

Document of
The World Bank

FOR OFFICIAL USE ONLY

Report No: PAD1960

INTERNATIONAL DEVELOPMENT ASSOCIATION

PROJECT PAPER

ON A

PROPOSED ADDITIONAL CREDIT

IN THE AMOUNT OF SDR58.20 MILLION
(US\$78.74 MILLION EQUIVALENT)

TO THE

SOCIALIST REPUBLIC OF VIETNAM

FOR THE

NORTHERN DELTA TRANSPORT DEVELOPMENT PROJECT

April 14, 2017

Transport & ICT Global Practice
East Asia and Pacific Region

This document has a restricted distribution and may be used by recipients only in the performance of their official duties. Its contents may not otherwise be disclosed without World Bank authorization.

CURRENCY EQUIVALENTS

(Exchange Rate Effective Date: February 28, 2017)

Currency Unit = Vietnamese Dong (VND)
VND22,232 = US\$1.00
US\$1.35389 = SDR1

FISCAL YEAR

January 1 – December 31

ABBREVIATIONS AND ACRONYMS

AF	Additional Financing
CO ₂	Carbon Dioxide
DNC canal	Day-Ninh Co interconnecting canal
DWT	Deadweight tons
ESIA	Environmental and Social Impact Assessment
EMP	Environmental Management Plan
ENPV	Economic Net Present Value
GoV	Government of Vietnam
GRS	Grievance Redress Service
EIRR	Economic Internal Rate of Return
FM	Financial Management
GHG	Greenhouse Gas
INT	World Bank Integrity Vice Presidency
MDTIDP	Mekong Delta Transport Infrastructure Development Project
MoF	Ministry of Finance
MONRE	Ministry of Natural Resources and the Environment
MoT	Ministry of Transport
NDTDP	Northern Delta Transport Development Project
PDO	Project Development Objective
PMU-W	Project Management Unit for Waterways
RAP	Resettlement Action Plan
SDR	Special Drawing Right
TA	Technical Assistance
STEP	Systematic Tracking of Exchanges in Procurement
US\$	United States Dollar
VAT	Value-added Tax
VIWA	Vietnam Inland Waterway Administration
VND	Vietnamese Dong

Regional Vice President:	Victoria Kwakwa
Country Director:	Ousmane Dione
Senior Global Practice Director:	Jose Luis Irigoyen
Practice Manager:	Almud Weitz
Task Team Leader:	Luis C. Blancas Mendivil

**SOCIALIST REPUBLIC OF VIETNAM
NORTHERN DELTA TRANSPORT DEVELOPMENT PROJECT
ADDITIONAL FINANCING**

CONTENTS

Project Paper Data Sheet	4
Project Paper	
I. Introduction	7
II. Background and Rationale for Additional Financing	7
III. Proposed Changes	10
IV. Appraisal Summary	12
V. World Bank Grievance Redress	20
Annex 1. Revised Results Framework and Monitoring Indicators	21
Annex 2. Nature of Implementation Delays and Cost Overruns Incurred During Implementation of the Original Credit	24
Annex 3. Detailed Economic Analysis of the Proposed Additional Credit	27

ADDITIONAL FINANCING DATA SHEET

Vietnam

Northern Delta Transport Development Project Additional Financing (P158976)

EAST ASIA AND PACIFIC

GTI02

Basic Information – Parent									
Parent Project ID:	P095129	Original EA Category:	A - Full Assessment						
Current Closing Date:	26-Jun-2017								
Basic Information – Additional Financing (AF)									
Project ID:	P158976	Additional Financing Type (from AUS):	Cost Overrun						
Regional Vice President:	Victoria Kwakwa	Proposed EA Category:							
Country Director:	Ousmane Dione	Expected Effectiveness Date:	29-Sep-2017						
Senior Global Practice Director:	Jose Luis Irigoyen	Expected Closing Date:	31-Dec-2019						
Practice Manager/Manager:	Almud Weitz	Report No:	PAD1960						
Team Leader(s):	Luis C. Blancas Mendivil								
Borrower									
Organization Name	Contact	Title	Telephone	Email					
Ministry of Transport									
Project Financing Data - Parent (Northern Delta Transport Development Project-P095129) (in USD Million)									
Key Dates									
Project	Ln/Cr/TF	Status	Approval Date	Signing Date	Effectiveness Date	Original Closing Date	Revised Closing Date		
P095129	IDA-44740	Effective	24-Jun-2008	10-Nov-2008	07-Feb-2009	30-Jun-2014	26-Jun-2017		
Disbursements									
Project	Ln/Cr/TF	Status	Currency	Original	Revised	Cancelled	Disbursed	Undisbursed	% Disbursed
P095129	IDA-44740	Effective	XDR	104.40	95.51	8.89	94.17	1.34	98.60

Project Financing Data - Additional Financing Northern Delta Transport Development Project Additional Financing (P158976)(in USD Million)					
<input type="checkbox"/>	Loan	<input type="checkbox"/>	Grant	<input type="checkbox"/>	IDA Grant
<input checked="" type="checkbox"/>	Credit	<input type="checkbox"/>	Guarantee	<input type="checkbox"/>	Other
Total Project Cost:		107.19		Total Bank Financing: 78.74	
Financing Gap:		0.00			
Financing Source – Additional Financing (AF)				Amount	
BORROWER/RECIPIENT				28.45	
International Development Association (IDA)				78.74	
Total				107.19	
Policy Waivers					
Does the project depart from the CAS in content or in other significant respects?					No
Explanation					
Does the project require any policy waiver(s)?					No
Explanation					
Team Composition					
Bank Staff					
Name	Role	Title	Specialization	Unit	
Luis C. Blancas Mendivil	Team Leader (ADM Responsible)	Sr Transport. Spec.		GTI02	
Hoang Xuan Nguyen	Procurement Specialist (ADM Responsible)	Senior Procurement Specialist		GGO08	
Cung Van Pham	Financial Management Specialist	Sr Financial Management Specialist		GGO20	
Chanin Manopiniwes	Team Member	Infrastructure Economist		GTI02	
Dung Anh Hoang	Team Member	Sr Transport. Spec.	Co-TTL	GTI02	
Hien Thi Thu Vu	Team Member	Team Assistant		EACVF	

Ly Thi Dieu Vu	Safeguards Specialist	Consultant	Environmental Specialist	GEN2B	
Thang Duy Nguyen	Safeguards Specialist	Senior Social Development Specialist	Social Development Specialist	GSU02	
Extended Team					
Name		Title	Location		
Gerald Barnes		Senior Consultant			
Locations					
Country	First Administrative Division	Location	Planned	Actual	Comments
Vietnam	Nam Định	Tỉnh Nam Định		X	
Institutional Data					
Parent (Northern Delta Transport Development Project-P095129)					
Practice Area (Lead)					
Transport & ICT					
Contributing Practice Areas					
Additional Financing Northern Delta Transport Development Project Additional Financing (P158976)					
Practice Area (Lead)					
Transport & ICT					
Contributing Practice Areas					
Consultants (Will be disclosed in the Monthly Operational Summary)					
Consultants Required ?No consultants are required					

I. Introduction

1. This Project Paper seeks the approval of the Executive Directors to provide an additional credit in the amount of US\$78.74 million equivalent to the Socialist Republic of Vietnam for the Northern Delta Transport Development Project (NDTDP) (P095129; original credit 4474-VN). The safeguards policy on Natural Habitats (OP 4.04) is being triggered for this additional credit for the first time.
2. The proposed additional credit will be used solely to help finance an activity that has always been part of the project scope since inception—construction of a canal to connect two rivers with a navigational lock, known as the Day-Ninh Co interconnecting canal (“DNC canal”)—but for which there are insufficient funds remaining in the original credit due to cost overruns incurred during project implementation.
3. This Additional Financing (AF) operation will also restructure the Parent Project by removing a small activity, originally estimated at US\$1 million—less than 1 percent of the value of the original credit—for the implementation of a pilot waterway maintenance contract, as there is insufficient time remaining in the project period, including over the duration of the proposed additional credit, to adequately implement a performance-based contract as originally intended. In addition, the Project Results Framework will be expanded to include performance indicators specifically focused on the DNC canal. It is expected that construction of the canal will further contribute to achieving the project development objective by reducing transport and logistics costs, including the cost of environmental externalities, along a major waterway corridor in the Red River Delta region.

II. Background and Rationale for Additional Financing

4. The original credit of SDR104.4 million (US\$170 million at the time of approval) was approved by the Board of Executive Directors on June 24, 2008 and its Financing Agreement was signed on November 10, 2008. The credit became effective on February 6, 2009. The Project Development Objective (PDO) is to enhance the efficiency, environmental sustainability, and safety of transport infrastructure and services through the alleviation of physical and institutional bottlenecks in two major waterway corridors in the Northern Delta Region.
5. The project scope, as originally defined at appraisal, comprises three components:
 - **Component A: Multimodal Transport Corridor Investments**, which consists of improvements to two waterway corridors in the project region to increase the efficiency of multimodal transport and supply chains, and to enhance the environmental sustainability of the waterway freight transport network.

