

Morocco

## Meknes-Fes Track Doubling Project

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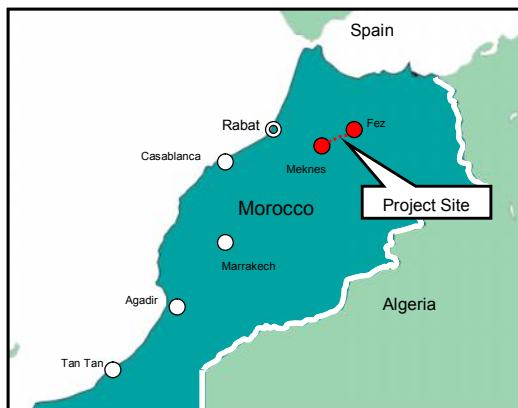
### 0. Summary

This project is highly consistent with government policies and no problems with operation and maintenance (O&M) systems can be found. Revenue from Morocco's key product, phosphates, dipped temporarily with the global economic slowdown. It is now on the track to recovery, however, with no apparent financial problems in particular.

With respect to freight transport, traffic has been declining over the long term because of intensifying competition from trucking due to development of the national highway network, and was affected by the aftermath of the Lehman Brothers collapse. Meanwhile, passenger transport has mostly achieved at least 80% of its targets in key indicators such as transport volume, trains in operation, travel time, and maximum speed.

Also, the project has made a number of positive impacts. Other than greatly contributing to increased convenience for residents along the project region, it has greatly improved the level of rail service and helped improve the business environments of local companies. In addition, in terms of efficiency, although the project period was longer than planned, project cost was kept within the planned amount. In light of the above, this project is evaluated to be satisfactory.

### 1. Project Description



Location Map



Upgraded Track and Passenger Train

#### 1.1 Background

In 1998, the Morocco railway network spanned 1,907 km. Single track accounted for 1,537 km of this, however, and the network had reached its limits in terms of both passenger and

freight transport capacity. Passenger transport in particular accounted for less than a 10% presence<sup>1</sup> when compared to road transport. Given this, Morocco recognized the need to enhance railway transport capacity between the most important axis in economic development, running between the Casablanca area (population of 3.3 million), Rabat (1.38 million), Kenitra (1.06 million), and Fes (1.28 million). Seeing this as one of the most important policy issues in the rail sector, the administration undertook a project to convert the 320 km Casablanca-Fes rail segment to double tracks from 1975.

Of the above rail segment, the 57 km between Meknes and Fes was the last to be developed. In 1998, the railway transport volume for this last segment had reached 77%<sup>2</sup> single track usage with approximately 1.51 million passengers and 880,000 tons of freight. Well above the International Union of Railways (UIC) standard value of 60% for single track usage rates, the segment greatly needed double tracking to enhance its transport capacity.

Given the above, the Moroccan government of the time recognized the Meknes-Fes Track Doubling Project as a pressing issue and desired early implementation of the project.

## 1.2 Project Outline

The objective of this project is to strengthen the transport capacity, speed up trains, cut transport time and to improve punctual operation in the section between Meknes and Fes as well as in the section between Casablanca and Fez by doubling the track of 53 km, thereby contributing to increase logistics efficiency of the related area, and to accelerate economic development of the area along the track.

Loan Amount / Disbursed Amount	4,947 million yen / 3,871 million yen
Exchange of Notes / Loan Agreement Signing Date	June 2000 / February 2001
Terms and Conditions	Interest Rate:2.20% Repayment Period:30 years (Grace Period:10 years) Conditions for Procurement: General Untied
Borrower / Executing Agencies	Office National des Chemins de Fer, ONCF / The same with left
Final Disbursement Date	May 2008
Main Contractors (over 1 billion yen)	CEGELEC (Morocco), ALSOMA GEIE (France)
Main Consultant (over 100 million yen)	N.A.
Feasibility Studies, etc.	1997 Master Plan Study (by ONCF)

<sup>1</sup> Based on person-km, 1988 data (Source: JICA internal materials)

<sup>2</sup> Percentage of track capacity for trains in actual operation on said segment (including passenger vehicles, freight vehicles, maintenance vehicles, etc.).

## 2. Outline of the Evaluation Study

### 2.1 External Evaluator

Hajime Onishi (Mitsubishi UFJ Research & Consulting)

### 2.2 Duration of Evaluation Study

Duration of the Study: December, 2010 – December, 2011

Duration of the Field Study: April 20, 2011 – May 4, 2011 / August 15, 2011  
– August 22, 2011

### 2.3 Constraints during the Evaluation Study

The project is co-financed by the European Investment Bank (EIB) and the French government (AFD). Evaluations for efficiency, impact and sustainability include both EIB and French portions. To the extent possible, the data regarding both EIB and French portions were acquired for inclusion in efficiency evaluations.

Directly comparable freight transport data<sup>3</sup> corresponding to the target values set at the time of project appraisal were not provided. As such, the achievement rate to the target values was not able to be evaluated, but rather trends in recent years were evaluated.

## 3. Result of the Evaluation (Overall Rating: B<sup>4</sup>)

### 3.1 Relevance (Rating: ③<sup>5</sup>)

#### 3.1.1 Relevance with the Development Plan of Morocco

##### Relevance with the national policies

At the time that project appraisal was carried out in 2001, the Moroccan government had plans to enhance transport capacity and improve safety for its railways. In its Five Year Development Program (2000-2004), the administration called for the following rail sector policies: (1) commercialization, (2) service upgrades, (3) modernized O&M, and (4) increased safety.

Even now in 2011, the 2010 Finance Act<sup>6</sup> calls for improved public access to basic services and corrections in regional disparities through rural development. In particular, it stipulates increased investment in road construction and airport construction along with

<sup>3</sup> Regarding the freight transport target values at the time of project appraisal, directly comparable data (with either origin or destination in the Meknes-Fes segment) was not provided.

<sup>4</sup> A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

<sup>5</sup> ③: High, ②: Fair, ①: Low

<sup>6</sup> Following the completion of the Economic and Social Development Plan (2000-2004), no new five-year long-term development plan has been formulated in Morocco. For the immediate future, it has been decided that provisional development policies will be denoted through the Finance Bill/Finance Act of each year.

modernization of the rail sector as part of efforts to strengthen infrastructure development programs.

From the above, enhanced transport capacity and increased investments in the rail sector were given as key policies both during project planning and ex-post evaluation. This is highly consistent with project objectives of “promotion and economic development of logistics by enhancing rail transport capacity, reducing travel time and ensuring safety.”

#### Relevance with the sector policies

In 1996, the Moroccan government and ONCF entered into the 1996-2000 Business Project. The Business Project arranged for ONCF to start two key projects: 1) the Meknes-Fes Track Doubling Project and 2) procurement of freight and passenger railcars. ONCF was expected to invest a total of 6.7 billion Moroccan Dirhams (MAD).

Even now in 2011, the ONCF Investment Program for 2010-2015 stipulates upgrades to existing track as a key strategy along with modernization of facilities, procurement of new railcars, and a construction project for a new Tangier-Casablanca TGV line, with a total investment program of 32.8 billion Dirhams. Of this, 900 million Dirhams is expected to be invested between 2010-2015 on the project’s Meknes-Fes section and points further east. The money will fund a track doubling and modernization project for the Fes-Oujda segment, a key component included in the above investment program.

From the above, it can be seen that rail sector policy for the Meknes-Fes Track Doubling Project was given high priority both during project planning and ex-post evaluation, and that it is fully consistent with the project’s directionality.

#### 3.1.2 Relevance with the Development Needs of Morocco

The table below gives railway transport volume for the Meknes-Fes and Casablanca-Fes sections since 2001 (also described in Section 3.3 Effectiveness). The project was completed in December 2006 with operation on double tracks commencing in January 2007. As a result, passenger traffic between Meknes and Fes is growing faster than the national average<sup>7</sup>.

