economy experienced a severe downturn after 2011.** The Central Bank of Egypt devalued the Egyptian pound (EGP) by 5 percent in 2014/15 and a further 13 percent in March 2016.[80] Egypt liberalized the exchange rate in November 2016 to restore it to its market value, abolish the parallel market rate, and eliminate acute shortages in hard currency. The exchange rate had initially overshot to EGP19.5/USD by mid-December 2016 (120% weaker than before liberalization), but it began to strengthen thereafter. The government introduced a bold program of economic reforms, including a floating currency, new value-added tax regulation, and gradual reduction of subsidies. Nevertheless, inflation spiked, with the headline rate jumping to a three-decade high of 33 percent in July 2017 on the back of the impact of the depreciation (along with

[77] Source: Disclosable version of the ISR Sq. 26, February 23, 2021.
[78] Wikipedia page Ministry of Transport Egypt, in Arabic. See the chronology in section: "Rationale for Changes and Their Implication on the Original Theory of Change."
[79] See also a reference to this in the borrower ICR, Section 15 "Evaluation of the borrower performance during the preparation and implementation of the operation and lessons learned".
[80] International Monetary Funds. November 11, 2016. IMF Executive Board Approves US$12 billion Extended Arrangement Under the Extended Fund Facility for Egypt. Available online: *https://www.imf.org/en/News/Articles/2016/11/11/PR16501-Egypt-Executive-Board-Approves-12-billion-Extended-Arrangement* [Retrieved on February 18, 2021].

other factors such as energy price adjustments and a value-added tax rate increase).[81] All these economic factors increased the costs of execution of the contracts for the following reasons:

(i) The government did not issue the legislation for compensation for international contractors' losses under the new extraordinary conditions in time (new value-added tax formula and high inflation rate).

(ii) The contracts included many prices in EGP, and the adjustment price formula did not account for Egypt's extraordinary economic situation. The parts of civil works executed with local subcontractors (for component 1) were contracted in EGP; the devaluation affected contractors' cash flow, and they had to renegotiate their contracts with their subcontractors. It took about 1 year to find a solution.[82]

77. **The high level of bureaucracy and the lack of coordination among different entities on the borrower's side contributed to unexpectedly long waiting times.** Interviews highlighted what appears to be unnecessary time lost. Modernizing a railway signaling system requires digging trenches for electrical cables. Even though ENR owned the land, contractors had to obtain permits from the army to dig trenches. Interviews highlighted the lack of coordination among entities, leading to long wait times to receive permits and delays. There was a similar lack of coordination for imports, work permits in station, and commissioning of each station.

78. **Social, political, and economic instability led to insecurity, vandalism, and theft.** Because of international companies' safety requirements, it was challenging to organize site visits as part of the procurement process during the project's early years.

Factors general subject to implementing agency control (management effectiveness, staffing adequacy, and quality)

79. **The PMU was established early but faced challenges.** The PMU structure was developed according to administrative decree 2859 (dated December 11, 2010) to include the PMU Director, financial specialist (part time), two accountants, procurement specialist, reporting specialist, information technology specialist, and environment specialist,[83] but in the beginning, PMU staff were not working full time on the project.[84] Staffing was inadequate, and capacity was thin to manage such a large project. This affected the PMU's ability over the project's lifetime to act as a strong project management team. This situation remains the same because the current head of the

[81] Source: exchange with a WBG economist based in Cairo.
[82] Source: interview with the project's supervision consultant.
[83] Source: Aide-Memoire, Supervision mission July 2011.
[84] Sources: ENRRP ISRs Sq. 4 and Sq. 5; one interview conducted as part of the ICR process and email exchange between the PMU and the WBG team.

PMU does not work full time on ENRRP. Interviews also highlighted that the PMU was established but was not embedded in the ENR hierarchy, leading to two main challenges:

(i) ENR staff did not understand what it meant to work for the PMU. Because it was the first PMU established at ENR, ENR staff did not understand the role and function of the PMU. Moreover, working for the PMU did not help ENR staffs' careers, so ENR employees expressed little interest;
(ii) The PMU had little power. PMU staff had to go back to each department for decision-making, which took time and did not empower the PMU staff.

80. Determination of technical solution took time. Several technological options were available to migrate the outdated signaling system to an up-to-date system. Proprietary and open solutions are on the market, and major railway operators use both. Proprietary solutions, used among others in Canada, South Korea, and the United States, are usually cheaper but do not offer interoperability. Open solutions such as the Electronic Train Controlling System offer independence from suppliers. Given the cultural "shock" that a new signaling system introduces, it took time for ENR to determine which solutions were best suited to their network.

81. The procurement process took a long time. ENR had little experience with two-stage bidding processes, and preparation of the bidding documents took a very long time.[85] ENR chose to base the procurement process on functional requirements. Interviews highlight that it was not technically possible to have a more straightforward procurement process. Another possibility would have been a procurement process based on detailed design specifications, but this would have limited competition, and the market would not have had the opportunity to suggest solutions. According to one interview, the prequalification stage took 1.5 years, whereas it should have taken 6 months. Interviews conducted as part of the ICR preparation report place blame on both sides: ENR needed time to conduct back-and-forth communication to finalize complex bidding documents. The bidding package for each procurement process had more than 1,600 pages, including the description of the functional requirements for each component of the new system (e.g., signaling, power supply, telecommunication, civil works). Consequently, the WBG also took time to clear procurement documents.

82. Lack of anticipation and change orders contributed to delays. The contractors and the supervision engineer overlooked the lack of updated rules book and signaling principles at ENR, the necessity of track renewal works in railway stations, the poor quality of existing cables, and

[85] Sources: Aide-Memoire, Launch mission, May 2009; Aide-Memoire, supervision mission, April 2020.

difficulties digging trenches because of groundwater level at the start of the project, leading to delays or additional work. Lack of an asset management system led to unforeseen work. In 2019, the contractors identified defective track, turnout, tie, and ballast conditions. In order to ensure the correct functionality of the new signaling system in the stations imposed works that have not been planned in the initial stage of contracting activities. Moreover, the detailed design of the new signaling system revealed the need for extensive track renewal works in addition to the track renewal works planned under component 2. The track work identified during the detailed design phase was necessary to ensure the functionality of the modernized signaling system.[86] Lack of anticipation of challenges also affected the workflow: ENR chose to weld rails and renew tracks in stations in house, but the quality of the work was not always acceptable or on schedule, leading to delays.

83. **Miscommunication and lack of partnership between stakeholders affected the ENRRP.** The supervision team reported significant delays (15 months) because of miscommunication and inefficient procedures. The supervision team reported, for example, that ENR units not involved in the project rejected documents that the Project Manager signed and that weekly supervision meetings took place at ENR without people with the capacity to make decisions.[87] Miscommunication challenges continued 2 years later. The supervision team reported that trivial problems, such as the types of cable to be installed and the diameter of the main signals, remained unsolved for a long time, disrupting the workflow.[88] The WBG had to intervene to ensure that all contractors were paid on time.

84. **The selected contractors were new to Egypt.** One contract was awarded to Thales France but executed by Thales Spain. Thales Spain was present in Egypt before 2009 but as a subcontractor, not a main contractor. Moreover, neither contractor (Alstom or Thales) is a civil project company.[89] Both contractors had to find local subcontractors to perform parts of the project. All stakeholders had to learn to work together.

85. **No one conducted a root cause analysis to understand the project's delays holistically**. The supervision engineer submitted quarterly progress reports to the PMU, but the few reports the team read while preparing the ICR report did not seem to be integrated and did not seem to suggest solutions to delays.[90] The reporting was fragmented, and the works were monitored and assessed

[86] Source: Aide-Memoire, Supervision Mission, April 2020.
[87] Source: Aide-Memoire, supervision mission, December 2013.
[88] Source: Aide-Memoire, supervision mission, November 2015.
[89] Source: information obtained through interview.
[90] Source: Reports shared by the PMU.

after completion. Active, forward-looking contract management and a better understanding of the project's critical path might have helped avoid delays.

Factors generally subject to WBG control

86. The WBG supervision teams monitored the project through missions organized twice a year. Twenty-six implementation status reports were filed over the project's lifetime. According to many interviewees, WBG supervision missions helped move the project forward. Some task team leaders organized "interim" missions between full-fledged missions or weekly video calls to maintain pressure on stakeholders.[91]

87. Preparation of the parent loan required 147.58 staff weeks, for a total of USD868,578. The total supervision amount for the overall project was USD1,884,995. The annual amount for supervision increased each year over the project's lifetime except in FY2016 and FY2017 (Annex 2).

IV. BANK PERFORMANCE, COMPLIANCE ISSUES, AND RISK TO DEVELOPMENT OUTCOME

A. QUALITY OF MONITORING AND EVALUATION (M&E)

M&E Design

88. Although indicators are defined in the PAD for each of the PDOs, and all components were associated with at least one intermediate indicator in the original PAD, the M&E design was generally insufficient to monitor and assess the project. PDO indicators were little attributable to the project and had unclear definitions. Therefore, the PDO indicators did not captured useful information to inform and track the project's progress. The minutes of the decision meeting highlighted that several indicators were not related to project activities in the peer reviewers' opinions.[92] Although project activities and outputs contributed to the goals of ENRRP, some indicators were barely—or not directly—attributable to project activities. Indicators related to the locomotives and the fleet are an example of indicators with poor attribution.

89. Original targets are missing or lack ambition. Another source of concern during the decision review meeting was lack of baseline or target values in the PAD.[93] For example, the PDO-level outcome "Available ratio of the useful fleet: long-distance passenger" had the same value for baseline and target. Regarding the PDO-level outcome "Average number of fatalities due to railway accidents on the ENR

[91] Source: ISR Sq. 17, September 2016; ISR Sq. 18, January 2017.
[92] Source: Egypt National Railways Restructuring Project (ENRRP), Minutes of the Decision Review Meeting, Washington, D.C., October 20, 2008.
[93] Source: Egypt National Railways Restructuring Project (ENRRP), Minutes of the Decision Review Meeting, Washington, D.C., October 20, 2008.

network," the PAD mentions "typical" and "nontypical" accidents, but even in the PAD, only total values—for baseline and target—are available. The definition of indicators lacked clarity.

90. **Intermediate indicators were not granular enough to serve as a checklist for project implementation.** According to the PAD, the goal of the intermediate outcome indicators is to "detect implementation delays, identify causes, and take corrective actions" (p. 41), although it is challenging to understand how the three original intermediate outcome indicators ("Punctuality on Cairo–Alexandria Line," "Maintenance costs on renewed tracks," "Training time of management") serve this goal. Additional intermediate indicators such as "Installation of a modernized signaling system on Cairo–Alexandria line completed and operating 24/7" added later support for this goal, but the indicator is too aggregated to support project monitoring.

M&E Implementation

91. **The additional financing introduced indicators to reflect the additional scope of work** on the Beni Suef–Asyut line and updated baselines for some original indicators. The first restructuring changed the results framework by dropping indicators related to freight and public service obligations-paid and adding indicators to reflect the updated scope of work. Limitations of the results framework were observed during the project's lifetime; in 2014, the WBG supervision team reported that "indicators on passenger long- and short-distance services affected by, among others, demonstration on railways tracks, trains not running at full capacity, passengers preferring other alternative transportation due to cancellation of some trips."[94] This did not lead to an in-depth adjustment of the results framework.

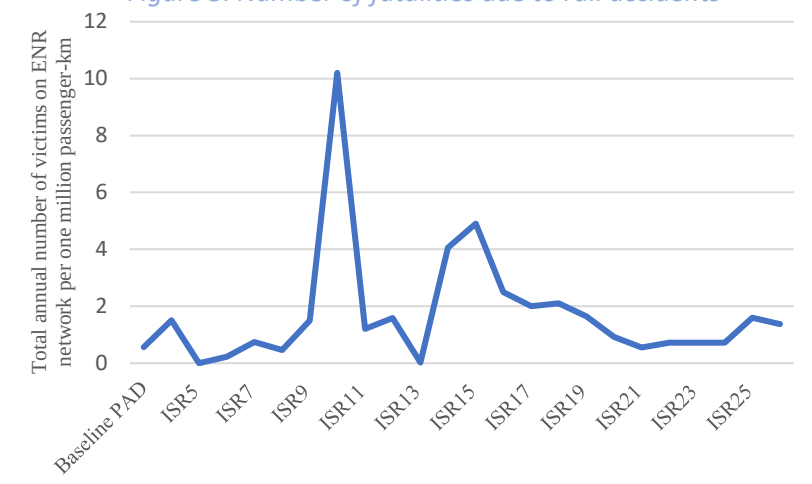
92. **The validity of some indicators is questionable**. This is, for example, the case for the PDO-level indicator "Number of fatalities due to rail accidents." The WBG supervision team reports a misunderstanding in the way data were collated. Figure 3 highlights the evolution of the reported values for this indicator over the project's lifetime. The large variations call into question its robustness. Moreover, the following points can be noted:

[94] Source: Aide-Memoire, supervision mission, June 2014.

