

DETAILED ECONOMIC ANALYSIS

A. Overview

1. Extensive research has shown the importance of, and significant returns from, investments in education. There is growing international consensus that education, even at the early stage of childhood development,¹ is critical to economic growth and development.² Cost-benefit studies of high-quality child education programs have consistently found substantial long-term benefits derived over the course of many years and decades. A particular study indicated that increasing investment in good quality education for child development is one of the most cost-effective strategies for breaking the inter-generational transmission of poverty and improving productivity and social cohesion in the long run. These education programs contribute to strengthening the prospects of children achieving their full potential and enable the country to improve its future competitiveness and overcome the challenges of an aging population and the transition from a middle- to high-income economy.³ The effects are positive, long-lasting, and largest for the most disadvantaged. Education is especially vital in developing economies where an expansion of the supply of skilled workers allows the economy and industries to modernize, adopt new technologies, attract foreign investment, increase productivity and trade competitiveness, and better respond to new opportunities created by shifting markets. Education also promotes inclusive growth.

2. In addition to benefiting the economy, education and human capital accumulation are critical in determining employment outcomes for individuals. In particular, many economic development studies have demonstrated significant wage returns to education, with most finding that one additional year of schooling raises an individual's earnings by about 10%.⁴ The returns to primary and secondary schooling are particularly high in less developed countries, and secondary education appears particularly important in rapidly growing economies, including those in Asia.⁵ Many studies have found that completion of secondary education by girls has a large impact on wages, as well as broader impacts such as participation in the formal labor market and non-agriculture sectors.⁶

1. Education in the Viet Nam Context

3. Viet Nam's economic objective during 2011–2020 is to maintain macroeconomic stability, with gross domestic product (GDP) growing at 7%–8% per year. In order to sustain and enhance the growth and competitiveness of the economy and to counter economic downturn, the government has maintained sound economic policies while acknowledging the need to invest in the development of a more skilled labor force. Upgrading of the labor force is needed in order to modernize and increase the efficiency of the industrial, agricultural, and services sectors, develop an intellectual economy, rapidly increase exports, and increase technological and scientific content in domestic products. A key factor towards achieving this is increased

¹ Boocock, S.S. 1995. "Early Childhood Programs in Other Nations: Goals and Outcomes." *The Future of Children, Long-term Outcomes of Early Childhood Programs*. Vol. 5, No. 3.

² See, for example, Cohen, D. and M. Soto. 2007. Growth and Human Capital: Good Data, Good Results. *J. Econ. Growth*, 12: 51–76.

³ Kin B.W., M.E. Young, and J. Cai. 2012. *Early Child Development in China*. World Bank eLibrary.

⁴ Psacharopoulos, G. and H.A. Patrinos. 2004. Returns to Investment in Education: A Further Update. *Educ. Econ.* 12 (2):111–35.

⁵ Barro, R. and J. Lee. 2010. A New Data Set of Educational Attainment in the World, 1950–2010. *NBER Working Paper 15902*.

⁶ C. Spohr. 2003. Formal Schooling and Workforce Participation in a Rapidly Developing Economy: Evidence from Compulsory Junior High School in Taipei, China. *J. Dev. Econ.*, 70 (2): 291–327.

productivity among young laborers, who make up half of the total labor force. This may be achieved by strengthening the quality of middle skill workers who enter the labor market after graduating with an upper secondary or higher education qualification. Lower secondary education (LSE) is therefore particularly important in providing a strong foundation for the youth to learn and acquire the skills required for adapting to and applying new technologies. An equally important issue recognized by the government is promoting balanced development between the rich and the poor, especially for disadvantaged groups. Recent programs, including those for education, seek to improve the socioeconomic condition of poor, remote, and disadvantaged regions. Education that aims to improve labor skills for local economic development is a government priority. Focus on encouraging young girls to attend and continue LSE is currently being accorded high priority in order for them increase participation in the formal labor market and non-agriculture sectors.

2. Education Sector Context

4. Public and private investment in education at all levels has been substantial in Viet Nam since the comprehensive socioeconomic reform policy, “*Doi Moi*,” was initiated in 1986. Increased government and household education spending at all levels has had a direct impact on access to, and participation in, education. In recent years, enrolment in primary, lower secondary, and upper secondary schools has increased significantly. However, net enrolment rate (NER), by socioeconomic status, indicated that secondary education enrolment in 2010 was only 23.2% for the poorest households compared with 56.1%–82.3% for the average to well-off households.

5. The challenge for LSE is that more densely settled urban areas have better access to sectors with employment growth which, in turn, provide more immediate benefits to school leavers. Poorer rural and remote areas depend more on agriculture and have declining employment opportunities, less access to post-school training opportunities, and include more ethnic minority (EM) students. Moreover, in poor rural areas, families see the costs of allowing children to continue at school and the loss of more immediate earnings as barriers to keeping students in school. Improving access to affordable, quality schooling is therefore an important step towards improving long-term outcomes for poor families. The challenge for Viet Nam’s education sector is to improve access to LSE among ethnic, gender, and socioeconomic groups as well as improve teaching and learning methods and materials that are relevant to local requirements. Of equal importance is the need for further investments in new school classrooms, equipment, textbooks, and learning materials in remote disadvantaged areas, supported by strengthened teacher capacity, improved education sector management, and increased awareness among parents and students of the need to continue schooling.

B. The Project

6. The project will assist the Government of Viet Nam (GOV) in creating strategic and long-term changes to further develop the country’s LSE and human resources in order to sustain the achievements of the Lower Secondary Education for the Most Disadvantaged Regions Project (LSEMDRP).⁷ The project will have a substantial strategic impact on the three key dimensions of LSE in the most disadvantaged regions, viz., access and equity, quality and relevance, and efficiency and sustainability.

⁷ ADB. 2007. *Report and Recommendation of the President to the Board of Directors for the Proposed Loan to the Socialist Republic of Viet Nam for the Lower Secondary Education for the Most Disadvantaged Regions Project*. Manila.

7. **Output 1: Increased access to LSE and LSE equivalency program.** The proposed interventions under Output 1 will contribute to increasing the number of LSE student enrollees in the project provinces. The civil works to improve and construct 660 new classrooms, 100 additional subject rooms, and 70 libraries will increase the capacity of LSE schools and attract about 29,700 new Grade 6 student-enrollees annually. The construction of 350 semi-boarder facilities will accommodate an additional 3,780 students who encounter geographical and transportation difficulties in attending school. These, together with the awareness building program that will target EM and disadvantaged communities will encourage an additional 33,471⁸ LSE students to attend school. A total of 66,951 new students will be enrolled yearly under the project, resulting in an average NER of about 90%, compared with 84% before the project. Dropout rates, on average, are expected to decrease from 2.4% to 1.8%, and promotion and completion rates are envisioned to improve from 94.5% to 97.7% and 98.4% to 99.5%, respectively.

8. **Output 2: Decentralization of learning and teaching tools developed.** Project interventions under Output 2 will improve the quality and relevance of LSE for EM students through decentralization of learning and teaching. This is envisioned to improve the quality of LSE graduates, especially EM students, by providing them with better knowledge and skills in preparation for higher education. LSE graduates who do not have the opportunity to seek higher education, will join the labor market and look for opportunities for employment. With acquired improved knowledge and skills, their potential salary will be higher than that of other job-seekers who have not attended LSE. A study conducted in Viet Nam estimated that one year of education increases the average earning capacity of an individual by 11%. For students who have completed the four-year LSE requirements, this means that they have greater potential earning capacity (about 45% more) compared with those with only primary education.⁹ It is estimated that the future earnings of students who have completed LSE is about VND13.7 million/person/year compared with VND9.4 million/person/year for those who completed only primary education.¹⁰

9. The project will also introduce a new curriculum for disaster management education to help improve living conditions and the condition of the schools in typhoon-affected coastal areas. It will also construct buildings that can withstand typhoons and floods and serve as shelters for residents. These interventions will, in turn, improve the capacity of residents to cope with the impacts of natural calamities, thereby, reducing losses of life and property arising from the occurrence of strong typhoons every year.

10. **Output 3: New school clustering established.** The project will also contribute to improving the quality of planning and management of LSE schools through activities proposed under Output 3. School clustering and provision of block grants for selected EM LSSs in 28 provinces will empower officials and staff of beneficiary schools and communities to carry out initiatives for improving their respective schools according to their own needs and plans. The establishment of a strong network among schools and communities will facilitate cooperation in the use of school resources. It will also provide a framework for greater decentralization of financial management to school levels, thereby improving efficiency among LSSs. Improved efficiency in the use and management of education resources will reduce the unit cost per student from VND11.46 million/student/year to VND5.30 million/student/year, or a reduction of about 54%.

⁸ This is about 1.5% of the total children in the project area that are within the age group eligible for LSE.

⁹ Nguyen X.T. 2006. *Estimating the Return to Education in Viet Nam: A Difference-in-Difference Approach*.

¹⁰ Consultant estimates based on interviews conducted during the PPTA.

11. **Output 4: Project implementation and monitoring and evaluation capacity enhanced.** The project will improve project management and implementation through activities under Output 4. Training in project management for education planners, school principals, and administrators in charge of EM education and LSE equivalency programs will ensure that the proposed project interventions/activities will be implemented on time and within budget.

C. Contribution of the Project to NER in the Project Area

12. Current LSE NERs for Grades 6–9 in the project area are 83% in the Northern Midland and Mountainous and Central Highland area, 79% in the Mekong River Delta area, and 92% in the North Central and Central Coastal area, or an average of 84% overall (Table 1).

Table 1: Contribution of Project to NER in the Project Area

Region	With Project						
	Children in Age Group Belonging to LSE Level ^a	Total Current Students Enrolled	Net Enrolment Rate (NER) Before Project ^a	Additional New Student-enrollees due to Project ^b	Total LSE Enrolment due to Project ^b	New NER due to Project ^b	Increase in NER due to Additional Students ^b
	(28 Provinces)	(28 Provinces)	(28 Provinces)		(28 Provinces)	(28 Provinces)	(28 Provinces)
	[1]	[2]	[3] = [2] ÷ [1]	[4]	[5] = [2] + [4]	[6] = [5] ÷ [1]	[7] = [6] - [3]
Northern Midland and Mountainous Area	573,308	475,754	83%	15,756	491,510	86%	3%
Central Highland Area	316,357	262,165	83%	9,991	272,156	86%	3%
Mekong River Delta Area	296,671	234,778	79%	8,483	243,261	82%	3%
North Central and Central Coastal Area	1,088,384	1,000,432	92%	32,721	1,033,153	95%	3%
Average/Total	2,274,719	1,973,129	84%	66,951	2,040,080	90%	6%

^a Obtained from the Ministry of Education and Training, Department of Planning and Finance.

^b Consultant estimates.

13. Under the project, student enrolment is envisioned to increase by about 66,951 students as a result of the (i) improvement and construction of 660 classrooms, which will accommodate an additional 29,700 students; (ii) construction of semi-boardings facilities, which will house 3,780 students; and (iii) awareness building program on the importance of LSE, which will encourage an additional 33,471 LSE students to attend LSS. As a consequence, total LSE student enrolment in the project will increase from 1,973,129 to 2,040,080 students, with an overall NER of 90% for the project area. The contribution of the project to overall NER of the four regions is about 6% (Table 1). In the Northern Midland and Mountainous area, enrolment is expected to increase from 475,754 to 491,510 students; in the Central Highland area, from 262,165 to 272,156 students; in the Mekong River Delta area, from 234,778 to 243,261 students; and in the North Central and Central Coastal area, from 1,000,432 to 1,033,153 students. Correspondingly, region-specific NER is expected to increase from 83% to 86% for the Northern Midland and Mountainous and Central Highland areas, from 79% to 82% for the Mekong River Delta area, and from 92% to 95% for the North Central and Central Coastal area (Table 1).

14. A scenario in which enrolment rates will fall short by 20% is considered to determine the impact on the NER of each region and the project as a whole. Enrolment rate falling short by 20% of target will result in an NER of 89% for the whole project, about 85% in the Northern Midland and Mountainous area, 85% in the Central Highland area, 81% for the Mekong River Delta area, and 94% for the North Central and Central Coastal area (Table 2).

Table 2: Contribution of the Project to NER at 20% Short of Target Enrolment

Region	With Project						
	Children in Age Group Belonging to LSE Level ^a	Total Current Students Enrolled Grades 6-9 ^a	Net Enrolment Rate (NER) Before Project ^a	Additional New Student-enrollees at Enrolment Short by 20% ^b	Total LSE Enrolment at Enrolment Short by 20% ^b	New NER - Enrolment Short by 20% ^b	Increase in NER due to Additional Students ^b
	(28 Provinces)	(28 Provinces)	(28 Provinces)	(28 Provinces)	(28 Provinces)	(28 Provinces)	(28 Provinces)
	[1]	[2]	[3] = [2] ÷ [1]	[4]	[5] = [2] + [4]	[6] = [5] ÷ [1]	[7] = [6] - [3]
Northern Midland and Mountainous Area	573,308	475,754	83%	12,605	488,359	85%	2%
Central Highland Area	316,357	262,165	83%	7,993	270,158	85%	3%
Mekong River Delta Area	296,671	234,778	79%	6,786	241,564	81%	2%
North Central and Central Coastal Area	1,088,384	1,000,432	92%	26,177	1,026,609	94%	2%
Average/Total	2,274,719	1,973,129	84%	53,561	2,026,690	89%	5%

^a Obtained from the Ministry of Education and Training, Department of Planning and Finance.

^b Consultant estimates.

D. Economic Analysis¹¹

1. Assumptions Used in the Economic Analysis of the Project

15. The economic analysis was carried out in accordance with *ADB's Guidelines for the Economic Analysis of Projects* (1993). Key assumptions used in the economic analysis include the following:

- (i) Economic costs are in constant early 2014 prices and estimated using world price numeraire method;
- (ii) Standard conversion factor (SCF)=0.9; shadow wage rate factor (SWRF)=0.8;¹²
- (iii) Total project capital investment cost (excluding price contingencies, interest charges, fees, and taxes) is spread over the duration of project implementation of six years;
- (iv) Incremental operation and maintenance (O&M) costs assumed at 3.0% of total capital cost;
- (v) Replacement of equipment assumed to be carried out every five years;
- (vi) Recurrent cost of LSE schools for each of the four regions and the project is based on an average cost of VND5.88 million/student/year (MOET, 2013); this is inflated to its 2020 value and then multiplied by the estimated number of students to arrive at the value of recurrent cost for each region and the whole project;
- (vii) Opportunity cost of LSE students based on VND1,960,827/student/year,¹³
- (viii) Project life assumed at 25 years;
- (ix) Number of students completing LSE requirements assumed to remain at 2023 levels throughout project life; and
- (x) Discount rate of 12% applied in the calculation of project economic internal rate of return (EIRR).

¹¹ The economic analysis was undertaken in accordance with ADB's *Guidelines for Economic Analysis of Projects* (1993). The detailed economic analysis for the Northern Midland and Mountainous area, Central Highland area, Mekong River Delta area, and North Central and Central Coastal area are presented in Annexes B, C, D, and E, respectively.

¹² ADB. 2013. *Report and Recommendation of the President to the Board of Directors to the Socialist Republic of Viet Nam for the Productive Rural Infrastructure Sector Project in the Central Highlands*. Manila.

¹³ The value of wage earnings of LSE students is based on a study by Gallup, which estimated that the average wage rate of child labor was VND896/hour in 1995. Based on an employment rate of 50%, which assumes that some time is provided for other activities that children are normally involved in, such as play time and other non-income generating activities, the adjusted average rate (opportunity cost) is estimated at VND448/hour. Adjusting for inflation, the average wage rate, in 2014 value, is estimated at about VND6,536/hour or about VND26,144/day for a four-hour work-day or about VND1,960,827/year. Source: Gallup, J. 1995. *The Economic Value of Children in Viet Nam*. Institutes of Economics and Sociology, Hanoi, Viet Nam.

2. Quantification of Project Benefits

16. A standard method of cost-benefit analysis was used to calculate the project EIRR, i.e., the discount rate that makes the NPV of costs and benefits equal, which, in turn, served as basis for determining the economic viability of the project investments. The quantified project benefits are described below.

17. **Improved future income-generating capacity of LSE graduates.** In the long term, the strengthened capacity of school administrators and teachers will generate better educated LSE students with improved life and learning skills. These students will have greater opportunities to continue on to higher education as well as improve their income-generating capacity. For students who decide to work right after LSE, the cognitive and technical skills which they acquired from their lower secondary schooling will allow them to receive higher wages compared with those who completed only primary education. In quantifying the benefits generated by LSE students due to the project, the annualized NPV of the future incremental income stream of the additional number of LSE students (66,951 students) was estimated over a period of 20 years during which they were assumed to remain employed. The incremental future earnings of students having completed LSE was estimated based on the difference in earning of one who completed LSE, estimated at VND13.7 million/person/year, and one with only primary education (VND9.4 million/person/year). The projected number of LSE students completing LSE was based on the information provided in Table 3.

Table 3: Information for Projecting Benefits from Improved Income-generating Capacity of LSE Graduates

Region	Without Project			Annual New Grade 6 Enrollees	Annual Wage Earning (VND)
	Dropout Rate	Promotion Rate	Completion Rate		
Northern Midland and Mountainous Area	1.4%	96.8%	99.4%	11,587	9,369,108
Central Highland Area	3.9%	88.9%	98.1%	9,013	9,369,108
Mekong River Delta Area	3.4%	94.7%	98.0%	7,187	9,369,108
North Central and Central Coastal Area	1.0%	97.6%	98.2%	29,707	9,369,108
Average/Total	2.4%	94.5%	98.4%	57,494	9,369,108
Region	With Project			Annual New Grade 6 Enrollees	Annual Wage Earning (VND)
	Dropout Rate	Promotion Rate	Completion Rate		
Northern Midland and Mountainous Area	1.0%	99.0%	100.0%	15,756	13,717,311
Central Highland Area	2.5%	93.0%	99.5%	9,991	13,717,311
Mekong River Delta Area	2.5%	97.0%	99.5%	8,483	13,717,311
North Central and Central Coastal Area	0.8%	99.0%	99.5%	32,721	13,717,311
Average/Total	1.7%	97.0%	99.6%	66,951	13,717,311

18. It is expected that the impact of the project will start to be felt starting in 2020, when all civil works would have been completed, and the improvements in curriculum, educational materials, learning facilities, and teacher capacity implemented. As a consequence, the dropout, promotion, and completion rates under the project are expected to improve gradually every year until the target rates of 1.8%, 97.0%, and 99.6%, respectively, are reached by 2020. The incremental number of students completing LSE each year was projected to increase from 39,995 students in 2020 to 63,598 students in 2022, or a total of 1,236,489 students over the 20-year period of 2020–2039 (Table 4).

