

**Validation Report**  
September 2021

# People's Republic of China: Railway Energy Efficiency and Safety Enhancement Investment Program (Multitranche Financing Facility and the Five Tranches)

Reference Number: PVR-812  
Program Number: 43332-013  
MFF Number: 0040  
Loan Numbers: 2605, 2724, 2765, 3082, 3109

Independent  
Evaluation  ADB

*Raising development impact through evaluation*

## ABBREVIATIONS

ADB	– Asian Development Bank
CO <sub>2</sub>	– carbon dioxide
CRC	– China Railway Corporation
CSRGCL	– China State Railway Group Co., Ltd.
DMF	– design and monitoring framework
EIRR	– economic internal rate of return
FCR	– facility completion report
FIRR	– financial internal rate of return
IED	– Independent Evaluation Department
km	– kilometer
MFF	– multitranche financing facility
MOR	– Ministry of Railways
O&M	– operation and maintenance
PFR	– periodic financing request
PRC	– People’s Republic of China
SO <sub>2</sub>	– sulfur dioxide
TA	– technical assistance

## NOTE

In this report, “\$” refers to United States dollars.

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**PROGRAM BASIC DATA**

<b>Program number</b>	43332-013	<b>FCR circulation date</b>	20 Apr 2021	
<b>Loan and grant numbers</b>	MFF 0040 Loans 2605, 2724, 2765, 3082, 3109	<b>FCR validation date</b>	Sep 2021	
<b>Program name</b>	Railway Energy Efficiency and Safety Enhancement Investment Program			
<b>Sector and subsector</b>	Transport	Rail transport (non-urban)		
<b>Strategic agenda</b>	Environmentally sustainable growth Inclusive economic growth			
<b>Safeguard categories</b>	Environment		C	
	Involuntary resettlement		C	
	Indigenous peoples		C	
<b>Country</b>	People's Republic of China	<b>Approved</b> (\$ million)	<b>Actual</b> (\$ million)	
<b>ADB financing</b> (\$ million)	<b>ADF:</b> 0.00	<b>Total program costs</b>	<b>3,238.50</b>	<b>3,151.50</b>
	<b>OCR:</b> 1,000.00	<b>Loan</b>	1,000.00	962.76
		L2605 (tranche 1)	300.00	294.63
		L2724 (tranche 2)	100.00	99.59
		L2765 (tranche 3)	250.00	238.48
		L3082 (tranche 4)	180.00	177.74
	L3109 (tranche 5)	170.00	152.32	
	<b>Borrower</b>	2,238.52	2,188.75	
	L2605 (tranche 1)	667.34	677.51	
	L2724 (tranche 2)	223.73	245.59	
L2765 (tranche 3)	569.70	570.63		
L3082 (tranche 4)	367.60	308.04		
L3109 (tranche 5)	410.15	386.98		
	<b>Beneficiaries</b>	0.00	0.00	
	<b>Others</b>	0.00	0.00	
<b>Cofinanciers</b>	-	<b>Total cofinancing</b>	0.00	0.00
<b>Approval dates</b>		<b>Effectiveness dates</b>		
MFF0040	8 Dec 2009	L2605	-	26 Oct 2010
L2605	15 Dec 2009	L2724	-	10 Jun 2011
L2724	14 Dec 2010	L2765	-	15 Feb 2012
L2765	20 Jul 2011	L3082	-	10 Sep 2014
L3082	4 Dec 2013	L3109	-	10 Sep 2014
L3109	7 Feb 2014			
<b>Signing dates</b>		<b>Closing dates</b>		
L2605	8 Jun 2010	L2605	30 Jun 2016	31 Dec 2017
L2724	11 Mar 2011	L2724	30 Jun 2017	30 Jun 2019
L2765	25 Oct 2011	L2765	30 Jun 2017	30 Jun 2019
L3082	30 May 2014	L3082	30 Jun 2019	30 Jun 2019
L3109	30 May 2014	L3109	30 Jun 2019	30 Jun 2019
		<b>Financial closing dates</b>		
		L2605	-	9 May 2018
		L2724	-	4 Jun 2019
		L2765	-	30 Dec 2019
		L3082	-	24 Dec 2019
		L3109	-	24 Dec 2019

<b>Program Officer</b>		<b>Location</b>	<b>From</b>	<b>To</b>
Tranche 1 – L2605	Yuji Ono	ADB headquarters	Oct 2011	Dec 2012
Tranche 2 – L2724	Yuji Ono	ADB headquarters	Jun 2011	Dec 2012
Tranche 3 – L2765	Yuji Ono	ADB headquarters	Feb 2012	Dec 2012
Tranche 1,2,3 – Ls2605, 2724, 2765	Fang Wang	PRC Resident Mission	Dec 2012	Jun 2013
Tranche 1,2,3 – Ls2605, 2724, 2765	Wen Zhang	PRC Resident Mission	Jun 2013	Apr 2015
Tranche 4, 5 – Ls3082, 3109	Wen Zhang	PRC Resident Mission	Sep 2014	Apr 2015
Tranche 1, 2, 3, 4, 5 – Ls2605, 2724, 2765, 3082, 3109	Chenglong Chu	PRC Resident Mission	Apr 2015	Dec 2019
<b>IED review Director Team Leader</b>	N. Subramaniam, IESP M. Legal, Senior Evaluation Officer, IESP*			

ADB = Asian Development Bank, ADF = Asian Development Fund, FCR = facility completion report, IED = Independent Evaluation Department, IESP = Sector and Project Division, MFF = multitranche financing facility, OCR = ordinary capital resources.