Meanwhile, freight traffic between Meknes and Fes peaked in 2004 at 990,000 tons. It then declined sharply, cut to 300,000 tons in 2010. The main factors in the decline in freight traffic since 2008 have been competition from road transport,<sup>8</sup> as well as reduced phosphate derivative exports in the aftermath of the Lehman Brothers collapse and the associated reduction in domestic freight transport of phosphoric acid products.<sup>9</sup>

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<sup>7</sup> For example, passengers for the Meknes-Fes section for 2009-2010 increased 7.8%. Nationwide, passengers increased an average of 4.7% over the same period.

<sup>8</sup> Refer to Section 3.3 Effectiveness for detailed analysis.

<sup>9</sup> Refer to the column in 3.3 Effectiveness on the presence of phosphate derivative transport in Morocco rail freight transport.

Table-1: Railway Transport Volume between Casablanca/Fez and Meknes/Fez

Year	Passenger Casablanca - Fez (1000 persons)	Passenger Meknes - Fez (1000 persons)	Freight Casablanca - Fez (1000 tons)	Freight Meknes - Fez (1,000 tons)
2001	Not known	1,634	2,229	826
2002	Not known	1,738	2,339	764
2003	Not known	1,935	2,559	978
2004	Not known	2,148	2,568	987
2005	16,247	2,467	2,876	945
2006	17,764	2,508	2,372	862
2007	19,752	2,774	2,218	691
2008	20,395	2,953	2,007	556
2009	21,832	3,275	1,217	329
2010	22,945	3,530	483	298

Source: Answers to the questionnaire to ONCF

Note-1): The operation of the project facilities started in December 2006.

Note-2): Freight volume data shows the data where both of origin and destination of the freight are in between the sections described in the above table. (For example, the tonnage data on the extreme right in the Table-1 shows the freight volume transported between Meknes and Fez only.)

As mentioned above, passenger traffic has shown strong growth, and passenger transport demand in the project area is still high. Without the significant increases in transport capacity brought about by the project, passenger demand probably would not have been met, greatly impacting the quality of rail passenger service between Meknes and Fes. Meanwhile, there has been a significant reduction in freight traffic, greatly impacted by (1) competition with road transport and (2) reduced phosphate related exports, a key product, due to the aftermath of the Lehman Brothers collapse.

### 3.1.3 Relevance with Japan's ODA Policy

At the time of project appraisal in 2001, the Japan Bank for International Cooperation (JBIC) regarded infrastructural development for Morocco's sustainable growth, improving its international competitiveness, and promoting private investment as priority areas in Moroccan support in the enforcement policy for the Medium-Term Strategy for Overseas Economic Cooperation Operations to Morocco. For the rail sector in particular, JBIC provided three ODA loans in the 1970s and 1980s, all for rail vehicle procurement. Since the 1990s, policy has focused on the road and rail sectors, based on the aid framework for economic growth between Casablanca and Fes. Given the above, the project is highly consistent with Japanese aid policy.

This project has been highly relevant with the country's development plan, development needs, as well as Japan's ODA policy, therefore its relevance is high.

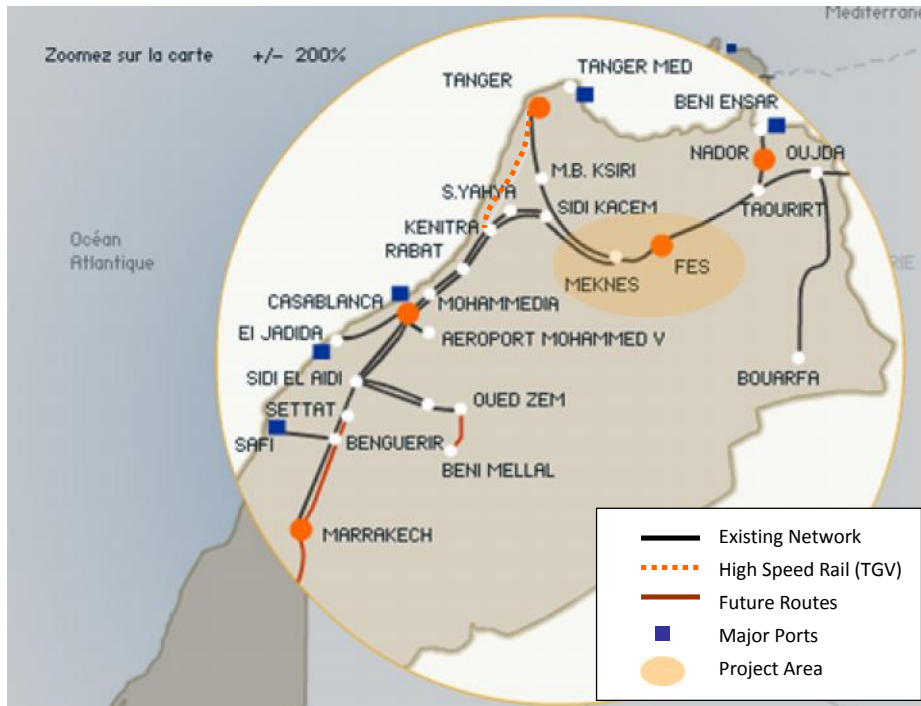


Figure-1: Location of the Project Site (Source: Prepared from the Figure on ONCF Website)

### 3.2 Efficiency (Rating: ②)

#### 3.2.1 Project Outputs

Comparison of outputs planned and actual performance is shown in Table 2 below. Of the components shown in Table 2, there are no major changes in output other than for tunnel and bridge construction under (4) Substructure, Tunnel and Bridge (EIB portion).

Table-2: Changes in Output

Project Components	Original	Actual	Differences
(1) Lot-1: Rail (JICA portion) • Procurement of steel rails	10,856 units	The same	As planned
(2) Lot-2: Switchgears (JICA portion) • Procurement of switchgears	51 units	The same	As planned
(3) Lot-3: Superstructure and Electrification Works (JICA portion)	Procurement and installation of sleeper, ballast, catenary wiring, and upgrading of substation	Mostly the same	Mostly as planned
(4) Substructure, Tunnel and Bridge (EIB portion) • Substructure construction works ➢ Double tracking of existing rail tracks ➢ Construction of new rail tracks • Construction of tunnel • Construction of bridges	33 km in total 20 km in total 800m Construction of bridges	The same 22 km in total Cancelled Boughani Viaduct Length: Extended to 856m Piers: Heightened	As planned Mostly as planned Changed Changed

Project Components	Original	Actual	Differences
(5) Telecommunication Facilities (EIB portion)	Procurement and installation of telecom facilities	The same	As planned
(6) Signal Facilities (AFD portion)	Procurement and installation of signal facilities	The same	As planned
(7) Consulting Services (EIB portion)			
• Consulting Service M/M	Approx. 10 M/M in total (Foreign: 6 M/M, Local: 4 M/M)	The same	As planned
• Consulting Service TOR	Study, Quality control and Support for construction supervision	The same	As planned

Source: JICA internal documents, answers to the questionnaire to ONCF and results of interviews

For tunnel construction, the geological survey showed that ground water levels in the planned section were higher than expected at the time of project design, and were expected to greatly exceed the budget for the originally planned wall slab construction. Thus the tunnel construction was cancelled, and they decided to raise the track bed and apply the open-cut method.

Along with the aforementioned increase in track bed height, the Boughani Viaduct, originally to be built over an approximately 1 km section headed east from the tunnel entrance facing Fes, was extended further than planned. Viaduct piers were also raised higher.