Table 4: Projected Number of Students, “with” vs. “without” Project Situation

Year	Without Project			With Project			
	Number of Student Enrollees	Number of Student Enrollees	Incremental Number of Student Enrollees	Number of Students Net of Drop-outs	Number of Students Promoted	Projected Incremental Students Completing LSE per Year	Projected LSE Graduates Finding Employment
2015	57,494	57,494	-				
2016	57,494	57,494	-				
2017	57,494	99,556	42,062	41,346	40,106		
2018	57,494	112,001	54,507	53,579	51,971		
2019	57,494	124,445	66,951	65,811	63,837		
2020	57,494	124,445	66,951	65,811	63,837	39,955	24,373
2021	57,494	124,445	66,951	65,811	63,837	51,776	31,584
2022	57,494	124,445	66,951	65,811	63,837	63,598	38,795
2023	57,494	124,445	66,951	65,811	63,837	63,598	38,795
2024	57,494	124,445	66,951	65,811	63,837	63,598	38,795
2025	57,494	124,445	66,951	65,811	63,837	63,598	38,795
2026	57,494	124,445	66,951	65,811	63,837	63,598	38,795
2027	57,494	124,445	66,951	65,811	63,837	63,598	38,795
2028	57,494	124,445	66,951	65,811	63,837	63,598	38,795
2029	57,494	124,445	66,951	65,811	63,837	63,598	38,795
2030	57,494	124,445	66,951	65,811	63,837	63,598	38,795
2031	57,494	124,445	66,951	65,811	63,837	63,598	38,795
2032	57,494	124,445	66,951	65,811	63,837	63,598	38,795
2033	57,494	124,445	66,951	65,811	63,837	63,598	38,795
2034	57,494	124,445	66,951	65,811	63,837	63,598	38,795
2035	57,494	124,445	66,951	65,811	63,837	63,598	38,795
2036	57,494	124,445	66,951	65,811	63,837	63,598	38,795
2037	57,494	124,445	66,951	65,811	63,837	63,598	38,795
2038	57,494	124,445	66,951	65,811	63,837	63,598	38,795
2039	57,494	124,445	66,951	65,811	63,837	63,598	38,795
Total	1,437,353	2,939,897	1,502,545	1,476,964	1,432,655	1,236,489	754,259

Notes:

Dropout rate under "with project" situation =	1.7%
Promotion rate under "with project" situation =	97.0%
Completion rate under "with project" situation =	99.6%
Employment rate of LSE students =	61%

19. The benefits generated from increased annual LSE student enrolment are closely related to the expected future benefits to be generated from increased potential income-generating capacity of LSE students. Of the projected total number of students (1,236,489) completing LSE requirements during the period, 2020–2039, a total of 755,259 students are expected to find employment (Table 4).¹⁴

20. The current annual wage earning of workers without LSE credentials is about VND23,891,220, which is the average annual wage for jobs (e.g., security services, food delivery services, clerical services, and public/private driving services), which typically hire workers with this qualification. The expected earning of students who completed all LSE requirements was calculated by adjusting this basic annual wage earning (i.e., VND23,891,220/student/year) by a factor of 1.1¹⁵ for each year of LSE completed from Grade 6 to 9. The resulting estimate is the value of expected annual wage earning of workers with LSE credentials, which is about VND34,979,135/student/year. In order to estimate the potential future annual earnings of a student without LSE credentials and one with LSE credentials, their respective annual earnings were projected over a 20-year period, the minimum number of employment years assumed in the analysis, and their corresponding NPVs at a 12% discount rate were calculated. The NPV of the stream of wage earnings for each student was then annualized to calculate the estimated future annual earnings of a student without and with LSE credentials.¹⁶ The expected annual future

¹⁴ This was based on a labor participation rate or 0.61 for labor force within the age of 15–24 years. Source: <http://www.indexmundi.com/facts/vietnam/labor-participation-rate>

¹⁵ Based on the findings of G. Psacharopoulos and H.A. Patrinos, 2004.

¹⁶ Annualized wage earning was obtained by dividing the NPV of projected annual wage earnings by 20 years, e.g., VND187,382,162 ÷ 20 = VND9,396,108 and VND274,346,223 ÷ 20 = VND13,717,311.

earnings of a student without and with LSE credentials are at VND9,369,108 and VND13,717,311, respectively (Table 5).

Table 5: Estimated Future Annual Earning of Students with vs. without LSE Credentials

Year	Average Annual Wage Without LSE	Average Annual Wage With LSE
2016		
2017		
2018		
2019		
2020	23,891,220	34,979,135
2021	23,891,220	34,979,135
2022	23,891,220	34,979,135
2023	23,891,220	34,979,135
2024	23,891,220	34,979,135
2025	23,891,220	34,979,135
2026	23,891,220	34,979,135
2027	23,891,220	34,979,135
2028	23,891,220	34,979,135
2029	23,891,220	34,979,135
2030	23,891,220	34,979,135
2031	23,891,220	34,979,135
2032	23,891,220	34,979,135
2033	23,891,220	34,979,135
2034	23,891,220	34,979,135
2035	23,891,220	34,979,135
2036	23,891,220	34,979,135
2037	23,891,220	34,979,135
2038	23,891,220	34,979,135
2039	23,891,220	34,979,135
NPV@12%	187,382,162	274,346,223
Annualized wage	9,369,108	13,717,311

Note: It is assumed that for each additional year of education, expected salary will increase by 10%.

21. Adjusting the annualized wage earnings with a shadow wage rate factor of 0.8, the economic values of VND7,495,286¹⁷ and VND10,973,849¹⁸ were estimated as the economic value of future annual wage earnings of students without and with LSE credentials, respectively, or an incremental annual earning of VND4,348,203 for a student having completed all the requirements of Grades 6–9. The total benefit accruing to the project is the total value of the incremental benefits generated by an employed LSE student over his/her 20-year employment period multiplied by the number of employed LSE students generated under the project. Over a 20-year period, students who have completed all LSE requirements and are able to find employment are projected to generate accumulated incremental income earnings of about VND26,859.42 billion in economic terms. The projected incremental benefits are presented in Table 6.

¹⁷ Calculated as VND9,369,108 x 0.8 = VND7,495,286.

¹⁸ Calculated as VND13,717,311 x 0.8 = VND10,973,849.

Table 6: Economic Benefits from Future Incremental Income

Year	Incremental Number of Students Completing LSE	Total Students With LSE Credentials Finding Employment	Projected Annual Incremental Income of Students With LSE Credentials (Financial) (VND billion)	Accumulated Incremental Income of Students With LSE Credentials (Financial) (VND billion)	Accumulated Incremental Income of Students With LSE Credentials (Economic) (VND billion)
2016					
2017					
2018					
2019					
2020	39,955	24,373	105.98	105.98	84.78
2021	51,776	31,584	137.33	243.31	194.65
2022	63,598	38,795	168.69	412.00	329.60
2023	63,598	38,795	168.69	580.68	464.55
2024	63,598	38,795	168.69	749.37	599.50
2025	63,598	38,795	168.69	918.06	734.45
2026	63,598	38,795	168.69	1,086.74	869.39
2027	63,598	38,795	168.69	1,255.43	1,004.34
2028	63,598	38,795	168.69	1,424.12	1,139.29
2029	63,598	38,795	168.69	1,592.80	1,274.24
2030	63,598	38,795	168.69	1,761.49	1,409.19
2031	63,598	38,795	168.69	1,930.18	1,544.14
2032	63,598	38,795	168.69	2,098.86	1,679.09
2033	63,598	38,795	168.69	2,267.55	1,814.04
2034	63,598	38,795	168.69	2,436.24	1,948.99
2035	63,598	38,795	168.69	2,604.92	2,083.94
2036	63,598	38,795	168.69	2,773.61	2,218.89
2037	63,598	38,795	168.69	2,942.30	2,353.84
2038	63,598	38,795	168.69	3,110.98	2,488.79
2039	63,598	38,795	168.69	3,279.67	2,623.74
Total	1,236,489	754,259	3,279.67	33,574.28	26,859.42
Earning of non-LSE students (VND/year) =			9,369,108		
Earning of LSE students (VND/year) =			13,717,311		
Earning increment (VND/year) =			4,348,203		
Employment rate of LSE students =			61%		
Shadow wage rate factor =			0.8		

22. **Improved management of LSE schools.** The strengthened capacity of education administrators and managers in planning and management will result in the improved efficiency of school operations and delivery of educational/instructional services in disadvantaged areas. School principals and BOET, DOET and MOET staff will receive training and support in planning and management issues, particularly on inclusive school development planning and management of pro-poor education initiatives. MOET staff will receive in-country and overseas training in policy planning for disadvantaged groups. Learning support through supplementary instructional materials in EM and awareness-raising activities will likewise improve learning outcomes, lower repetition and dropout rates, and improve promotion and completion rates. The proposed project is expected to improve cost-effectiveness by increasing capacity utilization of LSSs, thereby reducing the unit cost of financing LSE students. In estimating the incremental benefits due to improved cost efficiency in LSE schools, the difference between the annual cost of financing one LSE student under the “without project” situation and the annual cost of one LSE student under the “with project” situation multiplied by the total incremental number of students was projected over a period of 20 years.

23. Under the “without project” situation, the annual cost of LSE schools in 2020 projected at about VND658.99 billion, or an average cost per LSE student of VND11.46 million at a total enrolment of 57,494 LSE students. At a projected annual growth rate of 10%, the cost per LSE student is expected to increase to VND70.10 million in 2039. Under the “with project” situation, the number of students in 2020 is expected to increase to 124,445, and the cost per LSE student is estimated at VND5.30 million/student/year, a reduction of VND6.17 million/student/year. By 2039, the cost per LSE student is estimated at VND32.29 million/student/ year, a reduction of VND37.71 million/student/year (Table 7).

Table 7: Projected Economic Benefits from Improved Efficiency in LSE School Operations

Year	Without Project			With Project		Estimated Reduced Cost per LSE Student (Financial) ([6]=[5] - [3]) (VND million)	Financial Value of Benefits from Improved Efficiency in LSE ([7]=[6] x [4]) (VND billion)	Economic Value of Benefits from Improved Efficiency in LSE ^b ([8]=[7] x 0.9) (VND billion)
	Total LSE Annual Cost ^a ([1]) (VND billion)	Total Number of LSE Students ([2])	Average LSE Cost per Student (Financial) ([3]) (VND million)	Total Number of LSE Students ([4])	Average LSE Cost per Student (Financial) ([5]) (VND million)			
2016								
2017								
2018								
2019								
2020	658.99	57,494	11.46	124,445	5.30	6.17	767.39	690.65
2021	724.89	57,494	12.61	124,445	5.82	6.78	844.13	759.72
2022	797.38	57,494	13.87	124,445	6.41	7.46	928.54	835.69
2023	877.12	57,494	15.26	124,445	7.05	8.21	1,021.39	919.26
2024	964.83	57,494	16.78	124,445	7.75	9.03	1,123.53	1,011.18
2025	1,061.31	57,494	18.46	124,445	8.53	9.93	1,235.89	1,112.30
2026	1,167.44	57,494	20.31	124,445	9.38	10.92	1,359.48	1,223.53
2027	1,284.19	57,494	22.34	124,445	10.32	12.02	1,495.42	1,345.88
2028	1,412.61	57,494	24.57	124,445	11.35	13.22	1,644.97	1,480.47
2029	1,553.87	57,494	27.03	124,445	12.49	14.54	1,809.46	1,628.52
2030	1,709.26	57,494	29.73	124,445	13.73	15.99	1,990.41	1,791.37
2031	1,880.18	57,494	32.70	124,445	15.11	17.59	2,189.45	1,970.51
2032	2,068.20	57,494	35.97	124,445	16.62	19.35	2,408.40	2,167.56
2033	2,275.02	57,494	39.57	124,445	18.28	21.29	2,649.23	2,384.31
2034	2,502.52	57,494	43.53	124,445	20.11	23.42	2,914.16	2,622.74
2035	2,752.77	57,494	47.88	124,445	22.12	25.76	3,205.57	2,885.02
2036	3,028.05	57,494	52.67	124,445	24.33	28.33	3,526.13	3,173.52
2037	3,330.86	57,494	57.93	124,445	26.77	31.17	3,878.74	3,490.87
2038	3,663.94	57,494	63.73	124,445	29.44	34.29	4,266.62	3,839.96
2039	4,030.34	57,494	70.10	124,445	32.39	37.71	4,693.28	4,223.95
Total	37,743.78							39,556.98

^a Total annual LSE cost is projected to increase by about 10% every year.

^b Adjusted by SCF = 0.9

24. Total financial benefit due to the project is estimated by multiplying the reduced cost per student under the “with project” situation by the total number of students under the “with project” situation. The estimated financial benefit from improved efficiency in LSE was estimated at about VND767.39 billion (VND690.65 billion in economic terms) in 2020 and increasing to VND4,693.28 billion (VND4,223.95 billion in economic terms) in 2039. Total economic benefits due to improved efficiency is about VND39,556.98 billion for the period 2020–2039 (Table 7).

25. **Improved sanitation and hygienic conditions.** The World Health Organization (WHO) reported that improving water supply and sanitation can have a significant impact on human health. Potential reductions in morbidity as a result of improvements in water supply and sanitation are 80%–100% for cholera and typhoid, and 40%–50% for diarrheal diseases, dysentery, and gastroenteritis.¹⁹ The provision of sanitation facilities will, therefore, contribute to improved sanitation and hygienic practices in LSSs which are, in turn, expected to result in improved health conditions among students. Expression of these benefits in monetary terms was based on a cost of medical treatment of VND2.6 million/person/episode and an incidence rate of gastrointestinal diseases of 0.345%,²⁰ which is envisioned to decrease to about 0.1725% due to the project.

26. The improved sanitation facilities in LSE schools are envisioned to significantly reduce the incidence of gastrointestinal diseases among all students enrolled in LSE schools in the project

¹⁹ WHO. n.d. Water and Public Health, WHO Seminar Pack for Drinking-Water Quality, http://www.who.int/water_sanitation_health/dwq/en.

²⁰ The total number of cases of diarrheal disease in 2009 in Viet Nam was estimated at 296,000. The total population of the country at that time was 85,789,573 people, for an incidence rate of 0.345%. http://en.wikipedia.org/wiki/Environmental_issues_in_Vietnam

provinces. Disease incidence rate is expected to decline from 0.345%²¹ (without project) to 0.1725% (with project), or a reduction of about 50%.²² The number of persons falling ill annually under the “without project” situation was estimated at 1,484 and assumed to experience at least two episodes a year or about 2,967 episodes a year. Average financial cost of medical treatment²³ was estimated at VND2.59 million/episode²⁴ or VND2.33 million/episode in economic terms. The total cost of medical treatment under the “without project” situation is estimated at VND6.92 billion/year. Under the “with project” situation, this is expected to decrease to VND3.46 billion/year. The total accumulated medical cost over the period 2020–2039 is expected to decrease from VND127.98 billion (“without project”) to VND69.87 billion (“with project”) (Table 8).

Table 8: Projected Benefits from Improved Sanitation Facilities

Year	Without Project						With Project					
	Number of students to benefit from improved sanitation facilities	Incidence rate	Number of students falling sick	Total number of episodes per year at 2 episodes per	Total cost of medical treatment per year (Economic) (VND)	Total cost of medical treatment per year (Economic) (VND billion)	Incidence rate reduced by 50%	Number of students falling sick	Total number of episodes per year at 2 episodes	Total cost of medical treatment per year (Economic) (VND)	Total cost of medical treatment per year (Economic) (VND billion)	Reduced medical treatment cost (Economic) (VND billion)
2016												
2017												
2018												
2019												
2020	107,500	0.3450%	371	742	1,729,495,248	1.73	0.3450%	371	742	1,729,495,248	1.73	-
2021	215,000	0.3450%	742	1,484	3,458,990,496	3.46	0.3105%	668	1,335	3,113,091,447	3.11	0.35
2022	322,501	0.3450%	1,113	2,225	5,188,485,744	5.19	0.2760%	890	1,780	4,150,788,596	4.15	1.04
2023	430,001	0.3450%	1,484	2,967	6,917,980,993	6.92	0.2415%	1,039	2,077	4,842,586,695	4.84	2.08
2024	430,001	0.3450%	1,484	2,967	6,917,980,993	6.92	0.2070%	890	1,780	4,150,788,596	4.15	2.77
2025	430,001	0.3450%	1,484	2,967	6,917,980,993	6.92	0.1725%	742	1,484	3,458,990,496	3.46	3.46
2026	430,001	0.3450%	1,484	2,967	6,917,980,993	6.92	0.1725%	742	1,484	3,458,990,496	3.46	3.46
2027	430,001	0.3450%	1,484	2,967	6,917,980,993	6.92	0.1725%	742	1,484	3,458,990,496	3.46	3.46
2028	430,001	0.3450%	1,484	2,967	6,917,980,993	6.92	0.1725%	742	1,484	3,458,990,496	3.46	3.46
2029	430,001	0.3450%	1,484	2,967	6,917,980,993	6.92	0.1725%	742	1,484	3,458,990,496	3.46	3.46
2030	430,001	0.3450%	1,484	2,967	6,917,980,993	6.92	0.1725%	742	1,484	3,458,990,496	3.46	3.46
2031	430,001	0.3450%	1,484	2,967	6,917,980,993	6.92	0.1725%	742	1,484	3,458,990,496	3.46	3.46
2032	430,001	0.3450%	1,484	2,967	6,917,980,993	6.92	0.1725%	742	1,484	3,458,990,496	3.46	3.46
2033	430,001	0.3450%	1,484	2,967	6,917,980,993	6.92	0.1725%	742	1,484	3,458,990,496	3.46	3.46
2034	430,001	0.3450%	1,484	2,967	6,917,980,993	6.92	0.1725%	742	1,484	3,458,990,496	3.46	3.46
2035	430,001	0.3450%	1,484	2,967	6,917,980,993	6.92	0.1725%	742	1,484	3,458,990,496	3.46	3.46
2036	430,001	0.3450%	1,484	2,967	6,917,980,993	6.92	0.1725%	742	1,484	3,458,990,496	3.46	3.46
2037	430,001	0.3450%	1,484	2,967	6,917,980,993	6.92	0.1725%	742	1,484	3,458,990,496	3.46	3.46
2038	430,001	0.3450%	1,484	2,967	6,917,980,993	6.92	0.1725%	742	1,484	3,458,990,496	3.46	3.46
2039	430,001	0.3450%	1,484	2,967	6,917,980,993	6.92	0.1725%	742	1,484	3,458,990,496	3.46	3.46
Total persons =			27,447					14,985			69.87	58.11
Cost of medical treatment/person/epissode (VND)= 2,590,481 (Financial)												
Cost of medical treatment/person/epissode (VND)= 2,331,433 (Economic)												
SCF = 0.90												

²¹ The total number of cases of diarrheal disease in 2009 in Viet Nam was estimated at 296,000; the total population of the country at that time was 85,789,573 people or an incidence rate of 0.345%. Source: http://en.wikipedia.org/wiki/Environmental_issues_in_Vietnam

²² Bunker, J.P. 2001. The Role of Medical Care in Contributing to Health Improvements within Societies. *Int. J. Epidemiology*, 30 (6): 1260–1263. The author indicated that the incidence rate of respiratory diseases can be reduced by about 40% with effective medical care. WHO indicated that potential reductions in morbidity as a result of improvements in water supply and sanitation, complemented by effective awareness programs and medical services, are 80%–100% for cholera and typhoid, and 40%–50% for diarrhea diseases, dysentery, and gastroenteritis.