Component A has five subcomponents: (i) improvements to two national waterway corridors, known as Corridor 1 and Corridor 3, by expanding the navigational capacity of these corridors through the provision of dredging, bend correction, bank protection, river training, and the deployment of aids to navigation, with the aim of increasing the ability of the target waterways to carry larger vessels and reduce navigation times (Subcomponent A1); (ii) improvements to the Ninh Co river estuary, by providing a bypass access channel from the ocean into the river

system at the estuary, and an inter-connecting canal between the Day and Ninh Co rivers with a navigational lock—the DNC canal (Subcomponent A2); (iii) improvements to the provincial river ports of Viet Tri and Ninh Phuc, to increase the ports’ berthing and warehousing capacity and their environmental sustainability (Subcomponent A3); (iv) a small pilot maintenance activity to test the viability of using performance-based contracts for the delivery of routine maintenance at selected waterways in the project region (Subcomponent A4); and (v) the provision of detailed engineering design and construction supervision services for subcomponents A1-A3 (Subcomponent A5).

- **Component B: Investments in Ferry Boat Stages**, which includes physical improvements to 28 ferry boat crossing stations located in the 14 provinces that comprise the project’s target region (2 ferry boat stages per province).
- **Component C: Institutional Support to the Ministry of Transport (MoT), the Vietnam Inland Waterway Administration (VIWA), and the Provinces**, which comprises the delivery of several consulting services, including: (i) technical assistance to VIWA on the management of ports, landing stages, ferry boat crossings, and waterway maintenance schemes; (ii) technical assistance to VIWA on the role of community participation in, and supervision of, infrastructure development projects in the waterway sector; (iii) training and capacity building services provided to staff of MoT, VIWA, and other government agencies, including the Waterway Transport Vocational College No. 1 – Hai Duong; (iv) integrated project implementation audit services; (v) independent financial audit services; and (vi) the development of a Feasibility Study (FS) for a potential future transport project in the Red River Delta inland waterway network.

6. After eight years in the project implementation period, all of the above-listed civil works and consulting services activities have been completed—except for the DNC canal, which is the focus of the proposed additional credit, and the pilot maintenance contract, which will be excluded from the project scope under the AF.

7. Based on the above progress, the project is already generating the economic and social impacts sought at appraisal, in accordance with the PDO. Specifically, the interventions financed under the project have resulted in (a) improved connectivity and navigability at well-targeted segments of Corridors 1 and 3 of the Red River Delta inland waterway network; (b) increased vessel berthing, cargo handling, and storage capacity at two river ports; (c) improved access to market, health, education, and recreation facilities for local communities across 14 provinces in the target region through the provision of safer and more accessible ferry boat stages; and (d) knowledge transferred through the provision of technical assistance to VIWA and MoT. The list of completed civil works includes the construction of the bypass access channel at the Lach Giang estuary—the most transformational and technically complex construction activity financed under the original credit. Beyond improving connectivity and network resilience by providing sea-going vessels with year-round, 24/7 access to the inland waterway network at Corridor 3, construction of this structure resulted in the creation of significant technical capacity among the Vietnamese contractors that built the facility, none of whom had prior exposure to civil works in the open ocean.

8. The project's progress towards attaining the PDO has been corroborated by the Project Results Framework (see Annex 1). Specifically, travel times along the targeted Quang Ninh-Viet Tri inland waterway corridor (Corridor 1) have been reduced by 34 percent, well above the original target of 10 percent; travel times along the targeted Hanoi-Lach Giang inland waterway corridor (Corridor 3) have been reduced by 13 percent, substantially more than the original 5 percent target; average vessel waiting times to enter and exit the Red River Delta system from the coast at the Lach Giang estuary have been reduced by 95 percent, compared to the original 50 percent target; traffic accidents and fatalities at the targeted ferry boat crossings have been entirely prevented since completion of project-financed improvements; average vessel waiting time to berth at Viet Tri port has been reduced by 28 percent, compared to an initial target of 20 percent; the volume of total suspended solids (TSS) in effluent from storage areas at the ports of Viet Tri and Ninh Phuc has been reduced by 16 percent and 12 percent, respectively, compared to an initial target of 10 percent; and PM₁₀ emissions at Viet Tri and Ninh Phuc ports have been reduced by 48 percent and 64 percent, respectively, compared to initial targets of 10 percent and 20 percent.

9. **Implementation Challenges under the Original Credit.** As a result of implementation delays (see Annex 2 for details), most project activities were implemented later in the project period than originally envisaged. These delays, which led to three extensions of the project's closing date¹, exposed project activities to significant inflationary pressure over time. In addition, in the particular case of civil works—the mainstay of the project—there were changes in technical specifications at the detailed design stage, which was conducted during implementation, that resulted in increases in the quantity and scope of works required compared to those originally defined at appraisal on the basis of preliminary designs. While the latter issue was true of most civil works under the project, it was particularly true for the DNC canal, where changes in road traffic levels since appraisal had made it necessary to significantly expand the capacity of a bridge that sits atop the canal and is part of the DNC integrated facility. This resulted in a material increase in the cost of the DNC canal relative to initial estimates obtained several years earlier. In all, inflationary pressure and changes in technical specifications increased the cost of project activities relative to appraisal estimates (see Table 2 below) and left insufficient funds under the original credit for the construction of the DNC canal, even as all other originally-planned civil works were successfully completed.

10. **Rationale for Additional Financing.** Provision of AF funds to build the DNC canal is justified for two primary reasons. First, despite increases in cost, the DNC canal remains an economically viable investment that is directly aligned with the project development objective. And second, since project inception the DNC canal was conceived as an integrated connectivity solution together with the original credit-financed capacity improvements at Ninh Phuc port and the coastal shipping bypass access channel at Lach Giang. These three infrastructure interventions, together, enable a through-access corridor to/from Ninh Phuc port and the coast: seagoing vessels on the Gulf of Tonkin destined for the port—with Quang Ninh Province as the main origin—can more efficiently access it by first entering the river network through the Lach Giang bypass access channel at the estuary of the Ninh Co river, and then switching to the Day river—where Ninh Phuc

¹ The first from June 30, 2014 to December 31, 2015; the second from December 31, 2015 to May 31, 2016; and the third from May 31, 2016 to December 31, 2016. A fourth extension, through June 26, 2017, was processed with the main objective of providing the project with sufficient time to approve the proposed AF Credit and subsequently sign the Financing Agreement.

port is located—via the DNC canal. Construction of the canal would complete this corridor, thereby leveraging the Ninh Phuc port and Lach Giang estuary improvements already delivered under the project and enhancing their economic potential. The Government of Vietnam (GoV) remains strongly committed to building the DNC canal as an economic catalyst and as a contributor to the sustained use of the region’s inland waterways for freight transportation. Provision of additional funds to construct the canal will deepen project development impacts, allow the project to finish all major civil works—and therefore reach all target beneficiaries and locales—as originally planned, and contribute to further modernizing vital inland waterway infrastructure in one of the regions of the world most exposed to the risks of climate change. The completed corridor will contribute towards climate change mitigation, by facilitating the use of larger vessels that can produce lower carbon dioxide (CO₂) emissions per ton-kilometer transported (see paragraph 19), as well as climate change adaptation and resilience, by delivering permanent coastal access to Ninh Phuc port at a disruption-prone section of the Northern Delta inland waterway network exposed to sediment discharge and severe weather events such as typhoons. The interventions proposed contribute to the Bank’s twin goals by both facilitating economic activity such as trade and commerce, which generates economic growth, and reducing carbon emissions, which mitigates climate change risks that disproportionately affect the poor and those at the bottom 40 percent of the income distribution.

III. Proposed Changes

11. **Change in Project Scope.** The pilot maintenance activity under Component A will be excluded from the project. The reasons for this are threefold. First, implementation of this proof-of-concept activity was, by design, dependent upon prior implementation of the project’s technical assistance (TA) activity to support VIWA on the management of maintenance dredging under Component C, as the pilot maintenance contract would have implemented management approaches developed under this TA. However, lengthy delays in the launch of this TA (see Annex 2 for details) left insufficient time in the project period after the TA’s completion, including under the proposed additional financing, to properly conduct a performance-based maintenance contract which, international experience has shown, typically requires five or more years in duration to be attractive to prospective service providers. Second, and also based on international experience, performance-based contracts typically require a minimum amount in size to be attractive to service providers who must invest in and/or relocate costly maintenance equipment for the target waterways. The limited amount of funds allocated to this activity, of US\$1 million equivalent, is unlikely to attract bidders of the quality and caliber required to make a significant difference in inland waterway maintenance performance. And third, delivery of this activity is not critical to the attainment of the PDO, nor was it intended to support—due to its pilot nature—the provision of ongoing maintenance of project-financed infrastructure, which remains the responsibility of the respective government authorities and facility owners at the national, provincial, and local level.

12. **MDTIDP Inputs to Analytical Work under Component C.** The provision of technical assistance to VIWA on the management of ports, landing stages, and ferry boat crossings, and training and capacity building services for staff of MoT, VIWA, and other government agencies have been successfully completed. However, these services were not delivered on the basis of frameworks and curricula, respectively, developed under a separate Bank-financed project in Vietnam, the Mekong Delta Transport Infrastructure Development Project (MDTIDP), as originally intended, due to (a) a significant difference in the timing of implementation of these

activities between the two projects, and (b) a need to better tailor the NDTDP activities to the most current needs of the inland waterway sector in general and the Red River Delta region in particular. Delivery of technical assistance and training and capacity building services under NDTDP was nevertheless completed in full accordance with the PDO, in line with appraisal goals, and in accordance with international standards of analytical quality.