The distance for newly constructed double tracks given in (4) Substructures, Tunnels and Bridge (EIB Portion) was increased from the planned 20 km to 22 km by the time construction was completed. This change was made in detailed design (D/D) due to topographical conditions and other factors.

In addition, the Lot 3 bid for superstructure, electrification and substation construction was to be entrusted to one contractor, but the lowest bid significantly exceeded the estimated prices. The bid was then retendered with Lot 3 further divided into three portions<sup>10</sup> to ensure competitiveness. There were no scope changes for Lot 3 following this division.



Boughani Viaduct

Both consultant input volumes and consulting service terms (TOR) are as originally planned for consulting services. As mentioned below, the project is well behind schedule, but there have been no changes in the

<sup>10</sup> Source: JICA internal documents

volume of consultant employment or TOR. The ONCF is directly managing all increases in workload caused by the delays.

### 3.2.2 Project Inputs

#### 3.2.2.1 Project Cost

The total cost of the project (JICA portion only) was originally 6,596 million yen (the Japanese ODA loan share was 4,947 million yen) but the actual project cost was 3,871 million yen (the Japanese ODA loan share was 3,871 million yen), which was equivalent to 59% of the original plan.

The primary reason for the large decrease in total project cost is more efficient tendering<sup>11</sup> due to the subdivision of Lot 3. This subdivision has also greatly decreased foreign currency, local currency and ODA loans below initial estimates.

Note that the actual total project cost is 16,342 million yen, including EIB loans, loans from the French government and funds from the Moroccan government itself. This almost 17% cost overrun of the initially planned 13,975 million yen is attributable to depreciation of the yen (approximately 15% against the Moroccan Dirham).

#### 3.2.2.2 Project Period

The project period was longer than planned.

The project was scheduled from February 2001 to December 2003, a period of 35 months, but it was extended to 71 months, from February 2001 to December 2006,<sup>12</sup> which was equivalent to 203% of the original plan.

The main reasons for the delays were: (1) retendering the superstructure, electrification, and substation construction bid for Lot 3 and (2) cancelling tunnel construction and the associated redesign of the route alignment.

Regarding the first point, as described above in 3.2.1 Project Outputs, the bid for the superstructure, electrification and substation construction was to be entrusted to one contractor, but the lowest bid exceeded price estimates by 83%. According to ONCF, the prime contractor's lowest bid rose due to the increase in management costs from having to include several specialist subcontractors in the bid to cover the technical requirements of the Lot, spanning a) track laying, b) constructing the catenary wiring, and c) substation work. There was then a retender with the lot divided into three sub-portions to ensure its

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<sup>11</sup> The ONCF estimated price for Lot 3 was 442 million Moroccan Dirhams, and the lowest bid amounted to 807 million Dirhams, or approximately 1.8 times the estimates. By dividing Lot 3 and retendering, the total of the lowest bids came to 274 million Dirhams for a 66% discount off the initial estimated price. (Source: Answers to the questionnaire to ONCF)

<sup>12</sup> The loan disbursement was completed in June 2008, but as mentioned, the majority of work was completed in December 2006 and the double track section from the Project opened in January 2007. It was from this time that passenger and freight transport service started and the effects of the project started to show, so the above opening date can be considered as appropriate for project completion.



competitiveness. Contracts for Lots 3-1 through 3-3 were executed by May 2005, and said work was completed in December 2006. The above series of events resulted in almost a three year delay.

Table-3: Comparative Table of Project Periods

Task	Original Schedule (months)	Actual (months)	Differences (months)
JICA portion (Superstructure)			
EIA Approval & Land Acquisition	Completed in December 2001	Completed in March 2006	n.a.
Tender & Contract (Lot 1&2)	Completed in February 2002	Completed in July 2003	n.a.
Procurement & Civil Work (Lot 1&2)	Completed in July 2002	Aug. 2003 – Jan. 2005 (18.0)	n.a.
Tender & Contract (Lot 3)	Completed in August 2002	Completed in May 2005	n.a.
Procurement & Civil Work (Lot 3)	Completed in December 2003	Jun. 2005 – Dec. 2006 (19.0)	n.a.
EIB portion (Substructure / Telecommunications)			
Tender & Contract	Completed in June 2001	Completed in March 2002	n.a.
Procurement & Civil Work	Oct. 2001 – Mar. 2003 (18.0)	Apr. 2002 – Mar. 2005 (36.0)	+ 18.0
AFD portion (Signals)			
Procurement & Civil Work	Jun. 2003 – Dec. 2003 ( 7.0)	Apr. 2006 – Dec. 2006 ( 9.0)	+ 2.0
Total <sup>1)</sup>	Feb. 2001 – Dec. 2003 (35.0)	Feb. 2001 – Dec. 2006 (71.0) <sup>2)</sup>	+ 36.0

Source: JICA internal documents, answers to the questionnaire to ONCF and results of interviews.

Note-1): Project commencement was defined as the date of L/A conclusion (Feb.2001). For the definition of the date of project completion, refer to the Footnote-12.

Note-2): Although the construction works was completed in December 2006 and project completion certificate was issued in December 2007, the operation of the constructed facilities (commercial operation of the passenger train on the newly constructed tracks) started in January 2007.

Regarding the second point, as also described in 3.2.1 Project Outputs, tunnel construction was cancelled as ground water levels in the section scheduled for construction were deemed higher than estimated during design. With the raised track bed and other adjustments, longitudinal sections needed to be redesigned, including the Boughani Viaduct. The redesign took about eight months, thus delaying the tendering and contract for the EIB portion by eight months.

In addition, the delay in (2) above also delayed the start of adjustments on the French government portion (signal facilities) by about three years. Note that co-financing with EIB and the French government went forward as planned. There were no problems in coordinating components as the project progressed.

Although the project cost was lower than planned, the project period was longer than planned (203% of the original plan), therefore efficiency of the project is fair.

### 3.3 Effectiveness (Rating: ②)

#### 3.3.1 Quantitative Effects

##### 3.3.1.1 Results from Operation and Effect Indicators

###### (1) Passenger traffic

Passenger traffic shows strong growth. Since completion of the project in 2007, passenger traffic has grown an annual average of 8.4% (person-km). This greatly exceeds the national average for the same period at 6.3%.

In addition to population growth centered in Meknes and Fes, users have noted improvements in comfort, punctuality, and safety, as given in 3.4 Impact below. These improvements in service level are considered to have greatly contributed to the increase in passenger traffic.

Table-4: Achievement Rate of Main Indicators

Operation and Effect Indicators	Baseline Data (1998)	Target Value (3 Years After Facility Operation) <sup>2)</sup> a	Actual Value (2007, At the Time of Project Completion)	Actual Value (As of 2010) b	Achievement Ratio (%) b/a
Transportation Volume (Meknes-Fez)					
Passengers (thousand person)	1,507	3,008	2,774	3,530	117%
Passengers (thousand person-km)	Not known	906,308	150,463	191,926	21%
Freight (thousand ton)	Not known	Not known	691	298	n.a.
Freight (thousand ton-km)	Not known	Not known	172,000	124,000	n.a.
The Number of Running Train (Meknes-Fez, nos./day) <sup>1)</sup>	30	48	Not known	52	108%
The Running Hour (for Passenger Train)					
Casablanca – Fez (hrs./min.)	4 hrs. 40 min.	3 hrs. 10 min. <sup>2)</sup>	3 hrs. 20 min.	3 hrs. 20 min.	95%
Meknes – Fez (hrs./min.)	Approx. 50 min.	Approx. 30 min. <sup>2)</sup>	36 min.	47 min.	64%
Maximum Speed (Meknes-Fez)					
Passenger Train (km/h)	100	160 <sup>3)</sup>	160	160	133%
Freight Train (km/h)	65	Not known	80	80	123% <sup>4)</sup>

Source: Answers to the questionnaire to ONCF, results of interviews with ONCF, Project Completion Report (PCR) and JICA internal documents

Note-1): Total number of passenger and freight trains operated

Note-2): Target value at the time of project completion in 2007

Note-3): It was planned that a “pre-conditioning operation” was conducted with the maximum speed of 120 km/h until half a year after the project, then the maximum speed was increased up to 160 km/h (Source: JICA internal documents). In actual, such an operation was firstly conducted with the maximum speed of 120 km/h, and then it was increased to 160 km/h after the middle of 2007, as originally planned.