²³ Direct costs include medical treatment, medicines, laboratory tests, transportation, food, lodging, and cost of special items such as herbs. Indirect costs include lost wages due to missed work time by the patient, caregivers, and their substitutes as well as productivity losses due to non-market activity losses such as housework.

²⁴ Fischer, T.K. et al. 2005. Health Care Costs of Diarrheal Disease and Estimates of the Cost-effectiveness of Rotavirus Vaccination in Viet Nam. *J. Infectious Diseases*, 192 (10):1720–1726. The cost of medical treatment per episode was expressed in 2005 financial terms, which were adjusted by an inflation rate of 3.98 to arrive at a financial cost of medical treatment per episode of VND2,590,481 in 2014 terms.

27. **Improved climate resilience in typhoon-affected coastal areas.** The project will introduce a new curriculum for disaster management education to help students and their families and communities cope with the increasingly adverse impacts of climate change in the typhoon-affected coastal areas. It will also construct more durable school buildings that can withstand strong typhoons and floods and serve as shelters for residents during such climate events. These interventions will improve the capacity of residents to prepare for, and cope with, these natural calamities, thereby preventing, or at least minimizing, the risks to life and property resulting from the strong typhoons that pass through the coastal region every year.

28. The project provinces in the typhoon-affected coastal region experience an average of about six natural disasters a year caused by strong typhoons, strong winds, and floods. The average annual cost of damages was estimated at about VND14.75 billion per typhoon²⁵ in financial terms. The total financial cost of damages was estimated at about VND88.48 billion per year, or about VND79.63 billion per year in economic terms. Under the “with project” situation, the interventions are expected to improve the capacity of communities to respond to, and cope with, the destructive impacts of natural calamities, thereby reducing economic losses due to damages to personal property and school facilities as well as the loss of human life. Although it is envisioned that the target typhoon-affected coastal area will be completely resilient to impacts of climate change, it is assumed that damages due to destructive typhoons will be reduced by 50% every year or about VND39.82 billion/year in economic terms (Table 9).

Table 9: Projected Benefits from Increased Capacity for Climate Resilience

Year	Without Project			With Project	
	Number of typhoons per year	Cost of typhoon damage per typhoon (Financial) (VND billion)	Total cost of typhoon damage per year (Financial) (VND billion)	Total cost of typhoon damage per year (Economic) (VND billion)	Total cost of typhoon damage per year (Economic) (VND billion)
2016					
2017					
2018					
2019					
2020	6	14.75	88.48	79.63	39.82
2021	6	14.75	88.48	79.63	39.82
2022	6	14.75	88.48	79.63	39.82
2023	6	14.75	88.48	79.63	39.82
2024	6	14.75	88.48	79.63	39.82
2025	6	14.75	88.48	79.63	39.82
2026	6	14.75	88.48	79.63	39.82
2027	6	14.75	88.48	79.63	39.82
2028	6	14.75	88.48	79.63	39.82
2029	6	14.75	88.48	79.63	39.82
2030	6	14.75	88.48	79.63	39.82
2031	6	14.75	88.48	79.63	39.82
2032	6	14.75	88.48	79.63	39.82
2033	6	14.75	88.48	79.63	39.82
2034	6	14.75	88.48	79.63	39.82
2035	6	14.75	88.48	79.63	39.82
2036	6	14.75	88.48	79.63	39.82
2037	6	14.75	88.48	79.63	39.82
2038	6	14.75	88.48	79.63	39.82
2039	6	14.75	88.48	79.63	39.82
Total			1,769.64	1,592.68	796.34

Note: Under “with project” situation typhoon damage is assumed to be reduced by 50%
SCF = 0.90

²⁵ It is estimated, based on data provided by MOET, that an average of 20 classrooms are damaged each year due to natural calamities (e.g., typhoons, strong winds, and floods). At a cost of VND737,352,000 per classroom, the total cost of damage is about VND14.75 billion/year.

3. Estimation of Economic Costs

29. **Project investment cost.** Economic costs are at constant early 2014 prices and measured using the world price numeraire method. Specific costs estimated were project investments, operation and maintenance (O&M), and replacement costs. Local cost components, such as non-traded and labor cost components, were converted into economic values using an SCF of 0.9 and a SWRF of 0.8. Foreign cost components are mainly traded components, and their financial value was assumed to be equal to their respective economic values. The total financial capital investment cost was estimated at \$93.0 million, from which all price contingencies (\$4.19 million), taxes (\$7.44 million), and interest charges (\$3.20 million) were excluded.²⁶ The resulting value of \$78.21 million (or about VND1,642.47 billion)²⁷ served as basis for arriving at an economic investment cost of about \$70.24 million (or about VND1,475.13 billion) (Table 10).

Table 10: Estimation of Economic Investment Cost

Year	Cost					
	Civil Works and Equipment (VND billion)	Total Financial Cost (VND billion)	Traded Cost Component (VND billion)	Non-traded Cost Component (VND billion)	Labor Cost Component (VND billion)	Economic Cost (VND billion)
2015	73.91	73.91	10.33	46.56	9.47	66.37
2016	156.03	156.03	21.81	98.30	20.00	140.11
2017	492.74	492.74	68.88	310.43	63.16	442.46
2018	624.14	624.14	87.25	393.21	80.00	560.45
2019	279.22	279.22	39.03	175.91	35.79	250.73
2020	16.42	16.42	2.30	12.72		15.01
Total	1,642.47	1,642.47	229.59	1,037.13	208.41	1,475.13
Percent foreign exchange =					14%	
Percent local currency (non-labor) =					70%	
Percent local currency (labor) =					16%	
Standard conversion factor (on LC or non tradables) =					0.90	
Standard conversion factor (on FX or tradables) =					1.00	
Shadow wage rate factor =					0.80	

30. **Operation and maintenance cost.** The incremental annual O&M cost was assumed at 3.0% of capital investment costs. The value of the foregone wage earnings (opportunity cost) of LSE students during their enrolment was also included in the economic cost estimates. Estimates of opportunity costs of LSE students were based on the average annual salary that they would have received in jobs over a period of four years while attending LSE.

31. **Recurrent cost of LSE schools.** Estimates of the recurrent budgets for each of the four regions and the project as a whole were based on an average cost of VND5.88 million/student/year (MOET, 2013). This average cost/student/year was then multiplied by the estimated number of students to arrive at the value of recurrent cost for each region and the whole project. The estimated recurrent budgets were adjusted to their 2020 economic values and projected over a period of 20 years (2020–2039) at an annual growth rate of about 10%.

32. **Replacement cost.** Replacement of all equipment was assumed to be every five years.

33. **Opportunity cost of LSE students.** The value of wage earnings of LSE students was based on a study by Gallup (1995),²⁸ which estimated the average wage rate of child labor at VND896/hour in 1995. Based on an employment rate of 50%, to provide some time for other

²⁶ Obtained from detailed cost tables.

²⁷ At an exchange rate of VND21,000 to \$1.00.

²⁸ Gallup, J. 1995. *The Economic Value of Children in Viet Nam*. Institutes of Economics and Sociology, Hanoi, Viet Nam.

normal activities of children, such as play time and other non-income generating activities, the adjusted average rate was estimated at VND448/hour. Adjusting for inflation, the average wage rate in 2014 value was estimated at about VND6,536/hour or about VND26,144/day, for a four-hour work day or about VND1.96 million/year. The economic value of the average wage of children in 2014 value was estimated by applying a SWRF of 0.8 to arrive at a value of VND1.57 million/year. This value, multiplied by the total number of students who have completed LSE each year, provides the total annual opportunity cost of LSE students (Table 11).

Table 11: Projected Opportunity Cost of LSE Students

Year	Incremental LSE Students	Total Annual Opportunity Cost of LSE Graduates	Accumulated Opportunity Cost	Incremental Accumulated Opportunity Cost
		(VND billion)	(VND billion)	(VND billion)
2016				
2017				
2018				
2019				
2020	39,955	62.68	62.68	62.68
2021	51,776	81.22	143.90	143.90
2022	63,598	99.76	243.66	243.66
2023	63,598	99.76	343.42	343.42
2024	63,598	99.76	380.51	380.51
2025	63,598	99.76	399.05	399.05
2026	63,598	99.76	399.05	399.05
2027	63,598	99.76	399.05	399.05
2028	63,598	99.76	399.05	399.05
2029	63,598	99.76	399.05	399.05
2030	63,598	99.76	399.05	399.05
2031	63,598	99.76	399.05	399.05
2032	63,598	99.76	399.05	399.05
2033	63,598	99.76	399.05	399.05
2034	63,598	99.76	399.05	399.05
2035	63,598	99.76	399.05	399.05
2036	63,598	99.76	399.05	399.05
2037	63,598	99.76	399.05	399.05
2038	63,598	99.76	399.05	399.05
2039	63,598	99.76	399.05	399.05
Total	1,236,489	1,939.63	7,159.96	7,159.96

Notes:

- (i) Total graduates is net of dropout, promotion, and completion rates.
- (ii) Average annual earning of a child less than 20 years old (VND/year) = 1,568,662
 Gallup (1995) estimated the average wage rate of child labor at VND896 per hour. Based on an employment rate of 50%, by providing some time for other activities that children normally are involved in such as play time and other non-income generating activities, the adjusted average wage rate is estimated at VND448 per hour. Adjusting for inflation, the average wage rate in 2014 value is estimated at about VND6,536 per hour (about VND26,144 per day) or about VND1,960,827 per year. The economic value of the average wage rate of children, in 2014 value, is estimated by applying a shadow wage rate factor (SERF) of 0.8 to arrive at a value of VND1,568,662 per year.

4. EIRR and Sensitivity Analysis – Overall Project

34. **EIRR calculation.** The monetized value of the benefits compared with the projected economic costs of the project yielded a base EIRR value of 19.9% and a benefit-cost ratio (BCR) of 1.2 (Table 12).²⁹

²⁹ The calculated EIRR values are 16.7% for the Northern Midland and Mountainous area, 22.3% for the Central Highland area, 19.6% for the Mekong River Delta area, and 20.9% for the North Central and Central Coastal area.

Table 12: EIRR Calculation – Overall Project

Year	Cost				Benefits					Net Benefits	
	Investment	Operation and Maintenance	Recurrent Cost of LSE Schools	Opportunity Cost of LSE Students	Total Cost	Projected Income of LSE Students Who Completed Grade 9	Economic Value of Benefits from Improved Efficiency in LSE	Reduced Incidence of Gastro-intestinal Diseases due to Improved Sanitation Facilities	Climate Change Resiliency		Total Benefits
	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)
2015	66.37				66.37					-	(66.37)
2016	140.11				140.11					-	(140.11)
2017	442.46				442.46					-	(442.46)
2018	560.45				560.45					-	(560.45)
2019	250.73				250.73					-	(250.73)
2020	15.01	43.80	658.99	62.68	780.48	84.78	690.65	-	39.82	815.25	34.77
2021		43.80	724.89	143.90	912.59	194.65	759.72	0.35	39.82	994.53	81.93
2022	217.44	43.80	797.38	243.66	1,302.28	329.60	835.69	1.04	39.82	1,206.14	(96.15)
2023		43.80	877.12	343.42	1,264.34	464.55	919.26	2.08	39.82	1,425.69	161.35
2024		43.80	964.83	380.51	1,389.14	599.50	1,011.18	2.77	39.82	1,653.26	264.12
2025		43.80	1,061.31	399.05	1,504.17	734.45	1,112.30	3.46	39.82	1,890.02	385.85
2026		43.80	1,167.44	399.05	1,610.30	869.39	1,223.53	3.46	39.82	2,136.20	525.90
2027	217.44	43.80	1,284.19	399.05	1,944.49	1,004.34	1,345.88	3.46	39.82	2,393.50	449.02
2028		43.80	1,412.61	399.05	1,855.46	1,139.29	1,480.47	3.46	39.82	2,663.04	807.57
2029		43.80	1,553.87	399.05	1,996.73	1,274.24	1,628.52	3.46	39.82	2,946.03	949.31
2030		43.80	1,709.26	399.05	2,152.11	1,409.19	1,791.37	3.46	39.82	3,243.84	1,091.72
2031		43.80	1,880.18	399.05	2,323.04	1,544.14	1,970.51	3.46	39.82	3,557.92	1,234.88
2032	217.44	43.80	2,068.20	399.05	2,728.50	1,679.09	2,167.56	3.46	39.82	3,889.92	1,161.43
2033		43.80	2,275.02	399.05	2,717.88	1,814.04	2,384.31	3.46	39.82	4,241.63	1,523.75
2034		43.80	2,502.52	399.05	2,945.38	1,948.99	2,622.74	3.46	39.82	4,615.01	1,669.63
2035		43.80	2,752.77	399.05	3,195.63	2,083.94	2,885.02	3.46	39.82	5,012.23	1,816.60
2036		43.80	3,028.05	399.05	3,470.91	2,218.89	3,173.52	3.46	39.82	5,435.68	1,964.77
2037	217.44	43.80	3,330.86	399.05	3,991.15	2,363.84	3,490.87	3.46	39.82	5,887.98	1,896.83
2038		43.80	3,663.94	399.05	4,106.80	2,488.79	3,839.96	3.46	39.82	6,372.02	2,265.22
2039		43.80	4,030.34	399.05	4,473.19	2,623.74	4,223.95	3.46	39.82	6,890.96	2,417.77
										EIRR =	19.9%
										NPV @12% =	1,483.13
										BCR =	1.2

35. **Sensitivity analysis.** The sensitivity analysis indicated that the EIRR is sensitive to changes in costs and enrolment as the sensitivity indicator (SI) values for these change variables are significantly greater than 1. Switching values confirmed the sensitivity of the EIRR to changes in cost and enrolment variables (Table 13). Details are presented in Attachment 1.

Table 13: Sensitivity Analysis – Overall Project

Change Variable	Percent Change in Variable	Recalculated EIRR	Switching Value	Sensitivity Indicator	Likely Occurrence
1. Increase in costs	20%	12.4%	22%	1.87	Medium
2. Decrease in enrolment	20%	16.4%	42%	0.88	Low
3. Increase in costs and decrease in enrolment	20%	7.8%	14%	3.04	Low
4. Delay in benefits by one year		12.3%			Low
5. Benefits from improved efficiency short by	20%	13.8%	26%	1.54	Low
6. Reduction in disease incidence short by	20%	19.9%	>100%	0.00	Low
7. Benefits from climate change resiliency short by	20%	19.7%	>100%	0.05	Low
Base EIRR =		19.9%			
Base NPV @12% =		1,483.1 VND billion			
Benefit-cost ratio =		1.2			

5. Distribution of Project Benefits and Costs and Poverty Impact Analysis

36. The distribution of benefits and costs among the various project stakeholders was based on estimates of incremental benefits and costs generated by project investments. All financial and economic benefits and costs were expressed in early 2014 prices and in NPV terms at a discount rate of 12% (Table 14).

Table 14: Distribution of Benefits and Costs and Poverty Impact – Overall Project

Present Value (@12%) (in billion VND, 2014 Price)	Financial	Economic	Difference	Distribution of Benefits and Costs				Total
	Net Present	Net Present		Population		Government		
	Value	Value	Ethnic	Non-ethnic	Central	Provincial		
	(1)	(2)	Minority ¹	Minority ²				
			(1)-(2)					
Incremental Benefits From³	20,130.36	17,300.24	2,830.12	1,468.83	1,361.29	-	-	2,830.12
Improved income-generating capacity potential	8,170.82	6,536.65	1,634.16	848.13	786.03			1,634.16
Improved efficiency of LSE schools	11,609.90	10,448.91	1,160.99	602.55	558.44			1,160.99
Improved sanitation in LSE schools	19.19	17.27	1.92	1.00	0.92			1.92
Climate change resiliency	330.46	297.41	33.05	17.15	15.89			33.05
Incremental Costs	15,230.73	13,473.55	1,757.17	240.02	222.45	168.24	1,126.47	1,757.17
Project investment cost	1,476.29	1,326.54	149.75			134.78	14.98	149.75
Project O&M cost	364.37	327.19	37.18			33.46	3.72	37.18
Recurrent cost of LSE schools	11,077.73	9,969.95	1,107.77				1,107.77	1,107.77
Opportunity cost of LSE students	2,312.34	1,849.87	462.47	240.02	222.45			462.47
Net Benefits	4,899.63	3,826.69	1,072.94	1,228.81	1,138.84	(168.24)	(1,126.47)	1,072.94
Share of Benefits				114.53%	106.14%	-15.68%	-104.99%	100.00%
Proportion of poor ⁴				33%	14%	10%	10%	
Net benefits to the poor				409.19	158.30	(16.82)	(112.65)	438.02
Poverty Impact Ratio								0.41

¹ Ethnic population is estimated at about 51.9% of total population. Proportion of benefits accruing to ethnic population is based on this estimate.

² Non-ethnic population is estimated at about 48.1% of total population. Proportion of benefits accruing to non-ethnic is based on this estimate.

³ Based on net present value (at 12% discount rate) of incremental net benefits generated from investments under the project.

⁴ Data derived from World Bank, 2012 Viet Nam Poverty Assessment, World Bank, Ha Noi.