13. **Changes to the Project Results Framework.** During appraisal of the original credit no performance indicators under the Project Results Framework were defined to specifically target the expected impacts of constructing and operating the DNC canal. As part of requesting additional financing to build the canal, therefore, it is proposed to expand the Results Framework to include one additional outcome indicator and one intermediate indicator to assess such impacts (see Table 1). The full Results Framework for the project, across both the original and additional credits, is presented in Annex 1.

Table 1. Proposed Adjustments to Project Outcome and Intermediate Indicators

Type of Indicator	Definition	Unit of Measure	Changes with AF	Baseline	Target
Outcome	Vessel travel time from Quang Ninh to Ninh Phuc port	Hours	Added	60	20% reduction
Intermediate	Percentage of DNC canal civil works completed	Percent	Added	0%	100%

14. There are no changes to the PDO or the institutional, implementation, and fiduciary arrangements. Table 2 summarizes the changes in project implementation costs since appraisal of the original credit.

Table 2. NDTDP: Actual Implementation Costs Relative to Appraisal Estimates
Millions of US\$ (IDA financing only)

Component	Estimated Costs at Appraisal	Actual Costs	Actual vs. Appraisal Differential
Component A: Multimodal Corridors	141.0	198.8	57.8
1 Improvements to Corridor 1	57.0	47.0	(9.9)
2 Improvements to Corridor 3	5.7	8.6	2.9
3 Improvements to Lach Giang Estuary	49.9	61.8	12.0
4 Construction of DNC Canal	11.7	60.7	49.0
5 Improvements to Provincial Ports	6.7	6.1	(0.7)
6 Pilot Maintenance Contract	1.0	<i>Excluded</i>	
7 Design and Supervision	9.1	14.7	5.6

Continued on next page

Table 2. NDTDP: Actual Implementation Costs Relative to Appraisal Estimates (Cont.)
Millions of US\$ (IDA financing only)

Component	Estimated Costs at Appraisal	Actual Costs	Actual vs. Appraisal Differential
Component B: Ferry Boat Stages	4.3	4.7	0.4
Component C: Institutional Support	5.1	4.1	(1.0)
1 Institutional support to VIWA	1.0	0.9	(0.1)
2 Integrated Technical Audit	0.8	0.8	<i>nil</i>
3 Financial Audit	0.5	0.7	0.2
4 Training	0.5	0.5	<i>nil</i>
5 Preparation of a Future Transport Project	2.4	1.1	(1.3)
6 Independent Monitoring of RAP Implementation and Community Safety	-	0.2	0.2
Total Base Cost	150.4	207.7	57.2
Physical and Price Contingencies ¹	19.6	13.7	
Total Cost	170.0	221.3	
Addenda:			
Actual value of original IDA credit ²	154.7		
Actual cost excluding DNC canal	142.6		
Unused funds from original IDA credit	12.1		
Additional Financing need	78.7		

1\ Physical and price contingencies for the Actual Costs column refer to those associated with the DNC canal only, since all other activities under the project have been completed.

2\ Differential between initial and actual value of the original IDA credit is due to fluctuations in the SDR/US\$ exchange rate since appraisal. Most unused funds from the original credit have been cancelled by the Borrower so that the proposed AF operation may be financed out of a single credit—the additional credit.

IV. Appraisal Summary

15. **Scope of Additional Financing.** The proposed AF operation will comprise a single activity: construction of the DNC canal complex. The proposed credit will finance 100 percent of civil works, including the purchasing of operational equipment and other goods required thereof, and 100 percent of construction supervision, social safeguards and occupational safety monitoring, and financial audit services, at an estimated cost of US\$78.74 million, excluding Value-added Tax (VAT) payments. The GoV will provide counterpart funding, in the estimated amount of US\$28.45

million, to finance land acquisition, resettlement compensation, utility upgrading works, VAT payments to contractors, and project administration costs.

16. The scope of civil works comprises: (a) construction of a new navigation canal to connect the Day and Ninh Co rivers, approximately 1.5 kilometers long, 6.0 meters deep, and inclusive of flood protection dikes; (b) construction of a 160-meter navigational lock for low loaded river-coastal vessels up to 3,000 DWT in capacity to facilitate passage from the Ninh Co to the Day river—and on to Ninh Phuc port—and associated return trips; (c) construction of the Day - Ninh Co fixed-span bridge over the canal, 780 meters in length and with a 15-meter vertical clearance, to preserve continuous traffic along Provincial Road No. 490C between the two sides of the crossing canal and to allow sufficient vertical clearance for the passage of seagoing vessels; (d) construction of an approximately 1.2-kilometer long (12-meter wide) approach road to the bridge; and (e) replacement of facilities impacted by canal construction works (e.g., electricity and telecommunication poles, irrigation canals, and the like), and complementary landscape and environmental works. This scope of works is consistent with what was originally intended at parent project appraisal.

17. **Economic Analysis.** A standard cost-benefit analysis was conducted to evaluate the economic viability of the DNC canal investment taking into account the updated costs and benefits associated with its construction, and the fact that the bypass access channel at Lach Giang has already been completed under the original credit. Details of this assessment are presented in Annex 3. The cost-benefit analysis indicates that investing in the DNC canal is economically viable and therefore desirable. Specifically, the DNC canal subproject is expected to result in an Economic Internal Rate of Return (EIRR) of 13.8 percent and an Economic Net Present Value (ENPV) of US\$153 million in 2016 at the World Bank-recommended benchmark economic discount rate of 6 percent. Sensitivity analysis shows that the DNC canal's economic viability is robust to simultaneous increases in costs and reductions in benefits, relative to base case assumptions, of up to 44 percent each—an unlikely outcome. In addition, the base case economic assessment was conducted with several instances of conservatism in the underlying assumptions regarding the cost of civil works, the pace of freight traffic growth, the level of reduction in inventory levels, and the nature of vessel navigation patterns and the regional commodity mix. These results suggest that the economic viability of the proposed investment is robust.

18. The economic appraisal conducted for the original credit concluded that all planned investments at Corridor 3—including the Lach Giang estuary improvements, the DNC canal, the improvements at Ninh Phuc port, and bend correction works at selected portions of Corridor 3—collectively yielded an EIRR of 23 percent. This is not directly comparable to the EIRR estimated here for the DNC canal alone, but the fact that the latter is lower than the former gives an order-of-magnitude indication of the impact of past cost overruns on investment returns. Economic returns to NDTDP-financed investments at Corridor 3—including the DNC canal—were robust enough at appraisal of the original credit to remain within the viability threshold even in the face of cost overruns.

19. **GHG Emissions Accounting.** A greenhouse gas (GHG) emissions accounting exercise was conducted as part of the economic analysis. It is estimated that, without the project, by 2020—the year in which the DNC canal would come online under the with-project scenario—inland waterway transport activities linked to the project's target corridor will generate 48,393 tons of

CO₂ solely from transportation (in addition to approximately 937 tons of SO₂ and 392 tons of NO_x, which are local pollutants considered indirect greenhouse gases). In the absence of the project, this would translate to 44 grams of CO₂ per ton-kilometer transported. If built, the DNC canal would facilitate the use of larger vessels, which are both more fuel efficient and able to carry greater tonnage per kilometer transported; it would also shorten the length of the target corridor (see Annex 3 for details). It is estimated that the use of 2,000 DWT vessels along the corridor, which the DNC canal would make possible, would increase the carbon efficiency of inland waterway transport operations by 21 percent—to 34 grams of CO₂ per ton-kilometer transported—when 90 percent of the corridor’s tonnage is moved via 2,000 DWT vessels, a vessel adoption milestone that is assumed to be reached in 2035 under the with-project scenario. By that year, CO₂ emissions are projected to be 55 percent lower than in the without-project baseline. In other words, implementation of the DNC canal project is expected over the long run to approximately cut in half the annual emissions of CO₂ associated with the transportation of inland waterway freight along the project’s target corridor.

20. **Technical Aspects.** The proposed additional credit will enter implementation with strong readiness. Detailed engineering designs and bidding documents will be completed by the time the additional credit becomes effective in mid-2017. This will prevent many of the delays, technical difficulties, and cost overruns that impacted the original credit, which largely stemmed from a protracted period of time to procure, conduct, and finalize detailed designs and bidding documents during implementation. Assessments by the project’s Construction Supervision Consultant, the integrated project implementation auditor, and the World Bank task team indicate that the technical quality of the national and provincial infrastructure improvement works delivered under the original credit is satisfactory, well aligned with detailed designs, compliant with current MoT construction standards, and consistent with international engineering standards. Implementation of the proposed additional credit will continue to benefit from high-quality construction supervision to ensure that the same technical standards attained to date are maintained for the DNC canal. The project implementing agency, Project Management Unit for Waterways (PMU-W), has accumulated significant engineering experience in the DNC canal area, as well as valuable project management capabilities in inland waterways, through its experience implementing the original credit—most notably the delivery of the highly complex Lach Giang facility. This experience adequately equips PMU-W to carry out the construction of the DNC canal.

21. **Institutional Aspects.** Implementation arrangements for the original credit are functioning satisfactorily and will be retained for the proposed AF. The project implementing agency for all AF activities will be PMU-W, which has been established as a project management unit within MoT, pursuant to MoT Decision No. 4778/QD-BGTVT dated December 19, 2014. PMU-W will continue to report to MoT on all aspects of project implementation.