Note-4): Achievement rate to the baseline data

The person-km target value at the time of project appraisal was 906,300,000 person-km, which assumes each person will ride more than 300 km annually (906,308 / 3,008 = 301 km). In light of Morocco national passenger traffic levels for 2010 (approximately 4.4 billion person-km, or 140 km/person/year; see Table 5 for details) and Japanese examples,<sup>13</sup> it is likely that the estimated person-km target value might be unreasonable or that there is some

<sup>13</sup> For example, approx. 28 person-km/years is the average value of the six Japan Railways (JR) companies in 2008. (Source: Suji de Miru Tetsudo 2010 (written in Japanese))

sort of error.

Table-5: ONCF Passenger Transport Volume for Past Five Years

Year		2006	2007	2008	2009	2010
Casablanca - Fez	Thousand persons)	17,764	19,752	20,395	21,832	22,945
Casablanca - Fez	Million persons-kilometers)	1,696	1,867	1,933	2,056	2,145
Meknes - Fez	Thousand persons)	2,508	2,774	2,953	3,275	3,530
Meknes - Fez	Million persons-kilometers)	136	150	160	178	192
Whole Country	Thousand persons)	23,582	26,116	27,527	29,600	31,000
Whole Country	Million persons-kilometers)	3,333	3,658	3,820	4,190	4,398

Source: Answers to the questionnaire to ONCF

## (2) Freight traffic

As mentioned previously in Section 2.3 Constraints during the Evaluation Study, it is difficult to quantitatively assess freight transport as no data pertaining to target values was available. Even so, transport volume has been declining over time, as shown in Tables 1 and 4. Freight traffic (tons) between Meknes and Fes in 2010 slumped to 35% of 2006 levels.

Table-6: ONCF Freight Transport Volume for Past Five Years (for Reference)

Year		2006	2007	2008	2009	2010
Casablanca - Fez	Thousand ton)	2,372	2,218	2,007	1,217	483
Meknes - Fez	Thousand ton)	862	691	556	329	298
Whole Country	éxcl. Phosphate transport) Thousand ton)	3,803	4,036	4,836	4,127	4,960
Whole Country	incl. Phosphate transport) Thousand ton)	34,851	35,859	31,703	25,000	36,000
Whole Country	Million ton-kilometers)	5,827	5,794	4,986	4,111	5,572

Source: Answers to the questionnaire to ONCF and ONCF Annual Reports

As mentioned in 3.1 Relevance, production of phosphates, a major Morocco export, and domestic transport of derivative products (chemical fertilizer, etc.) dropped sharply with the global economic downturn following the collapse of Lehman Brothers in September 2008.<sup>14</sup> According to Fes regional ONCF freight officials, the Office Chérifien des Phosphates (OCP), owners of a phosphate fertilizer factory in Jorf Lasfer in southern Casablanca, has seen depleted transport volumes for chemical fertilizer heading towards Meknes and Fes.<sup>15</sup> Specific details on the above are unknown as no concrete data has been disclosed. In addition, officials also pointed out that volumes for coal, petroleum products and other imports bound for Fes and Meknes have also decreased along with the slowdown in the domestic economy. Presumably, the sharp decline in rail freight transport since 2008 over the project section is largely due to the above two points.<sup>16</sup>

<sup>14</sup> 2010 figures have recovered to 2006 levels. Refer to the footnote 16 for details.

<sup>15</sup> The Meknès-Tafilalet and Fès-Boulemane Regions are major agricultural supply regions for Morocco.

<sup>16</sup> Presence of phosphate transport in Morocco rail transport: As of 2010, Morocco boasts the world's largest deposits of phosphates (76% of world deposits). It is first in export volume and third in production behind China and the U.S. (Data source: USGS website). Nearly all phosphates for export or purification is transported by railway. ONCF exports an average of 30 million tons of phosphate derivatives annually; 1/3 of this is for export, and the remaining 2/3 is for domestic purification (ratio taken from ONCF website). In 2010, approximately 31 million tons of phosphate was transported, with phosphate-related transport accounting for 87% of the 36 million tons total of freight transport for 2010. Phosphate-related transport

In addition to the above, since the 1980s, Morocco rail freight transportation has shown a general decreasing trend with intensifying competition from truck transport owing to the development of the national highway system. With no detailed data this is only speculation, but for container transport of imported industrial goods and daily goods from the major trading ports of Tangier-Med and Casablanca, road transport is expected to continue gaining in predominance along with the development of the highway network as Meknes and Fes are 200-300 km away.<sup>17</sup>

### (3) Complementarily with High Speed Rail program in Morocco

From 2013, Morocco is scheduled to introduce the first high-speed rail (Train à Grande Vitesse, or TGV) on the African continent and new locomotives with technical assistance from France. The immediate plan is for a Tangier-Casablanca TGV. Construction started in September 2011 and the line is scheduled to open in late 2015.



Passenger Train on Meknes Station

In relation to the project, a TGV line is planned from near Sidi Kacem to Oujda, passing through Meknes and Fes, with service scheduled to start between 2025 and 2030. The track outfitted in the Meknes-Fes section in the project will be used as the TGV track (or further upgraded for use).<sup>18</sup> This will mean that the project will have outfitted some of the infrastructure for introducing future high-speed rail.

### 3.3.1.2 Results of Calculation of Internal Rates of Return (IRR)

#### (1) Financial Internal Rate of Return (FIRR)

FIRR figures were recalculated with several conditions described in Table 7 below.

The result of recalculating FIRR was -0.33%, which was much lower than the 8.80% (3.4% for the case with no increase in freight transport volume) at the time of project appraisal. The reason for this will be, (as described in Section 3.3 Effectiveness), that the estimated

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revenues also account for around 50% of annual ONCF operating revenues (Refer to the 3.5 Sustainability for more detail).

<sup>17</sup> Fes regional ONCF freight sector officials said that, "road and rail transport items are clearly segregated (rail transport is for phosphate and mineral resources, steel products, cement, energy-related and resource-related products; road transport is for daily goods and other products), and the two modes generally do not compete with one another." In contrast, a major freight forwarder with an office at Casablanca port replied that "it will depend on the goods for transport, but we generally use trucks to transport from Casablanca port to Meknes and Fes given the travel time."

<sup>18</sup> Source: Results of interview with ONCF

person-km target value might be unreasonable or there is some sort of error.<sup>19</sup>

Table-7: Recalculation of FIRR

Timing	Preconditions and Assumptions for Recalculation (Project Life: 20 years after the completion of the Project for each case)	FIRR
At the time of appraisal (in 2001)	Costs: Construction cost, consulting service cost and operation and maintenance cost. Revenue: Induced earnings caused by double tracking (Difference between unit operating revenue and marginal cost times additional demand on both passenger and freight transport.)	8.80% ( $\downarrow$ 4.4% <sup>1)</sup> )
At the time of ex-post evaluation (in 2011)	Costs: Construction cost, consulting service cost, operation and maintenance cost (based on the actual expenditure up to 2010) Revenue: Induced earnings caused by double tracking (Difference between unit operating revenue and marginal cost times additional demand on both passenger and freight transport.)	- 0.33%

Note-1): The case with no increase in freight transport after the completion of this project

## (2) Economic Internal Rate of Return (EIRR)

The economic internal rate of return (EIRR) was not calculated due to limited resources for this study, because it would have been necessary to clarify quantitative input data from the beneficiary side, such as “Cost reduction caused by the modal shift from road traffic to railway traffic”.