37. Incremental benefits will be generated through improvements in: (i) income-generating capacity of LSE students of about VND1,634.16 billion; (ii) efficiency of LSE schools due to improved management, VND1,160.99 billion; (iv) sanitation in LSE schools, VND1.92 billion; and (v) climate resilience and disaster preparedness of communities in typhoon-affected coastal areas, VND33.05 billion. The total incremental benefits were estimated at about VND2,830.12 billion. The distribution of benefits among EM and non-EM LSE students was estimated based on the proportion of EM and non-EM LSE students benefiting from project interventions, which were about 51.9% and 48.1%, respectively. Based on these proportions, the distribution of incremental benefits among EM and non-EM populations was estimated at VND1,468.83 billion and VND1,361.29 billion, respectively (Table 14).

38. Incremental costs (VND1,757.17 billion) were estimated based on: (i) project investment cost of about VND 149.75 billion; (ii) O&M cost of VND37.18 billion; (iii) recurrent cost of LSE schools of VND1,107.77 billion; and (iv) opportunity cost of LSE students of VND462.47 billion (Table 14).

39. The total net benefit was estimated at about VND1,072.94 billion. Based on the proportion of poor by EM LSE students, non-EM LSE students, central government, and provincial government, the total net benefit accruing to the poor was estimated at about VND438.02 billion. The poverty impact ratio was calculated at 0.41 (Table 14).³⁰

³⁰ Poverty impact ratios for the four project regions are: Northern Midland and Mountainous area, 0.88; Central Highland area, 0.50; Mekong River Delta area, 0.25; and North Central and Central Coastal area, 0.26.

RESULTS OF THE SENSITIVITY ANALYSIS – OVERALL PROJECT

Table 1: Increase in Project Costs by 20%

Year	Cost				Total Cost	Benefits				Net Benefits	
	Investment	Operation and Maintenance	Recurrent Cost of LSE Shools	Opportunity Cost of LSE Students		Projected Income of LSE Students Who Completed Grade 9	Economic Value of Benefits from Improved Efficiency in LSE	Reduced Incidence of Gastro-intestinal Diseases	Climate Change Resiliency		Total Benefits
	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)
2015	79.64	-	-	-	79.64						(79.64)
2016	168.14	-	-	-	168.14						(168.14)
2017	530.95	-	-	-	530.95						(530.95)
2018	672.54	-	-	-	672.54						(672.54)
2019	300.87	-	-	-	300.87						(300.87)
2020	18.01	52.56	790.79	62.68	924.05	84.78	690.65	-	39.82	815.25	(108.80)
2021	-	52.56	869.87	143.90	1,066.33	194.65	759.72	0.35	39.82	994.53	(71.80)
2022	260.93	52.56	956.86	243.66	1,514.01	329.60	835.69	1.04	39.82	1,206.14	(307.87)
2023	-	52.56	1,052.54	343.42	1,448.53	464.55	919.26	2.08	39.82	1,425.69	(22.84)
2024	-	52.56	1,157.80	380.51	1,590.87	599.50	1,011.18	2.77	39.82	1,653.26	62.39
2025	-	52.56	1,273.58	399.05	1,725.19	734.45	1,112.30	3.46	39.82	1,890.02	164.83
2026	-	52.56	1,400.93	399.05	1,852.55	869.39	1,223.53	3.46	39.82	2,136.20	283.65
2027	260.93	52.56	1,541.03	399.05	2,253.57	1,004.34	1,345.88	3.46	39.82	2,393.50	139.93
2028	-	52.56	1,695.13	399.05	2,146.75	1,139.29	1,480.47	3.46	39.82	2,663.04	516.29
2029	-	52.56	1,864.64	399.05	2,316.26	1,274.24	1,628.52	3.46	39.82	2,946.03	629.77
2030	-	52.56	2,051.11	399.05	2,502.72	1,409.19	1,791.37	3.46	39.82	3,243.84	741.11
2031	-	52.56	2,256.22	399.05	2,707.84	1,544.14	1,970.51	3.46	39.82	3,557.92	850.09
2032	260.93	52.56	2,481.84	399.05	3,194.39	1,679.09	2,167.56	3.46	39.82	3,889.92	695.54
2033	-	52.56	2,730.02	399.05	3,181.64	1,814.04	2,384.31	3.46	39.82	4,241.63	1,059.99
2034	-	52.56	3,003.03	399.05	3,454.64	1,948.99	2,622.74	3.46	39.82	4,615.01	1,160.36
2035	-	52.56	3,303.33	399.05	3,754.95	2,083.94	2,885.02	3.46	39.82	5,012.23	1,257.28
2036	-	52.56	3,633.66	399.05	4,085.28	2,218.89	3,173.52	3.46	39.82	5,435.68	1,350.40
2037	260.93	52.56	3,997.03	399.05	4,709.57	2,353.84	3,490.87	3.46	39.82	5,887.98	1,178.41
2038	-	52.56	4,396.73	399.05	4,848.35	2,488.79	3,839.96	3.46	39.82	6,372.02	1,523.67
2039	-	52.56	4,836.40	399.05	5,288.02	2,623.74	4,223.95	3.46	39.82	6,890.96	1,602.94
											EIRR = 12.4%
											NPV (@12%) = 79.78

Table 2: Decrease in LSE Annual Enrolment by 20%

Year	Cost				Total Cost	Benefits				Net Benefits	
	Investment	Operation and Maintenance	Recurrent Cost of LSE Shools	Opportunity Cost of LSE Students		Projected Income of LSE Students Who Completed Grade 9	Economic Value of Benefits from Improved Efficiency in LSE	Reduced Incidence of Gastro-intestinal Diseases	Climate Change Resiliency		Total Benefits
	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)
2015	66.37	-	-	-	66.37						(66.37)
2016	140.11	-	-	-	140.11						(140.11)
2017	442.46	-	-	-	442.46						(442.46)
2018	560.45	-	-	-	560.45						(560.45)
2019	250.73	-	-	-	250.73						(250.73)
2020	15.01	43.80	658.99	62.68	780.48	67.83	690.65	-	39.82	798.29	17.81
2021	-	43.80	724.89	143.90	912.59	155.72	759.72	0.35	39.82	955.60	43.00
2022	217.44	43.80	797.38	243.66	1,302.28	263.68	835.69	1.04	39.82	1,140.22	(162.06)
2023	-	43.80	877.12	343.42	1,264.34	371.64	919.26	2.08	39.82	1,332.78	68.44
2024	-	43.80	964.83	380.51	1,389.14	479.60	1,011.18	2.77	39.82	1,533.36	144.22
2025	-	43.80	1,061.31	399.05	1,504.17	587.56	1,112.30	3.46	39.82	1,743.13	238.96
2026	-	43.80	1,167.44	399.05	1,610.30	695.52	1,223.53	3.46	39.82	1,962.32	352.02
2027	217.44	43.80	1,284.19	399.05	1,944.49	803.47	1,345.88	3.46	39.82	2,192.63	248.15
2028	-	43.80	1,412.61	399.05	1,855.46	911.43	1,480.47	3.46	39.82	2,435.18	579.72
2029	-	43.80	1,553.87	399.05	1,996.73	1,019.39	1,628.52	3.46	39.82	2,691.19	694.46
2030	-	43.80	1,709.26	399.05	2,152.11	1,127.35	1,791.37	3.46	39.82	2,962.00	809.89
2031	-	43.80	1,880.18	399.05	2,323.04	1,235.31	1,970.51	3.46	39.82	3,249.09	926.06
2032	217.44	43.80	2,068.20	399.05	2,728.50	1,343.27	2,167.56	3.46	39.82	3,554.10	825.61
2033	-	43.80	2,275.02	399.05	2,717.88	1,451.23	2,384.31	3.46	39.82	3,878.82	1,160.94
2034	-	43.80	2,502.52	399.05	2,945.38	1,559.19	2,622.74	3.46	39.82	4,225.21	1,279.83
2035	-	43.80	2,752.77	399.05	3,195.63	1,667.15	2,885.02	3.46	39.82	4,595.44	1,399.81
2036	-	43.80	3,028.05	399.05	3,470.91	1,775.11	3,173.52	3.46	39.82	4,991.90	1,521.00
2037	217.44	43.80	3,330.86	399.05	3,991.15	1,883.07	3,490.87	3.46	39.82	5,417.22	1,426.06
2038	-	43.80	3,663.94	399.05	4,106.80	1,991.03	3,839.96	3.46	39.82	5,874.26	1,767.46
2039	-	43.80	4,030.34	399.05	4,473.19	2,098.99	4,223.95	3.46	39.82	6,366.22	1,893.02
											EIRR = 16.4%
											NPV (@12%) = 741.32

Table 3: Increase in Project Costs and Decrease in LSE Enrolment by 20%

Year	Cost					Benefits					Net Benefits
	Investment	Operation and Maintenance	Recurrent Cost of LSE Shools	Opportunity Cost of LSE Students	Total Cost	Projected Income of LSE Students Who Completed Grade 9	Economic Value of Benefits from Improved Efficiency in LSE	Reduced Incidence of Gastro-intestinal Diseases	Climate Change Resiliency	Total Benefits	
	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)
2015	79.64	-	-	-	79.64	#	-	-	-	-	(79.64)
2016	168.14	-	-	-	168.14	-	-	-	-	-	(168.14)
2017	530.95	-	-	-	530.95	-	-	-	-	-	(530.95)
2018	672.54	-	-	-	672.54	-	-	-	-	-	(672.54)
2019	300.87	-	-	-	300.87	-	-	-	-	-	(300.87)
2020	18.01	52.56	790.79	62.68	924.05	67.83	690.65	-	39.82	798.29	(125.75)
2021	-	52.56	869.87	143.90	1,066.33	155.72	759.72	0.35	39.82	955.60	(110.73)
2022	260.93	52.56	956.86	243.66	1,514.01	263.68	835.69	1.04	39.82	1,140.22	(373.79)
2023	-	52.56	1,052.54	343.42	1,448.53	371.64	919.26	2.08	39.82	1,332.78	(115.74)
2024	-	52.56	1,157.80	380.51	1,590.87	479.60	1,011.18	2.77	39.82	1,533.36	(57.51)
2025	-	52.56	1,273.58	399.05	1,725.19	587.56	1,112.30	3.46	39.82	1,743.13	17.94
2026	-	52.56	1,400.93	399.05	1,852.55	695.52	1,223.53	3.46	39.82	1,962.32	109.77
2027	260.93	52.56	1,541.03	399.05	2,253.57	803.47	1,345.88	3.46	39.82	2,192.63	(60.94)
2028	-	52.56	1,695.13	399.05	2,146.75	911.43	1,480.47	3.46	39.82	2,435.18	288.43
2029	-	52.56	1,864.64	399.05	2,316.26	1,019.39	1,628.52	3.46	39.82	2,691.19	374.93
2030	-	52.56	2,051.11	399.05	2,502.72	1,127.35	1,791.37	3.46	39.82	2,962.00	459.27
2031	-	52.56	2,256.22	399.05	2,707.84	1,235.31	1,970.51	3.46	39.82	3,249.09	541.26
2032	260.93	52.56	2,481.84	399.05	3,194.39	1,343.27	2,167.56	3.46	39.82	3,554.10	359.72
2033	-	52.56	2,730.02	399.05	3,181.64	1,451.23	2,384.31	3.46	39.82	3,878.82	697.18
2034	-	52.56	3,003.03	399.05	3,454.64	1,559.19	2,622.74	3.46	39.82	4,225.21	770.57
2035	-	52.56	3,303.33	399.05	3,754.95	1,667.15	2,885.02	3.46	39.82	4,595.44	840.50
2036	-	52.56	3,633.66	399.05	4,085.28	1,775.11	3,173.52	3.46	39.82	4,991.90	906.63
2037	260.93	52.56	3,997.03	399.05	4,709.57	1,883.07	3,490.87	3.46	39.82	5,417.22	707.64
2038	-	52.56	4,396.73	399.05	4,848.35	1,991.03	3,839.96	3.46	39.82	5,874.26	1,025.91
2039	-	52.56	4,836.40	399.05	5,288.02	2,098.99	4,223.95	3.46	39.82	6,366.22	1,078.20
EIRR = 7.8%											
NPV (@12%) = (662.04)											

Table 4: Delay in Project Benefits by One Year

Year	Cost					Benefits					Net Benefits
	Investment	Operation and Maintenance	Recurrent Cost of LSE Shools	Opportunity Cost of LSE Students	Total Cost	Projected Income of LSE Students Who Completed Grade 9	Economic Value of Benefits from Improved Efficiency in LSE	Reduced Incidence of Gastro-intestinal Diseases	Climate Change Resiliency	Total Benefits	
	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)
2015	66.37	-	-	-	66.37	-	-	-	-	-	(66.37)
2016	140.11	-	-	-	140.11	-	-	-	-	-	(140.11)
2017	442.46	-	-	-	442.46	-	-	-	-	-	(442.46)
2018	560.45	-	-	-	560.45	-	-	-	-	-	(560.45)
2019	250.73	-	-	-	250.73	-	-	-	-	-	(250.73)
2020	15.01	43.80	658.99	62.68	780.48	-	-	-	-	-	(780.48)
2021	-	43.80	724.89	143.90	912.59	84.78	690.65	-	39.82	815.25	(97.34)
2022	217.44	43.80	797.38	243.66	1,302.28	194.65	759.72	0.35	39.82	994.53	(307.76)
2023	-	43.80	877.12	343.42	1,264.34	329.60	835.69	1.04	39.82	1,206.14	(58.21)
2024	-	43.80	964.83	380.51	1,389.14	464.55	919.26	2.08	39.82	1,425.69	36.55
2025	-	43.80	1,061.31	399.05	1,504.17	599.50	1,011.18	2.77	39.82	1,653.26	149.09
2026	-	43.80	1,167.44	399.05	1,610.30	734.45	1,112.30	3.46	39.82	1,890.02	279.72
2027	217.44	43.80	1,284.19	399.05	1,944.49	869.39	1,223.53	3.46	39.82	2,136.20	191.71
2028	-	43.80	1,412.61	399.05	1,855.46	1,004.34	1,345.88	3.46	39.82	2,393.50	538.04
2029	-	43.80	1,553.87	399.05	1,996.73	1,139.29	1,480.47	3.46	39.82	2,663.04	666.31
2030	-	43.80	1,709.26	399.05	2,152.11	1,274.24	1,628.52	3.46	39.82	2,946.03	793.92
2031	-	43.80	1,880.18	399.05	2,323.04	1,409.19	1,791.37	3.46	39.82	3,243.84	920.80
2032	217.44	43.80	2,068.20	399.05	2,728.50	1,544.14	1,970.51	3.46	39.82	3,557.92	829.43
2033	-	43.80	2,275.02	399.05	2,717.88	1,679.09	2,167.56	3.46	39.82	3,889.92	1,172.05
2034	-	43.80	2,502.52	399.05	2,945.38	1,814.04	2,384.31	3.46	39.82	4,241.63	1,296.25
2035	-	43.80	2,752.77	399.05	3,195.63	1,948.99	2,622.74	3.46	39.82	4,615.01	1,419.38
2036	-	43.80	3,028.05	399.05	3,470.91	2,083.94	2,885.02	3.46	39.82	5,012.23	1,541.32
2037	217.44	43.80	3,330.86	399.05	3,991.15	2,218.89	3,173.52	3.46	39.82	5,435.68	1,444.53
2038	-	43.80	3,663.94	399.05	4,106.80	2,353.84	3,490.87	3.46	39.82	5,887.98	1,781.18
2039	-	43.80	4,030.34	399.05	4,473.19	2,488.79	3,839.96	3.46	39.82	6,372.02	1,898.83
EIRR = 12.3%											
NPV (@12%) = 69.43											

Table 5: Benefits from Improved Efficiency Short of Target by 20%

Year	Cost				Total Cost	Benefits					Net Benefits
	Investment	Operation and Maintenance	Recurrent Cost of LSE Shools	Opportunity Cost of LSE Students		Projected Income of LSE Students Who Completed	Economic Value of Benefits from Improved Efficiency in LSE	Reduced Incidence of Gastro-intestinal Diseases	Climate Change Resiliency	Total Benefits	
	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)
2015	66.37	-	-	-	66.37 #	-	-	-	-	-	(66.37)
2016	140.11	-	-	-	140.11	-	-	-	-	-	(140.11)
2017	442.46	-	-	-	442.46	-	-	-	-	-	(442.46)
2018	560.45	-	-	-	560.45	-	-	-	-	-	(560.45)
2019	250.73	-	-	-	250.73	-	-	-	-	-	(250.73)
2020	15.01	43.80	658.99	62.68	780.48	84.78	552.52	-	39.82	677.12	(103.36)
2021	-	43.80	724.89	143.90	912.59	194.65	607.77	0.35	39.82	842.58	(70.01)
2022	217.44	43.80	797.38	243.66	1,302.28	329.60	668.55	1.04	39.82	1,039.00	(263.28)
2023	-	43.80	877.12	343.42	1,264.34	464.55	735.40	2.08	39.82	1,241.84	(22.50)
2024	-	43.80	964.83	380.51	1,389.14	599.50	808.94	2.77	39.82	1,451.02	61.88
2025	-	43.80	1,061.31	399.05	1,504.17	734.45	889.84	3.46	39.82	1,667.56	163.39
2026	-	43.80	1,167.44	399.05	1,610.30	869.39	978.82	3.46	39.82	1,891.49	281.19
2027	217.44	43.80	1,284.19	399.05	1,944.49	1,004.34	1,076.71	3.46	39.82	2,124.32	179.84
2028	-	43.80	1,412.61	399.05	1,855.46	1,139.29	1,184.38	3.46	39.82	2,366.94	511.48
2029	-	43.80	1,553.87	399.05	1,996.73	1,274.24	1,302.81	3.46	39.82	2,620.33	623.61
2030	-	43.80	1,709.26	399.05	2,152.11	1,409.19	1,433.09	3.46	39.82	2,885.56	733.45
2031	-	43.80	1,880.18	399.05	2,323.04	1,544.14	1,576.40	3.46	39.82	3,163.82	840.78
2032	217.44	43.80	2,068.20	399.05	2,728.50	1,679.09	1,734.04	3.46	39.82	3,456.41	727.91
2033	-	43.80	2,275.02	399.05	2,717.88	1,814.04	1,907.45	3.46	39.82	3,764.76	1,046.89
2034	-	43.80	2,502.52	399.05	2,945.38	1,948.99	2,098.19	3.46	39.82	4,090.46	1,145.08
2035	-	43.80	2,752.77	399.05	3,195.63	2,083.94	2,308.01	3.46	39.82	4,435.23	1,239.60
2036	-	43.80	3,028.05	399.05	3,470.91	2,218.89	2,538.81	3.46	39.82	4,800.98	1,330.07
2037	217.44	43.80	3,330.86	399.05	3,991.15	2,353.84	2,792.70	3.46	39.82	5,189.81	1,198.66
2038	-	43.80	3,663.94	399.05	4,106.80	2,488.79	3,071.97	3.46	39.82	5,604.03	1,497.23
2039	-	43.80	4,030.34	399.05	4,473.19	2,623.74	3,379.16	3.46	39.82	6,046.17	1,572.98
EIRR =											13.8%
NPV (@12%) =											297.33