22. **Financial Management and Disbursements.** The same disbursement methods and documentation requirements utilized under the original credit will be used for the AF credit. However, a new segregated designated account will be opened in US\$ at a financial institution or commercial bank acceptable to the Bank to receive funds from the Bank under this additional financing. The ceiling of advance to this designated account will be variable based on forecast of one (1) quarter of expenditures to be paid out of the designated account. Bank funds from the AF will finance at 100 percent (exclusive of taxes) eligible expenditures, consisting of goods, works, consultants’ services, and non-consulting services for selected parts of Components A and C of

the Project, as defined in paragraph 15 of this Project Paper. The project is in compliance with all legal covenants and there are no overdue financial audits. MoT has confirmed that PMU-W will receive sufficient allocations of operational budget for project implementation throughout the implementation of the additional credit.

23. **Procurement.** PMU-W's procurement implementation capacity has been monitored and assessed based on their performance over the course of implementation of the original credit. During the early stages of project implementation, procurement activities were exposed to significant delays caused in large part by institutional rearrangements on the part of the project implementing agencies, which by now have been resolved. In addition, over the course of implementing the original credit PMU-W has accumulated significant procurement experience, improved its procurement capacity, and benefited from regular Bank-provided training on updated procurement policies and good procurement practices. Given PMU-W's current capacity and the high value of the contracts to be procured under the scope of the DNC canal complex, the overall procurement risk for the AF operation is rated as Substantial.

24. On behalf of MoT, PMU-W has prepared a procurement plan for the AF operation that has been discussed and agreed with the Bank during appraisal of the AF credit. Procurement of contracts for works will follow the International Competitive Bidding (ICB) procedure—mainly for the construction of the shiplock, which may follow the slice-and-package approach—as well as the National Competitive Bidding (NCB) procedure for other works estimated to cost less than US\$20 million per contract. In general, the selection of consulting firms estimated to cost more than US\$0.5 million per contract will follow the Quality- and Cost-Based Selection (QCBS) procedure. Given the special circumstance that the detailed design of the DNC canal has been prepared by the same firm that designed all Phase 2 works and supervised the construction of all civil works (Phases 1 and 2) under the original credit, based on a contract that was awarded competitively and in full accordance with Bank guidelines through a QCBS procedure, and under which the intention was to also supervise the construction of the DNC canal, the Bank has agreed in principle with the Borrower's proposal to extend the existing contract for environmental management and construction supervision services to be co-terminus with the AF credit, thereby retaining the same provider of these services for the AF credit as under the original credit. Such service continuity is considered an effective technical and implementation risk mitigation measure. It is also widely-accepted good international practice for the designer of a structure to supervise its construction. Upon extending the duration of this contract, its size will also be revised, through a variation order, to reflect the cost of service delivery during construction of the DNC canal.

25. Procurement of goods and works to be financed under the AF credit will continue to be carried out in accordance with the World Bank's "Guidelines: Procurement of Goods, Works, and Non-consulting Services under IBRD Loans and IDA Credits & Grants by World Bank Borrowers" dated January 2011, revised July 2014; while selection of consultants will follow "Guidelines: Selection and Employment of Consultants under IBRD Loans and IDA Credits & Grants by World Bank Borrowers" dated January 2011, revised July 2014; and comply with the provisions stipulated in the Financing Agreement.

26. The Procurement Plan will be updated on an annual basis, or as needed throughout the project, to reflect actual project implementation needs and improvements in institutional capacity. The updated Procurement Plan will specify procurement methods and their applicable thresholds,

as well as the applicable thresholds for the Bank's prior review. When and where appropriate, the slice-and-package approach will be followed under the ICB and NCB procedures. This approach can improve procurement efficiency by minimizing transactional burdens; it can also increase competition by allowing bids for one or more lots depending on individual bidders' financial capacity and technical qualifications. When the slice-and-package approach is followed, the total estimated cost of all lots comprising a particular package will be the basis to determine the estimated cost of the package. All updates to the Procurement Plan will be uploaded by PMU-W into the Bank's online Systematic Tracking of Exchanges in Procurement (STEP) system and will be subject to Bank review and clearance before implementation. Once cleared, STEP will automatically disclose the updated Procurement Plan on the World Bank's website.

27. **Safeguards.** Environmental Assessment (OP 4.01), Physical Cultural Resources (OP 4.11), and Involuntary Resettlement (OP 4.12) were triggered under the original credit, which was assessed as Environmental Category A. All of these safeguards policies will continue to be triggered under the additional credit, in addition to Natural Habitats (OP 4.04). The latter policy is being triggered under the AF due to the project's potential impact on aquatic biodiversity, a risk that will be adequately mitigated during construction (see paragraphs 32 and 33). There is no change to the environmental category under the AF, which remains an A. OP 7.50 on Projects on International Waterways was also triggered under the original credit, but the project, including the originally envisaged activities that will now be financed by the AF, falls under the exception to the notification requirements set out in paragraph 7 of OP 7.50.

28. Throughout parent project implementation World Bank environmental specialists regularly visited sub-project sites, including—but not limited to—Dai Ban commune; Lach Giang estuary; Dong Lac commune; Viet Tri port; Ninh Phuc port; and Loi ferry boat stage, Phu Tho province. Findings from these visits confirmed that the parent project's environmental management, as well as its occupational health and safety management, were consistent with international best practice. PMU-W and contractor performance in regular on-site monitoring, detailed reporting through the submission of Supervision Observation Forms, training in safety and environmental management, training in work-place safety, and follow-up on recommendations was of high quality. While there was, on occasion, opportunity for improvement on certain sub-projects' environmental and safety management, the diligence and commitment of the project implementation team, including the experience and knowledge brought to the project by the environmental management and construction supervision consultant (EMCSC), and the monitoring, follow-up, and enforcement undertaken by PMU-W, consistently resulted in adequate environmental and safety management practices across civil works sites. For example, the project's ranking of contractors based on environmental performance is an example of good practice, and this information should be retained for future GoV- and Bank-financed projects (including the proposed additional credit). The occasional use of a delay in payments as a penalty for environmental non-compliance also appears to have been an efficient means of effecting change.

29. Monitoring of Site-specific Environmental Management Plan (SEMP) implementation was performed regularly at all sites and illustrated project progress reports were prepared on a monthly basis. Innovative environmental measures were proposed by the EMCSC, some of which are being considered under the AF. These measures include (a) the promotion of ecological measures to protect embankments (e.g., encouraging mangrove plantation and introducing the use of vetiver to

prevent erosion); (b) the proposal to reduce concrete use for embankment construction; and (c) the proposal to maintain islands created by the bifurcation of water channels as ecological habitats.

30. Regarding social safeguards performance, in general land acquisition and resettlement compensation progress under the parent project met the required pace of construction, with a few exceptions. Findings from past implementation support missions confirm that the timing of site readiness at Corridor 3 was consistent with agreed timetables for construction completion under the original credit. At Corridor 1, all parent project civil works have been completed and the resulting infrastructure improvements has been put into operation. However, Corridor 1 works were exposed to a number of land acquisition challenges that will require the attention of PMU-W, MoT, and the World Bank such that they can be avoided under the additional credit. These include documentation delays (e.g., at Noth Tu Liem and Tay Ho districts), as well as delays in actual construction progress on the ground (e.g., in Dong Anh district, Hanoi, and in Thuy Nguyen district, Haiphong). In the latter case, the main obstacle for PMU-W was discussing and negotiating with local authorities and affected households (AHs)—4 AHs in Dong Anh and 3 AHs in Thuy Nguyen—in order to reach agreement on compensation packages. While these challenges were ultimately resolved under the parent project, PMU-W’s experience in confronting them will be valuable towards preventing similar delays under the additional credit.

31. The scope of civil works entailed by the DNC canal subproject remains largely the same as originally described under the parent project—a canal to connect two rivers with a navigational lock and a bridge over, and physically attached to, the canal to provide through connectivity to a road serving the communities located in close proximity to the canal. The only change in the nature of civil works relative to original descriptions at appraisal, which was introduced at the detailed design stage during implementation, is that the bridge will be a fixed-span bridge rather than a lifting-span bridge. This was considered a better solution given that the road to which the bridge connects has been expanded in its vehicle-carrying capacity since appraisal of the original credit and a fixed-span bridge was deemed more consistent with the nature of traffic that will use the expanded road. It was also deemed that a fixed-span bridge would be less disruptive to barge traffic across the canal. This change in design, however, does not significantly alter the project’s expected environmental and social impacts relative to those of a lifting-span bridge. Moreover, the environmental and social impacts of the bridge, including its approach roads, as well as appropriate mitigation measures, have been added to the updated safeguards documentation (see paragraph 34 for a list of these instruments).

32. The AF project’s detailed design incorporates an innovative ecological engineering approach—a mixed bank protection scheme, based on ecological bank protection (vegetation capacity to fix the banks) and classical bank protection (rip-rap), which will enhance biodiversity and protect against the effect of waves and erosion on the river banks and adjoining wetland, creating and/or restoring approximately 9 hectares of aquatic and wetland habitats. Ecological bank protection is based on (a) planting indigenous plants into the rip-rap holes; and (b) incorporating into project design the creation of friendly habitats for birds, small mammals, reptiles, batrachians, terrestrial and aquatic invertebrates, and fish. This environmentally friendly approach to bank protection has social and financial benefits. Depending on the choice of vegetation, local communities can generate income by harvesting part of the vegetation and also maintain the fish catch due to improved habitats for fish. In addition, a combination of rip-rap and

ecological bank protection is significantly less costly than the classical concrete plots typically used for bank protection in Vietnam.