### 3.3.2 Qualitative Effects

Along with the reduction in traffic accidents, eliminating railway crossings and moving to grade separation crossings has improved the safety of rail service. There were 15 crossings before the project, but 13 were eliminated as of August 2011.<sup>20</sup> Also, there were six cases of serious injury or death over the Project section from 2001 to 2006, but there have been zero cases since January 2007. Thus, eliminating railway crossings through the project has considerably improved the safety of train service.

From the above analysis, passenger travel has achieved at least 80% of its targets in all indicators, such as transport volume (in persons), trains in service, travel time, and maximum speed. Meanwhile, freight transport volumes are trending to decrease due to the sharp decline in transport volumes for fertilizer and energy-related products to Meknes and Fes. The underlying causes of this decline are the intensifying competition from trucking due to development of the national highway network and the aftermath of the Lehman Brothers

<sup>19</sup> 2006 estimates for three years after project completion were 906.3 million person-km, comprising almost a quarter of the current Morocco passenger traffic levels nationwide (approx. 4.4 billion person-km). From the scale of population along the Project areas (approx. 1.7 million), these estimates seem to be highly excessive. Incidentally, the total population of Morocco is around 31 million.

<sup>20</sup> Currently in 2011, ONCF is working together with local communes to eliminate the remaining railway crossings and install grade separation. The remaining two crossings are slated for elimination by 2015. (Source: Results of interview with ONCF)

collapse.

Therefore, this project has somewhat achieved its objectives, therefore its effectiveness is fair.

### 3.4 Impact

#### 3.4.1 Intended Impacts

(1) Increase in the level of convenience in the residential people along the project area

A beneficiary survey<sup>21</sup> on levels of railway service before and after the project completion yielded the following responses:

Table-8: Difference in Service Level before/after the Project (N=150)

Answers by Beneficiaries	No. of Respondent	%
After the project, service level provided by ONCF was clearly improved.	57	38%
After the project, service level provided by ONCF was improved to some extent.	81	54%
There is no change in ONCF's service level even after the project.	6	4%
No answers / I cannot judge the difference, etc.	6	4%
Total	150	100%

Source: Beneficiary survey

Additionally, asking respondents who answered that a service had “clearly improved” or “improved to some extent” what they thought was most improved yielded the following responses:

Table-9: Detailed Reasons for Service Level Improvement (N=138)

Answers by Beneficiaries	No. of Respondent	%
Passenger train's speed was much faster than before the project.	40	29%
The amount of time required to the destination was reduced after the project.	75	54%
The congestion level inside the train was improved to some extent after the project.	15	11%
The safety of the train was improved after the project.	8	6%
Total	138	100%

Source: Beneficiary survey

The above results from the survey of beneficiaries show that railway service levels have definitely improved with the project completion. In particular, respondents pointed out service improvements in terms of the following: (1) shorter travel time due to improvements in train speed, (2) less congestion due to more trains in service, and (3) fewer accidents (and improved safety) arising from the elimination of railway crossings.

Additionally, the beneficiary survey demonstrates the following responses in terms of

<sup>21</sup> Below is a summary of the survey of beneficiaries:

Locations: Along the Project region (Meknes, Fes, and 3 stations between Meknes and Fes)  
 Target groups: Common rail passengers, cargo shippers, retailers  
 Sample totals: 150 (140 common passengers, 5 cargo shippers, 5 retailers), segmented two-stage random sampling  
 Data collection method: Face-to-face interviews

major destinations when using rail before and after the project completion:

From Table 10, changes in user behavior can be observed in terms of rail destinations with the project completion. Before the project completion, they preferred relatively closer destinations (Meknes, Fes, etc.), but after completion they were more likely to select cities further away like Casablanca, Rabat and Oujda as destinations. Reading further into this finding, it can be noticed that residents living along the Meknes-Fes line will likely start considering rail for trips to more distant destinations than before owing to service speed improvements, reduced travel times, increased trains and other improvements. With improved access to Meknes and Fes for far off residents, traffic in the opposite direction is also expected to increase.

Table-10: Changes in the Passenger’s Primary Destination before/after the Project (N=150, Multiple Answers)

Primary Destinations	Before the Project	After the Project
Fez	146	90
Meknes	87	80
Oujida	27	37
Rabat	40	53
Casablanca	26	38
Tangier	0	1

Source: Beneficiary survey

## (2) Improvement in Logistic Efficiency and Business Environment

In-depth interviews on business environmental improvements were conducted with three manufacturers, one tourism company, and three other companies<sup>22</sup> in the Meknes and Fes areas during the field survey. The companies gave the following opinions on the direct effects of the project completion.

Table-11: Results of In-Depth Interview with Private Companies in Meknes-Fez Area

Answers by Interviewees	Number of Respondent (Type of Respondent)
Sales were increased due to the increase in the number of customers, after completion of the project.	4 companies (Tourism and other sector)
We started to use railway service for transporting our goods, after completion of the project.	3 companies (Manufacturing)
Because of this project, we decided to do additional investment (procurement of new machines, enhancement of storage capacities, etc.).	1 company (Cement production)
Because of this project, our factory became to avoid being shut down, due to timely and efficient supply of clinker from Oujida area.	1 company (Cement production)

The results shown in Table 11 suggest that business environments have improved after the project completion, especially for the manufacturing industry. The three manufacturing

<sup>22</sup> Manufacturing: 1 cement manufacturer and 2 food processing companies; Tourism: 1 hotel industry company; Other: 2 communications/postal companies and 1 logistics service company. Breakdown of manufacturing industry goods shipped - cement manufacturer: clinker (loaded as raw material) and cement (shipped as the product); food processor: caruppe (raw chocolate shipped as product), corn (loaded as raw material) and wheat (same).

companies in particular responded that they had switched domestic transport for some products from trucks to rail once the project was completed. All three companies identified (1) lower risk of product theft and (2) more reliability when compared to truck transport as the reasons for the switch.

### 3.4.2 Other Impacts

#### 3.4.2.1 Impact on Natural Environment

##### Implementation status of EIA and Environmental Monitoring during Construction

While Morocco had no laws in place pertaining to Environmental Impact Assessments (EIA) at the time of project appraisal, JBIC did hire external consultants to conduct an initial EIA in January 2000 and a detailed EIA in April 2001 in accordance with its guidelines. The EIAs reported no particular negative impacts.

Given the above, there was no large-scale environmental monitoring during construction. Contractors also monitored noise, vibration and other disturbances as appropriate for construction in urban areas. There were no complaints from nearby residents or businesses.<sup>23</sup>

#### 3.4.2.2 Implementation Status of Resettlement and Land Acquisition

The project involved land acquisition and resettlement of local residents (nine households in total) which occurred during the implementation of the project. Table 12 below shows the scale and process of the acquisition.