Table 6: Benefits from the Reduction in Disease Incidence Short of Target by 20%

Year	Cost				Total Cost	Benefits					Net Benefits
	Investment	Operation and Maintenance	Recurrent Cost of LSE Shools	Opportunity Cost of LSE Students		Projected Income of LSE Students Who Completed	Economic Value of Benefits from Improved Efficiency in LSE	Reduced Incidence of Gastro-intestinal Diseases	Climate Change Resiliency	Total Benefits	
	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)
2015	66.37	-	-	-	66.37 #	-	-	-	-	-	(66.37)
2016	140.11	-	-	-	140.11	-	-	-	-	-	(140.11)
2017	442.46	-	-	-	442.46	-	-	-	-	-	(442.46)
2018	560.45	-	-	-	560.45	-	-	-	-	-	(560.45)
2019	250.73	-	-	-	250.73	-	-	-	-	-	(250.73)
2020	15.01	43.80	658.99	62.68	780.48	84.78	690.65	-	39.82	815.25	34.77
2021	-	43.80	724.89	143.90	912.59	194.65	759.72	0.28	39.82	994.46	81.87
2022	217.44	43.80	797.38	243.66	1,302.28	329.60	835.69	0.83	39.82	1,205.93	(96.35)
2023	-	43.80	877.12	343.42	1,264.34	464.55	919.26	1.66	39.82	1,425.28	160.93
2024	-	43.80	964.83	380.51	1,389.14	599.50	1,011.18	2.21	39.82	1,652.71	263.56
2025	-	43.80	1,061.31	399.05	1,504.17	734.45	1,112.30	2.77	39.82	1,889.33	385.16
2026	-	43.80	1,167.44	399.05	1,610.30	869.39	1,223.53	2.77	39.82	2,135.51	525.21
2027	217.44	43.80	1,284.19	399.05	1,944.49	1,004.34	1,345.88	2.77	39.82	2,392.81	448.32
2028	-	43.80	1,412.61	399.05	1,855.46	1,139.29	1,480.47	2.77	39.82	2,662.35	806.88
2029	-	43.80	1,553.87	399.05	1,996.73	1,274.24	1,628.52	2.77	39.82	2,945.34	948.62
2030	-	43.80	1,709.26	399.05	2,152.11	1,409.19	1,791.37	2.77	39.82	3,243.14	1,091.03
2031	-	43.80	1,880.18	399.05	2,323.04	1,544.14	1,970.51	2.77	39.82	3,557.23	1,234.19
2032	217.44	43.80	2,068.20	399.05	2,728.50	1,679.09	2,167.56	2.77	39.82	3,889.23	1,160.73
2033	-	43.80	2,275.02	399.05	2,717.88	1,814.04	2,384.31	2.77	39.82	4,240.94	1,523.06
2034	-	43.80	2,502.52	399.05	2,945.38	1,948.99	2,622.74	2.77	39.82	4,614.32	1,668.94
2035	-	43.80	2,752.77	399.05	3,195.63	2,083.94	2,885.02	2.77	39.82	5,011.54	1,815.91
2036	-	43.80	3,028.05	399.05	3,470.91	2,218.89	3,173.52	2.77	39.82	5,434.99	1,964.08
2037	217.44	43.80	3,330.86	399.05	3,991.15	2,353.84	3,490.87	2.77	39.82	5,887.29	1,896.14
2038	-	43.80	3,663.94	399.05	4,106.80	2,488.79	3,839.96	2.77	39.82	6,371.33	2,264.53
2039	-	43.80	4,030.34	399.05	4,473.19	2,623.74	4,223.95	2.77	39.82	6,890.27	2,417.08
EIRR =											19.9%
NPV (@12%) =											1,481.17

Table 7: Benefits from Climate Change Resiliency Short of Target by 20%

Year	Cost				Benefits					Net Benefits	
	Investment	Operation and Maintenance	Recurrent Cost of LSE Shools	Opportunity Cost of LSE Students	Total Cost	Projected Income of LSE Students Who Completed Grade 9	Economic Value of Benefits from Improved Efficiency in LSE	Reduced Incidence of Gastro-intestinal Diseases	Climate Change Resiliency		Total Benefits
	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)
2015	66.37	-	-	-	66.37 #	-	-	-	-	-	(66.37)
2016	140.11	-	-	-	140.11	-	-	-	-	-	(140.11)
2017	442.46	-	-	-	442.46	-	-	-	-	-	(442.46)
2018	560.45	-	-	-	560.45	-	-	-	-	-	(560.45)
2019	250.73	-	-	-	250.73	-	-	-	-	-	(250.73)
2020	15.01	43.80	658.99	62.68	780.48	84.78	690.65	-	31.85	807.29	26.80
2021	-	43.80	724.89	143.90	912.59	194.65	759.72	0.35	31.85	986.56	73.97
2022	217.44	43.80	797.38	243.66	1,302.28	329.60	835.69	1.04	31.85	1,198.17	(104.11)
2023	-	43.80	877.12	343.42	1,264.34	464.55	919.26	2.08	31.85	1,417.73	153.39
2024	-	43.80	964.83	380.51	1,389.14	599.50	1,011.18	2.77	31.85	1,645.30	256.15
2025	-	43.80	1,061.31	399.05	1,504.17	734.45	1,112.30	3.46	31.85	1,882.06	377.89
2026	-	43.80	1,167.44	399.05	1,610.30	869.39	1,223.53	3.46	31.85	2,128.24	517.93
2027	217.44	43.80	1,284.19	399.05	1,944.49	1,004.34	1,345.88	3.46	31.85	2,385.54	441.05
2028	-	43.80	1,412.61	399.05	1,855.46	1,139.29	1,480.47	3.46	31.85	2,655.08	799.61
2029	-	43.80	1,553.87	399.05	1,996.73	1,274.24	1,628.52	3.46	31.85	2,938.07	941.35
2030	-	43.80	1,709.26	399.05	2,152.11	1,409.19	1,791.37	3.46	31.85	3,235.87	1,083.76
2031	-	43.80	1,880.18	399.05	2,323.04	1,544.14	1,970.51	3.46	31.85	3,549.96	1,226.92
2032	217.44	43.80	2,068.20	399.05	2,728.50	1,679.09	2,167.56	3.46	31.85	3,881.96	1,153.46
2033	-	43.80	2,275.02	399.05	2,717.88	1,814.04	2,384.31	3.46	31.85	4,233.66	1,515.79
2034	-	43.80	2,502.52	399.05	2,945.38	1,948.99	2,622.74	3.46	31.85	4,607.04	1,661.67
2035	-	43.80	2,752.77	399.05	3,195.63	2,083.94	2,885.02	3.46	31.85	5,004.27	1,808.64
2036	-	43.80	3,028.05	399.05	3,470.91	2,218.89	3,173.52	3.46	31.85	5,427.72	1,956.81
2037	217.44	43.80	3,330.86	399.05	3,991.15	2,353.84	3,490.87	3.46	31.85	5,880.02	1,888.87
2038	-	43.80	3,663.94	399.05	4,106.80	2,488.79	3,839.96	3.46	31.85	6,364.06	2,257.26
2039	-	43.80	4,030.34	399.05	4,473.19	2,623.74	4,223.95	3.46	31.85	6,883.00	2,409.81
EIRR = 19.7%											
NPV (@12%) = 1,449.38											

ANNEX A: NORTHERN MIDLAND AND MOUNTAINOUS AREA - DETAILED ECONOMIC ANALYSIS

A. The Project

1. Subproject Overview

1. The project will assist the Government of Viet Nam in creating strategic and long-term changes to further develop the country's LSE and human resources in order to sustain the achievements of the Lower Secondary Education for the Most Disadvantaged Regions Project (LSEMDRP).¹ The project will have a significant strategic impact on the three key dimensions of LSE in the most disadvantaged regions, viz., access and equity, quality and relevance, and efficiency and sustainability.

2. The proposed subproject interventions under Output 1² will contribute to increasing the number of LSE student enrollees in the project provinces. The civil works to improve and construct 122 new classrooms, 32 additional subject rooms, and 29 libraries will increase the capacity of LSE schools and attract about 5,490³ new Grade 6 student-enrollees annually. The construction of 314 semi-boarding facilities will accommodate 2,196 students who encounter geographical and transportation difficulties in attending school. School conditions will be more conducive with the construction of 32 additional kitchen and 71 segregated toilet/bathroom facilities. These, together with the awareness building program targeting EM communities, will encourage an additional 8,070⁴ LSE students to go to school. Dropout rates, on average, are expected to decrease from 1.4% to 1.0%. Promotion and completion rates are likewise envisioned to improve from 96.8% to 99.0% and 99.0% to 100.0%, respectively. An additional 15,756 new students will be enrolled yearly under the project, resulting in an average NER of about 86%, compared with 83% before the project.

3. Project interventions under Output 2⁵ will improve the quality of LSE graduates, especially EM students, by providing them with better knowledge and skills in order that they may be prepared for higher education. These graduates will also have greater employability and receive higher incomes when they join the labor market. LSE graduates who do not have the opportunity to seek higher education, will join the labor market and look for opportunities for employment. With acquired improved knowledge and skills, their potential salary will be higher than that of other job-seekers who have not attended LSE. A study conducted in Viet Nam estimated that one year of education increases the average earning capacity of an individual by 11%. For students who have completed the four-year LSE requirements, this means that they have greater potential earning capacity (about 45% more) compared with those with only primary education.⁶ It is estimated that the future earnings of students who have completed LSE is about VND13.7 million/person/year compared with VND9.4 million/person/year for those who only completed primary education.⁷

4. The project will also contribute to improving the quality of planning and management of LSE schools through activities proposed under Output 3.⁸ The provision of block grants for selected

¹ ADB. 2007. *Report and Recommendation of the President to the Board of Directors*. Proposed Loan to the Socialist Republic of Viet Nam: Lower Secondary Education for the Most Disadvantaged Regions Project. Manila.

² Increased access to LSE and LSE equivalency program.

³ Based on 45 students/classroom.

⁴ This is about 1.4% of the total children in the Northern Midland and Mountainous area, who are within the age group eligible for LSE.

⁵ Decentralized learning and teaching tools developed.

⁶ Nguyen Xuan Thanh. 2006. *Estimating the Return to Education in Viet Nam: A Difference-in-Difference Approach*. This is an updated version of a research paper written by the author in December 2005 at the John F. Kennedy School of Government, Harvard University, Cambridge, MA, USA.

⁷ Consultant estimates based on interviews conducted during the PPTA.

⁸ New school clustering established.

EM LSSs in 28 provinces will create opportunities for initiatives and autonomy in improved resource management by these schools. This will, in turn, empower the officials and staff of beneficiary schools and communities, to carry out their own initiatives for improving their respective schools according to their own needs and plans, thereby establishing a strong network for cooperation and support between the schools and the communities. Consequently, this will serve as basis for a solid foundation for building a sense of pride and ownership among teachers, students, and communities and provide a framework for greater decentralization of financial management to school levels, thereby improving efficiency among LSSs. Improved efficiency in using and managing education resources is envisioned to decrease the unit cost per student from VND11.46 million/student/year to VND4.86 million/student/year, or a decrease in cost/student by about 58%.

5. The project will likewise improve project management and implementation through activities under Output 4.⁹ Training of education planners, school principals, and administrators in charge of EM education/LSE equivalency programs on project implementation will ensure that the proposed project is implemented on time and within budget.

B. Economic Analysis

1. Assumptions Used in the Economic Analysis

6. The economic analysis was carried out according to *ADB's Guidelines for Economic Analysis of Projects* (1993). The economic analysis used the following key assumptions:

- (i) Economic costs are at constant early 2014 prices and measured using world price numeraire method.
- (ii) Standard conversion factor (SCF) used was 0.9, and shadow wage rate factor (SWRF) applied was 0.8.¹⁰
- (iii) Total project capital investment cost (excluding price contingencies, fees, and taxes) is spread across the duration of project implementation of 6 years;
- (iv) Incremental operation and maintenance (O&M) costs were assumed at 3.0% of total capital cost.
- (v) Replacement of equipment was assumed to be carried out every five years.
- (vi) Recurrent cost of LSE schools for each of the four regions and the project was based on an average cost of VND5.88 million/student/year (MOET, 2013) which was adjusted to its 2020 economic value and multiplied by the estimated number of students to arrive at the value of recurrent cost for each region and the project.
- (vii) Opportunity cost of LSE students was based on VND1,960,827/student/year.¹¹
- (viii) Project life was assumed at 25 years.
- (ix) The number of students completing all LSE requirements was assumed to remain at their 2023 levels throughout the project life.
- (x) A discount rate of 12% was applied in the calculation of the project's economic internal rate of return (EIRR).

⁹ Project implementation and monitoring and evaluation (M&E) capacity enhanced.

¹⁰ ADB. 2013. *Report and Recommendation of the President to the Board of Directors for the Proposed Loan to the Socialist Republic of Viet Nam for the Productive Rural Infrastructure Sector Project in the Central Highlands*. Manila.

¹¹ The value of wage earnings of LSE students is based on a study by Gallup (Gallup, J. *The Economic Value of Children in Viet Nam*. 1995. Institutes of Economics and Sociology, Tran Xuan Soan, Hanoi, Viet Nam), which estimated that the average wage rate of child labor was VND896/hour in 1995. Based on an employment rate of 50%, by providing some time for other activities that children normally are involved in, such as play time and other non-income generating activities, the adjusted average rate (opportunity cost) is estimated at VND448/hour. Adjusting for inflation, the average wage rate, in 2014 value, is estimated at about VND6,536/hour or about VND26,144/day, for a four-hour work-day, or about VND1,960,827/year.

7. A standard method of cost-benefit analysis was used to calculate the EIRR, i.e., the discount rate that makes the net present value (NPV) of costs and benefits equal, which, in turn, served as the basis for determining the economic viability of project investments.

2. Quantification of Project Benefits

8. **Improved future income generating capacity of LSE graduates.** In the long term, the strengthened capacity of school administrators and teachers will produce better educated LSE students with improved life and learning skills. These students will have greater opportunities to continue on to higher education and improve their income generating capacity. For students who decide to work right after LSE, the acquired cognitive and technical skills from LSE will allow them to receive higher wages compared with those who have only completed primary education. In quantifying the benefits generated by LSE students due to the project, the annualized NPV of the future incremental income stream of the additional number of LSE students (15,756 students) was estimated over a period of 20 years, during which they were assumed to remain employed. The incremental future earnings of students having completed LSE was estimated based on the difference in the earnings of one who completed LSE, estimated at VND13.7 million/person/year, and one with only primary education, estimated at VND9.4 million/person/year.

9. It is expected that the impact of the project will start to be felt starting in 2020, when all civil works shall have been completed and the improvements in curriculum, educational materials, learning facilities, and teacher capacity shall have been implemented. As a consequence, under the project, the dropout, promotion, and completion rates are expected to improve gradually every year until the target rates of 1.0%, 99.0%, and 100.0%, respectively, are reached by 2020. The number of students to complete LSE each year is projected to increase from 10,083 students in 2020 to 15,443 students in 2023 (Table A1).

Table A1: Projected Number of Students with and without the Project

Year	Without Project			With Project			
	Number of Student Enrollees	Number of Student Enrollees	Incremental Number of Student Enrollees	Number of Students Net of Drop-outs	Number of Students Promoted	Projected Incremental Students Completing LSE per Year	Projected LSE Graduates Finding Employment
2015	11,587	11,587	-				
2016	11,587	11,587	-				
2017	11,587	21,875	10,288	10,185	10,083		
2018	11,587	24,609	13,022	12,892	12,763		
2019	11,587	27,344	15,756	15,599	15,443		
2020	11,587	27,344	15,756	15,599	15,443	10,083	6,151
2021	11,587	27,344	15,756	15,599	15,443	12,763	7,785
2022	11,587	27,344	15,756	15,599	15,443	15,443	9,420
2023	11,587	27,344	15,756	15,599	15,443	15,443	9,420
2024	11,587	27,344	15,756	15,599	15,443	15,443	9,420
2025	11,587	27,344	15,756	15,599	15,443	15,443	9,420
2026	11,587	27,344	15,756	15,599	15,443	15,443	9,420
2027	11,587	27,344	15,756	15,599	15,443	15,443	9,420
2028	11,587	27,344	15,756	15,599	15,443	15,443	9,420
2029	11,587	27,344	15,756	15,599	15,443	15,443	9,420
2030	11,587	27,344	15,756	15,599	15,443	15,443	9,420
2031	11,587	27,344	15,756	15,599	15,443	15,443	9,420
2032	11,587	27,344	15,756	15,599	15,443	15,443	9,420
2033	11,587	27,344	15,756	15,599	15,443	15,443	9,420
2034	11,587	27,344	15,756	15,599	15,443	15,443	9,420
2035	11,587	27,344	15,756	15,599	15,443	15,443	9,420
2036	11,587	27,344	15,756	15,599	15,443	15,443	9,420
2037	11,587	27,344	15,756	15,599	15,443	15,443	9,420
2038	11,587	27,344	15,756	15,599	15,443	15,443	9,420
2039	11,587	27,344	15,756	15,599	15,443	15,443	9,420
Total	289,678	643,873	354,195	350,654	347,147	300,818	183,499

Notes:

Dropout rate under "with project" situation =	1.0%
Promotion rate under "with project" situation =	99.0%
Completion rate under "with project" situation =	100.0%
Employment rate of LSE students =	61%

10. Total incremental number of students completing LSE under the “with project” situation is estimated at 300,818 students over the 20-year period, 2020–2039 (Table A1).