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## I. PROGRAM DESCRIPTION

### A. Rationale

1. The People's Republic of China (PRC) experienced rapid economic growth that resulted in an increased transport demand from 1978 to 2008. The railway was the primary mode of long-distance and bulk transport. However, despite its large size, the railway network did not provide adequate coverage for the country's population and land area.<sup>1</sup> Southwestern PRC was one area underserved by rail and was relatively poor.<sup>2</sup> The region's railway density was also the lowest in the country.

2. The southwestern region is mostly mountainous with abundant natural reserves of coal, other nonferrous minerals, and famous tourist sites. However, rural poverty still existed because of inadequate and high-cost transport services which hindered economic growth. Railway development was needed to stimulate regional and interprovincial trade and the movement of people to integrate this poor and underdeveloped region. The region shares borders with Viet Nam and Yunnan and Guangxi provinces which are part of the Greater Mekong Subregion.

3. During the 2008 international economic downturn, the government adopted an aggressive plan to boost internal demand and consumption and implemented a stimulus package that emphasized railway development. The railway sector needed CNY1.5 trillion in total investments, such as new construction, upgrading of existing lines, double tracking, electrification, and upgrading and building new terminals. The PRC government requested the Asian Development Bank (ADB) to provide an investment program to support railway development in the less developed southwestern region.

<sup>1</sup> ADB. 2009. *Report and Recommendation of the President to the Board of Directors: Proposed Multitranche Financing Facility and Technical Assistance Grant to the People's Republic of China for the Railway Energy Efficiency and Safety Enhancement Investment Program*. Manila.

<sup>2</sup> Southwestern PRC comprises Guangxi, Guizhou, Sichuan, Yunnan provinces and Chongqing Municipality.

4. The investment program was to introduce modern technology for enhanced energy efficiency, environmental sustainability, and safety on a network basis in the southwestern railway lines, as well as to support institutional development and enhance staff capacity of railway agency and administration. ADB approved a \$1 billion multitranche financing facility (MFF) loan with five tranches for the Railway Energy Efficiency and Safety Enhancement Investment Program (the MFF) to finance the physical investment involving three railway lines with total length of 1,389 kilometers (km). In addition, an associated technical assistance (TA) project was approved amounting to \$600,000 for institutional support. This validation assesses the MFF and its five tranches.

## **B. Expected Impacts, Outcomes, and Outputs**

5. The MFF program's expected impact of the investment program was improved transport system in the region that supports sustainable socioeconomic development and the western region's development strategy. Its envisaged outcome was the development of an energy-efficient, safe, reliable, affordable, and environment friendly railway transport system in the region. The following four outputs were envisaged: (i) implementation of investment program comprised of energy-efficient technologies, environment-friendly equipment, and safety equipment; (ii) integration and institutionalization of energy efficiency and environmental issues in railway management; (iii) conduct of safety and energy audits of a nominated railway administration; and (iv) provision of capacity building support.

6. The five tranches had similar impact and outcome statements with the MFF program, although there were some differences on the indicators.<sup>3</sup> At the output level, tranches 1 and 2 envisioned to support outputs relating to institutional support, with tranche 1 aimed to support outputs 2 to 4, while tranche 2 supporting outputs 3 and 4. All the five tranches aimed to deliver output 1 (physical investment – energy efficient technologies, environment friendly equipment, and safety equipment installed).

## **C. Provision of Inputs**

7. The MFF was approved in December 2009, with 3 to 6 tranches anticipated and an availability of financing period of 7 years. The actual MFF had five tranches with actual availability period extended almost 10 years. Actual closing date was June 2019. The facility completion report (FCR) noted that the delay was due to the government order to temporary cease the implementation of the high-speed rail programs in 2011 and 2012 due to a serious collision accident in July 2011 involving two high-speed trains.<sup>4</sup>

8. The total investment program cost was \$3.24 billion at appraisal, of which, 31% was financed by ADB and the remainder was from the government. The total estimated cost included equipment, taxes and duties, price contingencies, interest, and other charges during implementation. No consultants' cost was envisioned. ADB's estimated share under each of the tranches at appraisal was between 29%–33% and at completion between 28%–37%. Tranche 1 became effective in October 2010 with total estimated cost of \$967 million, of which, \$300 million was financed by ADB. This tranche, covering Guangxi and Yunnan sections, had an original

<sup>3</sup> At the impact level, indicator on (i) total discharge of major pollutants by PRC railway was removed under Tranche 2, (ii) under Tranche 5, energy consumption on PRC railways per unit of revenue was removed. At the outcome level, (i) target year was updated under Tranche 3, (ii) under Tranche 4, a new outcome indicator on rate of accident was added, and (iii) under Tranche 5, energy consumption on PRC railways per unit of revenue was added.