Table-12: Status of Resettlement and Land Acquisition of the Project

Item	Actual Status
Project-Affected Families, PAFs	229 households
No. of Households (Land owners) for Land Acquisition	220 households
No. of Resettled Households	9 households (all illegally settled)
Detailed Process of Land Acquisition:	<ul style="list-style-type: none"> <li>• Public announcement of land sales in "Official Bulletin"</li> <li>• Inventory survey of land (boundary identification, etc.) for acquisition (implemented by ONCF)</li> <li>• Preparation of the agreement with the land owner about the result of inventory survey (implemented by ONCF)</li> <li>• Discussion and decision of land price by the special committee (consisting of Min. of Agriculture, Min. of Finance and representatives of the residential people)</li> <li>• Negotiation with the land owner, agreement and transfer of rights, etc. (mainly implemented by ONCF)</li> </ul>
Total Area of Land Acquisition	80 ha. in total
No. of Stakeholder Meetings Conducted	30 meetings in total
Total Expenses for Land Acquisition	6.1 million Moroccan Dirham

Source: Answers to the questionnaire to ONCF and results of interview with ONCF

As shown in Table 12, land was acquired from 220 land owners. All land acquired was farmland, covering a total of 80 ha. Some landowners with land from Fes Station to about 1.5 km in the Meknes direction did not agree to sell and had their land forcefully expropriated in

<sup>23</sup> Source: Results of interviews with ONCF personnel involved in Project construction management



accordance with domestic Morocco law. The expropriation was completed in March 2006. As already shown in 3.2.2.2 Project Period, the above forceful expropriation had almost no effect on the construction schedule.

Regarding the concerns noted at the time of project appraisal that "25 illegal homes located outside the city of Meknes have been successfully relocated without any special issues," it is confirmed by ONCF that (1) nine households, not 25, were resettled and (2) the above nine households were compensated through the local communes/government and resettled voluntarily with some support from the local communes/government. No specific problem was found in this resettlement process.<sup>24</sup>

#### 3.4.2.3 Unintended Positive/Negative Impact

Several incidental projects were implemented alongside the project, including dry port construction and redevelopment of the areas in front of stations. These can be evaluated as positive impacts of the project.

- ONCF is taking the lead in construction of the Ben Suda Dry Port as a multi-modal logistics hub on the outskirts of Fes Station. This dry port is planned as a transshipment base for rail and road freight, timed in anticipation of the project completion. Construction of this dry port will strengthen ties with road transport. It can be expected to make freight transport more efficient and have a synergistic effect with road transport.
- Related to the above dry port, a construction project is underway to construct a new rail freight terminal near Ras El Ma Station, an intermediate station on the project rail section.
- A related project was started after completion of the project to develop the plaza in front of Fes Station. Besides improving safety for pedestrians, this has drastically improved the flow of taxis and private cars near the station entrance and significantly improved passenger convenience.
- As mentioned in 3.3 Effectiveness, serious injury and deaths have plummeted in conjunction with the elimination of railway crossings and developing grade separations. The project has improved the safety of neighboring residents.



Fez Station and Station Square

<sup>24</sup> Source: Results of interviews with ONCF personnel involved in Project construction management

As given above, other than greatly contributing to convenience for neighboring residents, the project is significantly improving the level of rail service and helping to improve the business environments of local private companies, resulting in having induced various positive impacts.

### 3.5 Sustainability (Rating: ③)

#### 3.5.1 Structural Aspect of Operation and Maintenance

ONCF<sup>25</sup> is in charge of operation and maintenance (hereinafter O&M) for railway facilities constructed in the project. ONCF is comprised of 21 departments in total. Just under the Director General are Financial Management and Control, Strategy and Communication, Human Resources, Information Systems, and the Special Advisor to the Director General. Other departments include (1) Passenger Division, (2) Freight and Logistics Division, (3) Development Division, (4) Maintenance and Materials Division, (5) Safety and Administration Division, and (6) Infrastructure and Operations Division.

O&M for project-related facilities is handled by the following sections under the (6) Infrastructure and Operations Division: a) Infrastructure Maintenance Section, b) Infrastructure Engineering Section, and c) Direction Regionale Infrastructure et Circulation Nord (abbr.: DRICN). Details for the O&M implementation system is shown in Table 13.

Table-13: Responsibility Matrix of Operation and Maintenance Activities of Project Facilities

Planning	Preparation of Tender Documents	Implementation	Supervision	Planning
Daily Maintenance	DMI	n.a.	DRICN	DFCG / DMI
Periodical Maintenance For Superstructure, Substructure and Telecom For Catenary Wiring	DMI DMI	n.a. DMI	DRICN Contractors	DFCG / DMI DFCG / DMI
Large Scale Maintenance	PD / DI / DMI	PD / DI / DMI	DRICN / Contractors	PD

Source: Answers to the questionnaire to ONCF

Note-1): DMI refers to the Infrastructure Maintenance Section, DI refers to the Engineering Section and DRICN refers to Direction Regionale Infrastructure et Circulation Nord. (All of these divisions are under the Infrastructure and Operations Division.)

Note-2): DFCG refers to the Financial Management and Control Division, and PD refers to the Projects Department.

As shown in Table 13, daily and periodical maintenance<sup>26</sup> for superstructure facilities, substructure facilities, and communications facilities is all directly managed by ONCF, other than maintenance for overhead catenaries. Periodical maintenance activities for overhead

<sup>25</sup> ONCF was established by edict of the King of Morocco in 1963, nationalizing and consolidating three private rail companies. ONCF experienced chronic deficits in the 1980s due to underlying problems with redundant staff and management inefficiencies. It then started a recovery program in 1994 with job cuts, pension reform, and other measures. This led to its first recorded profit in 1998 (10 million Dirhams).

<sup>26</sup> Maintenance work includes the following: 1) track management, 2) railway crossing maintenance, 3) ballast (crushed stone) servicing, 4) overhead catenary maintenance, and 5) culvert cleaning.

catenaries are outsourced to private contractors (normally every four years, extendable to six years). In the future, periodical maintenance for telecommunications and signal facilities will be outsourced to a private company. There have been no large-scale repairs to date, but in the case of such repairs, three (3) departments such as i) the Projects Division, ii) the Infrastructure Maintenance and iii) Engineering Sections under the Infrastructure and Operations Division will work together to formulate a maintenance plan for detailed activities. Such a plan would be handled by DRICN or privately outsourced. There is an O&M manual written by project consultants. Considering these, no special problems in the above system for formulating O&M plans, tendering bids, managing contractors (for overhead catenaries) can be found.

Table-14: Number of Technical Staff of ONCF

Year	ONCF Technical Staff in Total	Of which, O&M Staff in Total	Of which, O&M Staff Exclusively in Charge of Project Facilities
2006	3,623	3,502	104
2007	3,390	3,269	98
2008	3,252	3,131	92
2009	3,124	3,003	87
2010	3,065	2,944	85

Source: Prepared from answers to the questionnaire to ONCF

Note): Part-time workers (such as construction workers) are excluded in the above table.

Through a World Bank-led restructuring from 1994, its own rolling plan, and other reorganization plans, ONCF has cut its total staff numbers from roughly 10,000 in 1999 to 7,784 as of 2010. Accordingly, O&M personnel member have been reduced. Project-related O&M personnel member have dropped 22% since 2006 to 85 members as of 2010.

Meanwhile, DRICN has said that O&M staff reductions are primarily due to (1) retirement and other natural attrition and (2) decrease in O&M staff numbers needed along with elimination of railway crossings. They added that the skill level has not decreased, and no essential personnel members have been let go. DRICN continues to keep itself suitably staffed in general.

To sum up, no problems can be found in the institutional structure of O&M implementation.

### 3.5.2 Technical Aspects of Operation and Maintenance

#### Technical skills of engineers and workers

The total number of employees who are in charge of O&M activities are 85 persons as of 2010, consisting of 4% of university graduates, 40% of vocational schools and high schools, and 56% of others. They have about 24 years of collective experience on average in operation

and maintenance of the railway facilities, which seems to be long and sufficient enough to conduct this kind of activities.

As shown in Table 14, the number of O&M workers who are exclusively in charge of project facilities has trended downward from 2006. However, the proportionate volume of personnel is being secured on an ongoing basis, and technical skills obsolescence and the loss of critical specialists did not happen. ONCF has a 2,110 km railway network in Morocco (as of 2010) with the approximately 370 km-double track railway, and it is amply accumulating O&M skills through the operation of these facilities. It would appear that there is no problem with the quantity and quality of engineering and technical staff.