(i) The indicator's scope covers the entire ENR network, which does not match the ENRRP scope.

(ii) The definition changed over time. As stated in the additional financing project paper, "ENR requested that the methodology and measurement method for collecting two indicators for ENRRP, mainly punctuality and locomotive availability, be further harmonized with ENR developed methods"[95]

Figure 3. Number of fatalities due to rail accidents



(iii) The measurement method, as explained in the results framework, is not straightforward; some WBG team members have questioned the denominator chosen (million, whereas yearly passenger-km are expressed in billion).

M&E Utilization

93. The results framework helped little to monitor the project. Even if, as discussed, all indicators included in the results framework were routinely updated, the indicators did not help the team monitor the progress of the work. The results framework summarizes investments of several million dollars in single "yes/no" indicators. No indicator monitors safeguards or health and safety, nor did the indicators target the project's main beneficiaries.

94. The results framework helped engage the dialog with the borrower.[96] The indicators monitored helped the WBG support the borrower. The results framework was slightly amended at additional financing and at the first restructuring in 2014 to reflect the project's orientation better. Given other challenges that the team faced over the project's lifetime, it does not seem that the results framework informed the subsequent restructurings, although the ENRRP results framework informed the RISE project results framework, which builds on ENRRP achievements. The RISE project results framework includes disaggregated indicators on safety, indicators on occupational health and safety, indicators of ENR users' perspective, and intermediate indicators to monitor project implementation.[97]

[95] Source: Project Paper on a proposed Additional Loan in the amount of US$330 million, Report No: 57022-EG, November 12, 2010.
[96] Source: ENRRP ISE Sq. 8, May 2012.
[97] Source: RISE PAD (Report No: PAD4192), and RISE Results Monitoring Plan post-Appraisal.

Justification of Overall Rating of Quality of M&E

95. The overall rating of M&E quality is negligible based on the significant shortcomings in M&E design, implementation, and use. In particular, the shortcomings in M&E design made it challenging to monitor progress toward objectives, and the restructurings and the additional financing did not include adequate changes to the results framework to allow for effective use of the data.

B. ENVIRONMENTAL, SOCIAL, AND FIDUCIARY COMPLIANCE

Environmental and social safeguards

96. The original loan and the additional financing were classified as category B. ENR hired an independent consultant to conduct an environmental and social impact assessment for both loans. The project triggered the following safeguards over its lifetime: environmental assessment (Operational Policy/Bank Procedure 4.01) and involuntary resettlement (Operational Policy/Bank Procedure 4.12). ENR established an Environmental Affairs Department at implementation of the project. The WBG team conducted about 16 missions dedicated to the safeguards and delivered five trainings on safeguards to the PMU, in addition to handholding support activities and on-the-job training. Moreover, with support from their contractors and the Bank, ENR established a grievance redress mechanism with phone numbers of contractors and of ENR at the central level. Still, the WBG did not receive a register of complaints received until the project closed. In the meantime, even though no complaints related to the behavior of workers were received, as a preventive measure, a code of conduct was prepared and disclosed at all construction sites. Contractors were required to conduct induction training on this code of conduct.

97. The following main concerns arose over the project's lifetime:

(i) At the beginning of the project, the PMU lacked resources to manage and monitor implementation of the environmental and social management plan. To help jump-start the project, an independent environmental consulting firm assisted the PMU in implementing environmental management plan requirements. Then the environmental affairs department was established and took responsibility for implementing the environmental and social management plan and managing environmental and social issues, including land-related issues. The capacity of the Environment Affairs Department to manage environmental and social risks has increased over the course of the Bank’s support of the project, specifically in gaining additional staff and benefitting from World Bank environmental and social specialists and training, including environmental and social framework training. Despite the increase in capacity, recurring performance shortfalls were also observed, particularly related to implementation of the project’s resettlement framework.

(ii) Component 2 generated a large amount of wooden waste, mainly sleepers, which was of concern because of possible contamination with hazardous chemicals. The Bank team flagged this concern, but ENR was not very responsive at an early stage. ENR shipped samples of the wooden sleepers to an international laboratory in Italy for chemical analysis; results confirmed that they were safe and free of hazardous and carcinogenic materials. Subsequently, ENR started selling the wooden waste at auction.

(iii) No resettlement plan was initially created because ENR owned the land, but the Bank team became aware that, even though all civil works were within the existing right of way of the rail corridor, which the state owned and was usually vacant, in some cases, ENR had rented the plots to employees or farmers, which therefore needed to be repurposed for project activities such as construction of technical buildings or shelters. Land tenants pay an annual fee to ENR; the receipts (or contracts in very rare cases) indicate that ENR has the right to take back this land as needed. Therefore, during the restructuring, the Bank decided to trigger Operational Policy 4.12, and a resettlement policy framework was prepared, cleared, and disclosed in November 2017 to ensure systematic compliance with Bank policies.

(iv) Although land impacts were limited in scale, and although the ENR Environment Affairs Department, with World Bank support, put in place internal systems to conduct land surveys along the corridor and screen and mitigate for land-related risks at work sites, there is a lack of adherence to the resettlement policy framework, mainly in lack of screening to avoid and mitigate economic displacement impacts before they occur. In December 2019, the Bank learned that such economic displacement of 67 project-affected parties at seven locations had occurred that did not conform to the project's resettlement policy framework, thus requiring corrective action. None of the 67 project-affected parties were physically displaced from homes; six at one location had small shops within the right of way that were relocated to another nearby location, albeit without adequate documentation of the relocation process. Land reports and corrective actions have resolved the nonconformance to WBG policies for these six. The World Bank is awaiting final documentation for the remaining 61 to confirm that due process has been followed and corrective actions, where necessary, have been taken, and these outstanding land issues from ENRRP will carry forward to RISE. The World Bank has received documentation for three sites for the economic displacement of eight project-affected parties, although the documentation has not been finalized. Documentation and corrective action necessary for economic displacement of 53 land tenants at three locations still must be taken. According to the Environmental and Social Commitment Plan of RISE, preparation, disclosure, and implementation of the corrective action plans (resettlement plans) are required not later

than 1 month after the effective date, and before any costs related to the performance of subject activities in those locations are reimbursed. Examples of subject activities are specified to include compensation to tenants and informal farmers cultivating land within the right of way for loss of standing crops, trees, or plants or access to them; loss of arable land; and loss of assets or structures.

(v) Regarding occupational health and safety, four fatalities occurred, one in 2015 and three in 2020, the first when a train passenger who was leaning out of a moving train collided with scaffolding at the contractor's site erected close to the tracks. In February 2020, two workers lost their lives in a highway traffic crash while on their way to patrol project sites. This incident highlighted weaknesses in one of the contractors' safety management plans and reporting to the Bank. The contractor prepared a root cause analysis and a safeguard corrective action plan. Some of the lessons learned included conducting a specific risk assessment for the security services jointly with the security subcontractor. This was included as part of the occupational health and safety documentation of the contractor's management system. Additionally, the contractor stopped using motor-bikes for project activities and provided induction training for all security personnel. ENR asked other contractors to follow this practice at the project level. In late November 2020, a passenger train struck and fatally injured a worker undertaking trenching activities beside the tracks. ENR and the contractor prepared a root cause analysis and a safeguard corrective action plan before the project closing date. Lessons learned from these fatalities will be incorporated into contractors' occupational health and safety plans for the new RISE project, such as requiring reduced train speeds near work locations and safety hazard analyses of security services. In March 2021, two trains collided between the two railway signaling towers of Maragha and Tahta. The two towers had been installed, commissioned, and handed over to ENR in September 2020 and December 2020 as part of the ENRRP. The Bank team is following up with ENR and will review the RISE project measures to develop safety awareness and safety practices built into the project to integrate lessons learned and the outcomes of the incident investigations during project implementation. An accident that occurred in May 2021 in Toukh on the Cairo-Benha segment is under investigation.

Financial Management

98. **Financial management was regularly rated moderately satisfactory.** The borrower submitted all requested reports on time, and all reports were in good standing. Ineligible expenditures have not been noted over the project's lifetime. The WBG team offered the usual training on financial management. From a financial management perspective, the ENRRP was not a high-risk project, but disbursements were slow.

Procurement

99. **Procurement was mostly rated moderately satisfactory.** Significant savings and strong competition from international bidders explain this rating. Nevertheless, although procurement went well, preparation of bidding documents and obtaining all necessary no objection took longer than expected.[98] The two-stage bidding process was chosen because it allows bidders to propose the best solutions based on functional requirements, but it took time. The procurement specialist assigned to the project met regularly with ENR during all phases of the procurement cycle. Procurement improved over the project's lifetime, with the last seven implementation status reports rating procurement as satisfactory.

C. BANK PERFORMANCE

Quality at Entry

100. **The ENRRP was a necessary and ambitious project** and was in line with the government's goals, although as explained above, it was challenging from a technical perspective. Minutes from the decision meeting highlight concerns regarding the difficult nature of the project, the fact that the ENRRP represented only 7 percent of the overall investment planned by the government, and the fact that the WBG does not finance component 3.

101. **No other organization was equipped to take on the scale of the challenge,** according to our assessment. ENRRP was a mega-project, and the team may have overlooked several potential challenges, whereas others could not have been foreseen. It was a complex project in a complex environment and had a very short five-year implementation period for a railway project; the WBG appraised projects with longer duration in other countries during the same period. Nevertheless, ENRRP achieved results, modernized a crucial sector for Egypt, and laid the foundation for further engagement through the RISE project.

Quality of Supervision

102. **The project started slowly.** The need to intervene to solve safety issues and the resulting speed of the preparation made it impossible to comply with the readiness checklist. The WBG supported the newly created PMU by hiring a consultant and supporting the staff recruited, although the WBG team could have done more for example, by providing more training and ensuring that the PMU was embedded in the ENR hierarchy. However, the supervision team did not reassess the project's risks: in 2023 and 2013, the instability is not reflected in the Aide-Memoires.

[98] Source: Electronic correspondence internally archived highlight that up to one month was necessary for the WBG to send its no objection.

103. A midterm review was performed in December 2013. At that time, the WBG team recognized that the targets of the PDO-level indicators linked to efficiency could not be reached because of factors beyond the control of ENR (figure 2). The WBG mission noted the ENRRP was gaining momentum. The team indicated that the coordination necessary to implement the ENRRP successfully was missing. The team also emphasized the importance of the Italian experts in supporting the ENR reform process. The WBG team urged ENR to find solutions to extend cooperation with the Italian experts beyond 2014. Although the WBG team took action after the midterm review through a restructuring, two opportunities were missed:

(i) The two dropped PDO-level indicators have not been replaced, nor were other PDO-level indicators. The midterm review would have been a good time to rethink the M&E design.

(ii) Closer cooperation with the Italian experts might have been possible through, for example, financial engagement of the WBG.

104. The WBG supervision team demonstrated strong adaptation skills, engaging in continuous dialog with ENR outside the scope of ENRRP. The supervision teams consistently adapted to anticipate ENR's needs and offer continuous technical guidance, as the following examples demonstrate.

(i) In 2013, the WBG team organized a study tour to Morocco and Tunisia to foster an exchange of knowledge.[99]

(ii) After the first restructuring in 2014, USD9 million was allocated for technical assistance. ENRRP was at that time one of the few WBG projects in Egypt with technical assistance included in the loan.

(iii) In 2015, the team guided ENR, who wanted to directly award a contract for the migration to ETCS-1, which may have been risky because of lack of experience.[100]

(iv) In 2019, the WBG financed video clips to promote safety in the railway system;[101] started a safety initiative; and brought in world-class safety experts to improve safety policy, procedures, and training at ENR.