33. The most significant environmental impact associated with DNC canal construction will be caused by dredging activities. To mitigate possible impacts on aquatic life, the following measures will be implemented:

- Any dredging close to the bank and in wetlands and spawning areas will be carried out between October and May, thus avoiding the peak of biological activity that occurs during the flood/rainy season;
- Although dredging of the center of the channel can be undertaken throughout the year, contractors will be required to take into consideration in their construction schedules that during the dry season the Total Suspended Solids (TSS)/turbidity levels downstream of the dredging areas will be much lower than during the rainy season.

34. Environmental and Social Impact Assessment (ESIA), Environmental Management Plan (EMP), and Resettlement Action Plan (RAP) documents for the DNC canal have been prepared in accordance with World Bank policy. These documents, which have also been approved by Vietnam's Ministry of Natural Resources and the Environment (MONRE), include an up-to-date evaluation of environmental impacts and reflect latest adjustments to the detailed engineering design, including those associated with the fixed-span bridge. In addition, the Corridor 3 Dredged and Excavated Materials Disposal Plan (DEM DP) that was prepared under the original credit remains fully adequate for use under the AF credit and is compliant with Bank policy.

35. The land acquisition required for the DNC canal component is estimated at 370,000 m² (permanent) and 80,000 m² (temporary), affecting 264 households (HHs) (1,061 people), of which 30 HHs will be relocated. The estimated budget for RAP implementation is VND119.4 billion (US\$5.4 million).

36. A total of 1,561,315 m³ will be excavated or dredged. The bulk of this—1,549,000 m³—will be excavated or dredged for the construction of the canal and shiplock. The earthworks for the bridge and approach road will mobilize 11,700 m³ of excavation and 27,800 m³ of soil filling. Direct reuse on site for the construction of the approach road will absorb 27,800 m³; and direct reuse by a brick factory near site will absorb 200,000 m³. The major part of the remaining materials could be temporarily stored for later reuse for brick production (up to 400,000 m³) and/or for agricultural land raising (up to 600,000 m³), as requested by local communes. If necessary, the remaining material can be transferred by boat and disposed of at Lach Giang's Southern Disposal Area. This area, built under the parent project, can be used to store up to 1,300,000 m³ of soil and sediments. This site is located 16 km by boat from the DNC construction site. There is also a soil disposal area at Duc Lam brick factory on the left side of the Day River for temporary storage of clay to reuse for brick production. The total capacity is 1,150,000 m³ over 25 hectares of surface. This site will accept a maximum quantity of 400,000 m³ of exclusively clay materials from the DNC project. Finally, the Nghia Lac disposal area at the Dong Bang brick factory will be used for temporary storage of clay, sand, and sediments to be reused for bricks production and later commune-managed construction activities. The total capacity of the latter is 900,000 m³ over 25

hectares of surface. The maximum quantity to be disposed on this site from the DNC project is estimated at about 400,000 to 600,000 m³.

37. Even if testing confirms that soil and sediments are not toxic, a management plan for dredging activities has been prepared and will be implemented, to ensure that any sludge containing toxic materials is removed, transported, and disposed of safely. Any sludge containing heavy metals or other toxic substances exceeding permitted standards will be disposed of in lined, sealed landfill sites, and nearby sensitive receptors will be taken into consideration.

38. All safeguards instruments have been prepared in accordance with applicable Vietnamese regulations and the World Bank's safeguards policies. All safeguards instruments have been reviewed and cleared by the World Bank and are subject to public disclosure per policy requirements. The instruments were disclosed locally in Vietnamese (on August 9, 2016) and in English at the World Bank InfoShop (on August 8, 2016).

39. **Gender.** Under the RAP for the DNC canal activity, the project will closely monitor and assess the livelihoods of project-affected women headed households in close coordination with the Bank's Social Development Specialist. Lessons learned from an HIV/AIDS-STI awareness and prevention program for workers at NDTDP civil works sites, which was successfully implemented under the original credit, will be incorporated under the AF credit, through the dissemination of printed material, interactive training sessions at the community level, and train-the-trainer activities.

40. **Duration of the Proposed AF Credit.** The proposed AF Credit will have a duration of 2.5 years, with a closing date of December 31, 2019. This will include six months for procurement activities and two years for construction and finalization activities.

41. **Risks.** The World Bank Integrity Vice Presidency (INT) conducted an investigation that substantiated fraudulent practices and other misconduct by an international consulting firm during the procurement and implementation of several contracts under the project. Separate investigations by INT also substantiated various forms of fraud and misconduct by several local firms during procurement of separate contracts under the project. In light of this, country- and sector-level Political and Governance risks, including the risk of fraud and corruption, as well as Fiduciary risks, are assessed as Substantial, but a number of governance-risk mitigation measures implemented under the original credit will continue and be enhanced under the AF operation. These include: (i) increased procurement oversight by the Bank, to routinely include an assessment of the decision making process in technical evaluation reports and during contract management; (ii) deeper due-diligence of bidders and technical proposals, aided inter alia by a Bank-provided integrity due diligence checklist, as well as more detailed documentation of procurement decisions, by PMU-W and further involvement of MoT in same; and (iii) ongoing Bank-provided training to PMU-W staff on procurement guidelines and good practices, as well as on good practices in project management. Technical risks associated with DNC canal construction are assessed as Moderate, as PMU-W has experience building similar navigational lock facilities elsewhere, such as under the recently completed, Bank-financed MDTIDP. Experience under the original credit suggests that insufficient and untimely availability of counterpart funds will remain a key risk to AF credit implementation. To mitigate this risk, the Bank will continue to proactively communicate counterpart funding shortfalls to the Borrower. Based on feedback from MoT, it is also understood

that NDTDP, including construction of the DNC canal, has been given priority for counterpart funding allocation going forward.

V. World Bank Grievance Redress

42. Communities and individuals who believe that they are adversely affected by a World Bank supported project may submit complaints to existing project-level grievance redress mechanisms or the World Bank's Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed in order to address project-related concerns. Project affected communities and individuals may submit their complaint to the World Bank's independent Inspection Panel which determines whether harm occurred, or could occur, as a result of World Bank non-compliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the World Bank's attention, and Bank Management has been given an opportunity to respond. For information on how to submit complaints to the World Bank's corporate GRS, please visit <http://www.worldbank.org/GRS>. For information on how to submit complaints to the World Bank Inspection Panel, please visit www.inspectionpanel.org.

Annex 1. Results Framework and Monitoring

VIETNAM: Northern Delta Transport Development Project

Project Development Objective (PDO): Enhance the efficiency, environmental sustainability and safety of transport infrastructure and services, through the alleviation of physical and institutional bottlenecks, in two major waterway corridors in the Northern Delta Region.							
PDO Level Results Indicators*	Core	D=Dropped C=Continue N= New R=Revised	Unit of Measure	Baseline	Target at Completion	November 2016 actual	Notes
Travel time of 4x400-DWT barges from Quang Ninh to Viet Tri during the dry season	<input type="checkbox"/>	C	Hours	47	10% reduction	31 hours (34% reduction)	Target met
			Km	280	4 km reduction	276.5 km (3.5 km reduction)	Target essentially met; distance reduced after improvement works in cutting curves and regulating shoals
Travel time of 4x400-DWT barges from Hanoi to Lach Giang estuary during the dry season	<input type="checkbox"/>	C	Hours	43	5% reduction	37.5 hours (12.8% reduction)	Target met
			Km	259	1.5 km reduction	257.8 km (1.2 km reduction)	Target essentially met; distance reduced after improvement works in cutting curves and regulating shoals
Average vessel waiting time to enter/exit river system at Lach Giang estuary during the dry season	<input type="checkbox"/>	C	Hours	20	50% reduction	1 hour (95% reduction)	Target met
Traffic accidents/fatalities related to river crossings at the pilot ferry boat stages	<input type="checkbox"/>	C	Count	7	20% reduction	None in the 18 months to November 2016 (100% reduction)	Target met

Waiting time for vessels calling at the Viet Tri Port	<input type="checkbox"/>	C	Hours	24	20% reduction	17.3 hours (28% reduction)	Target met
Total Suspended Solids (TSS) in effluent from coal storage area in Ninh Phuc Port	<input type="checkbox"/>	C	mg/l	50 ⁽¹⁾	10% reduction	44 (12% reduction)	Target met; Vietnam National Environmental Standard 08 MR 2015 BTNMT (latest available) is used as a baseline for comparison
Total Suspended Solids (TSS) in effluent from coal storage area in Viet Tri Port	<input type="checkbox"/>	C	mg/l	50 ⁽¹⁾	10% reduction	42 (16% reduction)	Target met; Vietnam National Environmental Standard 08 MR 2015 BTNMT (latest available) is used as a baseline for comparison
Emissions of PM ₁₀ at Viet Tri Port	<input type="checkbox"/>	C	(mg/m ³)	150	10% reduction	78 (48% reduction)	Target met; a covered warehouse was constructed under the project, which led to significant dust reductions
Emissions of PM ₁₀ at Ninh Phuc Port	<input type="checkbox"/>	C	(mg/m ³)	128	20% reduction	46 (64% reduction)	Target met; no covered warehouse was constructed. Port management uses water to spray as trucks enter and leave the loading areas to reduce dust. Emissions concentration further reduced by slight wind at the time of measurement.
Vessel travel time from Quang Ninh to Ninh Phuc port	<input type="checkbox"/>	N	Hours	60	20% reduction	Not yet due	Indicator added as part of the AF, to be measured by surveying beneficiaries. The baseline value (60 hours) refers to the current routing along Corridor 2 by self-propelled 200-600 DWT barges and 800-1,200 DWT push convoys. The project will enable a new coastal routing through the Lach Giang estuary bypass access channel and the DNC canal, for sea-river vessels 2,000 DWT in capacity.