#### Training programs provided by contractors of the Project

No training has been conducted by contractors because O&M activities at the related facilities do not require any special technique or skill. On the other hand, for the O&M skills of the upgraded substations, various trainings for technical staff for operation and maintenance have been conducted by the contractor, Siemens AG. Three types of training are provided; (1) lecture, (2) on-the-job training (OJT) during the commissioning period, and (3) the fire training, with a total number of participants of 20. Training is conducted by the contractor constantly, and the contents of the training are valued by the trainees.<sup>27</sup>

#### 3.5.3 Financial Aspects of Operation and Maintenance

ONCF currently finds itself in a favorable financial situation. With the global economic slowdown, revenue from phosphates dipped temporarily, but it is now on the track to recovery. There are no apparent financial problems in particular. In terms of the project related section, 2010 revenues turned a profit, and future revenues appear to be favorable.

##### (1) Earnings condition

Revenues temporarily dipped into the red in 2009 amidst the deteriorating global economic situation following the collapse of Lehman Brothers, but recovered to normal levels the next year in 2010 together with a quick recovery in transport-related revenues for phosphates. As shown in Table 15, while revenues for general freight other than phosphates are on a downward trend long-term, passenger revenue is steadily growing and more than compensating for the reduced freight revenue. ONCF is now completely profitable, primarily on the strength of steady implementation of the recovery program from 1994 with downsizing, pension reform and other measures and the World Bank's Railway Restructuring Project from 1996.

Morocco is in a unique situation with phosphate revenues. As phosphates and derivatives

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<sup>27</sup> Source: Results of interviews with employees who underwent training.

account for roughly 50% (49% in 2010) of all transport revenues, phosphate production and transport trends greatly affect revenue. Meanwhile, global demand for fertilizer is increasing, but the world's two largest suppliers by volume, China and the U.S., give priority to domestic demand. The supply for fertilizer has thus been tight since around 2007, with the international market increasing year by year. With the world's largest phosphate deposits, Morocco is in a position of superiority in a seller's market; many discuss the global food crisis and demand for phosphate as fertilizer material as a set. While it is possible that Morocco may exhaust its phosphate supply in the ultra longer term, there are no apparent long-term issues with ONCF revenue.

Table-15: Profit and Loss (P/L) Statement of ONCF

Unit: Million MD

Year / Item	2006	2007	2008	2009	2010
Sales <sup>1)</sup>	2,174	2,894	2,731	2,523	3,098
<i>Passenger traffic revenue</i>	870	970	1,003	1,097	1,179
<i>Freight traffic revenue<sup>2)</sup></i>	357	344	341	241	308
<i>Phosphate related revenue</i>	1,403	1,489	1,316	1,122	1,515
Cost of Sales <sup>3)</sup>	1,581	1,746	1,713	1,993	2,050
<i>Materials cost</i>	464	606	529	742	614
<i>Utility cost</i>	277	277	284	309	362
<i>Overhead Cost</i>	725	736	768	801	850
Gross Profit on Sales	1,133	1,148	1,019	529	1,048
Operating Profit	933	1,034	732	230	561
Ordinary Income	807	757	318	▲166	29
Net Income after Tax	762	712	267	▲179	▲41

Source: Prepared from the documents provided by ONCF

Note-1): Sales include some revenues other than those related to passenger, freight and phosphate shown in the above.

Note-2): Freight revenue in the above does not include the phosphate-related revenues.

Note-3): Cost of sales includes miscellaneous expenses other than costs of material, utility and overhead shown in the above.

Passenger railway fares have been raised twice in recent years: once in 2006, and once in 2009. Revenue from passengers increased approximately 13% from 2005 through 2006, and approximately 9% from 2008 through 2009. Given the growth in passenger numbers over the same periods (12% and 8%, respectively), the increase in revenue from fare hikes appears to have been limited.

As mentioned in 3.3 Effectiveness, work is underway on a plan to introduce the first high-speed rail (TGV) on the African continent with technical assistance from France. The Tangier-Casablanca TGV project is underway and scheduled to open in 2015. New tracks for the TGV are scheduled for construction in selected sections. While there are issues with the isolation of existing tracks over these sections, it can be expected to have a sharp increase in passenger revenues when the project is completed. In addition, creating a new source of passenger revenue with the TGV could greatly alter ONCF's unique financial structure and its heavy reliance on transport revenue from phosphates over the ultra long-term.

(2) Financial status

Since 2006, the capital ratio has maintained high levels, holding between 60-80%. Gross margin ratio, return on assets and net margin ratio were all significantly worse from 2008 along with the decrease in transport revenue from phosphates, but recovered rapidly in 2010 and appear to currently be on the track to recovery.

Meanwhile, total debt has been consistently on the rise. Increased new projects and new rail vehicle purchases have led to increases in fixed and current liabilities. It is important to note the increasing trend in future liabilities.

Table-16: Balance Sheet (B/S) of ONCF

Unit: Million MD

Year / Item	2006	2007	2008	2009	2010
<b>Assets</b>					
Current Assets	2,789	2,740	3,095	3,357	3,806
Fixed Assets	27,973	31,804	35,872	37,693	39,116
<i>Facilities</i>	6,880	7,364	7,553	13,690	15,400
<i>Locomotives</i>	787	759	713	692	1,377
<i>Rolling Stocks</i>	1,298	2,155	3,031	3,559	3,565
<b>Total Assets</b>	<b>30,762</b>	<b>34,544</b>	<b>38,967</b>	<b>41,050</b>	<b>42,922</b>
<b>Liabilities and Equity</b>					
Equity Capital	21,856	22,946	24,651	25,292	26,206
Current Liabilities	2,138	2,812	3,196	3,690	3,516
Fixed Liabilities	6,768	8,787	11,120	12,068	13,200
<b>Total Liabilities and Equity</b>	<b>30,762</b>	<b>34,544</b>	<b>38,967</b>	<b>41,050</b>	<b>42,922</b>

Source: Prepared from documents provided by ONCF

Table-17: Financial Indices

Year / Item	2006	2007	2008	2009	2010
Gross Margin Ratio (%)	41.8	39.7	37.3	21.0	33.8
Return on Assets (%)	2.5	2.1	0.7	▲0.4	▲0.1
Net Margin Ratio (%)	28.1	24.6	9.8	▲7.1	▲1.3
Gross Debt (Mil. MD)	8,906	11,598	14,316	15,759	16,716
Current Ratio (%)	130.5	97.5	96.8	91.0	108.2
Quick Asset Ratio (%)	128.0	138.6	145.5	149.0	149.3
Fixed Assets to Fixed Liability Ratio (%)	97.7	100.2	100.3	100.9	99.3
Capital Ratio (%)	71.0	66.4	63.3	61.6	61.1

Source: Prepared from P/L and B/S

(3) Operation and maintenance expenditure relating to the Project

Table 18 below shows the ONCF's O&M budgets and operating income for related facilities to the project (revenue and O&M expenses). Non-freight revenues for project-related facilities returned to profitability in 2010 with passenger revenues nearly doubling from 2007 to 2010. Development and population growth along the project rail section is expected to spur this along.

As shown below, annual O&M expenses have remained between 9-14 million MAD (approximately 100-150 million yen) since double track sections opened in January 2007. Maintenance costs are proportionately high for superstructure, particularly overhead catenaries.

As previously mentioned, ONCF is currently working to eliminate railway crossings remaining in the project rail section and install grade separations together with local governments. These projects not only improve safety, they will also reduce maintenance expenses for crossing facilities (crossing system maintenance costs and repair costs for tracks in the crossing) to zero. We anticipate future progress in these projects.