105. The WBG teams contributed to good working relationships between all stakeholders. During the supervision missions, the WBG ensured that all stakeholders (ENR, PMU, contractors, supervision engineer) actively participated and facilitated discussions between stakeholders if needed. As highlighted in the interviews, all stakeholders recognize the technical expertise of the WBG teams. The WBG maintained the momentum and the interest of the government in reforming the railway sector even in a very difficult economic environment.

[99] Source: Aide-Mémoire, Implementation Support Mission, April 28 – May 2, 2013. The study tour was funded thanks to a Trust Fund (TF017511).
[100] Source: Aide-Memoire, supervision mission, November 2015.
[101] Source: According to the task team leader in charge of the project at that time, the WBG funded the videos.

106. **The WBG supported stakeholders by agreeing twice, in 2014 and 2019, on advance payments,** which gave the contractors additional working capital and explains in part the increase in implementation pace.

107. **Before the COVID-19 pandemic, the WBG team had already started to organize weekly videoconferences with ENR to monitor the project's progress,** although the team began to monitor the project closely quite late in the project's lifetime. For example, an aide-memoire from 2016 mentions numerous changes in design and delays on all previously agreed deadlines.[102] No stakeholder ran an in-depth root cause analysis when the project experienced its first delays. The weekly videoconferences had results on the ground, with the disbursement rate increasing even with COVID-19, but it was unfortunate that closer supervision was not established earlier.

Justification of Overall Rating of Bank Performance

108. **Bank performance is rated moderately unsatisfactory.** Quality at entry and supervision was poor, such as inadequate M&E design with nonaligned indicators, which were not adjusted during project restructuring for the benefit of achieving expected results. Nevertheless, the World Bank teams demonstrated flexibility during implementation to adjust the project to respond to savings and changing needs, conducting two restructurings and an additional financing. In addition, close supervision helped accelerate disbursement toward the end of the implementation timeframe.

D. RISK TO DEVELOPMENT OUTCOME

109. **Risk to development outcome persists.** The remaining activities of the ENRRP have been rolled over to the Egypt RISE project. The two recent train crashes highlight that structural changes take time but also that a risk to development outcomes remains.

110. **Safety is linked to human behavior.** On March 26, 2021, there was a train crash on the Asyut–Nag Hammadi line. The prosecutors investigating the crash highlighted that the driver and his assistant had deactivated the automatic train control system, which controls speed and activates the brakes to stop a train in the case of imminent danger, and that a tower control guard and the train assistant were under the influence of drugs (hashish and tramadol, an opioid).[103] This highlights that, although modernized infrastructure is necessary to decrease the risk of crashes, human behavior is critical. As the WBG team has emphasized for several years, a culture of safety should be fostered at all staff levels. Maintaining the promotion of a culture of safety is necessary to continue a risk for the development outcomes of ENRRP in the future.

111. **On April 18, 2021, a second deadly crash happened in Toukh, on the Cairo–Benha section.**

[102] Source: Aide-Memoire, Supervision mission, December 2016.
[103] Source: "Egyptian prosecutors find gross negligence behind train crash," Al Jazeera, April 12, 2021.

This crash was a derailment with only one train involved, so it is unlikely that the signaling system was involved. This crash is under investigation.

112. **ENRRP laid the foundation for the RISE project,** which will mitigate the remaining risk by ensuring government ownership as well as financial sustainability of the project, and installation (through co-financing from the African Development Bank) of the ETCS-1, which is the necessary second layer of safety. Therefore, from an infrastructure perspective, development outcomes are likely to be achieved.

V. LESSONS AND RECOMMENDATIONS

113. **ENRRP was an ambitious project that included a reform agenda, complex civil projects, and a culture change.** As described in the ICR report, overall implementation was not always smooth. The following lessons are intended to inform future WBG operations:

114. **The project's complexity and necessary implementation time should be recognized.** The complexities arising from these projects must be recognized by allocating the necessary time and budget for appropriate supervision. Preparation time and the 5-year timeline at appraisal were unrealistic given the project's complexity and the limited experience of ENR with WBG projects. Moreover, expanding the project scope through additional financing 2 years after the original loan is not good practice because of the financial and administrative costs for the WBG and the borrower. The success of the RISE project, which was approved in March 2021 and is expected to close in September 2027, is linked to strong supervision and a clear definition of the borrower's, PMU's, contractors', supervision engineer's, and WBG's responsibilities. On the WBG side, the budget for supervision should be frontloaded in the early years of implementation to address any early challenges. Realism should come into project design for complex projects. Therefore, infrastructure projects should not be rushed but should be well designed to avoid implementation challenges and delays.

115. **ENRRP was technically the right solution.** Financing rolling stock is easier than modernizing a signaling system, but absent the signaling system, other investments will not deliver the expected results. Therefore, ENRRP remains a game-changing project for ENR, the Ministry of Transport, and Egypt by laying the groundwork for other investments. The WBG added substantial value in this project; interviews highlighted that it is difficult to think of other international financial institutions that would have financed modernization of a railway asset and provided the necessary knowledge over a decade.

116. **Accountability is critical to ensure effective implementation.** The borrower and the Bank

need to make sure that each knows its duties and responsibilities. A clear definition of each other's roles would help build a partnership and effective working relationships between stakeholders and avoid shifting the blame for problems arising during project implementation. Ideally, one entity, correctly staffed from the beginning, would have full responsibility for the project so that all stakeholders would have an accountable counterpart. The RISE project ensures strong accountability by having strong personal requirements for the PMU in the legal agreement.

117. **It is essential to assess stakeholder capacity early during the design stage to address gaps and ensure smooth implementation.** This transformational project was the first WBG project for ENR. Reforming the railway sector is challenging in all countries. Railways are public institutions and public employers. Railway staff must be motivated while, at the same time, substantial reforms are instituted. The WBG should keep embracing challenging, game-changing projects, but more than in other projects, the WBG must be realistic about client capacity and, for example, provide more training or closer supervision at the start of a project.

118. **ENRRP informed the RISE project.** The RISE project's design recognizes the need to strengthen the PMU to ensure that the PMU has decision-making power. The RISE project recognized the need for strong project management. A strong M&E framework was developed as part of the RISE project to monitor project implementation. The RISE project recognized the importance of the M&E framework and agreed with the borrower on a strong results framework to monitor project implementation.

119. **Managing risks correctly is critical for smooth implementation.** Identifying risks during the preparation phase is a necessary first step. In the case of ENRRP, all stakeholders overlooked risks during the design and supervision phases. Strong coordination between stakeholders to identify, assess, and monitor risks as early as possible and to implement planning mitigation measures is crucial to ensure that unforeseen events do not delay implementation. Project supervision should emphasize risk management to ensure timely delivery of the project.

120. **Projects should be used to support sector-wide dialog and mobilize donors.** ENRRP supported broader sector reforms. The ongoing dialog the WBG had with ENR also helped other development aid agencies, such as the Italian experts based in Cairo as part of the twinning program. WBG projects should keep engaging with all donors to enable deep sectoral transformations, but the Bank should ensure that it has influence over all project components by linking the results framework to attributable actions and by adding, for example, performance-based conditions, as in the RISE project.

121. **The results framework should focus on the final outcomes of the project.** As discussed above, the results framework of the ENRRP had substantial limitations. It is recommended that attributable and disaggregated indicators for all components be included to better capture the PDOs and implementation progress. M&E design should be directly linked to project PDOs. Project indicators should be attributable, achievable, and relevant to project activities. Indicators should be disaggregated to support project supervision; binary "yes/no" indicators should be avoided when monitoring investments of several hundred million dollars.

ANNEX 1. RESULTS FRAMEWORK AND KEY OUTPUTS

A. RESULTS INDICATORS

A.1 PDO Indicators

Objective/Outcome: The objective of the Project is to improve the reliability, efficiency and safety of the railways

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Availability ratio of the useful fleet (%): long distance passenger	Percentage	49.50 17-Mar-2009	85.00 10-Feb-2009	80.00 12-Nov-2010	50.00 30-Jun-2020

Comments (achievements against targets):
Baseline and target were similar (85) in the parent loan PAD. Baseline and target were revised at AF. The baseline in the system (49.50 on March 17, 2009) mixes the year of the parent loan (2009) with the revised baseline value at AF (49.50).

Partly achieved.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion

Availability ratio of the useful fleet (%): short distance passenger	Percentage	74.50 17-Mar-2009	85.00 10-Feb-2009	80.00 12-Nov-2010	71.70 30-Jun-2020

Comments (achievements against targets):
Baseline and target revised at AF. The baseline in the system (74.50 on March 17, 2009) mixes the year of the parent loan (2009) with the revised baseline value at AF (74.50). The baseline value in the PAD was 82.

Partly achieved.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Availability ratio of the useful fleet (%): freight	Percentage	15.30 17-Mar-2009	85.00 10-Feb-2009	77.00 12-Nov-2010	43.00 30-Jun-2020

Comments (achievements against targets):
Baseline and target revised at AF. The baseline in the system (15.30 on March 17, 2009) mixes the year of the parent loan (2009) with the revised baseline value at AF (15.30).

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Kilometrage per available	Kilometers	143,000.00	208.00	176.00	186,000.00

locomotive: long distance passenger		17-Mar-2009	10-Feb-2009	12-Nov-2010	30-Jun-2020

Comments (achievements against targets):
Baseline and target updated at AF.

Achieved.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Kilometrage per available locomotive: short distance passenger	Kilometers	68,000.00 17-Mar-2009	111.00 10-Feb-2009	97.00 12-Nov-2010	65,000.00 30-Jun-2020

Comments (achievements against targets):
Baseline and target updated at AF.

Not achieved.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Kilometrage per available	Kilometers	75,000.00	95.00	85.00	103,000.00

locomotive: freight		17-Mar-2009	10-Feb-2009	12-Nov-2010	30-Jun-2020

Comments (achievements against targets):
Baseline and target updated at AF.

Achieved.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Long distance passenger traffic on Cairo-Alexandria: total annual passenger-km in air conditioned (AC) trains (million)	Number	855.00 17-Mar-2009	1028.00 10-Feb-2009	1,907.00 12-Nov-2010	1,205.00 30-Jun-2020

Comments (achievements against targets):
Baseline and target revised at AF.

Partly achieved.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Long distance passenger	Number	1,323.00	1453.00	2,503.00	2,948.00

traffic on Cairo-Alexandria: total annual passenger-km in non-AC long distance trains (million)		17-Mar-2009	10-Feb-2009	12-Nov-2010	30-Jun-2020

Comments (achievements against targets):
Baseline and target revised at AF.

Partly achieved.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Long distance passenger traffic on Beni Suef - Asyut: total annual passenger-km in AC trains (million)	Number	2,245.00 17-Mar-2009	3204.00 12-Nov-2010		1,126.00 30-Jun-2020

Comments (achievements against targets):
Indicator added at AF to reflect the additional scope of the project.

Achieved.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion

Long distance passenger traffic on Beni Suef - Asyut: Total annual passenger-km in non-AC long distance trains (million)	Number	4,239.00 17-Mar-2009	4944.00 12-Nov-2010		1,928.00 30-Jun-2020

Comments (achievements against targets):
Indicator added at AF to reflect the expended scope of the project.

Not achieved.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Average number of fatalities due to railway accidents on the ENR network measured as the total annual number of victims on ENR network per one million passenger-km	Number	0.60 30-Jun-2008	0.31 10-Feb-2009	0.30 12-Nov-2010	1.37 30-Jun-2020

Comments (achievements against targets):
Not achieved.

The definition changed over the time. As stated in the AF project's paper, *"ENR requested that the methodology and measurement method for collecting two indicators for ENRRP, mainly punctuality and locomotive availability, be further harmonized with ENR developed methods". However, the target was not adjusted while the methodology changed.*

A.2 Intermediate Results Indicators

Component: Component 1-1: Signaling Modernization - Cairo (Arab El Raml) to Alexandria

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Punctuality of AC trains on the line Cairo-Alexandria	Number	0.29 30-Jun-2008	18.00 10-Feb-2009	0.07 12-Nov-2010	0.54 30-Jun-2019

Comments (achievements against targets):
Not achieved.