Intermediate Results for Component A: Multimodal Transport Corridor Investments							
Length of waterways improved to desired operating standards	<input type="checkbox"/>	C	Km	0	539	539	Target met
Percentage of DNC canal civil works completed	<input type="checkbox"/>	N	Percent	0	100%	Not yet due	Indicator added as part of the AF
Intermediate Results for Component B: Investments in small ferry boat stages							
Number of ferry boat stages with improved safety design	<input type="checkbox"/>	C	Count	0	28	31 ⁽²⁾	Target met
Intermediate Results for Component C: Institutional support to MoT, VIWA and provinces							
Timely completion of physical works	<input type="checkbox"/>	C	Percent	0	100%	100%	Target met
Delivery to MoT/VIWA of draft framework for the planning and sustainable management of inland waterways	<input type="checkbox"/>	C	Yes/No	No	Yes	Yes	Target met
Delivery to MoT/VIWA of draft framework for the planning and sustainable management of ferry boat stages	<input type="checkbox"/>	C	Yes/No	No	Yes	Yes	Target met

Notes:

1/ Vietnam Environmental Standard: National Technical Regulation 08 MT:2015 BTNMT on surface water quality.

2/ Including three additional ferry boat stages: Vu Dien – Ha Nam Province, Cua Ga – Nam Dinh Province, and Nha Tao – Thai Binh Province.

Annex 2. Nature of Implementation Delays and Cost Overruns Incurred During Implementation of the Original Credit

Implementation Delays

1. As designed at appraisal, project implementation activities included not only the procurement and execution of civil works, but also the procurement, delivery, and approval of detailed engineering designs and bidding documents for all civil works under the project's scope. The implication of this was that the main driver of the project's development impact—the execution of civil works to upgrade critical infrastructure—was to be preceded by a number of preparation activities, implementation of which proved invariably lengthy in practice.

2. Delays were substantial and impacted both Phase 1 and Phase 2 activities. Detailed designs and bidding documents for Phase 1 activities were finalized in mid-2011 with a 12-month delay, having incurred a 9-month procurement process and an 18-month service delivery period. The subsequent procurement of the associated Phase 1 works took a further six to eight months to complete, depending on package complexity. Delays worsened with regard to the production of design and bidding documents for Phase 2 activities, which were finalized by May 2013 with a two-year delay relative to plan. Procurement of the resulting Phase 2 works followed, again with a duration of six to eight months per package; in other words, no noticeable reduction in the duration of civil works procurement was realized between Phase 1 and Phase 2. Root causes for the various delays included a number of unforeseen challenges, chief among them (a) changes to the scope of the design work; (b) changes in river conditions relative to the feasibility study stage; and (c) longer-than-expected processing and approval procedures by the project implementing agencies.²

3. Significant implementation delays were also present in the procurement of consulting services for the project's main Technical Assistance (TA) activity under Component C. As a result of these delays, this TA activity, which provided support to VIWA on the management of maintenance dredging, river ports, landing stages, and ferry boat crossings, was launched more than two years later than originally planned.

Cost Overruns

4. The period between project appraisal (2008) and the procurement of civil works for Phase 2 activities (2012-2013) coincided with a three-year period of annual double-digit inflationary pressure in Vietnam. Between 2010 and 2012, Vietnam's annual economy-wide inflation averaged 12.5 percent, by far the highest among developing Southeast Asian countries during that span. Inflationary pressure for the construction market in particular was even higher, at an estimated average annual rate of 18.1 percent for 2010-2012. Even in U.S. dollar terms (i.e., controlling for the dong's depreciation against the dollar over that period) average annual inflation for the construction sector remained in double digits, at 11.2 percent, implying a roughly 50 percent

² Although delays in the form of implementation bottlenecks also impacted the construction period of civil works, these latter bottlenecks were, by and large, satisfactorily managed by the project implementing agencies in close coordination with the Bank.

increase in U.S. dollar construction unit costs between 2008 and 2012. Not surprisingly, the actual cost of civil works for Phase 2 activities was considerably higher than appraisal projections obtained five to six years earlier.³

5. In addition to inflationary pressure on unit costs, civil works were impacted by changes in technical specifications at the detailed design stage that resulted in increases in the quantity of works required compared to those originally planned on the basis of preliminary designs drawn up years earlier. This was particularly true for the Day-Ninh Co interconnecting canal (“DNC canal”), where changes in traffic levels since project appraisal had made it necessary to significantly expand the capacity and engineering design of a bridge crossing the canal (e.g., to provide the bridge with a lifting span). This resulted in a material increase in the cost of the canal complex.

6. As a result of the above cost increases, partially offset by some base-cost savings in the procurement of Corridor 1 works, river port improvement works, and two consulting services contracts, the cost of all activities under the project, including the DNC canal, is estimated at US\$221.3 million (see Table A2.1 below). The difference between the latter amount and the actual U.S. dollar value of the activities financed under the original credit, of US\$142.6 million, is US\$78.7 million, which is the amount of additional IDA financing being proposed. The Borrower has decided that the approximately US\$12.1 million difference between the actual cost of activities under the original credit (US\$142.6 million) and the actual value of available proceeds under the credit (US\$154.7 million) will be cancelled and reallocated to other Bank-financed projects in Vietnam’s portfolio. This will simplify implementation of the AF operation, as all disbursements under it will come from a single credit—the additional credit—rather than two.

³ While the procurement of Phase 1 works was exposed to some inflationary pressure, the impact of this on the cost of works relative to appraisal estimates was much reduced, as most Phase 1 procurement activities had been concluded by the middle of 2011. Moreover, the proximity of Phase 1 procurement processes to 2009, when Vietnam saw its lowest annual rate of economic growth since 1990 (except for 1999 at the height of the Asian economic crisis), and its aftermath in 2010, likely offset cost inflation as many—particularly domestic—contractors were generally perceived as being keen on issuing competitive financial proposals in an environment of markedly reduced demand (the project in fact realized savings in base costs for Phase 1 works). Both of these forces had largely dissipated by the time Phase 2 works were procured.

Table A2.1. NDTDP: Actual Implementation Costs Relative to Appraisal Estimates
Millions of US\$ (IDA financing only)

Component	Estimated Costs at Appraisal	Actual Costs	Actual vs. Appraisal Differential
Component A: Multimodal Corridors	141.0	198.8	57.8
1 Improvements to Corridor 1	57.0	47.0	(9.9)
2 Improvements to Corridor 3	5.7	8.6	2.9
3 Improvements to Lach Giang Estuary	49.9	61.8	12.0
4 Construction of DNC Canal	11.7	60.7	49.0
5 Improvements to Provincial Ports	6.7	6.1	(0.7)
6 Pilot Maintenance Contract	1.0	<i>Excluded</i>	
7 Design and Supervision	9.1	14.7	5.6
Component B: Ferry Boat Stages	4.3	4.7	0.4
Component C: Institutional Support	5.1	4.1	(1.0)
1 Institutional support to VIWA	1.0	0.9	(0.1)
2 Integrated Technical Audit	0.8	0.8	<i>nil</i>
3 Financial Audit	0.5	0.7	0.2
4 Training	0.5	0.5	<i>nil</i>
5 Preparation of a Future Transport Project	2.4	1.1	(1.3)
6 Independent Monitoring of RAP			
Implementation and Community Safety	-	0.2	0.2
Total Base Cost	150.4	207.7	57.2
Physical and Price Contingencies ^{1\}	19.6	13.7	
Total Cost	170.0	221.3	
Addenda:			
Actual value of original IDA credit ^{2\}	154.7		
Actual cost excluding DNC canal	142.6		
Unused funds from original IDA credit	12.1		
Additional Financing need	78.7		

1\ Physical and Price contingencies for the Actual Costs column refer to those associated with the DNC canal only, since all other activities under the project have been completed.

2\ Differential between initial and actual value of the original IDA credit is due to fluctuations in the SDR/US\$ exchange rate since appraisal. Most unused funds from the original credit have been cancelled by the Borrower so that the proposed AF operation may be financed out of a single credit—the additional credit.

Annex 3. Economic Analysis

VIETNAM: Northern Delta Transport Development Project Additional Financing

1. An economic analysis was conducted to determine the economic viability of constructing and operating the DNC canal. A standard discounted resource flow analysis of the net benefits and costs of building the canal, over a period of 25 years, was used to assess the canal's economic returns relative to a without-project, "business-as-usual" baseline.

DNC Canal Value Proposition

2. The purpose of building the DNC canal complex is to reduce transport and logistics costs associated with the movement of bulk freight via inland waterway vessels to and from Ninh Binh province.