Table-18: O&M Budget of ONCF and Income and Expenditure relating to Project  
Unit: Thousand MD

Item	2007	2008	2009	2010
Passenger Revenue (from the project section)	<b>6.1</b>	<b>6.9</b>	<b>8.6</b>	<b>11.5</b>
O&M Expenditure relating to this project				
Expenses for Superstructure	5.7	6.8	9.1	5.8
Expenses for Substructure	1.5	0.3	2.4	3.1
Expenses for Telecoms and Signals	1.1	1.6	1.0	0.2
Other Expenses	1.0	1.5	1.7	1.9
O&M Expenditure in Total	<b>9.3</b>	<b>10.2</b>	<b>14.2</b>	<b>11.0</b>
Operating Surplus of the project	<b>▲3.2</b>	<b>▲3.3</b>	<b>▲5.6</b>	<b>0.5</b>
O&M Budget of ONCF in total	<b>211.0</b>	<b>214.0</b>	<b>260.0</b>	<b>294.0</b>

Source: Prepared from documents provided by ONCF

Note-1): Passenger revenue of 2006 was 4.5 million MD.

Note-2): Revenues related to the freight traffic are not known.

With no data being disclosed for early budget allotments for project-related facilities, no comparisons can be made with current O&M expenses. However, as shown in Table 18, ONCF has increased the O&M budget by 40% from 2007 to 2010, so ample resources for O&M costs have been set aside.

### 3.5.4 Current Status of Operation and Maintenance

ONCF usage and O&M for its facilities and equipment (superstructure, overhead catenaries, substructure, tunnels and bridges, telecommunications equipment, and signal facilities) are exceedingly good with no particular problems. O&M manuals and documentation have been provided within the project. There have been no particular problems to date about the power supply from the Office National de l'Electricité (ONE), Morocco's power authority. There were torrential rains within the project region in 2010, but no ballasts were washed away and no track beds were damaged. There are also arrangements in place for residing departments and other parties to respond to any damage or issues with overhead catenaries or track that may occur in a timely manner to minimize disruptions to train services.

As seen above, there have been no major problems, and the facilities and systems developed in the project are running properly. However, with regards to this high performance, (1) only four years have passed since the project section opened for service, and procured equipment and systems are still reliable, (2) ONCF has ample capital for O&M, and (3) much will depend on the technical capabilities of DRICN and other ONCF personnel.

Given these, no major problems have been observed in the operation and maintenance system, therefore sustainability of the project is high.

## 4. Conclusion, Lessons Learned and Recommendations

### 4.1 Conclusion

This project is highly consistent with government policies and no problems with operation

and maintenance (O&M) systems can be found. Revenue from Morocco's key product, phosphates, dipped temporarily with the global economic slowdown. It is now on the track to recovery, however, with no apparent financial problems in particular. With respect to freight transport, traffic has been declining over the long term because of intensifying competition from trucking due to development of the national highway network, and was affected by the aftermath of the Lehman Brothers collapse. Meanwhile, passenger transport has mostly achieved at least 80% of its targets in key indicators such as transport volume, trains in operation, travel time, and maximum speed. Also, the project has made a number of positive impacts. Other than greatly contributing to increased convenience for residents along the project areas, it has greatly improved the level of rail service and helped improve the business environments of local companies. In addition, in terms of efficiency, although the project period was longer than planned, project cost was kept within the planned amount.

In light of the above, this project is evaluated to be satisfactory.

## **4.2 Recommendations**

### **4.2.1 Recommendations for Executing Agency**

Since the 1980s, Morocco rail freight transportation has shown a decreasing trend with intensifying competition from trucking thanks to development of the national highway system. Freight transport in the project region has also been declining from its 2004 peak of 990,000 tons, plummeting especially hard since the collapse of Lehman Brothers in 2008. Freight in the region dropped to almost 30 tons in 2010. Excluding phosphate transport, revenue from other freight transport makes up less than 10% of overall ONCF revenue. ONCF should make an earnest effort to intensify new customer acquisitions and stop the decline in rail freight handling volume to diversify its revenue sources and right its heavy reliance on phosphate rock income<sup>28</sup>.

The Ben Suda Dry Port that ONCF is building as a multi-modal logistics hub on the outskirts of Fes Station is an example of a key project that could have an influence on the restoration of rail freight in the project region. Rail freight should not view competition from trucking as a negative, but rather continually look to strategically increase rail freight by fully leveraging transshipment bases like Ben Suda in the future.

### **4.2.2 Recommendations for JICA**

N.A.

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<sup>28</sup> ONCF fully realized the necessity to diversify its revenue sources, and has started to implement some projects including logistics platforms, dry ports, telecom infrastructure, etc.



### **4.3 Lessons Learned**

As mentioned previously, the Lot 3 bid for line superstructure, electrification and substation construction was to be entrusted to one contractor, but the lowest bid significantly exceeded price estimates and was retendered. The prime contractor's lowest bid rose due to the increase in management costs from having to include several specialist subcontractors in the bid to cover the technical requirements of the Lot, spanning a) track laying, b) building catenaries, and c) substation work. As it increases ordering tasks, approval tasks and administrative burdens with regards to contractor progress, subdividing the Lot was not preferable from an ordering perspective, but doing so greatly reduced project costs. Having assessed the management capacity of ONCF, the best method of dividing lots should be considered carefully at the planning stage, taking indivisible portions into account.

Taking Morocco's national passenger traffic levels and examples from Japan, it must be noted that the 906.3 million person-km figure for passenger demand forecasts at the time of project appraisal were unreasonable. Improving demand forecast accuracy is always difficult due to data availability and technical issues, but simulations should be conducted as precise as possible based on realistic assumptions.

## Comparison of Original and Actual Scope

Item	Plan	Actual
A) Output		
1.1 Lot-1: Rail (JICA portion) • Procurement of steel rails	10,856 units	As planned
1.2 Lot-2: Switchgears (JICA portion) • Procurement of switchgears	51 units	As planned
1.3 Lot-3: Superstructure, Electrification and Substations Works (JICA portion)	Procurement and installation of sleeper, ballast, catenary wiring (53km in total) Upgrading of Substations	(Lot 3 was further divided into 3 sub-lots) • Lot 3-1: Superstructure works (Procurement and installation of sleeper and ballast) • Lot 3-2: Electrification works (Catenary wiring: 53km in total) • Lot 3-3: Substation works (Upgrading of substations)
1.4 Substructure, Tunnel and Bridge (EIB portion) • Substructure construction works including railway bed ✓ Double tracking of existing rail tracks ✓ Construction of new rail tracks by realignment  • Construction of tunnel • Construction of bridges	33 km in total 20 km in total  800 m Construction of bridges	As planned 22 km in total  Cancelled Changes in Boughani Viaduct (Length: Extended to 856m, Piers: Hightened)
1.5 Telecommunication Facilities (EIB portion)	Procurement and installation of telecom facilities	As planned
1.6 Signal Facilities (AFD portion)	Procurement and installation of signal facilities	As planned
1.7 Consulting Service • Consulting Service M/M	Approx. 10 M/M in total (Foreign: 6 M/M, Local: 4 M/M)	As planned
• Consulting Service TOR	Study, Quality control and Support for construction supervision	As planned
B) Project Period	February 2001 – December 2003 (35 months)	February 2001 – December 2006 (71 months)
C) Project Cost		
Foreign currency	3,248 million yen	2,677 million yen
Local currency	3,348 million yen	86,674 thousand MAD
Total	6,596 million yen	3,871 million yen
Japanese ODA loan portion	4,947 million yen	3,871 million yen
Exchange rate	1 MAD = 10.76 yen (As of Nov. 1999)	1 MAD = 13.78 yen (As of Oct. 2008)