11. The benefits generated from increased annual LSE student enrolment is closely related to the expected future benefits generated from increased potential income-generating capacity of LSE students. Of the projected total number of students completing LSE requirements during the period 2020–2039 (300,818 students) a total of 183,499 students are expected to find employment.¹²

12. Current annual wage earning of workers without LSE credentials is about VND23,891,220, which is the average annual wage for jobs (e.g., security services, food delivery services, clerical services, and public/private driving services), which typically hire workers with this qualification. The expected earning of students having completed all LSE requirements was, therefore, calculated by adjusting this basic annual wage earning (VND23,891,220/year/student) by a factor of 1.1¹³ for each year of LSE completed from Grades 6–9. The resulting estimate is the value of expected annual wage earning of workers with LSE credentials, which is about VND 34,979,135 per year per student. In order to estimate the potential future annual earnings of a student without LSE credentials and one with LSE credentials, their respective annual earnings were projected over a 20-year period, the minimum number of employment years assumed in the analysis, and their corresponding NPV at a 12% discount rate was calculated. The NPV of the stream of wage earnings for each student was then annualized to calculate the estimated future annual earnings of a student with and without LSE credentials.¹⁴ The expected annual future earnings of a student with and without LSE credentials are VND13,717,311 and VND9,369,108, respectively (Table A2).

Table A2: Estimated Future Annual Earning of Students with vs. without LSE Credentials

Year	Average Annual Wage Without LSE	Average Annual Wage With LSE
2016		
2017		
2018		
2019		
2020	23,891,220	34,979,135
2021	23,891,220	34,979,135
2022	23,891,220	34,979,135
2023	23,891,220	34,979,135
2024	23,891,220	34,979,135
2025	23,891,220	34,979,135
2026	23,891,220	34,979,135
2027	23,891,220	34,979,135
2028	23,891,220	34,979,135
2029	23,891,220	34,979,135
2030	23,891,220	34,979,135
2031	23,891,220	34,979,135
2032	23,891,220	34,979,135
2033	23,891,220	34,979,135
2034	23,891,220	34,979,135
2035	23,891,220	34,979,135
2036	23,891,220	34,979,135
2037	23,891,220	34,979,135
2038	23,891,220	34,979,135
2039	23,891,220	34,979,135
NPV@12%	187,382,162	274,346,223
Annualized wage	9,369,108	13,717,311

Note: It is assumed that for each additional year of education, expected salary will increase by 10%.

¹² This is based on a labor participation rate of 0.61 for the labor force within the ages of 15–24 years. Source: <http://www.indexmundi.com/facts/vietnam/labor-participation-rate>

¹³ Based on the findings of Psacharopoulos, G. and H.A. Patrinos, 2004.

¹⁴ Annualized wage earning was obtained by dividing the NPV of projected annual wage earnings by 20 years, e.g., VND187,382,162 ÷ 20 = VND9,369,108 and VND274,346,223 ÷ 20 = VND13,717,311.

13. Adjusting the annualized wage earnings with a shadow wage rate factor of 0.8, the economic values of VND10,973,849¹⁵ and VND7,495,286¹⁶ were estimated as the economic value of future annual wage earnings of students with and without LSE credentials, respectively, or an incremental annual earning of VND4,348,203 for a student who completed all the requirements of Grades 6–9. The total benefits accruing to the project is the total value of the incremental benefits generated by an employed LSE student over his/her 20-year employment period multiplied by the number of employed LSE students generated by the project. Over a 20-year period, students who have completed all LSE requirements and are able to find employment are projected to generate accumulated incremental income earnings of about VND6,545.91 billion in economic terms. The projected incremental benefits are presented in Table A3.

Table A3: Economic Benefits from Future Incremental Income

Year	Incremental Number of Students Completing LSE	Total Students With LSE Credentials Finding Employment	Projected Annual Incremental Income of Students With LSE Credentials (VND billion)	Accumulated Incremental Income of Students With LSE Credentials (Financial) (VND billion)	Accumulated Incremental Income of Students With LSE Credentials (Economic) (VND billion)
2016					
2017					
2018					
2019					
2020	10,083	6,151	26.74	26.74	21.40
2021	12,763	7,785	33.85	60.60	48.48
2022	15,443	9,420	40.96	101.56	81.25
2023	15,443	9,420	40.96	142.52	114.01
2024	15,443	9,420	40.96	183.48	146.78
2025	15,443	9,420	40.96	224.44	179.55
2026	15,443	9,420	40.96	265.40	212.32
2027	15,443	9,420	40.96	306.36	245.09
2028	15,443	9,420	40.96	347.32	277.86
2029	15,443	9,420	40.96	388.28	310.63
2030	15,443	9,420	40.96	429.24	343.40
2031	15,443	9,420	40.96	470.20	376.16
2032	15,443	9,420	40.96	511.17	408.93
2033	15,443	9,420	40.96	552.13	441.70
2034	15,443	9,420	40.96	593.09	474.47
2035	15,443	9,420	40.96	634.05	507.24
2036	15,443	9,420	40.96	675.01	540.01
2037	15,443	9,420	40.96	715.97	572.78
2038	15,443	9,420	40.96	756.93	605.54
2039	15,443	9,420	40.96	797.89	638.31
Total	300,818	183,499	797.89	8,182.38	6,545.91
Earning of non-LSE students (VND/year) =			9,369,108		
Earning of LSE students (VND/year) =			13,717,311		
Earning increment (VND/year) =			4,348,203		
Employment rate of LSE students =			61%		
Shadow wage rate factor =			0.8		

14. **Improved management of LSE schools.** Strengthened capacity of education administrators and managers in planning and management will result in the improved efficiency of school operations and delivery of educational/instructional services in disadvantaged areas. School principals and BOET, DOET and MOET staff will receive training and support in planning and management issues, particularly in the inclusive school development planning and management of pro-poor education initiatives. MOET staff will receive in-country and overseas training in policy planning for disadvantaged groups. Learning support through supplementary instructional materials in EM languages and awareness-raising activities will likewise improve learning outcomes, lower repetition and dropout rates, and improve promotion and completion rates. The proposed project is, therefore, expected to improve cost-effectiveness by increasing capacity utilization of LSE schools, thereby reducing the unit cost of financing LSE students. In estimating the incremental benefits due to improved cost efficiency in LSE schools, the difference between the annual cost of financing one LSE student under the “without project” situation and the annual cost of one LSE student under the “with project” situation multiplied by the incremental number of students is projected over 20 years.

¹⁵ Calculated as VND13,717,311 x 0.8 = VND10,973,849.

¹⁶ Calculated as VND9,369,108 x 0.8 = VND7,495,286.

15. Under the “without project” situation, the annual cost of LSE schools in 2020 was estimated at about VND132.81 billion, or an average cost per LSE student of VND11.46 million per student at a total enrolment of 11,587 LSE students. At a projected annual growth rate of 10%, the cost per LSE student is expected to increase to VND70.10 million in 2039. Under the “with project” situation, the number of students in 2020 is expected to increase to 27,344, and the cost per LSE student is estimated to decrease to VND4.86 million, a reduction of VND6.60 million/student/year. By 2039, the cost per LSE student is estimated at VND29.71 million/student/year, or a reduction of VND40.39 million/student/year (Table A4).

Table A4: Projected Economic Benefits from Improved Efficiency in LSE School Operations

Year	Without Project		With Project		Estimated Reduced Cost per LSE Student (Financial)	Financial Value of Benefits from Improved Efficiency in LSE	Economic Value of Benefits from Improved Efficiency in LSE ^b	
	Total LSE Annual Cost ^a	Total Number of LSE Students	Average LSE Cost per Student (Financial)	Total Number of LSE Students				Average LSE Cost per Student (Financial)
	[1] (VND billion)	[2]	[3] (VND million)	[4]	[5] (VND million)	[6]=[5] - [3] (VND million)	[7]=[6] x [4] (VND billion)	[8]=[7] x 0.9 (VND billion)
2016								
2017								
2018								
2019								
2020	132.81	11,587	11.46	27,344	4.86	6.60	180.60	162.54
2021	146.09	11,587	12.61	27,344	5.34	7.27	198.66	178.79
2022	160.70	11,587	13.87	27,344	5.88	7.99	218.52	196.67
2023	176.77	11,587	15.26	27,344	6.46	8.79	240.38	216.34
2024	194.45	11,587	16.78	27,344	7.11	9.67	264.42	237.97
2025	213.89	11,587	18.46	27,344	7.82	10.64	290.86	261.77
2026	235.28	11,587	20.31	27,344	8.60	11.70	319.94	287.95
2027	258.81	11,587	22.34	27,344	9.47	12.87	351.94	316.74
2028	284.69	11,587	24.57	27,344	10.41	14.16	387.13	348.42
2029	313.16	11,587	27.03	27,344	11.45	15.57	425.84	383.26
2030	344.48	11,587	29.73	27,344	12.60	17.13	468.43	421.58
2031	378.92	11,587	32.70	27,344	13.86	18.84	515.27	463.74
2032	416.82	11,587	35.97	27,344	15.24	20.73	566.80	510.12
2033	458.50	11,587	39.57	27,344	16.77	22.80	623.48	561.13
2034	504.35	11,587	43.53	27,344	18.44	25.08	685.82	617.24
2035	554.78	11,587	47.88	27,344	20.29	27.59	754.41	678.97
2036	610.26	11,587	52.67	27,344	22.32	30.35	829.85	746.86
2037	671.29	11,587	57.93	27,344	24.55	33.38	912.83	821.55
2038	738.41	11,587	63.73	27,344	27.01	36.72	1,004.12	903.70
2039	812.26	11,587	70.10	27,344	29.71	40.39	1,104.53	994.07
Total	7,606.71							9,309.43

^a Total annual LSE cost is projected to increase by about 10% every year.

^b Adjusted by SCF = 0.9

16. The total financial benefit due to the project was estimated by multiplying the reduced cost/student under the “with project” situation by the total number of students under the “with project” situation. The financial benefit from improved efficiency in LSE was estimated at about VND180.60 billion (VND162.54 billion in economic terms) in 2020 and increasing to VND1,104.53 billion (VND994.07 billion in economic terms) in 2039. The total economic benefit due to improved efficiency in LSE was estimated at about VND9,309.43 billion for the period, 2020–2039 (Table A4).

17. **Improved sanitation and hygienic conditions.** The World Health Organization (WHO) reported that improving water supply and sanitation can have a significant impact on human health. Potential reductions in morbidity as a result of improvements in water supply and sanitation are 80%–100% for cholera and typhoid, and 40%–50% for diarrheal diseases, dysentery, and gastroenteritis.¹⁷ The provision of sanitation facilities will, therefore, contribute to improved sanitation and hygienic practices in LSSs which will result, in turn, in improved health conditions among students. Expression of these benefits in monetary terms was based on a cost of medical treatment of VND2.6 million/person/episode and an incidence rate of

¹⁷ WHO. n.d. Water and Public Health, WHO Seminar Pack for Drinking-Water Quality, http://www.who.int/water_sanitation_health/dwq/en.

gastrointestinal diseases of 0.345%,¹⁸ which is envisioned to decrease to about 0.1725% due to the project.

18. The improved sanitation facilities in LSE schools are expected to significantly reduce the incidence of gastrointestinal diseases among all students enrolled in LSE schools in the project provinces. Disease incidence rate is expected to decline from 0.345%¹⁹ (“without project”) to 0.1725% (“with project”), or a reduction of about 50%.²⁰ The number of persons falling ill annually under the “without project” situation was estimated at 325 and assumed to experience at least two episodes a year or about 651 episodes a year. The average financial cost of medical treatment²¹ was estimated at VND2.59 million/episode²² or VND2.33 million/episode in economic terms. Total cost of medical treatment under the “without project” situation is estimated at VND1.52 billion/year. Under the “with project” situation, this is expected to decrease to VND0.76 billion/year. Thus, the total accumulated medical cost over the period, 2020–2039, is expected to decrease from VND28.08 billion (“without project”) to VND15.33 billion (“with project”) (Table A5).

Table A5: Projected Benefits from Improved Sanitation Facilities

Year	Without Project					With Project						
	Number of students to benefit from improved sanitation facilities	Incidence rate	Number of students falling sick	Total number of episodes per year at 2 episodes per	Total cost of medical treatment per year (Economic) (VND)	Total cost of medical treatment per year (Economic) (VND billion)	Incidence rate reduced by 50%	Number of students falling sick	Total number of episodes per year at 2 episodes	Total cost of medical treatment per year (Economic) (VND)	Total cost of medical treatment per year (Economic) (VND billion)	Reduced medical treatment cost (Economic) (VND billion)
2016												
2017												
2018												
2019												
2020	23,583	0.3450%	81	163	379,409,290	0.38	0.3450%	81	163	379,409,290	0.38	-
2021	47,166	0.3450%	163	325	758,818,579	0.76	0.3105%	146	293	682,936,721	0.68	0.08
2022	70,749	0.3450%	244	488	1,138,227,869	1.14	0.2760%	195	391	910,582,295	0.91	0.23
2023	94,332	0.3450%	325	651	1,517,637,159	1.52	0.2415%	228	456	1,062,346,011	1.06	0.46
2024	94,332	0.3450%	325	651	1,517,637,159	1.52	0.2070%	195	391	910,582,295	0.91	0.61
2025	94,332	0.3450%	325	651	1,517,637,159	1.52	0.1725%	163	325	758,818,579	0.76	0.76
2026	94,332	0.3450%	325	651	1,517,637,159	1.52	0.1725%	163	325	758,818,579	0.76	0.76
2027	94,332	0.3450%	325	651	1,517,637,159	1.52	0.1725%	163	325	758,818,579	0.76	0.76
2028	94,332	0.3450%	325	651	1,517,637,159	1.52	0.1725%	163	325	758,818,579	0.76	0.76
2029	94,332	0.3450%	325	651	1,517,637,159	1.52	0.1725%	163	325	758,818,579	0.76	0.76
2030	94,332	0.3450%	325	651	1,517,637,159	1.52	0.1725%	163	325	758,818,579	0.76	0.76
2031	94,332	0.3450%	325	651	1,517,637,159	1.52	0.1725%	163	325	758,818,579	0.76	0.76
2032	94,332	0.3450%	325	651	1,517,637,159	1.52	0.1725%	163	325	758,818,579	0.76	0.76
2033	94,332	0.3450%	325	651	1,517,637,159	1.52	0.1725%	163	325	758,818,579	0.76	0.76
2034	94,332	0.3450%	325	651	1,517,637,159	1.52	0.1725%	163	325	758,818,579	0.76	0.76
2035	94,332	0.3450%	325	651	1,517,637,159	1.52	0.1725%	163	325	758,818,579	0.76	0.76
2036	94,332	0.3450%	325	651	1,517,637,159	1.52	0.1725%	163	325	758,818,579	0.76	0.76
2037	94,332	0.3450%	325	651	1,517,637,159	1.52	0.1725%	163	325	758,818,579	0.76	0.76
2038	94,332	0.3450%	325	651	1,517,637,159	1.52	0.1725%	163	325	758,818,579	0.76	0.76
2039	94,332	0.3450%	325	651	1,517,637,159	1.52	0.1725%	163	325	758,818,579	0.76	0.76
Total persons =	6,021					28.08		3,287			15.33	12.75

Cost of medical treatment/person/episode (VND): (Financial)
Cost of medical treatment/person/episode (VND): (Economic)
SCF = 0.90

¹⁸ Total number of cases of diarrheal disease in 2009 in Viet Nam was estimated at 296,000. Total population of the country at that time was 85,789,573 people, or an incidence rate of 0.345%. Source: http://en.wikipedia.org/wiki/Environmental_issues_in_Vietnam

¹⁹ Total number of cases of diarrheal disease in 2009 in Viet Nam was estimated at 296,000. Total population of the country at that time was 85,789,573 people, or an incidence rate of 0.345%. Source: http://en.wikipedia.org/wiki/Environmental_issues_in_Vietnam

²⁰ Bunker, J.P. 2001. The Role of Medical Care in Contributing to Health Improvements within Societies. *Intl. J. Epidemiology*, 30(6):1260–1263. The author indicated that the incidence rate of respiratory diseases can be reduced by about 40% with effective medical care. WHO indicated that potential reductions in morbidity as a result of improvements in water supply and sanitation, complemented by effective awareness programs and medical services, are 80%–100% for cholera and typhoid and 40%–50% for diarrheal diseases, dysentery, and gastroenteritis.

²¹ Direct costs include medical treatment, medicines, laboratory tests, transportation, food, lodging, and cost of special items such as herbs. Indirect costs include lost wages due to missed work time by the patient, caregivers, and their substitutes as well as productivity losses due to nonmarket activity losses such as housework.

²² Fischer, T.K. *et al.* 2005. Health Care Costs of Diarrheal Disease and Estimates of the Cost-effectiveness of Rotavirus Vaccination in Viet Nam. *J. Infectious Diseases*, 192 (10):1720–1726. The cost of medical treatment per episode was expressed in 2005 financial terms, which were adjusted by an inflation rate of 3.98 to arrive at a financial cost of medical treatment per episode of VND2,590,481 in 2014 terms.

3. Estimation of Economic Costs

19. **Project investment cost.** Economic costs were at constant early 2014 prices and measured using the world price numeraire method. Specific costs estimated were project investments, operating and maintenance, and replacement costs. Local cost components, such as non-traded and labor cost components, were converted into economic values using an SCF of 0.9 and SWRF of 0.8. Foreign cost components were mainly the traded components, and their financial value was assumed to be equal to their respective economic values. The total financial capital investment cost was estimated at \$36.98 million, from which all price contingencies (\$1.66 million), taxes (\$2.96 million), and interest charges (\$1.26 million) were excluded.²³ The resulting value of \$31.10 million (or about VND653.16 billion)²⁴ served as basis for arriving at an economic investment cost of about \$27.93 million (or about VND586.62 billion) (Table A6).

Table A6: Estimation of Economic Investment Cost

Year	Civil Works and Equipment	Total Financial Cost	Cost			Economic Cost
			Traded Cost Component	Non-traded Cost Component	Labor Cost Component	
	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)
2015	29.39	29.39	4.11	18.52	3.77	26.39
2016	62.05	62.05	8.67	39.09	7.95	55.72
2017	195.95	195.95	27.39	123.45	25.12	175.95
2018	248.20	248.20	34.69	156.37	31.81	222.87
2019	111.04	111.04	15.52	69.95	14.23	99.71
2020	6.53	6.53	0.91	5.06		5.97
Total	653.16	653.16	91.30	412.43	82.88	586.62
Percent foreign exchange =					14%	
Percent local currency (non-labor) =					70%	
Percent local currency (labor) =					16%	
Standard conversion factor (on LC or non tradables) =					0.90	
Standard conversion factor (on FX or tradables) =					1.00	
Shadow wage rate factor =					0.80	

20. **Operation and maintenance cost.** The incremental annual O&M cost was assumed at 3.0% of capital investment costs. The value of the foregone wage earnings (opportunity cost) of LSE students during their enrolment was also included in the economic cost estimates. Estimates of opportunity costs of LSE students were based on the average annual salary that they would have received in jobs over a period of four years while attending LSE.