<sup>4</sup> ADB. 2021. *Completion Report; Railway Energy Efficiency and Safety Enhancement Investment Program in the People's Republic of China*. Manila.

closing date of June 2016. This validation notes that it was extended to December 2017 due to the delays in completing the construction of the Yunnan section.<sup>5</sup> Tranche 2 became effective in June 2011 with total estimated cost of \$324 million, of which, \$100 million was funded by ADB. Tranche 3 became effective in February 2012 with total estimated cost of \$820 million, of which, \$250 million was financed by ADB. Tranches 4 and 5 became effective in September 2014 with total estimated cost of \$548 million and \$580 million, respectively. ADB's approved \$180 million under tranche 4 and \$170 million under Tranche 5. Tranches 2 and 3, which covered the Chengdu-Chongqing Railway Line, had an original closing date of June 2017. Tranches 4 and 5, covered the Chongqing-Guiyang Railway Line, had an original closing date of June 2019. The actual closing date for tranches 2 and 3 was extended to June 2019, while tranches 4 and 5 were closed as originally planned. This validation notes that construction of two railway stations in Chongqing, to which the equipment under tranches 2 and 3 were to be installed, had resettlement issues causing the delays in disbursing the amount under two equipment contracts, which later on were dropped because they could not be completed until 2025.<sup>6</sup> All the five tranches were financially closed within 5 to 6 months after the actual closing date.<sup>7</sup>

9. The actual total investment program cost was 97% of the appraised amount, keeping the ADB-government share at appraisal. Actual total cost under tranche 1 slightly exceeded by 1%, while tranche 2 exceeded by 7%, compared to their respective estimates. Actual costs of tranches 3 to 5 were between 89% to 99% of the appraised amount. During implementation, \$410,000 was cancelled under tranche 2, \$10 million under tranche 3, and \$15 million under tranche 5. This validation notes that the cancellations under tranches 2 and 3 were mainly attributed to the cancelled contract packages (para. 8).

10. The MFF program was classified category C for all the safeguard aspects (environment, involuntary resettlement, and indigenous people). No negative safeguard impacts were expected because the investment program dealt with the procurement of energy-efficient, environment-friendly, and safety equipment. The program was categorized as "no gender elements;" thus, no gender action plan was prepared, and no gender indicators were included in the design and monitoring framework (DMF).

11. A \$600,00 TA grant was attached to the MFF for the institutional development and enhancement of staff capacity of the Ministry of Railways (MOR) and railway administration in areas of energy efficiency, environmental sustainability, and safety management.<sup>8</sup> It was approved mainly to deliver outputs 2 to 4 of the MFF through a review of existing institutional arrangements to integrate energy efficiency and environmental issues in railway management and operation, and compare these with developed countries, identify the gaps, and make recommendations. It also aimed to undertake safety and energy audits of a nominated railway administration; identify areas where improvements can be made; and undertake capacity assessment and provide capacity building programs to familiarize and create awareness on energy efficiency, environmental sustainability, and safety. With a 98% disbursement rate at completion, the TA's recommendations on tunnel disaster relief, energy-efficiency management measures, and internal audit management, among others, were expected to be used by the government in the future. Safety and energy audits for selected railway lines under the Kunming Railway Administration were also conducted, and 165 railway staff received training. The FCR

<sup>5</sup> ADB (EARD). 2014. Midterm Review for Tranches 1, 2 and 3. Back-to-office report. 4 February (internal).

<sup>6</sup> ADB (EARD). 2015. Review for Tranches 1, 2, 3, 4, and 5. Back-to-office report. 16 November (internal); ADB (EARD). 2016. Review for Tranches 2, 3, 4 and 5. Back-to-office report. 29 November (internal).

<sup>7</sup> Except for tranche 2 where it was financially closed weeks before the closing date.

<sup>8</sup> ADB. 2009. *Technical Assistance to the People's Republic of China for the Railway Institutional and Capacity Development*. Manila.

mentioned that recommendations on energy audit and environmental management were adopted in the railway sector reform (FCR, para. 51). The TA's original completion date was June 2012 and was extended three times, mainly to complete the activities, such as the overseas training and submission of final report. Actual completion date was May 2013 and was rated successful.<sup>9</sup>

#### **D. Implementation Arrangements**

12. As envisaged, the MOR was the executing agency responsible for overall program implementation. The Foreign Capital and Technical Import Center, under the MOR, was the implementing agency responsible in coordinating the day-to-day operations under the MFF, including procurement and report preparation for submission to ADB. A steering committee, headed by the Foreign Capital and Technical Import Center's director general, was responsible for the selection of projects under the MFF. All throughout the MFF implementation, the implementation arrangements were unchanged, except for the transfer of the executing agency responsibility to the newly established China Railway Corporation (CRC), following the railway sector reform in 2013 that dissolved the MOR and created the CRC and the National Railway Administration. The FCR noted that within the CRC, the then-centralized responsibilities of MOR were distributed among various CRC departments; thus, creating additional coordination workload for ADB. With no change in implementation arrangements, the CRC was restructured to China State Railway Group Co., Ltd. (CSRGCL) in June 2019.

13. All 115 loan covenants for the five tranches were complied with. This validation notes that covenants relating to safeguard policy assumed that the investment program did not have impact on resettlement, among other things. At completion, two railway stations in Chongqing, to which the equipment under tranches 2 and 3 were to be installed, encountered resettlement issues, and were not resolved during the MFF implementation period (para. 8).