3. Located approximately 100 kilometers south of Hanoi, Ninh Binh is a major center of industrial activity at the heart of the Red River Delta, with direct access to the coast at the Gulf of Tonkin via two main navigable tributaries of the Red River: the Day and Ninh Co rivers. Ninh Binh is home to a 330-MW power plant, two large cement plants with aggregate annual capacity of 5 million tons, and one steel plant with annual capacity of 365,000 tons. All three of these activities rely on large volumes of coal to be reliably supplied, day in and day out, to feed their operations. Ninh Binh province is therefore a major destination for coal movements, a commodity that in Vietnam is primarily transported via the waterways. Nationwide, it is estimated that approximately 79 percent of all coal movements take place via Vietnam's vast network of navigable rivers in both the Mekong and Red River deltas. In the particular case of Ninh Binh province, the incidence of inland waterway transport in the transportation of coal shipments is estimated to be higher than the national average, at approximately 85 percent. And substantially all the coal that is supplied to Ninh Binh province originates from Quang Ninh province, located up the coast from Ninh Binh to the northeast. Quang Ninh and Ninh Binh therefore form an important industrial corridor in Vietnam's northern region.

4. In addition to being a destination for coal, Ninh Binh is also an origin for the transportation of bulk commodities produced in the province: cement and steel, as listed above, in addition to limestone. These commodities, which are all inputs to Vietnam's rapidly-growing infrastructure and urban construction sector, are primarily transported to the main centers of national economic activity: the extended metropolitan areas of Hanoi, in the northern region, and Ho Chi Minh City (HCMC), in the southeastern region. It is estimated that approximately 40 percent of all cement and limestone produced in Ninh Binh, as well as 2 percent of steel, is transported via the waterways at present.

5. All waterway movements of coal from Quang Ninh to Ninh Binh, and all waterway movements of bulk products (cement, steel, and limestone) out of Ninh Binh, are handled through 3 main river ports located in Ninh Binh province, of which Ninh Phuc port, which has benefited

from infrastructure and equipment improvements under NDTDP, is by far the largest, with an estimated 2015 provincial tonnage share of 65 percent.

6. In 2015, an estimated 3.8 million tons of cargo (all bulk materials) moved through Ninh Binh’s provincial river ports. The majority of this cargo—2.2 million tons—was coal transported from Quang Ninh into Ninh Binh. The remaining 1.6 million tons were transported outbound from Ninh Binh, most of this (1.4 million tons) to destinations outside of the Hanoi/Red River Delta area. Table A3.1 presents an estimated origin-destination matrix for 2015 inland waterway cargo to/from Ninh Binh province.

Table A3.1. Estimated 2015 Origin-Destination Inland Waterway Flows To/From Ninh Binh Province
Millions of metric tons

Origin	Destination	Commodity	Tonnage
Quang Ninh	Ninh Binh	Coal	2.2
Ninh Binh	Hanoi	Cement	0.2
Ninh Binh	Hanoi	Steel	0.001
Ninh Binh	Hanoi	Limestone	0.1
Ninh Binh	ex-Red River Delta	Cement	1.1
Ninh Binh	ex-Red River Delta	Steel	0.004
Ninh Binh	ex-Red River Delta	Limestone	0.3
Total			3.8

7. There are generally two ways to transport coal from Quang Ninh to Ninh Binh via the waterways: (i) through the Red River delta inland waterway network, along the Luoc river, Red river, and Dao Nam Dinh river, traversing what is known as national waterway Corridor 2; and (ii) via the coastal route, utilizing sea-river vessels, from Quang Ninh through the Gulf of Tonkin, into the river network at the estuaries of either the Day or Ninh Co rivers, then on to Ninh Phuc port (primarily, but also other ports) located on the Day river. The coastal route is significantly shorter and generally far less constrained as to navigational depths relative to Corridor 2, but it is impacted by the presence of permanent sand bars at the mouths of both the Day and Ninh Co rivers, a result of sediment accumulation at these estuaries. The sand bars impede sea-going vessels from accessing the river network during most of the day, and sometimes entirely, depending on the time of year. To address this bottleneck, NDTDP’s original credit financed the construction of a bypass access channel at the Ninh Co river mouth, known as the Lach Giang estuary. This access channel, the most transformational piece of waterway infrastructure financed under the original credit, now provides sea-going vessels with constant access to the river network.

8. However, vessels destined to Ninh Phuc port and other destinations along the Day river utilizing the Lach Giang access channel (thus bypassing the sand bar at the river mouth) still need to find a way to switch from the Ninh Co river to the adjacent Day river. At present, such a passage is not only circuitous and time consuming as to its routing to/from the river mouth, but, critically, constrained as to navigational depths. This not only increases travel times, but also limits the size

of vessels that can reach Ninh Phuc port from the Ninh Co river, including substantially all sea-going cargo vessels, which are generally larger in size and capacity than river-only barges.

9. The DNC canal, by linking the Day and Ninh Co rivers in a more efficient manner, directly addresses this bottleneck. Specifically, the canal (a) is to be located at the point where the distance between the Day and Ninh Co rivers is the shortest and the facility is closest to the bypass access channel at Lach Giang; and (b) will allow 24/7 access to Ninh Phuc port to sea-going vessels up to 3,000 DWT in capacity by providing permanent passage between the Day and Ninh Co rivers via a navigational lock. With the DNC canal, the coastal route out of Quang Ninh and into Ninh Phuc port becomes more attractive for the transportation of freight than the traditional route via Corridor 2, because (a) it is approximately 82 kilometers shorter, and (b) allows for 2,000 DWT vessels (initially), and up to 3,000 DWT vessels (eventually), throughout the route, compared to a current average of approximately 300-500 DWT for self-propelled barges, and 800-1,200 DWT for push-convoys, along Corridor 2. The combination of a shorter, unimpeded route and larger vessels results in faster and more predictable travel times, less congestion in the waterways, fewer accidents, and lower emissions of greenhouse gases and local pollutants due to the much higher fuel efficiency per ton-kilometer transported made possible by the use of the larger vessels.

10. As regards cargo flows out of Ninh Phuc port, for those flows destined for markets outside the Red River Delta, without the DNC canal these flows need to be transshipped from barges to larger sea-going vessels at Haiphong port before embarking on longer journeys to Da Nang, HCMC, and, in some cases, international destinations. With the DNC canal, these flows would not need to transship at Haiphong, and would be able to access the coast directly, and faster, through the canal (and onwards via the Lach Giang bypass access channel). With regard to Ninh Phuc port flows destined to Hanoi, use of the DNC canal does not represent as big an improvement compared to flows destined for points outside of the Red River Delta, because (a) the Ninh Phuc port-Hanoi routing through the canal is longer than through the current combination of Corridors 2 and 3; and (b) depths all the way to Hanoi on Corridor 3 may not guarantee 24/7/365 access to 2,000 DWT and 3,000 DWT vessels. For this reason, and to be conservative in the definition of the value proposition of the DNC canal and the estimation of benefits accruing to its construction, the portion of tonnage out of Ninh Phuc port destined to Hanoi is assumed not to use the DNC canal.

Cost-Benefit Analysis

11. For the purposes of the Cost-Benefit Analysis (CBA) of the DNC canal, a without-project scenario was assumed as benchmark, in which no navigational capacity increases take place at Corridor 2, other than the provision of routine maintenance, through the analysis period of 25 years, from 2020 to 2045. In other words, this is used as a “do-minimum”, “business-as-usual” reference baseline. It was further assumed that construction of the DNC canal will take place during 2017-2019, including one year of procurement activities and two years of construction, and that operations would commence in 2020. Table A3.2 summarizes the expected demand growth for bulk commodities transported to and from Ninh Binh province (excluding the Hanoi market) via the waterways over the CBA period.

12. The calculation of net benefits generated by the with-project scenario compared to the without-project benchmark was conducted via a spreadsheet model of inland waterway

transportation that takes into consideration (a) the physical characteristics of the waterway routes used in each scenario regarding length, least available depth, and vessel carrying capacity; (b) the physical characteristics of the vessel fleet used in each scenario, as regards cargo carrying capacity, fixed costs of utilization (e.g., depreciation, insurance, crew, and maintenance), variable operating costs (chiefly among these, fuel), and speed; (c) the physical characteristics of the ports used, in this particular case the port of Haiphong (when used for transshipment activities in the without-project case), including waiting times and handling costs; and (d) the emission factors per ton-kilometer transported for CO₂, SO₂, and NO_x associated with the types of vessels used. Table A3.3 illustrates some of the key differences between vessels in the Red River Delta fleet.

Table A3.2. Projected Origin-Destination Inland Waterway Volume Growth, 2015-2045

Origin	Destination	Commodity	Average Annual Growth Rate			
			2015-2020	2020-2030	2030-2040	2040-2045
Quang Ninh	Ninh Binh	Coal	5.0%	5.5%	4.7%	4.0%
Ninh Binh	ex-Red River Delta	Cement	4.8%	5.3%	4.5%	3.7%
Ninh Binh	ex-Red River Delta	Steel	6.8%	6.0%	5.0%	4.2%
Ninh Binh	ex-Red River Delta	Limestone	6.8%	6.0%	5.0%	4.2%
Vietnam GDP			6.2%	6.0%	5.3%	4.7%

Table A3.3. Red River Delta Vessel Fleet Cost and Emissions Profile

DWT capacity	Fuel and lubricant costs per ton-km (US\$ cents)	Annual fixed costs of deployment (US\$)	Round-trip CO ₂ emissions (grams per ton-km)
200	0.40	42,491	88
500	0.40	94,591	52
800	0.32	136,174	44
1,200	0.25	188,992	39
1,600	0.20	299,837	36
2,000*	0.20	292,595	32
3,000*	0.16	382,625	30

*Sea-river vessels.