21. **Recurrent cost of LSE schools.** Estimates of the recurrent budgets for each of the four regions and the project were based on an average cost of VND5.88 million/student/year (MOET, 2013). This average cost/student/year was then multiplied by the estimated number of students to arrive at the value of recurrent cost for each region and the whole project. The estimated recurrent budgets were adjusted to their 2020 economic values and projected over a period of 20 years (2020–2039) at an annual growth rate of about 10%.

22. **Replacement cost.** Replacement of all equipment was assumed to be every five years.

23. **Opportunity cost of LSE students.** The value of wage earnings of LSE students was based on a study by Gallup (1995),²⁵ which estimated that the average wage rate of child labor was VND896/hour in 1995. Based on an employment rate of 50%, to provide some time for other activities that children are normally involved in, such as play time and other non-income

²³ Obtained from detailed cost tables.

²⁴ Exchange rate used is VND21,000 to \$1.00.

²⁵ Gallup, J. 1995. *The Economic Value of Children in Viet Nam*, Institutes of Economics and Sociology, Hanoi, Viet Nam.

generating activities, the adjusted average rate was estimated at VND448/hour. Adjusting for inflation, the average wage rate, in 2014 value, was estimated at about VND6,536/hour, or about VND26,144/day, for a four-hour work day, or about VND1.96 million/year. The economic value of the average wage of children, in 2014 value, was estimated by applying a SWRF of 0.8, giving a value of VND1.57 million/year. This value multiplied by the total number of students who completed LSE each year provides the total annual opportunity cost of LSE students (Table A7).

Table A7: Projected Opportunity Cost of LSE Students

Year	Incremental LSE Students	Total Annual Opportunity Cost of LSE Graduates (VND billion)	Accumulated Opportunity Cost (VND billion)	Incremental Accumulated Opportunity Cost (VND billion)
2016				
2017				
2018				
2019				
2020	10,083	15.82	15.82	15.82
2021	12,763	20.02	35.84	35.84
2022	15,443	24.22	60.06	60.06
2023	15,443	24.22	84.29	84.29
2024	15,443	24.22	92.69	92.69
2025	15,443	24.22	96.90	96.90
2026	15,443	24.22	96.90	96.90
2027	15,443	24.22	96.90	96.90
2028	15,443	24.22	96.90	96.90
2029	15,443	24.22	96.90	96.90
2030	15,443	24.22	96.90	96.90
2031	15,443	24.22	96.90	96.90
2032	15,443	24.22	96.90	96.90
2033	15,443	24.22	96.90	96.90
2034	15,443	24.22	96.90	96.90
2035	15,443	24.22	96.90	96.90
2036	15,443	24.22	96.90	96.90
2037	15,443	24.22	96.90	96.90
2038	15,443	24.22	96.90	96.90
2039	15,443	24.22	96.90	96.90
Total	300,818	471.88	1,742.18	1,742.18

Notes:

- (i) Total graduates is net of dropout, promotion, and completion rates.
- (ii) Average annual earning of a child less than 20 years old (VND/year) = 1,568,662
 Gallup (1995) estimated the average wage rate of child labor at VND896 per hour. Based on an employment rate of 50%, by providing some time for other activities that children normally are involved in such as play time and other non-income generating activities, the adjusted average wage rate is estimated at VND448 per hour. Adjusting for inflation, the average wage rate in 2014 value is estimated at about VND6,536 per hour (about VND26,144 per day) or about VND1,960,827 per year. The economic value of the average wage rate of children, in 2014 value, is estimated by applying a shadow wage rate factor (SERF) of 0.8 to arrive at a value of VND1,568,662 per year.

4. EIRR and Sensitivity Analysis

24. **EIRR calculation.** The monetized value of the benefits compared with the projected economic costs of the project yielded an EIRR value of 16.7% and a benefit-cost ratio (BCR) of 1.2 (Table A8).

Table A8: EIRR Calculation for the Northern Midland and Mountainous Area

Year	Cost					Benefits				Net Benefits
	Investment	Operation and Maintenance	Recurrent Cost of LSE Schools	Opportunity Cost of LSE Students	Total Cost	Projected Income of LSE Students Who Completed Grade 9	Economic Value of Benefits from Improved Efficiency in LSE	Reduced Incidence of Gastro-intestinal Diseases due to Improved Sanitation Facilities	Total Benefits	
	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)
2015	26.39				26.39				-	(26.39)
2016	55.72				55.72				-	(55.72)
2017	175.95				175.95				-	(175.95)
2018	222.87			-	222.87				-	(222.87)
2019	99.71			-	99.71				-	(99.71)
2020	5.97	17.42	132.81	15.82	172.02	21.40	162.54	-	183.93	11.92
2021		17.42	146.09	35.84	199.35	48.48	178.79	0.08	227.35	28.00
2022	86.54	17.42	160.70	60.06	324.72	81.25	196.67	0.24	278.16	(46.56)
2023		17.42	176.77	84.29	278.48	114.01	216.34	0.49	330.84	52.37
2024		17.42	194.45	92.69	304.56	146.78	237.97	0.65	385.41	80.85
2025		17.42	213.89	96.90	328.21	179.55	261.77	0.81	442.14	113.93
2026		17.42	235.28	96.90	349.60	212.32	287.95	0.81	501.08	151.48
2027	86.54	17.42	258.81	96.90	459.67	245.09	316.74	0.81	562.65	102.98
2028		17.42	284.69	96.90	399.01	277.86	348.42	0.81	627.09	228.08
2029		17.42	313.16	96.90	427.48	310.63	383.26	0.81	694.70	267.22
2030		17.42	344.48	96.90	458.79	343.40	421.58	0.81	765.79	307.00
2031		17.42	378.92	96.90	493.24	376.16	463.74	0.81	840.72	347.48
2032	86.54	17.42	416.82	96.90	617.68	408.93	510.12	0.81	919.86	302.19
2033		17.42	458.50	96.90	572.82	441.70	561.13	0.81	1,003.64	430.83
2034		17.42	504.35	96.90	618.67	474.47	617.24	0.81	1,092.53	473.86
2035		17.42	554.78	96.90	669.10	507.24	678.97	0.81	1,187.02	517.92
2036		17.42	610.26	96.90	724.58	540.01	746.86	0.81	1,287.68	563.11
2037	86.54	17.42	671.29	96.90	872.15	572.78	821.55	0.81	1,395.14	522.99
2038		17.42	738.41	96.90	852.73	605.54	903.70	0.81	1,510.06	657.33
2039		17.42	812.26	96.90	926.57	638.31	994.07	0.81	1,633.20	706.63
									EIRR =	16.7%
									NPV (@12%) =	301.16
									BCR =	1.2

25. **Sensitivity analysis.**²⁶ The sensitivity analysis indicated that the EIRR is sensitive to changes in costs, enrolment, and efficiency in LSE school operations, as the sensitivity indicator (SI) values for these change variables are significantly greater than 1. Switching values confirmed the sensitivity of EIRR to changes in these variables (Table A9).

Table A9: EIRR Sensitivity Analysis – Northern Midland and Mountainous Area

Change Variable	Percent Change in Variable	Recalculated EIRR	Switching Value	Sensitivity Indicator	Likely Occurrence
1. Increase in costs	20%	11.5%	18%	1.57	Medium
2. Decrease in enrolment	20%	14.1%	33%	0.80	Low
3. Increase in costs and decrease in enrolment	20%	8.3%	12%	2.53	Low
4. Delay in benefits by one year		11.5%			Low
5. Benefits from improved efficiency short by	20%	12.4%	23%	1.30	Low
6. Reduction in disease incidence short by	20%	16.7%	>100%	0.00	Low
Base EIRR =		16.7%			
Base NPV @12% =		301.2 VND billion			
Benefit-cost ratio =		1.2			

²⁶ Details of the EIRR calculation for each sensitivity analysis scenario are presented in the annex at the end of this document.

5. Distribution of Project Benefits and Costs and Poverty Impact Analysis

26. The distribution of benefits and costs among the various project stakeholders was based on estimates of incremental benefits and costs generated by project investments. All financial and economic benefits and costs were expressed in early 2014 prices and in NPV terms at a discount rate of 12% (Table A10).

Table A10: Distribution of Benefits and Costs and Poverty Impact – Northern Midland and Mountainous Area

Present Value (@12%) (in billion VND, 2014 Price)	Financial	Economic	Difference	Distribution of Benefits and Costs				Total
	Net Present Value	Net Present Value		Population		Government		
	(1)	(2)	(1)-(2)	Ethnic Minority ¹	Non-ethnic Minority ²	Central	Provincial	
Incremental Benefits From³	4,731.74	4,059.08	672.67	583.87	88.79	-	-	672.67
Improved income-generating capacity potential	1,994.92	1,595.94	398.98	346.32	52.67			398.98
Improved efficiency of LSE schools	2,732.30	2,459.07	273.23	237.16	36.07			273.23
Improved sanitation in LSE schools	4.52	4.06	0.45	0.39	0.06			0.45
Incremental Costs	3,528.76	3,118.33	410.43	97.93	14.89	66.92	230.69	410.43
Project investment cost	587.20	527.64	59.56			53.61	5.96	59.56
Project O&M cost	144.90	130.11	14.79			13.31	1.48	14.79
Recurrent cost of LSE schools	2,232.56	2,009.30	223.26				223.26	223.26
Opportunity cost of LSE students	564.10	451.28	112.82	97.93	14.89			112.82
Net Benefits	1,202.98	940.74	262.24	485.95	73.90	(66.92)	(230.69)	262.24
Share of Benefits				185.31%	28.18%	-25.52%	-87.97%	100.00%
Proportion of poor ⁴				51%	14%	10%	10%	
Net benefits to the poor				249.78	10.42	(6.69)	(23.07)	230.44
Poverty Impact Ratio								0.88

¹ Ethnic population is estimated at about 86.8% of total population. Proportion of benefits accruing to ethnic population is based on this estimate.

² Non-ethnic population is estimated at about 13.2% of total population. Proportion of benefits accruing to non-ethnic is based on this estimate.

³ Based on net present value (at 12% discount rate) of incremental net benefits generated from investments under the project.

⁴ Data derived from World Bank, 2012 Viet Nam Poverty Assessment, World Bank, Ha Noi.

27. Incremental benefits will be generated through improvements in the (i) income generating capacity of LSE students of about VND398.98 billion, (ii) efficiency of LSE schools due to improved management, VND273.23 billion, and (iii) sanitation in LSE schools, VND0.45 billion. The total generated incremental benefits were estimated at about VND672.67 billion (Table A10). The distribution of benefits among EM and non-EM LSE students was estimated based on the proportion of EM and non-EM LSE students benefiting from project interventions of about 86.8% and 13.2%, respectively. Based on these proportions, the distribution of incremental benefits among EM and non-EM population was estimated at VND583.87 billion and VND88.79 billion, respectively (Table A10).

28. Incremental costs totaling VND410.43 billion were estimated based on (i) a project investment cost of about VND 59.56 billion, (ii) an O&M cost of VND14.79 billion, (iii) a recurrent cost of LSE schools of VND223.26 billion, and (iv) the opportunity cost of LSE students of VND112.82 billion (Table A10).

29. The total net benefit was estimated at about VND262.24 billion. Based on the proportion of poor by EM LSE students, non-EM LSE students, central government, and provincial government, the total net benefit accruing to the poor was estimated at about VND230.44 billion. The poverty impact ratio is calculated at 0.88 (Table A10).

ATTACHMENT 1: RESULTS OF THE EIRR SENSITIVITY ANALYSIS FOR THE NORTHERN MIDLAND AND MOUNTAINOUS AREA

Attachment Table A1: Increase in Project Costs by 20%

Year	Cost					Benefits				Net Benefits
	Investment	Operation and Maintenance	Recurrent Cost of LSE Schools	Opportunity Cost of LSE Students	Total Cost	Projected Income of LSE Students Who Completed Grade 9	Economic Value of Benefits from Improved Efficiency in LSE	Reduced Incidence of Gastro-intestinal Diseases	Total Benefits	
	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)
2015	31.67	-	-	-	31.67					(31.67)
2016	66.86	-	-	-	66.86					(66.86)
2017	211.14	-	-	-	211.14					(211.14)
2018	267.45	-	-	-	267.45					(267.45)
2019	119.65	-	-	-	119.65					(119.65)
2020	7.16	20.90	159.37	15.82	203.26	21.40	162.54	-	183.93	(19.32)
2021	-	20.90	175.31	35.84	232.05	48.48	178.79	0.08	227.35	(4.70)
2022	103.85	20.90	192.84	60.06	377.66	81.25	196.67	0.24	278.16	(99.49)
2023	-	20.90	212.12	84.29	317.32	114.01	216.34	0.49	330.84	13.53
2024	-	20.90	233.34	92.69	346.94	146.78	237.97	0.65	385.41	38.47
2025	-	20.90	256.67	96.90	374.47	179.55	261.77	0.81	442.14	67.66
2026	-	20.90	282.34	96.90	400.14	212.32	287.95	0.81	501.08	100.94
2027	103.85	20.90	310.57	96.90	532.22	245.09	316.74	0.81	562.65	30.42
2028	-	20.90	341.63	96.90	459.43	277.86	348.42	0.81	627.09	167.66
2029	-	20.90	375.79	96.90	493.59	310.63	383.26	0.81	694.70	201.11
2030	-	20.90	413.37	96.90	531.17	343.40	421.58	0.81	765.79	234.62
2031	-	20.90	454.71	96.90	572.51	376.16	463.74	0.81	840.72	268.21
2032	103.85	20.90	500.18	96.90	721.83	408.93	510.12	0.81	919.86	198.03
2033	-	20.90	550.20	96.90	668.00	441.70	561.13	0.81	1,003.64	335.65
2034	-	20.90	605.22	96.90	723.02	474.47	617.24	0.81	1,092.53	369.51
2035	-	20.90	665.74	96.90	783.54	507.24	678.97	0.81	1,187.02	403.48
2036	-	20.90	732.31	96.90	850.11	540.01	746.86	0.81	1,287.68	437.57
2037	103.85	20.90	805.54	96.90	1,027.19	572.78	821.55	0.81	1,395.14	367.94
2038	-	20.90	886.10	96.90	1,003.90	605.54	903.70	0.81	1,510.06	506.16
2039	-	20.90	974.71	96.90	1,092.51	638.31	994.07	0.81	1,633.20	540.69
EIRR =										11.5%
NPV (@12%) =										(35.01)

Attachment Table A2: Decrease in LSE Annual Enrolment by 20%

Year	Cost					Benefits				Net Benefits
	Investment	Operation and Maintenance	Recurrent Cost of LSE Schools	Opportunity Cost of LSE Students	Total Cost	Projected Income of LSE Students Who Completed Grade 9	Economic Value of Benefits from Improved Efficiency in LSE	Reduced Incidence of Gastro-intestinal Diseases	Total Benefits	
	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)
2015	26.39	-	-	-	26.39					(26.39)
2016	55.72	-	-	-	55.72					(55.72)
2017	175.95	-	-	-	175.95					(175.95)
2018	222.87	-	-	-	222.87					(222.87)
2019	99.71	-	-	-	99.71					(99.71)
2020	5.97	17.42	132.81	15.82	172.02	17.12	162.54	-	179.66	7.64
2021	-	17.42	146.09	35.84	199.35	38.78	178.79	0.08	217.66	18.31
2022	86.54	17.42	160.70	60.06	324.72	65.00	196.67	0.24	261.91	(62.81)
2023	-	17.42	176.77	84.29	278.48	91.21	216.34	0.49	308.04	29.56
2024	-	17.42	194.45	92.69	304.56	117.43	237.97	0.65	356.05	51.49
2025	-	17.42	213.89	96.90	328.21	143.64	261.77	0.81	406.23	78.02
2026	-	17.42	235.28	96.90	349.60	169.86	287.95	0.81	458.62	109.02
2027	86.54	17.42	258.81	96.90	459.67	196.07	316.74	0.81	513.63	53.96
2028	-	17.42	284.69	96.90	399.01	222.29	348.42	0.81	571.52	172.51
2029	-	17.42	313.16	96.90	427.48	248.50	383.26	0.81	632.57	205.10
2030	-	17.42	344.48	96.90	458.79	274.72	421.58	0.81	697.12	238.32
2031	-	17.42	378.92	96.90	493.24	300.93	463.74	0.81	765.49	272.25
2032	86.54	17.42	416.82	96.90	617.68	327.15	510.12	0.81	838.08	220.40
2033	-	17.42	458.50	96.90	572.82	353.36	561.13	0.81	915.30	342.49
2034	-	17.42	504.35	96.90	618.67	379.58	617.24	0.81	997.63	378.97
2035	-	17.42	554.78	96.90	669.10	405.79	678.97	0.81	1,085.57	416.47
2036	-	17.42	610.26	96.90	724.58	432.01	746.86	0.81	1,179.68	455.10
2037	86.54	17.42	671.29	96.90	872.15	458.22	821.55	0.81	1,280.58	408.44
2038	-	17.42	738.41	96.90	852.73	484.44	903.70	0.81	1,388.95	536.22
2039	-	17.42	812.26	96.90	926.57	510.65	994.07	0.81	1,505.54	578.97
EIRR =										14.1%
NPV (@12%) =										120.05

Attachment Table A3: Increase in Project Costs and Decrease in LSE Enrolment by 20%