## **II. EVALUATION OF PERFORMANCE AND RATINGS**

### **A. Relevance of Design and Formulation**

14. The FCR rated the program highly relevant as it was aligned with the government's Eleventh Five-Year Plan, 2006–2010.<sup>10</sup> Railway network expansion in the less developed western region and energy-saving and emission-reduction plan for the railway sector were among its priorities. The program supported the railway development plan of 2009–2016 in the PRC's southwestern region and it remained aligned with the government's Thirteenth Five-Year Plan, 2016–2020<sup>11</sup>, where the promotion of electrification and upgrading of trunk railways in the southwestern region was a key focus. The FCR also noted that it was aligned with ADB's country strategy for the PRC, which prioritized inclusive growth and balanced development, and resource efficiency and environmental sustainability. This validation notes that the program was aligned with ADB's country partnership strategy for 2008–2010, 2011–2015, and 2016–2020, with key focus on resource efficiency and environmental sustainability through energy efficiency

<sup>9</sup> ADB. 2014. *Technical Assistance Completion Report: Institutional and Capacity Development in the People's Republic of China*. Manila.

<sup>10</sup> United Nations Economic and Social Commission for Asia and the Pacific. China: 11<sup>th</sup> Five-Year Plan (2006–2010) for National Economic and Social Development. <https://policy.asiapacificenergy.org/node/115> (accessed 7 July 2021).

<sup>11</sup> United Nations Economic and Social Commission for Asia and the Pacific. China: 13<sup>th</sup> Five-Year Plan for Economic and Social Development of the People's Republic of China (2016–2020). <https://policy.asiapacificenergy.org/node/2509> (accessed 7 July 2021).

technologies, support to efficient and safe railways with strong regional dimensions, and transportation modes with lower emissions and energy consumption.<sup>12</sup>

15. The FCR considered the program as innovative as it introduced new and modern technologies. This validation views that the innovative features described in the FCR was a result of the advanced technology aspects of the equipment available in the market for procurement and did not fully demonstrate innovation from the program design itself. The FCR noted that the MFF employing a time-slice approach was appropriate to finance the investment program because of the MOR's strong institutional capacity, the need for long-term engagement and the need to finance multiple projects under an investment program and to provide flexible tranche financing requirements to suit the readiness of individual projects. The MFF modality was aimed at improving the efficiency of ADB financing by lowering borrowing costs and increasing operational flexibility. The FCR also noted that the DMF for the MFF was formulated satisfactorily, although it acknowledged that the formulation of each tranche's output 1 could have clearly reflected their individual contribution to MFF's output 1. Impact and outcome statements of the MFF was the same for all the tranches. It also acknowledged the shortcoming of tranche 1's DMF, such that it included outputs that were to be delivered by the TA and noted that succeeding tranches had only the physical investment as output. This validation notes that aside from tranche 1, tranche 2's DMF also had outputs that were under the TA (conduct of safety audit and capacity building). Target years at the outcome level did not also match the completion date of the MFF, each tranche, and there were missing baselines. The outcome target for freight traffic was not adjusted to reflect the recent developments in the country.<sup>13</sup> Outcome indicator on safety enhancement in the railways was also missing in the MFF.<sup>14</sup> This validation also notes that the TA was designed as a stand-alone, short-term support to the MOR, with no linkages to the tranche deliverables. With a railway development plan of 2009–2016 in the PRC's southwestern region in place, a long-term, TA-supported institutional and sector reform could have been designed which covered the MFF period. The FCR also acknowledged this shortcoming, and one of the recommendations was related to this issue (FCR, para. 69).

16. On the whole, the validation was aligned with the government's and ADB's strategies. The MFF as modality was appropriate as it provided flexibility in financing the program's physical investments. However, it could have been designed in a way to provide better support for long-term institutional needs of the sector. There were also some deficiencies in the DMF that the FCR mostly acknowledged. This validation assesses the MFF relevant.

## **B. Effectiveness in Achieving Program Outcomes and Outputs**

17. The FCR rated the program effective in fully achieving its intended outcome and outputs. Out of the six MFF's outcome indicators, the FCR noted that they were all achieved or likely to be achieved, except the freight traffic target not being achieved. Related to the first outcome indicator, the FCR indicated that passenger traffic increased to 166.7 billion passenger-km, against the 140 billion passenger-km target. However, freight traffic did not meet the 470 billion

<sup>12</sup> ADB's strategy focused on inclusive growth and balanced development, and resource efficiency and environmental sustainability. ADB. 2008. *Country Partnership Strategy: The People's Republic of China, 2008–2010*. Manila. ADB's country strategy – Pillar 2 on environmentally sustainable growth; ADB. 2012. *Country Partnership Strategy: The People's Republic of China, 2011–2015*. Manila. ADB's strategic priorities on managing climate change and the environment, and climate change mitigation and adaptation; ADB. 2016. *Country Partnership Strategy: Transforming Partnership: People's Republic of China and Asian Development Bank, 2016–2020*. Manila

<sup>13</sup> To take in consideration the decreasing trend in bulk cargo for coal, metallic ores, and steel, comprising majority of total freight in 2019.