The nature of the civil works undertaken for the ENRRP requires to partially close the circulation of trains or to reduce the speed or frequency of trains on the line under modernization. During the work periods, it is expected to face high probability of delays, especially on extremely dense network like the ENR network. The non-adaptation of publicly disclosed timetables to reflect ongoing civil works explains that this indicator did not reach its target.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion

Installation of a modernized signaling system on Cairo-Alexandria line completed and operating 24/7	Yes/No	No 30-Jun-2013	Y 25-Jun-2014		No 30-Jun-2019

Comments (achievements against targets):
Not achieved. At Closing, the work was completed at 77%. The remaining work will be rolled out to the RISE project. The target is expected to be achieved by 2022.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Completion of studies to prepare the next phase of the modernization of the signaling system (ETCS level 1)	Yes/No	No 30-Jun-2013	Y 25-Jun-2014		Yes 30-Sep-2018

Comments (achievements against targets):
Achieved.

Component: Component 1-2: Signaling Modernization - Beni Suef to Asyut

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised	Actual Achieved at

				Target	Completion
Punctuality of AC trains on the line Beni Suef - Asyut	Number	0.42 30-Jun-2009	0.09 12-Nov-2010		0.53 30-Jun-2019

Comments (achievements against targets):
Not achieved.

The nature of the civil works undertaken for the ENRRP requires to partially close the circulation of trains or to reduce the speed or frequency of trains on the line under modernization. During the work periods, it is expected to face high probability of delays, especially on extremely dense network like the ENR network. The non-adaptation of publicly disclosed timetables to reflect ongoing civil works explains that this indicator did not reach its target.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Installation of a modernized signaling system on Beni Suef-Asyut line completed and operating 24/7	Yes/No	No 30-Jun-2013	Y 25-Jun-2014		No 30-Jun-2019

Comments (achievements against targets):
Not achieved. At Closing, the work was completed at 66%. The remaining work will be rolled out to the RISE project. The target is expected to be achieved by 2022.

Component: Component 2: Renewal of track

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of kilometers of renewed tracks along the Cairo-Aswan and Benha-Port Said lines	Kilometers	0.00 30-Jun-2008	260.00 25-Jun-2014		297.40 30-Sep-2018

Comments (achievements against targets):
Exceed.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Maintenance costs on sections where tracks are renewed: annual total cost of track infrastructure maintenance on sections renewed under the project (EGP million)	Number	2.77 30-Jun-2008	507.00 10-Feb-2009	0.54 12-Nov-2010	1.76 30-Jun-2019

Comments (achievements against targets):
Achieved.

Component: Component 3: Modernization of Management and Operating Practices

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Average management training time: ratio between the number of staff-days allocated for training during a year and the average number of management staff at ENR	Number	2.90 30-Jun-2008	9.00 10-Feb-2009	12.00 12-Nov-2010	12.10 30-Jun-2019

Comments (achievements against targets):
Achieved.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Completion of studies to support the restructuring of ENR	Yes/No	No 30-Jun-2013	Y 25-Jun-2014		Yes 30-Sep-2018

Comments (achievements against targets):
Indicator added at the first restructuring.

Achieved.

A. KEY OUTPUTS BY COMPONENT

Objective/Outcome 1 Improve reliability of railway services	
Outcome Indicators	1. Available ratio of the useful fleet (for long- and short-distance passenger, and freight) 2. Total annual passenger-km on the Cairo–Alexandria line (in air conditioned and non-air-conditioned trains) 3. Total annual passenger-km on the Beni Suef–Asyut line (in air conditioned and non-air-conditioned trains)
Intermediate Results Indicators	1. Punctuality of air-conditioned trains on the Cairo–Alexandria line 2. Punctuality of air-conditioned trains on the Beni Suef-Asyut line 3. Number of kilometers of renewed track along the Cairo-Aswan line
Key Outputs by Component (linked to the achievement of the Objective/Outcome 1)	1. Reliability will be fully achieved once the ongoing work to modernize the signaling system is achieved in 2022. 2. A total number of 297.4 km of track renewed
Objective/Outcome 2 Improve efficiency of railway services	
Outcome Indicators	1. Kilometrage per available locomotive (for long- and short-distance passengers, and freight)
Intermediate Results Indicators	1. Maintenance costs on sections where tracks are renewed
Key Outputs by Component (linked to the achievement of the Objective/Outcome 2)	1. Better maintenance of assets

	2. Reorganization of ENR along business units and introduction of Key Performance Indicators 3. Reduction of ENR staff number 4. Increased training time

Objective/Outcome 3 Improve safety of railway services	
Outcome Indicators	1. Number of fatalities due to rail accidents
Intermediate Results Indicators	1. Installation of modernized signaling system on Cairo–Alexandria line completed and operating 24/7 2. Installation of modernized signaling system on Beni Suef–Asyut line completed and operating 24/7 3. Completion of studies to prepare next phase of modernization of signaling system (European Train Control System level 1) and signaling on secondary lines
Key Outputs by Component (linked to the achievement of the Objective/Outcome 3)	1. Modernized signaling system partly operating 2. Completed studies lay foundation for RISE project. 3. Increased awareness on safety, training on safety, introduction of safety licenses

ANNEX 2. BANK LENDING AND IMPLEMENTATION SUPPORTSUPERVISION

A. TASK TEAM MEMBERS

Name	Role
Preparation	
Arturo Ardila Gomez	Task Team Leader(s)
Luis R. Prada Villalobos, Basheer Ahmad Fahem Sadeq Jaber	Procurement Specialist(s)
Wael Ahmed Elshabrawy	Financial Management Specialist
Salma Hany Adly Abdelfattah Ibrahim	Team Member
Maysra Mahmoud Ali Shamseldin	Environmental Specialist
Nobuhiko Daito	Team Member
Benjamin Loic Fouchard	Team Member
Cathie Philippe Gerald Youhann Wissa	Social Specialist
Deborah Beth Berger	Social Specialist
Hebatallah Mohamed Mady Abdelz Aboelleil	Procurement Team
Clotilde Virginie Minster	Team Member
Ingy Ahmed Elsaid Mohamed Awad	Procurement Team
Georges Tony Abou Rjaily	Team Member
Maya Abi Karam	Counsel
Layla Mohamed-Kotb Abdel Wahab	Procurement Team
Rahmoune Essalhi	Team Member
Khalid Boukantar	Procurement Team
Vasile Olievschi	Team Member

Supervision/ICR	
Arturo Ardila Gomez	Task Team Leader(s)
Luis R. Prada Villalobos, Mohamed El Hafedh Hendah, Ashraf Ahmed Hasan Al-Wazzan	Procurement Specialist(s)
Wael Ahmed Elshabrawy	Financial Management Specialist
Maya Abi Karam	Counsel
Georges Tony Abou Rjaily	Team Member
Ingy Ahmed Elsaid Mohamed Awad	Team Member
Branko Bajatovic	Team Member
Clotilde Virginie Minster	Team Member
Deborah Beth Berger	Social Specialist
Cathie Philippe Gerald Youhann Wissa	Social Specialist
Nobuhiko Daito	Team Member
Maysra Mahmoud Ali Shamseldin	Environmental Specialist
Salma Hany Adly Abdelfattah Ibrahim	Team Member
Rahmoune Essalhi	Team Member
Vasile Olievschi	Team Member

B. STAFF TIME AND COST

Stage of Project Cycle	Staff Time and Cost	
	No. of staff weeks	US$ (including travel and consultant costs)
Preparation		
FY06	2.550	20,654.67
FY07	45.726	249,719.88
FY08	52.422	286,026.34
FY09	39.732	266,046.06

FY10	7.150	46,268.87
FY11	0	- 342.46
FY12	0	39.77
FY15	0	164.59
Total	**147.58**	**868,577.72**
Supervision/ICR		
FY09	9.500	69,154.80
FY10	14.232	83,261.38
FY11	24.733	176,005.58
FY12	15.700	125,084.30
FY13	22.950	135,268.35
FY14	18.363	118,240.90
FY15	23.950	141,921.72
FY16	32.732	207,896.91
FY17	23.001	138,643.13
FY18	21.475	162,029.37
FY19	29.463	208,052.06
FY20	48.108	318,387.96
FY21	0	1,049.02
Total	**284.21**	**1,884,995.48**

ANNEX 3. PROJECT COST BY COMPONENT

The table below presents the project cost by component at approval and at closing.

Table 3.1. Project Cost by Component.

Component	Amount at Approval (USD million)		Amount at AF (USD million)		Restructuring #1 (USD million)	Actual at Project Closing (USD million)[d]	Percentage of IBRD financing
	IBRD	Government	IBRD	Government	IBRD[c]	IBRD	IBRD
Component 1: Signaling modernization: Cairo – Alexandria line[a]	197	5	0	0	(-27.5)[f]	397[e]	78%[e]
Component 1-2: Signaling modernization: Beni Suef to Asyut[b]	n/a		329	8	No changes		
Component 2: Renewal of track	60	20	0	0	26	83.6	97%
Component 3: Modernization of management and operating practices	0	10	0	2	1.5	0.1	6%
Physical and price contingencies	12.3	0	0	0	No changes		
Front end fees	0.7	0	0.8	0	n/a	1.4	100%
Total	270	35	330	10	n/a	**482**	

Sources: Additional financing project paper (report No.: 57022-EG), loan agreement for additional financing, restructuring paper No. RES13265, data shared by the PMU and WBG disbursement data as of June 16, 2021. The 2017 and 2020 restructurings are not reflected in this table as both restructurings reallocated funds between disbursement categories, which does not affect the components' costs.

[a] In the project appraisal document, the scope of this component was the Cairo – Alexandria line. This component was merged with component 1.2, and the overall scope was extended at the 2017 restructuring to include the Asyut-Sohag-Naga Hamady line.

[b] Component added at additional financing.

[c] Reallocation of IBRD budget savings resulting from successful bidding process.

[d] Disbursed amounts as of June 16, 2021. The WBG did not issue the closure notice as of June 17, 2021. This table reflects the best estimated costs as of today by component, not disbursement category. Figures may change until the end of June, when the designated account will be closed. Government contributions at closing are not reflected in this table.

[e] Component 1 and component 1-2 are calculated together are they were merged at the 2017 project restructuring as per the second amendment to the loan 7656-EG dated December 27, 2017.

[f] The scope of Component 1 was expended to finance studies using budget savings of the same component.

ANNEX 4. EFFICIENCY ANALYSIS

In assessing the efficiency of the project, an ex-post economic benefit cost analysis was conducted. Based on ex-ante benefit cost analyses prepared for appraisal of the original loan and additional financing, spreadsheet models of Cairo–Alexandria, Beni Suef–Asyut, and Asyut–Nag Hammadi signal modernization and Cairo–Aswan High Dam track renewal were developed.

The analysis focused on ensuring methodological consistency with the ex-ante analyses. A 12 percent discount rate was assumed in all analyses, and the Egyptian pound (EGP)-US dollar (USD) exchange rate in 2009 was applied consistently throughout the analysis period. The analysis used 25 years as the horizon after completion of projects; project implementation began in 2009, and it was assumed that signal modernization for Cairo–Alexandria, Beni Suef–Asyut, and Asyut–Nag Hammadi would be completed in 2022 and that the benefits would accrue from 2023 until 2047. The analysis accounted for investment costs on the cost side as reflected in disbursements in each year. For investment costs in 2021 and 2022, the analysis assumed that the disbursement would continue with the speed typical of these projects. For signal modernization projects, on the benefit side, the same benefits as the ex-ante analyses were used: time savings for existing traffic, generated traffic benefits, generalized cost savings for traffic diverted from cars and trucks, savings in highway maintenance costs, savings in maintenance costs, and safety benefits. The analysis of track renewal accounted for savings in maintenance costs as a benefit of the investment. The following sections discuss in detail estimation of economic benefits according to component. Key assumptions for the analysis are presented in table 4.6.

Cairo–Alexandria Signal Modernization

Time savings for existing traffic consisted of time savings for freight and passenger traffic. For freight traffic, the distance from Cairo to Alexandria is 207 km, and the current average freight journey time is 355 minutes. The project is expected to reduce travel time to 320 minutes, a reduction of 35 minutes. Average freight journey speed therefore improves from 35.0 km/h to 38.8 km/h, with an average time savings per ton of freight traffic of 1.01 hours. Current traffic level was assessed based on available information for transport of grains, phosphate, clay, cement, containers, and general cargo, which with an average distance transported of 357 km/ton, in aggregate was assessed to be 268,352,759 ton-km in 2009. After the ex-ante analysis, it was assumed that, without the project, freight traffic would grow 6 percent per year, and that, with the project, growth would be 12 percent per year for 6 years after project completion and after that would stabilize at 10 percent per year, subject to track capacity. Based on available data, an average of 627 tons would be transported per train throughout the analysis period. Assuming 365 working days for ENR, there was an average three freight trains per day in 2009 and 12 trains per day as of completion of the project in 2022. Travel time savings for freight traffic were therefore calculated by multiplying the average time saving by the difference in number of trains between the do minimum and do something scenarios, as well as average value of time, which was assumed to be constant through the analysis period.