13. **Economic Benefits.** The analysis considered four sources of economic benefits associated with the use of the DNC canal: (i) reductions in transport costs, (ii) reductions in in-transit inventory carrying costs, (iii) reductions in the cost of navigational accidents, and (iv) reductions in the emissions of CO₂, SO₂, and NO_x. Based on current literature and cap-and-trade markets, the

economic value of a ton of CO₂ is assumed to be US\$35 in 2015, growing gradually in real terms to reach US\$50 in 2025 and US\$56 in 2028 and thereafter. The economic value of a ton of SO₂ and a ton of NO_x in 2015 was assumed to be US\$1,788 and US\$883, respectively. The incidence of these benefits is directly driven by (a) the volume of freight transported, expressed in ton-kilometers; and (b) the speed of adoption of the larger vessels that construction of the DNC canal would allow to reach all the way to Ninh Phuc port. Table A3.4 shows the assumptions made about the speed of adoption of larger vessels and the resulting projected transport volumes associated with transporting the commodities listed in Table A3.1 (under the growth profile shown in Table A3.2) in the with- and without-project scenarios.

Table A3.4. Projected Transport Volumes and Rate of Adoption of Larger Vessels

Year	Share of tonnage moved in 2000 DWT vessels	Millions of vessel ton-km transported	
		With DNC	Without DNC
2020	25%	978	1,111
2021	29%	1,007	1,172
2022	34%	1,037	1,237
2023	38%	1,067	1,305
2024	42%	1,097	1,377
2025	47%	1,127	1,453
2026	51%	1,157	1,532
2027	55%	1,187	1,616
2028	60%	1,216	1,704
2029	64%	1,246	1,797
2030	68%	1,274	1,896
2031	73%	1,297	1,990
2032	77%	1,318	2,088
2033	81%	1,338	2,192
2034	86%	1,357	2,301
2035	90%	1,374	2,415
2036	90%	1,436	2,523
2037	90%	1,500	2,635
2038	90%	1,567	2,753
2039	90%	1,637	2,875
2040	90%	1,711	3,004
2041	90%	1,779	3,123
2042	90%	1,850	3,246
2043	90%	1,923	3,374
2044	90%	2,000	3,508
2045	90%	2,079	3,647

14. **Economic Costs.** The economic costs associated with the project include the cost of producing a detailed design for the facility, the cost of land acquisition and resettlement compensation, and the cost of civil works and construction supervision, all assumed to have an aggregate economic value (i.e., excluding transfer payments such as direct and indirect taxes, as well as financing costs) of US\$97 million. This is based on the estimated costs of building the DNC canal in accordance with guidance obtained from PMU-W based on the facility’s detailed design, with conservative assumptions as to price, physical, and incidental contingencies. In addition, it was assumed that routine maintenance and insurance costs, with an economic value of US\$920,000, will be incurred every year throughout the period of analysis, as well as periodic maintenance every 10 years (for the years 2030 and 2040 within the period of analysis) of US\$7.6 million each. Lastly, “negative” economic costs of US\$18 million were assumed for the salvage economic value of the DNC facility at the end of the analysis period (2045).

15. **Economic Returns.** Comparing the economic benefits and costs of the with- and without-project scenarios yields an Economic Internal Rate of Return (EIRR) of 13.8 percent, which is well above the recommended economic discount rate of 6 percent (see Table A3.5). At this rate, DNC’s estimated Economic Net Present Value (ENPV) is estimated to be US\$153 million in 2016. Constructing the DNC canal is therefore found to be solidly viable economically, thereby resulting in net-positive benefits to the Vietnamese economy. Detailed results from the benefit-cost analysis at the resource flow level over the analysis period 2020-2045 are presented in Table A3.6.

Table A3.5. Economic Costs and Benefits of the DNC Canal Project
Millions of 2016 US\$ (except for EIRR, in percent)

Present Value of Cost Increases		Present Value of Cost Reductions				ENPV	EIRR
Capital	Recurrent	Transport	Inventory	Safety	Emissions		
(80.6)	(15.3)	208.5	1.6	0.4	38.6	153.1	13.8%

16. **Sensitivity Analysis.** Given the uncertainty embedded in the demand forecast and vessel adoption rate assumptions, sensitivity analysis was conducted to assess the robustness of the results presented in Table A3.5 to changes in the level of projected benefits and costs. The results of this analysis, presented in Table A3.7, show that the project remains economically viable relative to the benchmark discount rate of 6 percent even if costs are assumed to be 40 percent higher and, simultaneously, benefits are assumed to be 40 percent lower than under base-case assumptions. Further analysis shows that benefits and costs would both need to be 45 percent lower than projected—a highly unlikely outcome—for the project to fall below the viability threshold at the 6 percent discount rate. The economic viability of building the DNC canal is therefore assessed as robust.

Table A3.6. Economic Appraisal of the DNC Canal
Millions of 2016 US\$

Year	Capital Costs	Operation and maintenance costs	Net transport cost benefits	Net inventory carrying cost benefits	Net safety benefits	Net emission reduction benefits	Net resource flow
2016	(2)						(2)
2017	(5)						(5)
2018	(36)						(36)
2019	(54)						(54)
2020		(1)	4	0.03	0.005	1	4
2021		(1)	5	0.04	0.01	1	5
2022		(1)	6	0.04	0.01	1	6
2023		(1)	7	0.05	0.01	1	8
2024		(1)	9	0.06	0.01	1	9
2025		(1)	10	0.07	0.01	2	11
2026		(1)	11	0.08	0.02	2	13
2027		(1)	13	0.10	0.02	2	15
2028		(1)	15	0.11	0.02	3	17
2029		(1)	17	0.12	0.02	3	19
2030		(9)	19	0.14	0.03	4	14
2031		(1)	21	0.16	0.03	4	24
2032		(1)	23	0.17	0.04	4	27
2033		(1)	26	0.19	0.04	5	30
2034		(1)	29	0.22	0.05	5	34
2035		(1)	32	0.24	0.05	6	37
2036		(1)	33	0.25	0.06	6	39
2037		(1)	35	0.26	0.06	7	41
2038		(1)	36	0.28	0.07	7	42
2039		(1)	38	0.29	0.07	7	44
2040		(9)	39	0.30	0.08	7	39
2041		(1)	41	0.32	0.08	8	48
2042		(1)	43	0.33	0.09	8	50
2043		(1)	44	0.35	0.10	8	52
2044		(1)	46	0.36	0.10	9	54
2045	18	(1)	48	0.38	0.11	9	74
						ENPV@6%	153
						EIRR	13.8%

17. **Conservatism in Estimates.** Several instances of conservatism in the benefits and costs associated with the DNC canal project were reflected in the benefit-cost analysis to further reduce the risk of over-stating the project’s economic viability. Specifically, (i) the cost of civil works and construction supervision reflects conservatively ample levels of price, physical, and incidental contingencies; (ii) cargo flows, particularly for coal, were assumed to grow at a modest pace going

forward relative to GDP growth, which itself was assumed to grow slower than historically over the period of analysis; (iii) estimates consider the adoption and use of 2,000 DWT vessels throughout the analysis period, when in reality vessels up to 3,000 DWT will be able to reach Ninh Phuc port via the DNC canal, if built; (iii) the calculation of inventory carrying cost benefits reflects only changes in in-transit inventory, when in reality the levels of safety stock inventory would also be expected to fall as a result of the project; and (iv) no containerized volumes were modeled, even though the river ports of Ninh Binh province, which at the moment do not capture containerized freight, are likely to attract containerized cargo at some point in the future, especially if improvements like the DNC canal are implemented.

Table A3.7. Sensitivity Analysis of the DNC Canal Investment

**Net Present Value at 6% Under Lower Levels of Benefits and Costs
Relative to Base Case Assumptions**
Millions of 2016 US\$

Costs	Benefits				
	Base case	-10%	-20%	-30%	-40%
Base case	153	128	103	78	53
+10%	143	119	94	69	44
+20%	134	109	84	59	34
+30%	124	99	74	50	25
+40%	115	90	65	40	15

VIETNAM NORTHERN DELTA TRANSPORT DEVELOPMENT PROJECT

PROJECT COMPONENTS:

- CORRIDOR 1 (QUANG NINH - HAI PHONG - PHÁ LAI - HANOI - VIET TRI)
- CORRIDOR 3 (HANOI - LACH GIANG)
- - - - - NINH CO RIVER ESTUARY IMPROVEMENTS
- DAY - NINH CO CANAL (DNC)
- ★ ★ RIVER PORT IMPROVEMENTS
- PROJECT PROVINCES
- SELECTED CITIES
- PROVINCE CAPITALS
- NATIONAL CAPITAL
- PROVINCE BOUNDARIES
- INTERNATIONAL BOUNDARIES



This map was produced by the Map Design Unit of The World Bank. The boundaries, colors, denominations and any other information shown on this map do not imply, on the part of The World Bank Group, any judgment on the legal status of any territory, or any endorsement or acceptance of such boundaries.