<sup>14</sup> Tranches 4 and 5, however, had an outcome indicator of 20% reduction in rate of accidents per billion traffic by 2020 from 2008.

ton-km target with slight increase to 287.6 billion ton-km in 2019 compared to the 2009 baseline of 281 billion.<sup>15</sup> The FCR indicated that this was due to change in energy consumption structure in the southwestern region with a decline in coal consumption by more than 60% and increase in hydroelectricity usage supported by abundant hydroelectric power. The second outcome indicator was to reduce travel cost from 35 fen/km in 2008 to 15 fen/km in 2015. Travel cost remained low and affordable because the differentiated railway fare for passengers was adopted: 51 fen/km for 300 km/hour above lines; 29 fen/km for 200-250 km/hour lines; and 11 fen/km for below 200 km/hour lines in 2015. This validation notes that the reduced travel cost target was partly achieved since the 15 fen/km target at completion was not fully achieved for all lines. The third outcome indicator was increased fuel savings from CNY936 million in 2016 to CNY3.2 billion in 2035, and the fourth outcome indicator for carbon dioxide (CO<sub>2</sub>) emissions to reduce by 22,106 tons in 2016 and 1.82 million tons in 2035. The FCR noted that fuel savings were targeted to increase to CNY4.2 billion and CO<sub>2</sub> emission reduction to reach 32,027 tons by 2035. Using a constant annual growth rate, this validation assesses that the actual increase fuel savings of CNY2.67 billion reached the target at completion. Although the target for the fuel savings was anticipated to be achieved, the validation notes that many factors can influence the cost of fuel in the next 15 years, including the exchange rate. Also, although the FCR noted that the CO<sub>2</sub> emission reduction estimates were too high at appraisal, without any revisions in the DMF, this validation assesses this indicator, based on the 22,106 tons target of CO<sub>2</sub> emission reduction in 2020 which was reflected in Tranche 4's DMF and the 1.82 million tons in 2035 reflected in the MFF's DMF. However, assessing the likelihood of its achievement is not possible because there is no baseline to estimate the annual rate of reduction. The FCR also noted that the railways' electrification rate in the southwestern region had already reached 94% in 2019, thus limiting the potential for further significant reductions.<sup>16</sup> The fifth outcome indicator was for the SO<sub>2</sub> emissions in the southwestern region to be reduced by 10% from 2009 to 2015, which the FCR reported met the target reduction by 29.9% (3,819 tons to 2,679 tons). This validation notes that the first set of railway section under this program was only completed in 2016 (Guangxi section under Tranche 1), thus, this achievement cannot be attributed to the program. Additional information was provided to the Independent Evaluation Department (IED) indicating that SO<sub>2</sub> emissions was reduced to 658 tons in 2018, which exceeded the 10% reduction.<sup>17</sup> The sixth outcome indicator was related to the adoption of the recommendations on energy and safety audits by 2012. The FCR noted that the PRC adopted these recommendations. However, this validation assesses that the FCR did not provide full details as to how these recommendations were adopted. Of the six outcome indicators, this validation assesses three as achieved (fuel savings increased, passenger traffic increased, SO<sub>2</sub> emissions reduced), two partly achieved (reduced travel cost and recommendations adopted), and one that could not be validated (reduced CO<sub>2</sub> emission). This validation also notes that one important outcome indicator under tranches 4 and 5 was not assessed, which was the 20% reduction in rate of accident per billion traffic by 2020 from 2008. Additional information was provided to IED indicating that in 2019, railway accident rate in the southwestern region was reduced from 0.1143 per billion converted ton-km in 2008 to 0.0582 billion converted ton-km, exceeding the 20% reduction.<sup>18</sup>

18. The FCR assessed all four program outputs to be achieved, with a note that the TA delivered outputs 2, 3 and 4 (FCR, footnote 3). Under output 1, energy-efficient, environment-friendly, and safety equipment was procured and installed by 2018, earlier than the 2015 target.

<sup>15</sup> The reduction in freight traffic indicates lower usage of coals, metallic ores, and steel, which comprised 76% of the total freight tons of bulk cargo (see FCR, Table 12.2, Appendix 12). A reduced trade in these items support CO<sub>2</sub> emission reduction.

<sup>16</sup> This should have been recognized early on and appropriate revisions in the DMF should have been made.

<sup>17</sup> No official source document was provided to IED.

<sup>18</sup> No official source document was provided to IED.

This validation notes that the planned procurement of environmental protection equipment was not delivered under tranche 4 (PRC, Appendix 4)<sup>19</sup> but was procured under tranche 5. The track safety operation and maintenance equipment were also procured under Tranche 5.<sup>20</sup> Under output 2, the FCR noted that a detailed energy efficiency audit was introduced to the MOR and railway administrations, and the development of an environmental management program was recommended to railway administrations responsible for the railway lines operation. The energy audit and environmental management are now being required in a feasibility study, technical design and review, construction, and operations and maintenance (O&M) of the railway sector in the PRC.<sup>21</sup> Under output 3, the FCR noted that safety and energy audits for Kunming Railway Administration were conducted, and recommendations were formulated based on the audit results. Under output 4, a total of 165 railway staff were trained in the concerned areas under the attached TA, against the 200 targets. The FCR also noted that an annual national safety work meeting, and periodic energy efficiency and railway environment management awareness campaigns were conducted in the three railway administrations in the southwestern region. Of the four output indicators, this validation assesses three as achieved (outputs 1, 2 and 3) and one substantially achieved (outputs 4).