For passenger traffic, current average passenger travel time between Cairo and Alexandria is 239 minutes; the project is expected to reduce the travel time to 219 minutes, a reduction of 20 minutes. Average passenger traffic speed therefore improves from 52.0 km/h to 56.7 km/h, and 8 percent of time is saved on an average journey. Current traffic levels were assed based on available passenger traffic

statistics, and it was assumed that traffic would increase by 4.5 percent per year, subject to track capacity. The assessment found that 135,211,883 passengers traveled on the segment in 2009, and with an average travel distance of 21 km, total passenger-km traveled would be 2,839,449,552. Based on the average number of 3,528 passengers per train, in 2009, 105 passenger trains were needed per day, and as of completion of the project in 2022, 186 passenger trains would be needed per day. Travel time savings for freight traffic is calculated by multiplying the average time savings by the difference in traffic between the do minimum and do something scenarios and the average value of time. The rule of a half was used to multiply the value of time, time savings, and the traffic increase attributed to the project to estimate the generated traffic benefits.

Before project completion, the capacity of rail track for this segment was 224 trains per day; the project would increase that to 320. When capacity was reached, it was assumed that, following current ENR policy to prioritize passenger trains over freight trains, according to its legal mandate, ENR would cap the share of daily freight trains to 14 percent of all trains.

Generalized cost savings for passenger and freight transport for diverted traffic (traffic volume under do something scenario minus traffic volume under do minimum scenario) was calculated by multiplying by the value of time savings and the difference in operating costs for road transport and railway service. The diverted traffic from road to railway service was also used in calculating highway maintenance costs, which is a function of traffic volumes for cars, buses, and trucks and average maintenance cost for single-axle load for these vehicle classes.

Savings in maintenance costs of signaling equipment was assumed to be EGP15 million per year starting in 2021, after project closing. The benefit of safety improvements would start in 2023 as the product of improved Esperance, lower average accident costs for rail and road traffic, lower traffic volumes for road and rail transport, and diverted traffic from road to rail. It was assumed that the average rail accident would cost EGP5.67 million, and the average road accident cost would be EGP1.77 million.

The analysis assumed that economic benefits would accrue from 2023 to 2047. Economic internal rate of return was 12.3 percent, and net present value (NPV) at a discount rate of 12 percent was USD5.3 million. The benefit cost ratio was 1.04. Table 4.1 summarizes the analysis.

Table 4.1. Analysis Summary Cairo – Alexandria Signaling Modernization

Year	Investment Costs	Freight Time Savings	Pax Time Savings	Freight GC Savings	Pax GC Savings	Time Savings for existing traffic	Generated Traffic Benefits	GC Savings for diverted traffic	Savings in Highway Maintenance costs	Savings in Maintenance costs	Safety Benefits	Total Benefits in EGP	Total Net Benefit in EGP	Total in US$
2009	-	-	-	-	-	-	-	-	-			-	-	$0
2010	-	-	-	-	-	-	-	-	-			-	-	$0
2011	-	-	-	-	-	-	-	-	-			-	-	$0
2012	-	-	-	-	-	-	-	-	-		-	-	-	$0
2013	(95,214,923)	-	-	-	-	-	-	-	-		-	-	(95,214,923)	($17,140,709)
2014	(50,751,039)	-	-	-	-	-	-	-	-		-	-	(50,751,039)	($9,136,265)
2015	(183,247,711)	-	-	-	-	-	-	-	-		-	-	(183,247,711)	($32,988,481)
2016	(120,382,275)	-	-	-	-	-	-	-	-		-	-	(120,382,275)	($21,671,367)
2017	(245,943,542)	-	-	-	-	-	-	-	-		-	-	(245,943,542)	($44,275,062)
2018	(147,994,119)	-	-	-	-	-	-	-	-		-	-	(147,994,119)	($26,642,085)
2019	(526,440,195)	-	-	-	-	-	-	-	-		-	-	(526,440,195)	($94,770,418)
2020	(549,882,353)	-	-	-	-	-	-	-	-		-	-	(549,882,353)	($98,990,504)
2021	(203,260,980)	-	-	-	-	-	-	-	-		-	-	(203,260,980)	($36,591,294)
2022	(112,349,028)	-	-	-	-	-	-	-	-		-	-	(112,349,028)	($20,225,212)
2023		10,269,490	21,114,056	-	-	31,383,546	17,073,592	-	-	15,000,000	147,679,683	211,136,820	211,136,820	$38,009,113
2024		11,296,438	22,064,189	-	-	33,360,627	17,841,903	-	-	15,000,000	155,724,207	221,926,737	221,926,737	$39,951,527
2025		12,426,082	23,057,077	-	8,250,439	35,483,160	18,644,789	8,250,439	3,507,596	15,000,000	171,632,428	252,518,411	252,518,411	$45,458,678
2026		13,668,691	24,094,646	-	28,493,779	37,763,336	19,483,804	28,493,779	12,113,860	15,000,000	198,780,292	311,635,073	311,635,073	$56,100,933
2027		15,035,560	25,178,905	-	49,809,497	40,214,464	20,360,576	49,809,497	21,176,036	15,000,000	227,463,122	374,023,695	374,023,695	$67,332,210
2028		16,539,116	26,311,955	-	72,261,992	42,851,071	21,276,802	72,261,992	30,721,502	15,000,000	257,781,321	439,892,688	439,892,688	$79,190,028
2029		18,193,027	27,470,762	-	95,499,276	45,663,789	22,234,258	95,499,276	40,600,612	15,000,000	289,321,297	508,319,232	508,319,232	$91,508,260
2030		20,012,330	27,470,762	-	99,796,463	47,483,092	23,234,799	99,796,463	42,427,521	15,000,000	297,661,650	525,603,525	525,603,525	$94,619,800
2031		22,013,563	27,470,762	-	104,523,369	49,484,325	24,280,365	104,523,369	44,437,120	15,000,000	306,836,039	544,561,218	544,561,218	$98,032,587
2032		24,214,919	27,470,762	9,148,250	105,054,806	51,685,681	25,372,982	114,203,056	50,437,221	15,000,000	325,347,139	582,046,078	582,046,078	$104,780,658
2033		26,636,411	27,470,762	20,356,935	105,054,806	54,107,173	26,514,766	125,411,741	57,511,885	15,000,000	346,763,670	625,309,235	625,309,235	$112,568,945
2034		29,300,052	27,470,762	32,686,488	105,054,806	56,770,814	27,707,930	137,741,294	65,294,016	15,000,000	370,321,855	672,835,909	672,835,909	$121,124,756
2035		32,230,057	27,470,762	46,248,997	105,054,806	59,700,819	28,954,787	151,303,802	73,854,360	15,000,000	396,235,858	725,049,627	725,049,627	$130,524,335
2036		35,453,063	27,470,762	61,167,756	105,054,806	62,923,825	30,257,752	166,222,562	83,270,738	15,000,000	424,741,261	782,416,139	782,416,139	$140,851,526
2037		35,202,097	27,470,762	60,006,075	105,054,806	62,672,859	31,619,351	165,060,881	82,537,512	15,000,000	422,521,628	779,412,232	779,412,232	$140,310,758
2038		35,202,097	27,367,690	60,006,075	103,335,393	62,569,786	33,042,222	163,341,468	81,806,520	15,000,000	420,390,650	776,150,647	776,150,647	$139,723,604
2039		35,202,097	27,259,979	60,006,075	101,538,607	62,462,076	34,529,122	161,544,682	81,042,634	15,000,000	418,163,777	772,742,291	772,742,291	$139,110,027
2040		35,202,097	27,147,421	60,006,075	99,660,965	62,349,518	36,082,933	159,667,040	80,244,372	15,000,000	415,836,696	769,180,559	769,180,559	$138,468,840
2041		35,202,097	27,029,799	60,006,075	97,698,830	62,231,895	37,706,665	157,704,905	79,410,189	15,000,000	413,404,895	765,458,549	765,458,549	$137,798,799
2042		35,202,097	26,906,883	60,006,075	95,648,398	62,108,980	39,403,464	155,654,473	78,538,467	15,000,000	410,863,664	761,569,048	761,569,048	$137,098,606
2043		35,202,097	26,778,436	60,006,075	93,505,697	61,980,533	41,176,620	153,511,772	77,627,518	15,000,000	408,208,077	757,504,520	757,504,520	$136,366,905
2044		35,202,097	26,644,209	60,006,075	91,266,574	61,846,306	43,029,568	151,272,650	76,675,576	15,000,000	405,432,989	753,257,089	753,257,089	$135,602,277
2045		35,202,097	26,503,942	60,006,075	88,926,691	61,706,038	44,965,899	148,932,766	75,680,797	15,000,000	402,533,022	748,818,523	748,818,523	$134,803,241
2046		35,202,097	26,357,362	60,006,075	86,481,513	61,559,459	46,989,364	146,487,589	74,641,253	15,000,000	399,502,556	744,180,221	744,180,221	$133,968,248
2047		35,202,097	26,204,187	60,807,059	86,753,446	61,406,284	49,103,886	147,560,505	73,554,929	15,000,000	396,335,719	742,961,323	742,961,323	$133,748,821

Beni Suef–Asyut Signal Modernization

An equivalent analysis was conducted for the Beni Suef–Asyut segment signal modernization work, with the following assumptions. The distance between Beni Suef and Asyut is 252 km, and the project is expected to increase the track capacity from 98 to 230 trains per day. Before the project, travel time for freight trains for the segment was 330 minutes, which the project will reduce by 45 minutes to 285 minutes (14 percent). For passenger trains, travel time before the project was 185 minutes, which the project will reduce by 38 minutes to 147 minutes (21 percent). Savings on maintenance of signaling equipment was assumed to be EGP20 million per year, and the same Esperance and average accident costs for rail and road were used to estimate safety improvement benefits. Table 4.2. summarizes the analysis.