19. The FCR reported that a safeguard framework was prepared to ensure compliance with ADB's safeguard policy statement (2009)<sup>22</sup> and served as basis for the selection and implementation of the MFF's tranches. The framework also helped to guide the executing agency in safeguard assessment of tranches under the MFF. It also noted that one of the selection criteria required that installation of equipment and materials financed under the tranches should not involve land acquisition or involuntary resettlement, and should have no adverse impacts on ethnic minorities, or the environment. According to the FCR, the equipment selection for all tranches followed these criteria. However, this validation notes that contract packages under tranches 2 and 3 were cancelled due to unresolved resettlement issues in the railway stations that were supposed to be constructed (para. 8).

20. Of the six outcome indicators, this validation assesses, three as achieved, two partly achieved and one could not be validated. Physical investments involving energy-efficiency, environmental protection, and safety enhancement equipment were installed. Critical outcome targets, such as SO<sub>2</sub> reduction and reduced rate of accidents were achieved. However, achievement on CO<sub>2</sub> cannot be validated. Furthermore, there was lack of evidence on how recommendations from the TA were adopted. All the four outputs were generally achieved. This validation assesses the program effective.

### **C. Efficiency of Resource Use**

21. The FCR rated the program efficient. The recalculated economic internal rate of return (EIRR) was based on the entire railway network in the southwestern region, which implied that the program's EIRR was 20.4%, higher than the threshold level of 12% and lower than the 26.8% estimated at appraisal.<sup>23</sup> Sensitivity analysis was conducted to test impacts of an increase in operation and maintenance costs, a decrease in benefits, and a combination of the two. The

<sup>19</sup> This is contrary to the FCR's main report discussion on tranche 4 (para. 29).

<sup>20</sup> Additional information was provided by the FCR team during the finalization of this report.

<sup>21</sup> Additional information was provided by the FCR team during the finalization of this report.

<sup>22</sup> ADB. 2009. *Safeguard Policy Statement*. Manila.

<sup>23</sup> The FCR noted the following reasons for lower EIRR compared at appraisal: (i) higher capital costs to finance 9,672 km of railways as opposed to the 6,500 km in the initial railway development plan; (ii) lower freight traffic in the region; and (iii) benefits from electrification not materializing to the extent envisioned. This validation views that the delay of two years also contributed to lower EIRR at completion.

results ranged between 13.4% and 18.8% indicating that program remained to be economically viable even under the worst scenarios.

22. Under the government's railway development plan 2009–2016 for southwestern region, a total of 47 railway lines were constructed (FCR, Appendix 12) totaling 9,672 km in length. Of these railway lines, this validation notes that the program supported the Guangxi and Yunnan section, Chengdu-Chongqing Railway Line (308km), and Chongqing-Guiyang Railway Line (344 km).<sup>24</sup> Although equipment financed under the MFF was not necessarily limited for those installed in these railway lines, majority of the investments went to these railway lines.<sup>25</sup> It was also inappropriate to assume that the EIRR for the entire railway network in the southwestern region was representative of the program's EIRR.<sup>26</sup> The program also financed the equipment purchases for energy-efficiency, environmental protection, and safety enhancement. Considering this, economic benefits related to energy savings and pollution reduction benefits specific to the program should have been identified, quantified, and valued accordingly. In addition, the FCR stated that the program did not generate economic benefits associated with user cost savings for diverted freight and passenger traffic, time savings for freight and passenger traffic, avoided road infrastructure and maintenance costs, and avoided road accidents.

23. The program was delayed for 2 years mainly due to a railway accident and resettlement issue involving a 10 km section in two railway stations in Chongqing (Caiyuanba and Shapingba) under Tranches 2 and 3, which remained unresolved at completion.<sup>27</sup> Under the MFF, there was no cost overrun.<sup>28</sup> This validation views that the economic benefits attributed to the energy-efficiency, environmental protection, and safety enhancement equipment required a thorough economic analysis at appraisal to form a basis for a more appropriate quantification of benefits at completion. These should have been the focus of the MFF's economic analysis, given the difficult nature of quantifying these types of benefits (see para. 32 for more details). Notwithstanding these methodological issues, and recognizing the economic benefits generated, this validation assesses the program efficient.

#### **D. Preliminary Assessment of Sustainability**

24. The FCR rated the program likely sustainable. It noted that financial internal rate of return (FIRR) was not calculated for the program both at appraisal and completion since calculating FIRRs was not feasible for each of the 47 railway lines built under the southwestern region's railway development plan. The FCR, however, noted that FIRRs were computed for a sample of three railway lines that crossed the PRC's southwestern region and showed that each railway line was financially viable (FCR, footnote 11).<sup>29</sup> In validation's view, FIRRs for railway lines do not represent the program's financial viability. The FCR also noted that availability of O&M funds, availability of spare parts and consumables, and required skills of the staff that would operate this equipment were important to ensure the sustainability of the equipment and materials. For these reasons, financial sustainability of CSRGL, the company administering the railway lines through

<sup>24</sup> ADB (EARD). 2015. Midterm Review for Tranches 1, 2 and 3. Back-to-office report. 4 February (internal); ADB (EARD). 2015. Review Mission for the MFF. Back-to-office report. 16 November (internal).

<sup>25</sup> ADB (EARD). 2014. Review Mission for Tranches 1, 2 and 3. Back-to-office report. 2 January (internal). Even using the target km line at appraisal, it only comprised 14% of the total railway line (FCR, para. 48).

<sup>26</sup> Additional information provided by the FCR team indicating that at completion, the three railway stations have EIRRs above 12%.

<sup>27</sup> ADB (EARD). 2016. Review Mission for Tranches 2, 3, 4, and 5. Back-to-office report. 29 November (internal).

<sup>28</sup> Tranches 1 and 2 had 1% and 7%, respectively, cost overrun (see para. 9).

<sup>29</sup> Additional information on the calculation for the three railway lines were provided to the IED during the finalization of this validation report.

its affiliated companies, is crucial.<sup>30</sup> Although the FCR referred to a financial performance assessment of CSRGL in 2019 associated with another ADB project and confirmed its financial health, a financial sustainability analysis of CSRGL, presented in the FCR, would have been adequate to clearly provide evidence on the financial sustainability of the program (FCR, footnote 10).<sup>31</sup>

25. This validation notes that one of the loan covenants complied with was on sustainability, specifically ensuring that appropriate budgetary allocations were made for the project equipment's continued operation and maintenance. Based on the project debt service and O&M share to revenue, CSRGL is also financially sound (footnote 20). This validation assesses that the program is likely sustainable.

### III. OTHER PERFORMANCE ASSESSMENTS

#### A. Preliminary Assessment of Development Impact

26. The FCR rated the program's development impact satisfactory, indicating that the program exceeded all its four impact targets. First, the FCR noted that annual gross domestic product per capita in the southwestern region increased on average from 2015 to 2019 by 9.6% ranging from 7.8% in 2015 to 11.8% in 2019, compared to the annual target of 5%–6%. Second, the southwestern region's per capita rural income increased to CNY13,227 in 2019, compared to the CNY4,700 target in 2020. Third, energy consumption on the PRC railways per unit of revenue was reduced by 40.6% from 2009 to 2015 in the southwestern region, compared to the 20% reduction target. Fourth, the PRC railways' total discharge of major pollutants was reduced by 23.5% from 2009 to 2015, as against the target of 10% reduction. This validation notes that the last two achievements cannot be fully attributed to the program because, except for railway lines under Tranche 1 and the 288 km section under Tranches 2 and 3, railway lines under the program started operation only in 2017/2018.<sup>32</sup> Therefore, it will be difficult to validate the extent to which the program will likely have contributed to reducing energy consumption and major pollutant discharge.

27. The FCR also stated that during the program's implementation and operation of the railway lines, more than 10 million person-months of job opportunities were provided which created new sources of income for the local people. It was further noted that more than 50% were given to poor local people and about 20% to women. The transport network development increased opportunities for women to participate in the labor and tourism markets and raised women's net income and savings. Expansion of secondary and tertiary industries generated additional employment opportunities close to their homes. Although the FCR provided limited evidence, except the increased in annual per capita gross domestic product and rural incomes (para. 26), there were no evidence that suggested that negative impacts resulted to improved railway networks in the southwestern region. The equipment purchased, in fact, were specifically

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<sup>30</sup> The railway lines in the southwestern region of the PRC are administered by China Railway Kunming Bureau Group Co., Ltd., China Railway Chengdu Bureau Group Co., Ltd., and China Railway Nanning Bureau Group Co., Ltd., which are directly affiliated companies of CR.

<sup>31</sup> The 2019 financial sustainability analysis projected an average annual share of 0.84% debt service and O&M to revenue from 2026–2043. See linked document on financial analysis for the Proposed Multimodal Passenger Hub and Railway Maintenance Project. ADB. 2019. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to the People's Republic of China for the Multimodal Passenger Hub and Railway Maintenance Project*. Manila.

<sup>32</sup> ADB (EARD). 2016. Review Mission for Tranches 2, 3, 4 and 5. Back-to-office report. 29 November (internal); and ADB (EARD). 2018. Review Mission for the MFF. Back-to-office report 19 November (internal).

intended to support environment protection and safety, although not appropriately quantified. Nevertheless, this validation preliminary assesses the development impact satisfactory.

#### **B. Performance of the Borrower and Executing Agency**

28. The FCR rated the performance of the borrower and executing agency satisfactory mainly due to the government's adequate and timely financial and administrative support during the processing and implementation of the MFF program. The loan proceeds were reported to be withdrawn in a timely manner and the financial management arrangement for the MFF implementation sound and effective. Loan covenants were complied with for all five tranches. Along with the implementation of railway constructions, the government launched sector reforms, such as the MOR reorganization, that helped improve the institutional arrangements and efficiency of railway operations. Apart from some resettlement issues and despite designing the MFF as category C under involuntary resettlement, this validation rates the performance of the borrower and executing agency satisfactory.

#### **C. Performance of the Asian Development Bank**

29. The FCR rated ADB's performance satisfactory based on the efficient processing and implementation of the MFF program. The FCR noted that the ADB processing team quickly decided to finance the program when the government's railway development plan in the PRC's southwestern region was formulated. The program was also gradually delegated to the PRC Resident Mission in December 2012, while the East Asia Department's Transport Division remained to be the processing team for the tranches. This validation notes that a total of 18 missions supported the MFF's implementation that included nine review missions, two midterm review missions, six inception and/or consultation missions, and a special review mission, mainly to hand over to PRC Resident Mission the program's implementation, were conducted. As the program mainly involved procuring high-technology equipment, the FCR noted that ADB worked closely with the executing agency in standardizing the technical requirements for smooth and efficient procurement processing. This validation rates the performance of ADB satisfactory.