Table 4.2. Analysis Summary Beni Suef – Asyut Signaling Modernization

Year	Investment cost	Freigh Time Savings	Pax Time Savings	Freight GC savings	Pax GC savings	Time savings for existing traffic	GC savings for diverted traffic	Generated traffic benefits	Savings in highway maintenance costs	Savings in maintenance costs of the signaling system	Safety benefits	Total Benefits in EGP	Total net benefits in EGP	Total in US$
2009	-					-	-			-		-	-	-
2010	-					-	-			-		-	-	-
2011	-					-	-			-		-	-	-
2012	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2013	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	64,381,790	-	-	-	-	-	-	-	-	-	-	-	(64,381,790)	(11,590,090)
2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2017	21,421,915	-	-	-	-	-	-	-	-	-	-	-	(21,421,915)	(3,856,400)
2018	143,708,432	-	-	-	-	-	-	-	-	-	-	-	(143,708,432)	(25,870,571)
2019	115,521,657	-	-	-	-	-	-	-	-	-	-	-	(115,521,657)	(20,796,352)
2020	187,712,254	-	-	-	-	-	-	-	-	-	-	-	(187,712,254)	(33,792,193)
2021	78,292,951	-	-	-	-	-	-	-	-	-	-	-	(78,292,951)	(14,094,394)
2022	112,349,028	-	-	-	-	-	-	-	-	-	-	-	(112,349,028)	(20,225,212)
2023	-	4,518,912	146,164,549	423,215	2,511,311	150,683,461	2,934,526	5,258,980	332,000	20,000,000	136,908,813	316,117,781	316,117,781	56,907,916
2024		4,518,912	146,164,549	897,216	5,123,074	150,683,461	6,020,290	5,469,339	677,336	20,000,000	155,845,614	338,696,041	338,696,041	60,972,482
2025		4,518,912	146,164,549	1,428,097	7,839,308	150,683,461	9,267,404	5,688,113	1,036,547	20,000,000	175,688,756	362,364,282	362,364,282	65,233,268
2026		4,518,912	146,164,549	2,022,684	10,664,191	150,683,461	12,686,874	5,915,637	1,410,196	20,000,000	196,492,358	387,188,526	387,188,526	69,702,160
2027		4,518,912	146,164,549	2,688,621	13,602,069	150,683,461	16,290,690	6,152,263	1,798,867	20,000,000	218,314,845	413,240,126	413,240,126	74,392,001
2028		4,518,912	146,164,549	3,434,470	16,657,462	150,683,461	20,091,933	6,398,353	2,203,173	20,000,000	241,219,383	440,596,303	440,596,303	79,316,694
2029		4,518,912	146,164,549	4,130,596	19,835,072	150,683,461	23,965,668	6,654,288	2,623,521	20,000,000	264,727,770	468,654,708	468,654,708	84,367,803
2030		4,518,912	146,164,549	4,896,335	23,139,785	150,683,461	28,036,121	6,920,459	3,060,752	20,000,000	289,340,467	498,041,259	498,041,259	89,658,006
2031		4,518,912	146,164,549	5,738,648	26,576,687	150,683,461	32,315,336	7,197,277	3,515,546	20,000,000	315,118,043	528,829,663	528,829,663	95,200,573
2032		4,518,912	146,164,549	6,665,192	30,151,066	150,683,461	36,816,258	7,485,169	3,988,614	20,000,000	342,125,131	561,098,632	561,098,632	101,009,673
2033		4,518,912	146,164,549	7,684,390	33,868,419	150,683,461	41,552,810	7,784,575	4,480,696	20,000,000	370,430,752	594,932,293	594,932,293	107,100,451
2034		4,518,912	146,164,549	8,805,509	33,868,419	150,683,461	42,673,928	7,784,575	4,482,522	20,000,000	374,832,117	600,456,603	600,456,603	108,094,944
2035		4,518,912	146,164,549	10,038,739	33,868,419	150,683,461	43,907,158	7,784,575	4,484,532	20,000,000	379,673,618	606,533,344	606,533,344	109,188,886
2036		4,518,912	146,164,549	11,395,292	33,868,419	150,683,461	45,263,711	7,784,575	4,486,742	20,000,000	384,999,269	613,217,758	613,217,758	110,392,223
2037		4,518,912	146,164,549	12,887,500	33,868,419	150,683,461	46,755,919	7,784,575	4,489,173	20,000,000	390,857,486	620,570,615	620,570,615	111,715,893
2038		4,518,912	146,164,549	14,528,930	33,868,419	150,683,461	48,397,349	7,784,575	4,491,847	20,000,000	397,301,524	628,658,756	628,658,756	113,171,930
2039		4,518,912	146,164,549	16,334,502	33,868,419	150,683,461	50,202,921	7,784,575	4,494,789	20,000,000	404,389,966	637,555,712	637,555,712	114,773,571
2040		4,518,912	146,164,549	18,320,631	33,868,419	150,683,461	52,189,050	7,784,575	4,498,025	20,000,000	412,187,253	647,342,364	647,342,364	116,535,377
2041		4,518,912	146,164,549	20,505,374	33,868,419	150,683,461	54,373,793	7,784,575	4,501,584	20,000,000	420,764,267	658,107,680	658,107,680	118,473,362
2042		4,518,912	146,164,549	22,908,590	33,868,419	150,683,461	56,777,009	7,784,575	4,505,499	20,000,000	430,198,384	669,949,529	669,949,529	120,605,147
2043		4,518,912	146,164,549	25,552,128	33,868,419	150,683,461	59,420,547	7,784,575	4,509,806	20,000,000	440,577,172	682,975,562	682,975,562	122,950,109
2044		4,518,912	146,164,549	28,460,020	33,868,419	150,683,461	62,328,439	7,784,575	4,514,544	20,000,000	451,993,179	697,304,198	697,304,198	125,529,568
2045		4,518,912	146,164,549	18,622,073	55,241,014	150,683,461	73,863,087	7,784,575	7,318,149	20,000,000	553,106,563	812,755,836	812,755,836	146,313,315
2046		4,518,912	146,164,549	18,622,073	55,241,014	150,683,461	73,863,087	7,784,575	7,318,149	20,000,000	553,106,563	812,755,836	812,755,836	146,313,315
2047		4,518,912	146,164,549	18,622,073	55,241,014	150,683,461	73,863,087	7,784,575	7,318,149	20,000,000	553,106,563	812,755,836	812,755,836	146,313,315

The analysis assumed that economic benefits would accrue from 2023 to 2047. Economic internal rate of return was 26.6 percent, and NPV at a discount rate of 12 percent was USD99.6 million. The benefit cost ratio was 3.69.

Asyut–Nag Hammadi Signal Modernization

The following assumptions were made for the Asyut–Nag Hammadi segment. The distance between Asyut and Nag Hammadi is 180 km, and the project is expected to increase track capacity from 55 to 230 trains per day. Before the project, average travel time from Asyut to Nag Hammadi was 428 minutes for freight trains and 240 minutes for passenger trains; it was assumed that the project would decrease travel time by 14 percent for freight trains to 370 minutes and 21 percent for passenger trains to 191 minutes. The average speed before the project was 25 km/h for freight trains and 45 km/h for passenger trains; with the project, these would increase to 45 km/h and 57 km/h, respectively. Savings on maintenance of signaling equipment was assumed to be EGP14.4 million per year, and the same Esperance and average accident costs for rail and road were used to estimate safety improvement benefits. Table 4.3 summarizes the analysis.

Table 4.3. Analysis Summary Asyut – Nag Hammadi Signaling Modernization

Year	Investment cost	Freigh Time Savings	Pax Time Savings	Freight GC savings	Pax GC savings	Time savings for existing traffic	GC savings for diverted traffic	Generated traffic benefits	Savings in highway maintenance costs	Savings in maintenance costs of the signaling system	Safety benefits	Total Benefits in EGP	Total net benefits in EGP	Total in US$
2009	-					-	-			-		-	-	-
2010	-					-	-			-		-	-	-
2011	-					-	-			-		-	-	-
2012	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2013	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	84,635,723	-	-	-	-	-	-	-	-	-	-	-	(84,635,723)	(15,236,228)
2019	240,323,872	-	-	-	-	-	-	-	-	-	-	-	(240,323,872)	(43,263,402)
2020	273,413,308	-	-	-	-	-	-	-	-	-	-	-	(273,413,308)	(49,220,203)
2021	162,648,398	-	-	-	-	-	-	-	-	-	-	-	(162,648,398)	(29,280,167)
2022	83,323,500	-	-	-	-	-	-	-	-	-	-	-	(83,323,500)	(15,000,000)
2023	-	4,474,163	78,928,856	10,343,625	3,554,635	83,403,019	13,898,260	2,851,073	2,693,174	14,400,000	151,312,467	268,557,993	268,557,993	48,346,144
2024		4,474,163	78,928,856	12,687,108	3,933,389	83,403,019	16,620,497	2,965,116	2,980,730	14,400,000	163,474,204	283,843,566	283,843,566	51,097,871
2025		4,474,163	78,928,856	15,311,808	4,327,294	83,403,019	19,639,102	3,083,721	3,279,878	14,400,000	176,277,699	300,083,419	300,083,419	54,021,390
2026		4,474,163	78,928,856	18,251,473	4,736,954	83,403,019	22,988,427	3,207,069	3,591,092	14,400,000	189,767,258	317,356,866	317,356,866	57,130,977
2027		4,474,163	78,928,856	21,543,898	5,163,001	83,403,019	26,706,898	3,335,352	3,914,867	14,400,000	203,991,194	335,751,330	335,751,330	60,442,372
2028		4,474,163	78,928,856	24,616,827	5,606,090	83,403,019	30,222,917	3,468,766	4,251,425	14,400,000	218,493,194	354,239,321	354,239,321	63,770,603
2029		4,474,163	78,928,856	27,997,050	6,066,902	83,403,019	34,063,951	3,607,517	4,601,534	14,400,000	233,727,993	373,804,014	373,804,014	67,292,663
2030		4,474,163	78,928,856	31,715,294	6,546,147	83,403,019	38,261,441	3,751,818	4,965,744	14,400,000	249,740,174	394,522,196	394,522,196	71,022,376
2031		4,474,163	78,928,856	35,805,364	7,044,561	83,403,019	42,849,925	3,901,890	5,344,629	14,400,000	266,577,633	416,477,095	416,477,095	74,974,724
2032		4,474,163	78,928,856	40,304,440	7,562,912	83,403,019	47,867,352	4,057,966	5,738,786	14,400,000	284,291,858	439,758,981	439,758,981	79,165,958
2033		4,474,163	78,928,856	45,253,423	8,101,998	83,403,019	53,355,421	4,220,285	6,148,838	14,400,000	302,938,249	464,465,811	464,465,811	83,613,712
2034		4,474,163	78,928,856	50,697,306	8,662,646	83,403,019	59,359,952	4,389,096	6,575,434	14,400,000	322,576,450	490,703,951	490,703,951	88,337,135
2035		4,474,163	78,928,856	56,685,576	9,245,721	83,403,019	65,931,297	4,564,660	7,019,251	14,400,000	343,270,729	518,588,955	518,588,955	93,357,028
2036		4,474,163	78,928,856	63,272,673	9,852,118	83,403,019	73,124,791	4,747,246	7,480,991	14,400,000	365,090,386	548,246,434	548,246,434	98,696,004
2037		4,474,163	78,928,856	70,518,480	10,482,772	83,403,019	81,001,252	4,937,136	7,961,389	14,400,000	388,110,196	579,812,992	579,812,992	104,378,655
2038		4,474,163	78,928,856	78,488,868	11,138,651	83,403,019	89,627,519	5,134,621	8,461,211	14,400,000	412,410,900	613,437,272	613,437,272	110,431,740
2039		4,474,163	78,928,856	66,398,838	12,773,134	83,403,019	79,171,972	5,340,006	9,691,537	14,400,000	446,502,988	638,509,522	638,509,522	114,945,278
2040		4,474,163	78,928,856	66,398,838	12,671,134	83,403,019	79,069,972	5,553,607	9,614,398	14,400,000	443,750,529	635,791,525	635,791,525	114,455,980
2041		4,474,163	78,928,856	66,398,838	12,565,054	83,403,019	78,963,892	5,775,751	9,534,173	14,400,000	440,887,972	632,964,807	632,964,807	113,947,111
2042		4,474,163	78,928,856	66,398,838	12,454,730	83,403,019	78,853,569	6,006,781	9,450,740	14,400,000	437,910,913	630,025,021	630,025,021	113,417,887
2043		4,474,163	78,928,856	66,398,838	12,339,994	83,403,019	78,738,832	6,247,052	9,363,969	14,400,000	434,814,771	626,967,644	626,967,644	112,867,494
2044		4,474,163	78,928,856	66,398,838	12,220,668	83,403,019	78,619,507	6,496,934	9,273,728	14,400,000	431,594,783	623,787,971	623,787,971	112,295,086
2045		4,474,163	78,928,856	66,398,838	12,096,570	83,403,019	78,495,408	6,756,812	9,179,877	14,400,000	428,245,996	620,481,112	620,481,112	111,699,781
2046		4,474,163	78,928,856	66,398,838	11,967,507	83,403,019	78,366,345	7,027,084	9,082,271	14,400,000	424,763,258	617,041,978	617,041,978	111,080,664
2047		4,474,163	78,928,856	66,398,838	11,833,282	83,403,019	78,232,120	7,308,167	8,980,762	14,400,000	421,141,210	613,465,279	613,465,279	110,436,782

The analysis assumed that economic benefits would accrue from 2023 to 2047. The economic internal rate of return was 24.6 percent, NPV with a 12 percent discount rate was USD75.0 million, and the benefit cost ratio was 2.89.

Track Renewal

The project financed track renewal of 13 segments along the Cairo–Aswan High Dam corridor, reaching 267 km and 23 turnouts. Although maximum operational speed increased from 90 km/h to 120 km/h for some segments, the benefit of these projects is the savings in maintenance costs. The project reduced maintenance costs of 267 km of track from EGP 6.6million to EGP1.24 million and that of 23 turnouts from EGP332,000 to EGP37,000. The trend of production costs closest to maintenance costs over the last 5 years, for which data were available, showed an average annual increase in maintenance costs of 38 percent. It was therefore assumed that, under a do minimum scenario, the annual increase in maintenance costs would continue this trend, whereas under a do something scenario, it was assumed that maintenance costs would remain constant. Table 4.4 summarizes the analysis.