### **IV. OVERALL ASSESSMENT, LESSONS, AND RECOMMENDATIONS**

#### **A. Overall Assessment and Ratings**

30. The FCR rated the MFF investment program successful, based on highly relevant, effective, efficient, and likely sustainable ratings. This validation assesses the program relevant since innovation was only related to the nature of the equipment purchased and not brought about by the program design along with deficiency in the DMF. The project was effective, as most of the critical outcome and output indicators were either fully achieved or substantially achieved. It was efficient, with a note that costs and benefits associated with the purchased high-technology equipment need to be appropriately quantified. The project's low risks across financial, operational, and environmental aspects suggest its likely sustainability. The overall assessment is successful.

**Overall Ratings**

<b>Validation Criteria</b>	<b>FCR</b>	<b>IED Review</b>	<b>Reason for Disagreement and/or Comments</b>
Relevance	Highly relevant	Relevant	Innovative features were based on the advanced technology of equipment available for purchase and did not necessarily demonstrate innovation from the program design itself. Program could have been better designed to support the long-term institutional needs of the sector. It also had DMF deficiencies.
Effectiveness	Effective	Effective	
Efficiency	Efficient	Efficient	
Sustainability	Likely sustainable	Likely sustainable	
<b>Overall Assessment</b>	<b>Successful</b>	<b>Successful</b>	
Preliminary Assessment of Impact	Satisfactory	Satisfactory	
Borrower and executing agency	Satisfactory	Satisfactory	
Performance of ADB	Satisfactory	Satisfactory	
Quality of FCR		Satisfactory	Para. 35.

ADB = Asian Development Bank, DMF = design and monitoring framework, FCR = facility completion report, IED = Independent Evaluation Department, FCR = facility completion report.  
 Source: ADB (IED).

**B. Lessons**

31. The FCR provided three lessons. First, accurate investment cost estimation provides critical basis for adequately planning and determining the required counterpart financing from the government. Second, identifying priority sections or railway lines from the entire southwestern region railway links to adequately distribute the equipment and materials procured, enables the MFF implementation more manageable for procurement, equipment delivery and installation, quality control, and funds management. Delivering them to the selected typical railway lines ensures implementation efficiency of the MFF and ensured the quality of its implementation. Third, for investments involving specific technical requirements, a standard guide for bidding documents for procurement of goods provides clarity among suppliers and bid evaluation committees and ensured the quality of equipment procured.

32. This validation offers two additional lessons on results framework and monitoring. First, for investments that specifically target energy efficiency, as well as environmental and safety benefits through equipment purchasing, appropriate economic benefits need to be identified to assess their efficiency and whether significant benefits to the environment and safety of railway users were generated from the equipment’s additional features to the infrastructure that was built. A 5-month period of preparation to determine the economic viability of this kind of investment is insufficient to conduct accurate assessment. Second, once these benefits are identified, appropriately designed and operational project performance management system is crucial in conducting proper economic analysis of the program, resulting to robust estimates.

### **C. Recommendations for Follow-Up**

33. The FCR suggested that no further action for follow-up was needed for the MFF.

## **V. OTHER CONSIDERATIONS AND FOLLOW-UP**

### **A. Monitoring and Reporting**

34. The Foreign Capital and Technical Import Center under the former MOR was responsible for monitoring the performance indicators and reporting the baseline and periodic achievements to ADB. Data and information were included in the progress reports. The auditor's reports and audited project financial statements for each tranche were submitted annually to ADB in a timely manner. No issues regarding loan proceeds were reported in the auditor's reports. The report and recommendation of the President required a project performance management system for the MFF, which included monitoring economic development and socioeconomic indicators, railway transport volume and costs, energy efficiency consumption per unit of revenue, environmental indicators, and accident rates. The plan was to measure these at inception, completion and 3 years later.

### **B. Comments on Facility Completion Report Quality**

35. This validation assesses FCR quality satisfactory. The FCR recognized the importance of having an appropriate TA designed to support the long-term programmatic support to a sector along with the implementation of investment projects. This was one of the FCR's recommendations. Lessons for a better program implementation designed as an MFF were also identified. However, the FCR did not provide sufficient evidence to support the ratings on relevance.<sup>33</sup> The innovative features the FCR described were a result of the advanced technology features of the equipment available in the market for procurement and did not fully demonstrate innovation from the program design itself. The methodology employed for the economic analysis was not completely appropriate since it did not isolate the incremental costs and benefits of the additional features in the three-railway links through advance technology equipment procurement.

### **C. Data Sources for Validation**

36. The data sources were the report and recommendation of the President, the FCR, back-to-office reports, and ADB's country partnership strategies.

### **D. Recommendation for Independent Evaluation Department Follow-Up**

37. The FCR recommended that the MFF's project performance evaluation be prepared when the economic activities in the region returned to normal, about a year after the end of the pandemic since it significantly affected passenger and freight traffic volumes in the region. This validation supports this recommendation. However, the evaluation could focus on the environmental and social benefits resulting from the equipment purchased and not on traffic volumes in the region generated by the constructed railway links that were not financed by the MFF.

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<sup>33</sup> Achievements of critical outcome targets related to the main purpose of the equipment purchased were not fully substantiated. Additional information was provided during the finalization of this report.