Table 4.4. Track Renewal Analysis

Year	Investment cost	Savings in maintenance costs of the rail tracks	Total Benefits in EGP	Total net benefits in EGP	Total in US$
2009	-	-	-	-	-
2010	-	-	-	-	-
2011	38,130,521	-	-	(38,130,521)	(6,864,304)
2012	-	-	-	-	-
2013	50,822,453	-	-	(50,822,453)	(9,149,121)
2014	164,235,863	-	-	(164,235,863)	(29,565,944)
2015	90,860,039	-	-	(90,860,039)	(16,356,737)
2016	94,545,314	-	-	(94,545,314)	(17,020,165)
2017	-	1,021,621	1,021,621	1,021,621	183,913
2018	-	1,497,153	1,497,153	1,497,153	269,519
2019	-	2,153,321	2,153,321	2,153,321	387,644
2020	-	3,058,740	3,058,740	3,058,740	550,638
2021	-	4,308,089	4,308,089	4,308,089	775,548
2022	-	6,032,015	6,032,015	6,032,015	1,085,891
2023	-	8,410,789	8,410,789	8,410,789	1,514,121
2024		11,693,160	11,693,160	11,693,160	2,105,017
2025		16,222,368	16,222,368	16,222,368	2,920,371
2026		22,472,034	22,472,034	22,472,034	4,045,443
2027		31,095,689	31,095,689	31,095,689	5,597,885
2028		42,995,113	42,995,113	42,995,113	7,740,034
2029		59,414,634	59,414,634	59,414,634	10,695,896
2030		82,071,251	82,071,251	82,071,251	14,774,569
2031		113,334,177	113,334,177	113,334,177	20,402,559
2032		156,472,592	156,472,592	156,472,592	28,168,390
2033		215,997,502	215,997,502	215,997,502	38,884,139
2034		298,133,456	298,133,456	298,133,456	53,670,355
2035		411,469,452	411,469,452	411,469,452	74,073,242
2036		567,857,094	567,857,094	567,857,094	102,226,340
2037		783,649,914	783,649,914	783,649,914	141,073,631
2038		1,081,413,477	1,081,413,477	1,081,413,477	194,677,398
2039		1,492,285,069	1,492,285,069	1,492,285,069	268,643,012
2040		2,059,229,737	2,059,229,737	2,059,229,737	370,705,096
2041		2,841,533,173	2,841,533,173	2,841,533,173	511,536,332
2042		3,921,001,239	3,921,001,239	3,921,001,239	705,863,515
2043		5,410,514,454	5,410,514,454	5,410,514,454	974,007,535
2044		7,465,831,965	7,465,831,965	7,465,831,965	1,344,008,347
2045		10,301,879,357	10,301,879,357	10,301,879,357	1,854,557,122
2046		14,215,223,534	14,215,223,534	14,215,223,534	2,559,042,203
2047		19,615,084,865	19,615,084,865	19,615,084,865	3,531,131,949

The economic internal rate of return was 19.2 percent, the NPV using a 12 percent discount rate was USD185.9 million, and the benefit cost ratio was 5.73.

Project Total

The analyses for the four modules of the analysis were aggregated to calculate the project-wide economic internal rate of return and NPV (table 4.5).

Table 4.5. Project Total Analysis

Analysis	Results
Economic rate of return (%)	
Cairo–Alexandria	12.3
Beni Suef–Asyut	26.6
Asyut–Nag Hammadi	24.6
Track upgrade	19.2
Total	**18.3**
Economic net present value, USD (12% discount rate)	**365,822,088**
Benefits/Costs	**2.5**

Table 4.6. Key Assumptions

Variable	Value	Unit
Investment cost		
Cairo–Alexandria	165,000,000	USD
Beni Suef–Asyut	117,000,000	USD
Asyut–Nag Hammadi	152,000,000	USD
267 km of track upgrades	79,000,000	USD
Exchange rate (2009)	5.55	USD/EGP
Discount rate	12	%
Annual maintenance cost savings of signaling		
Cairo–Alexandria	15,000,000	EGP
Beni Suef–Asyut	20,000,000	EGP
Asyut–Nag Hammadi	14,400,000	EGP
Maintenance cost of 267 km of upgraded track	1,242,000	EGP
Annual increase in maintenance cost of 267 km of track without upgrading	38	% (average increase FY14-FY19)
Freight value of time	2.88	EGP/ton/hour
Gross domestic product growth	6	%
Passenger value of time	2.35	EGP/passenger/hour
Annual passenger traffic growth		
Cairo–Alexandria	4.5	%
Beni Suef–Asyut	4.0	%
Asyut–Nag Hammadi	4.0	%
Annual freight traffic growth		
Without project	6	%
5 years after project completion	12	%
Then until 2047	10	%
Road freight operating cost	0.22	EGP/ton km
Rail freight operating cost	0.17	EGP/ ton km
Road passenger operating cost	0.16	EGP/passenger-km
Rail passenger operating cost	0.05	EGP/passenger-km
Improved rail Esperance	4.1	Accident/billion Traffic Unit
Improved road Esperance	46.9	Accident/billion Traffic Unit
Average rail accident cost	5,670,000	EGP/accident
Average road accident cost	1,770,000	EGP/accident

ANNEX 5. BORROWER, CO-FINANCIER, AND OTHER PARTNER/STAKEHOLDER COMMENTS

The ICR report was shared with the Borrower. As of June 17, 2021, no written comments were received by the WBG team. The WBG team and the PMU discussed the ICR report on June 15, 2021. Oral comments received focused on Annex 3; the WBG team took into account the observations shared by the PMU in this version of the ICR report. The Borrower ICR is presented below.

Borrower ICR (Abridged version)

Introduction

On May 17, 2009, the World Bank approved the Egyptian National Railways (ENR) Restructuring Project (ENRRP) in the amount of USD270 million to invest in development of railway sector in Egypt. On December 14, 2010, the World Bank approved additional financing for ENRRP in the amount of USD 330 million to increase the scope of the project.

USD486.2 million (81 percent of the two loans) was disbursed through December 31, 2020 (USD256.6 million from International Bank for Reconstruction and Development (IBRD) 76560; USD229.6 million from IBRD 79820). USD30 million of the disbursed amount remains in the designated account to cover activities that will be performed between December 31, 2020, and June 30, 2021. As of December 31, 2020, the undisbursed amount was USD113.8 million, taking into consideration that the project will continue disbursing for activities conducted before December 31, 2020, during the grace period and that ENR will continue submitting withdrawal applications until April 30, 2021.

Project description
The project comprises two loans with a total amount of USD600 million as follows.

The original loan of USD270 million.

Component 1 of the project financed needed investments in signaling systems from Arab El Raml to Alexandria and centralized traffic control for that section and for Cairo to Banha (on the Cairo–Alexandria line). The total investment cost of this component was estimated during project preparation at USD202 million and was revised during implementation at USD169.3 million, with USD164.3 million financed by the IBRD loan and USD5 million financed by ENR for supervision of the project. The objective of this project is to increase the line capacity from 224 trains/day to 320 trains/day, cover the forecasted traffic demands, increase the line speed from 140 km/h to 160 km/h, and increase safety.

Component 2 financed priority track renewal works for 200 km of track on the Cairo–Aswan line and supervision of those projects; the length of track to be renewed was increased to 297.4 km during implementation. Track sections to be renewed were identified based on track condition, traffic level, and contiguity with track in similar condition. The rationale for Bank involvement is to help ENR modernize working methods and transfer knowledge from specialized engineering firms involved in the design and supervision of works. The identified sections were fully renewed, including installation of long-welded

rail, concrete ties, elastic fastenings, and ballast, without any land acquisition. The renewal significantly decreased the risk of derailments and track maintenance costs while increasing train speed (notably through elimination of speed restrictions due to poor-quality track). Investment costs were estimated during project preparation at USD80 million and revised during implementation to USD103.7 million, of which the loan financed USD83.7 million and ENR financed USD20 million (USD15 million for rails and turnouts; USD5 million for supervision). A single contractor selected under international competitive bidding procedures performed the work (with prequalification of bidders).

Component 3 consists of modernization of management and operating practices. The estimated cost of this component is USD10 million. activities under this component, which ENR financed, are directed toward developing and cementing changes in managerial and staff practices that reflect the operational and financial restructuring of ENR. The activities are grouped under four subcomponents.

Subcomponent 3.1: Support development of a railway academy

Activities under this subcomponent supported development of the new Railway Academy.

Subcomponent 3.2: Support reengagement of ENR with international railways bodies.

ENR has been absent from the International Union of Railways for several years and does not participate in other international bodies either. Participation would allow ENR to benefit from joint research initiatives and studies, gather information on best practices developed by other railways, and access international training programs. Support provided under the project could identify the most appropriate programs for ENR to join.

Subcomponent 3.3: Support modernization of managerial practices

In conjunction with subcomponent 3.1, this subcomponent would encompass development and delivery of an intensive management training program for mid- and upper-level ENR management and relevant officials from the Ministry of Transport. In addition, training modules would include topics on developing and monitoring business plans, marketing, financial budgeting and management, pricing policies and subsidy calculations, technical project management, and regulation of railways.

The World Bank would assist ENR in preparing terms of reference to assess training needs and develop a training program. The subcomponent would also include development of human resource policies to support ENR’s restructuring, development of young professionals and distance learning programs, and strengthening of capacity and skills required to manage freight business.

Subcomponent 3.4: Business development activities

This subcomponent would consist of short-term consulting assignments to study near-term business development to support the newly established strategy department and the business development units in strategic business units. Studies may include market research for development of freight business, demand and usage analysis of key passenger lines, and analysis of how to increase revenues from ENR property.

Component 6: Consultancy services

It is estimated that USD16 million was used under this component to conduct studies to support the restructuring of the project implementing entity and improve the safety of its operations such as:
(i) Consultancy services for migration to the European Train Control System-1 along the Alexandria–Cairo–Assuit corridor
(ii) Study for signaling system and automatic train protection on remaining ENR secondary lines
(iii) Modernization of signaling along Asyut–Sohag–Nagh Hammadi corridor (studies and bidding document preparation)
(iv) Definition of strategy for reform of railway sector in Egypt
(v) Contract management and supervision of signaling modernization work along Asyut–Sohag–Nagh Hammadi corridor
(vi) Extension of contract management and supervision of signaling modernization works along Beni Suef–Asyut corridor
(vii) Extension of contract management and supervision of signaling modernization project along Cairo–Alexandria corridor.
(viii) Environmental and social studies for Cairo–Beni Suef corridor

Additional financing of USD330 million
Part A: Signaling Modernization: This part was planned during project preparation to modernize signaling along the Beni Suef–Asyut corridor. After the contract was awarded, and it was found that there was a surplus in the loan amount, it was agreed with the Bank to add the Asyut–Nagh Hammadi corridor to the scope of the project. Modernization of signaling system along the Beni Suef–Asyut and Asyut–Sohag–Nagh Hammadi corridors consisting of an automatic block signaling system (on the open line), electronic interlocking systems (in stations), level-crossing protection systems, consultant services for supervisory engineering and goods, and installation of a computerized central traffic control system for these lines through the provision of consultant services for supervisory engineering and goods.

Part B: Modernization of Management and Operating Practices. Support for modernization of railway maintenance practices, particularly review and evaluation of existing maintenance procedures at ENR. The objective of the activities is to strengthen the suitability of maintenance spending in the current environment of important investments in track renewal, modernization of signaling systems, and acquisition of new locomotives and wagons.

Project rating: moderately satisfactory
The following factors explain the rating:
- The disbursement percentage at December 31, 2020, was 81 percent.
- The implementation progress percentage at December 31, 2020, was 80.2 percent, and the percentage of each components was as follows:
  - Component 1: signaling modernization and automatic train control equipment (Cairo–Alexandria, 77.5 percent; Asyut–Nagh Hammadi, 50.1 percent; Beni Suef–Asyut, 71 percent; supply of automatic train control equipment, 38 percent), average percentage of component 1 is 59.2 percent
  - Component 2: track renewal, 100 percent (considering that it was planned to renew 200 km of track, and 297.4 km has been renewed);
  - Component 6: consultancy services, 81.5 percent

- In the last year of the project, implementation progress and disbursements increased substantially.
  - The disbursement percentage in December 2019 was 55 percent and increased by 26 percentage points in 2020 to 81 percent by December 2020.
  - For component 1 especially, implementation percentage was 38 percent in December 2019 and increased by 21 percentage points in 2020 to 59 percent.

Implementation progress by component

Loan 76560 - Component 1: Signaling modernization on Arab El Raml–Alexandria line

The procurement process for this contract was started in January 2009 based on two-stage bidding with initial selection. Prequalification was launched in January 2009, evaluation of prequalification was completed by September 2009, the first stage was started in March 2010 and completed in January 2012, the second stage was started in April 2012 and completed in April 2013, and the contract was signed in August 2013. The original implementation period was 4 years. The procurement process took a long time because:

- this was the first signaling project between ENR and World Bank, so it took time to understand each other.
- the tendering was based on two-stage bidding with initial selection.
- the Arab Spring revolution and security challenges in Egypt starting in January 2011 prevented bidders from traveling to Egypt and restricted work in Egypt.
- bidders requested an extension of the submission deadline to prepare their technical and financial proposals.

The implementation plan was to finish the project in 4 years (August 2017). The project faced some delays because:

- the design phase took the contractor a long time.
- the contractor delayed implementing the civil projects (main technical building, secondary technical building, cable laying).
- the contractor changed its civil subcontractor more than three times.
- the contractor had delays in supplying the power and signaling cables, and those cables failed the factory acceptance test and did not match the technical specifications.
- there were delays in obtaining work permits from various government agencies (e.g., electricity, irrigation)
- the armed forces stopped cable laying along the corridor for 5 months until the required permits were obtained.
- devaluation of the Egyptian pound led to higher prices in Egypt, including for petroleum materials and energy, which slowed progress

Amendments to the contract:

- On August 16, 2017, amendment 01 was signed based on the 5-month delay due to the stoppage by the army. The total time period shall be 53 months.
- On January 18, 2018, amendment 02 was signed after the agreement between ENR/Thales to add the scope of the Cairo–Benha area to the Arab El Raml–Alexandria scope. The total time period shall be 77

months; the new projection completion date is January 2020.
- In September 2019, amendment 03 was signed to add the cables on the Cairo–Benha line to the scope of work; the total time period shall be 88 months; the new projected completion date is December 2020.
- In October 2019, amendment 04 was signed to pay the contractor 15 percent of the remaining contract price as an interim cash advance against a letter of guarantee.
- In February 2020, amendment 05 was signed to pay the contractor the cost of third-party incidents.

By December 2020, implementation progress was 77.5 percent. Twelve of 19 signaling towers had been commissioned, and 58 of 80 level crossings had been modernized.

IBRD 76560 - Component 2: renewal of 297.4 km of track on the Cairo–Aswan mainline

The procurement process was started in September 2009 based on one-stage bidding without initial selection. The contract was signed in April 2011 and effective in August 2011; the original completion deadline was 30 months to renew 200 km of track.

The implementation plan was to finish the project in 30 months (February 2014). The contract was amended to increase the scope of work by 75 km, and the completion date became May 2016. Another amendment was signed to increase the scope of work by 21 km, and the completion date became October 2016. By December 2020, this component had been fully completed.

Loan 79820 - Component 1: signaling modernization on the Beni Suef–Asyut line

The procurement process was started in August 2011 based on two-stage bidding with initial selection. The contract was signed in December 2014 and was effective in January 2015; the original completion timeline was 4 years.

The procurement process took a long time because:
- tendering was based on two-stage bidding with initial selection.
- the Arab Spring and security challenges in Egypt beginning in January 2011 prevented bidders from traveling to Egypt and restricted the ability to work in Egypt
- bidders requested extension of the submission deadline to prepare their technical and financial proposals.

The implementation plan was to finish the project in 4 years (January 2019). The project faced some delays for the same reasons that affected the Arab El Raml–Alexandria corridor (see above).
Amendments to the contract:
- In November 2019, amendment 01 was signed to settle outstanding changes, claims, and disputes and to extend the completion time to August 2020.
- In November 2019, amendment 02 was signed to pay the contractor 15 percent of the remaining contract price as an interim cash advance against the letter of guarantee.
- In September 2020, amendment 03 was signed to pay the contractor the cost of third-party incidents.

By December 2020, implementation progress was 71 percent. Six of 15 signaling towers had been

commissioned, and 24 of 62 level crossing had been modernized.

Loan 79820 - Component 1: signaling modernization on the Asyut–Nagah Hammadi corridor
The procurement process was started in March 2016 based on two-stage bidding without initial selection. The contract was signed in November 2017 and effective in January 2018; the original completion timeline was 3 years (January 2021). The project faced some delays for similar reasons as the other corridors.
Amendments to the contract:

- In October 2019, amendment 01 was signed to pay the contractor 15 percent of the remaining contract price as an interim cash advance against the letter of guarantee.
- By December 2020, the implementation progress was 50 percent. Three of 17 signaling towers had been commissioned, and nine of 55 level crossings had been modernized.

Agreed-upon signaling project completion plans

The three key signaling projects had not been completed by December 31, 2020. Completion percentages were 77.5 percent for Cairo–Alexandria, 71 percent for Beni Suef–Asyut, and 50.1 percent for Asyut–Nagh Hammadi. The RISE project will ensure completion of the three corridors by October 2022.

Progress of new track renewal contractors

ENR's subsidiary companies (Egyfrai and ERtrack) are performing the necessary track projects. Because of delays in the track renewal projects that affect the signaling progress along the three corridors, ENR contracted with two local companies to assist ENR's subsidiaries with the track projects. Both companies were contracted for 24 months—one in July 2020 and the other in October 2020.

Evaluation of Bank performance
Bank performance is rated by assessing two dimensions: performance in supporting ENR and quality of supervision.

Bank performance in supporting ENR: Satisfactory

Because the Bank did not provide any grants attached to the loan, in addition to the limited training provided over 10 years and irregular follow-up of financial management procedures and safety measures.

Other criteria have minor to moderate shortcomings:

- implementation arrangements: The Bank faced difficulty in controlling the quality of implementation, effectiveness, and efficiency because of the poor performance of some implementation stakeholders (namely the contractors). This resulted in delays, poor quality control, low productivity, and lack of efficiency in cost control till project completion
- monitoring and evaluation (M&E) arrangements
- environmental aspects: as a result of weakly identified health, safety, and environmental standards in the tender and contract documents, compliance was not enforced during construction despite monitoring of the implementing agency's Environmental Monitoring Unit.

Quality of Bank supervision: highly satisfactory.

The Bank proactively identified and resolved threats within its portfolio and its relevant fiduciary role.

The Bank provided well-articulated implementation support to the implementing agency. Frequency of monitoring and support visits were adjusted to address outstanding bottlenecks or risks to meeting project objectives, timed outputs, and outcome indicators.

Bank tasks were supported by maintaining the PMU.

The Bank country office held workshops for procurement and financial management, "specifically electronic disbursement methods," to enhance knowledge flow and updates for new guidelines.
The Bank was in full contact with all parties and helped solve many problems and disputes that arose during the project.

Evaluation of the Borrower

Overall rating: satisfactory.

Government ownership and commitment
During the early phases of the project, there was a high degree of ownership and commitment due to stable management. After the political upheaval of 2011, management changed many times in a few years, which significantly affected the rating of this criterion.

Enabling environment
No negative legislation or reforms were introduced, although corrective measures were taken in the last years to modify investment plans, reducing debts and increasing projects.

Several external disruptive events occurred during project implementation, such as protests, sit-ins, and strikes by communities near the rail lines. In most cases, these events led to stoppage of rail movement along the lines ranging from a few hours to several weeks in some cases.

Fiduciary; financial management; provision of counterpart funding; procurement; reimbursement; compliance with covenants
All the above were highly satisfactory because of strong expertise in the PMU.

Adequacy of M&E arrangements: M&E was efficiently implemented and involved all stakeholders

Lessons learned

In complex, large projects, the Bank should act as a partner in all aspects of the project, not only the construction component. A partnership reinforces developmental outcomes and enhances transparency,

professionalism, and depth in funding provided.

Prior review of key personnel selection for all consultants and contractors working in the project should be emphasized.

Interest in providing more trainings for stakeholders and in regular follow-up of financial management procedures. Attention to compliance with occupational safety and health procedures.

The knowledge management platform should be enhanced and developed to produce same-time system-generated tables and briefs and to exchange information from the Bank and the borrower or implementing agency concerning related developments, decisions, enhancements.

ANNEX 6. SUPPORTING DOCUMENTS (IF ANY)

This Implementation Completion and Results (ICR) report is based on a desk review that included:

(i) a virtual mission held in January 2021, during which the ICR mission members met current and former Egyptian National Railways (ENR) staff and Ministry of Transport, contractor, and engineering company representatives
(ii) interviews with World Bank Group (WBG) staff involved in project preparation and supervision, including the project's four task team leaders
(iii) An interview with the former head of the Italian experts delegation, who worked closely with the WBG team on component 3
(iv) technical external guidance obtained from expert interviews on the Egyptian legal system, railway procurement processes in France, and railway signaling
(v) review of project documents and supporting external literature (see bibliography).

According to the ENR restructuring project appraisal document, project beneficiaries are passengers, businesses, and the government. Because the work is not completed yet, expected benefits have not materialized yet, so no beneficiary survey was conducted as part of this ICR.

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ANNEX 7. RAILWAY SAFETY: KEY ELEMENTS

Safety on rail networks depends on human behavior, equipment, and infrastructure. Two infrastructure-related elements contribute to safety:

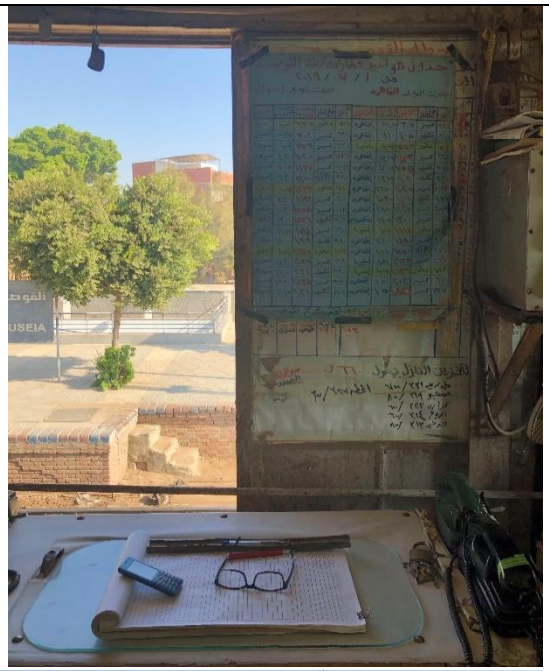
1. the *tracks* should be in good condition to train drivers to drive trains at the maximum authorized speed without derailment risk. Many tracks on the Egyptian National Railways (ENR) network were in poor condition (see pictures below);

2. the *signaling system*, which has two parts:

(a) One part (ZUB, a proprietary system installed in the 1980s) is on the locomotives. Much of the equipment was malfunctioning and stopped the locomotives without actual problems, so drivers would turn it off. The Transurb-Technirail, a technical study (not financed by the World Bank Group) recommended that ENR replace the system in place over the next 15 years with the European Train Control System-1, a nonproprietary system.[104]

(b) An element installed on the track enables safe, efficient operation of trains by preventing collisions between trains. Railway lines are divided into sections called "blocks." Only one train per direction is allowed in a block at the same time to avoid collisions. The shorter the blocks, the more trains can run on the line while maintaining a high safety level. On the ENR network, the existing signaling dated from 1910 in some segments and the 1960s in the most modern ones. On the ENR network, blocks are delimited by two stations, which are several kilometers apart, and operating rules were transmitted orally. Our interviewees reported accidents that occurred because an operator did not pick up a call informing him that a train had just left a station.

[104] Source: Aide-Mémoire, Technical Mission, March 26-28, 2007.



Signaling system before Egypt National Railways Restructuring Project

Source: WBG supervision team, December 2019

Examples of deteriorated tracks

(left: missing screw leading to unstable rails, right: cracked welds)

Source: SALCEF & SYSTRA. 2016. Contract progress report. ENRRP. Execution of 200 km of track renewal work. Document shared with the ICR author by members of the project's supervision team.

Signaling system after Egypt National Railways Restructuring Project

Source: Borrower ICR, March 2021

ANNEX 8. MAP OF THE PROJECT