Year	Cost				Total Cost	Benefits				Net Benefits
	Investment	Operation and Maintenance	Recurrent Cost of LSE Schools	Opportunity Cost of LSE Students		Projected Income of LSE Students Who Completed Grade 9	Economic Value of Benefits from Improved Efficiency in LSE	Reduced Incidence of Gastro-intestinal Diseases	Total Benefits	
	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)
2015	31.67	-	-	-	31.67 #	-	-	-	-	(31.67)
2016	66.86	-	-	-	66.86	-	-	-	-	(66.86)
2017	211.14	-	-	-	211.14	-	-	-	-	(211.14)
2018	267.45	-	-	-	267.45	-	-	-	-	(267.45)
2019	119.65	-	-	-	119.65	-	-	-	-	(119.65)
2020	7.16	20.90	159.37	15.82	203.26	17.12	162.54	-	179.66	(23.60)
2021	-	20.90	175.31	35.84	232.05	38.78	178.79	0.08	217.66	(14.39)
2022	103.85	20.90	192.84	60.06	377.66	65.00	196.67	0.24	261.91	(115.74)
2023	-	20.90	212.12	84.29	317.32	91.21	216.34	0.49	308.04	(9.28)
2024	-	20.90	233.34	92.69	346.94	117.43	237.97	0.65	356.05	9.12
2025	-	20.90	256.67	96.90	374.47	143.64	261.77	0.81	406.23	31.75
2026	-	20.90	282.34	96.90	400.14	169.86	287.95	0.81	458.62	58.48
2027	103.85	20.90	310.57	96.90	532.22	196.07	316.74	0.81	513.63	(18.59)
2028	-	20.90	341.63	96.90	459.43	222.29	348.42	0.81	571.52	112.09
2029	-	20.90	375.79	96.90	493.59	248.50	383.26	0.81	632.57	138.98
2030	-	20.90	413.37	96.90	531.17	274.72	421.58	0.81	697.12	165.94
2031	-	20.90	454.71	96.90	572.51	300.93	463.74	0.81	765.49	192.98
2032	103.85	20.90	500.18	96.90	721.83	327.15	510.12	0.81	838.08	116.25
2033	-	20.90	550.20	96.90	668.00	353.36	561.13	0.81	915.30	247.31
2034	-	20.90	605.22	96.90	723.02	379.58	617.24	0.81	997.63	274.61
2035	-	20.90	665.74	96.90	783.54	405.79	678.97	0.81	1,085.57	302.03
2036	-	20.90	732.31	96.90	850.11	432.01	746.86	0.81	1,179.68	329.57
2037	103.85	20.90	805.54	96.90	1,027.19	458.22	821.55	0.81	1,280.58	253.39
2038	-	20.90	886.10	96.90	1,003.90	484.44	903.70	0.81	1,388.95	385.05
2039	-	20.90	974.71	96.90	1,092.51	510.65	994.07	0.81	1,505.54	413.03
EIRR =										8.3%
NPV (@12%) =										(216.12)

Attachment Table A4: Delay in Project Benefits by One Year

Year	Cost				Total Cost	Benefits				Net Benefits
	Investment	Operation and Maintenance	Recurrent Cost of LSE Schools	Opportunity Cost of LSE Students		Projected Income of LSE Students Who Completed Grade 9	Economic Value of Benefits from Improved Efficiency in LSE	Reduced Incidence of Gastro-intestinal Diseases	Total Benefits	
	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)
2015	26.39	-	-	-	26.39	-	-	-	-	(26.39)
2016	55.72	-	-	-	55.72	-	-	-	-	(55.72)
2017	175.95	-	-	-	175.95	-	-	-	-	(175.95)
2018	222.87	-	-	-	222.87	-	-	-	-	(222.87)
2019	99.71	-	-	-	99.71	-	-	-	-	(99.71)
2020	5.97	17.42	132.81	15.82	172.02	-	-	-	-	(172.02)
2021	-	17.42	146.09	35.84	199.35	21.40	162.54	-	183.93	(15.41)
2022	86.54	17.42	160.70	60.06	324.72	48.48	178.79	0.08	227.35	(97.37)
2023	-	17.42	176.77	84.29	278.48	81.25	196.67	0.24	278.16	(0.31)
2024	-	17.42	194.45	92.69	304.56	114.01	216.34	0.49	330.84	26.28
2025	-	17.42	213.89	96.90	328.21	146.78	237.97	0.65	385.41	57.20
2026	-	17.42	235.28	96.90	349.60	179.55	261.77	0.81	442.14	92.54
2027	86.54	17.42	258.81	96.90	459.67	212.32	287.95	0.81	501.08	41.41
2028	-	17.42	284.69	96.90	399.01	245.09	316.74	0.81	562.65	163.64
2029	-	17.42	313.16	96.90	427.48	277.86	348.42	0.81	627.09	199.61
2030	-	17.42	344.48	96.90	458.79	310.63	383.26	0.81	694.70	235.91
2031	-	17.42	378.92	96.90	493.24	343.40	421.58	0.81	765.79	272.55
2032	86.54	17.42	416.82	96.90	617.68	376.16	463.74	0.81	840.72	223.05
2033	-	17.42	458.50	96.90	572.82	408.93	510.12	0.81	919.86	347.05
2034	-	17.42	504.35	96.90	618.67	441.70	561.13	0.81	1,003.64	384.98
2035	-	17.42	554.78	96.90	669.10	474.47	617.24	0.81	1,092.53	423.43
2036	-	17.42	610.26	96.90	724.58	507.24	678.97	0.81	1,187.02	462.44
2037	86.54	17.42	671.29	96.90	872.15	540.01	746.86	0.81	1,287.68	415.54
2038	-	17.42	738.41	96.90	852.73	572.78	821.55	0.81	1,395.14	542.41
2039	-	17.42	812.26	96.90	926.57	605.54	903.70	0.81	1,510.06	583.49
EIRR =										11.5%
NPV (@12%) =										(31.39)

Attachment Table A5: Benefits from Improved Efficiency Short of Target by 20%

Year	Cost					Benefits				Net Benefits
	Investment	Operation and Maintenance	Recurrent Cost of LSE Schools	Opportunity Cost of LSE Students	Total Cost	Projected Income of LSE Students Who Completed Grade 9	Economic Value of Benefits from Improved Efficiency in LSE	Reduced Incidence of Gastro-intestinal Diseases	Total Benefits	
	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)
2015	26.39	-	-	-	26.39	#	-	-	-	(26.39)
2016	55.72	-	-	-	55.72	-	-	-	-	(55.72)
2017	175.95	-	-	-	175.95	-	-	-	-	(175.95)
2018	222.87	-	-	-	222.87	-	-	-	-	(222.87)
2019	99.71	-	-	-	99.71	-	-	-	-	(99.71)
2020	5.97	17.42	132.81	15.82	172.02	21.40	130.03	-	151.43	(20.59)
2021	-	17.42	146.09	35.84	199.35	48.48	143.03	0.08	191.59	(7.76)
2022	86.54	17.42	160.70	60.06	324.72	81.25	157.34	0.24	238.83	(85.90)
2023	-	17.42	176.77	84.29	278.48	114.01	173.07	0.49	287.57	9.10
2024	-	17.42	194.45	92.69	304.56	146.78	190.38	0.65	337.81	33.25
2025	-	17.42	213.89	96.90	328.21	179.55	209.42	0.81	389.78	61.57
2026	-	17.42	235.28	96.90	349.60	212.32	230.36	0.81	443.49	93.89
2027	86.54	17.42	258.81	96.90	459.67	245.09	253.39	0.81	499.30	39.63
2028	-	17.42	284.69	96.90	399.01	277.86	278.73	0.81	557.41	158.40
2029	-	17.42	313.16	96.90	427.48	310.63	306.61	0.81	618.05	190.57
2030	-	17.42	344.48	96.90	458.79	343.40	337.27	0.81	681.48	222.68
2031	-	17.42	378.92	96.90	493.24	376.16	370.99	0.81	747.97	254.73
2032	86.54	17.42	416.82	96.90	617.68	408.93	408.09	0.81	817.84	200.17
2033	-	17.42	458.50	96.90	572.82	441.70	448.90	0.81	891.42	318.60
2034	-	17.42	504.35	96.90	618.67	474.47	493.79	0.81	969.08	350.41
2035	-	17.42	554.78	96.90	669.10	507.24	543.17	0.81	1,051.23	382.13
2036	-	17.42	610.26	96.90	724.58	540.01	597.49	0.81	1,138.31	413.73
2037	86.54	17.42	671.29	96.90	872.15	572.78	657.24	0.81	1,230.83	358.68
2038	-	17.42	738.41	96.90	852.73	605.54	722.96	0.81	1,329.32	476.59
2039	-	17.42	812.26	96.90	926.57	638.31	795.26	0.81	1,434.39	507.81
EIRR =										12.4%
NPV (@12%) =										22.09

Attachment Table A6: Benefits from the Reduced Disease Incidence Short of Target by 20%

Year	Cost					Benefits				Net Benefits
	Investment	Operation and Maintenance	Recurrent Cost of LSE Schools	Opportunity Cost of LSE Students	Total Cost	Projected Income of LSE Students Who Completed Grade 9	Economic Value of Benefits from Improved Efficiency in LSE	Reduced Incidence of Gastro-intestinal Diseases	Total Benefits	
	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)
2015	26.39	-	-	-	26.39	#	-	-	-	(26.39)
2016	55.72	-	-	-	55.72	-	-	-	-	(55.72)
2017	175.95	-	-	-	175.95	-	-	-	-	(175.95)
2018	222.87	-	-	-	222.87	-	-	-	-	(222.87)
2019	99.71	-	-	-	99.71	-	-	-	-	(99.71)
2020	5.97	17.42	132.81	15.82	172.02	21.40	162.54	-	183.93	11.92
2021	-	17.42	146.09	35.84	199.35	48.48	178.79	0.07	227.34	27.99
2022	86.54	17.42	160.70	60.06	324.72	81.25	196.67	0.20	278.11	(46.61)
2023	-	17.42	176.77	84.29	278.48	114.01	216.34	0.39	330.75	52.27
2024	-	17.42	194.45	92.69	304.56	146.78	237.97	0.52	385.28	80.72
2025	-	17.42	213.89	96.90	328.21	179.55	261.77	0.65	441.97	113.76
2026	-	17.42	235.28	96.90	349.60	212.32	287.95	0.65	500.92	151.32
2027	86.54	17.42	258.81	96.90	459.67	245.09	316.74	0.65	562.48	102.81
2028	-	17.42	284.69	96.90	399.01	277.86	348.42	0.65	626.93	227.92
2029	-	17.42	313.16	96.90	427.48	310.63	383.26	0.65	694.54	267.06
2030	-	17.42	344.48	96.90	458.79	343.40	421.58	0.65	765.63	306.84
2031	-	17.42	378.92	96.90	493.24	376.16	463.74	0.65	840.56	347.32
2032	86.54	17.42	416.82	96.90	617.68	408.93	510.12	0.65	919.70	302.03
2033	-	17.42	458.50	96.90	572.82	441.70	561.13	0.65	1,003.48	430.67
2034	-	17.42	504.35	96.90	618.67	474.47	617.24	0.65	1,092.36	473.70
2035	-	17.42	554.78	96.90	669.10	507.24	678.97	0.65	1,186.86	517.76
2036	-	17.42	610.26	96.90	724.58	540.01	746.86	0.65	1,287.52	562.94
2037	86.54	17.42	671.29	96.90	872.15	572.78	821.55	0.65	1,394.98	522.83
2038	-	17.42	738.41	96.90	852.73	605.54	903.70	0.65	1,509.90	657.17
2039	-	17.42	812.26	96.90	926.57	638.31	994.07	0.65	1,633.04	706.47
EIRR =										16.7%
NPV (@12%) =										300.70

ANNEX B: CENTRAL HIGHLAND AREA - DETAILED ECONOMIC ANALYSIS

A. The Project

1. Subproject Overview

1. The project will assist the Government of Viet Nam in creating strategic and long-term changes to further develop the country's LSE and human resources in order to sustain the achievements of the Lower Secondary Education for the Most Disadvantaged Regions Project (LSEMDRP).¹ The project will have a significant strategic impact on the three key dimensions of LSE in the most disadvantaged regions, viz., access and equity, quality and relevance, and efficiency and sustainability.

2. The proposed subproject interventions under Output 1² will contribute to increasing the number of LSE student enrollees in the project provinces. The civil works to improve and construct 88 new classrooms, 19 additional subject rooms, and 9 libraries will increase the capacity of LSE schools and attract about 3,960³ new Grade 6 student-enrollees annually. The construction of 36 semi-boarding facilities will accommodate 1,584 students who encounter geographical and transportation difficulties in attending school. School conditions will be more conducive with the construction of five additional kitchens and six segregated toilet/bathroom facilities. These, together with the awareness building program targeting EM communities, will encourage an additional 4,447⁴ LSE students to go to school. Dropout rates, on average, are expected to decrease from 3.9% to 2.5%. Promotion and completion rates are likewise envisioned to improve from 88.9% to 93.0% and from 98.1% to 99.5%, respectively. An additional 9,991 new students will be enrolled yearly under the project, resulting in an average NER of about 86%, compared with 83% before the project.

3. Project interventions under Output 2⁵ will improve the quality of LSE graduates, especially EM students, by providing them with better knowledge and skills in order that they may be prepared for higher education. These graduates will also have greater employability and receive higher incomes when they join the labor market. LSE graduates who do not have the opportunity to seek higher education, will join the labor market and look for opportunities for employment. With acquired improved knowledge and skills, their potential salary will be higher than that of other job-seekers who have not attended LSE. A study conducted in Viet Nam estimated that one year of education increases the average earning capacity of an individual by 11%. For students who have completed the four-year LSE requirements, this means that they have greater potential earning capacity (about 45% more) compared with those with only primary education.⁶ It is estimated that the future earnings of students who have completed LSE is about VND13.7 million/person/year compared with VND9.4 million/person/year for those who only completed primary education.⁷

¹ ADB. 2007. *Report and Recommendation of the President to the Board of Directors. Proposed Loan to the Socialist Republic of Viet Nam: Lower Secondary Education for the Most Disadvantaged Regions Project*. Manila.

² Increased access to LSE and LSE equivalency program.

³ Based on 45 students/classroom.

⁴ This is about 1.4% of the total children in the Central Highland area, who are within the age group eligible for LSE.

⁵ Decentralized learning and teaching tools developed.

⁶ Nguyen Xuan Thanh. 2006. *Estimating the Return to Education in Viet Nam: A Difference-in-Difference Approach*. This is an updated version of a research paper written by the author in December 2005 at the John F. Kennedy School of Government, Harvard University, Cambridge, MA, USA.

⁷ Consultant estimates based on interviews conducted during the PPTA.

4. The project will also contribute to improving the quality of planning and management of LSE schools through activities proposed under Output 3.⁸ The provision of block grants for selected EM LSSs in 28 provinces will create opportunities for initiatives and autonomy in improved resource management by these schools. This will, in turn, empower the officials and staff of beneficiary schools and communities, to carry out their own initiatives for improving their respective schools according to their own needs and plans, thereby establishing a strong network for cooperation and support between the schools and the communities. Consequently, this will serve as basis for a solid foundation for building a sense of pride and ownership among teachers, students, and communities and provide a framework for greater decentralization of financial management to school levels, thereby improving efficiency among LSSs. Improved efficiency in using and managing education resources is envisioned to decrease the unit cost per student from VND11.46 million/student/year to VND5.44 million/student/year, or a decrease in cost/student by about 52%.

5. The project will likewise improve project management and implementation through activities under Output 4.⁹ Training of education planners, school principals, and administrators in charge of EM education/LSE equivalency programs on project implementation will ensure that the proposed project is implemented on time and within budget.

B. Economic Analysis

1. Assumptions Used in the Economic Analysis

6. The economic analysis was carried out according to *ADB's Guidelines for Economic Analysis of Projects* (1993). The economic analysis used the following key assumptions:

- (i) Economic costs are at constant early 2014 prices and measured using world price numeraire method.
- (ii) Standard conversion factor (SCF) used was 0.9, and shadow wage rate factor (SWRF) applied was 0.8.¹⁰
- (iii) Total project capital investment cost (excluding price contingencies, fees, and taxes) is spread across the duration of project implementation of 6 years;
- (iv) Incremental operation and maintenance (O&M) costs were assumed at 3.0% of total capital cost.
- (v) Replacement of equipment was assumed to be carried out every five years.
- (vi) Recurrent cost of LSE schools for each of the four regions and the project was based on an average cost of VND5.88 million/student/year (MOET, 2013) which was adjusted to its 2020 economic value and multiplied by the estimated number of students to arrive at the value of recurrent cost for each region and the whole project.
- (vii) Opportunity cost of LSE students was based on VND1,960,827/student/year.¹¹

⁸ New school clustering established.

⁹ Project implementation and monitoring and evaluation (M&E) capacity enhanced.

¹⁰ ADB. 2013. *Report and Recommendation of the President to the Board of Directors for the Proposed Loan to the Socialist Republic of Viet Nam for the Productive Rural Infrastructure Sector Project in the Central Highlands*. Manila.

¹¹ The value of wage earnings of LSE students was based on a study by Gallup (Gallup, J. *The Economic Value of Children in Viet Nam*. 1995. Institutes of Economics and Sociology, Tran Xuan Soan, Hanoi, Viet Nam), which estimated that the average wage rate of child labor was VND896/hour in 1995. Based on an employment rate of 50%, by providing some time for other activities that children normally are involved in, such as play time and other non-income generating activities, the adjusted average rate (opportunity cost) is estimated at VND448/hour. Adjusting for inflation, the average wage rate, in 2014 value, is estimated at about VND6,536/hour or about VND26,144/day, for a four-hour work-day, or about VND1,960,827/year.

- (viii) Project life was assumed at 25 years.
- (ix) The number of students completing all LSE requirements was assumed to remain at their 2023 levels throughout the project life.
- (x) A discount rate of 12% was applied in the calculation of the project's economic internal rate of return (EIRR).

7. A standard method of cost-benefit analysis was used to calculate the EIRR, i.e., the discount rate that makes the net present value (NPV) of costs and benefits equal, which, in turn, served as the basis for determining the economic viability of project investments.

2. Quantification of Project Benefits

8. **Improved future income generating capacity of LSE graduates.** In the long term, the strengthened capacity of school administrators and teachers will produce better educated LSE students with improved life and learning skills. These students will have greater opportunities to continue on to higher education and improve their income generating capacity. For students who decide to work right after LSE, the acquired cognitive and technical skills from LSE will allow them to receive higher wages compared with those who have only completed primary education. In quantifying the benefits generated by LSE students due to the project, the annualized NPV of the future incremental income stream of the additional number of LSE students (9,991 students) was estimated over a period of 20 years, during which they were assumed to remain employed. The incremental future earnings of students having completed LSE was estimated based on the difference in the earnings of one who completed LSE, estimated at VND13.7 million/person/year, and one with only primary education, estimated at VND9.4 million/person/year.

9. It is expected that the impact of the project will start to be felt starting in 2020, when all civil works shall have been completed and the improvements in curriculum, educational materials, learning facilities, and teacher capacity shall have been implemented. As a consequence, under the project, the dropout, promotion, and completion rates are expected to improve gradually every year until the target rates of 2.5%, 93.0%, and 99.5%, respectively, are reached by 2020. The number of students to complete LSE each year is projected to increase from 5,585 students in 2020 to 9,014 students in 2022. Total incremental number of students completing LSE under the "with project" situation is estimated at 175,141 students over the 20-year period, 2020–2039 (Table B1).

Table B1: Projected Number of Students without and with the Project

Year	Without Project			With Project			
	Number of Student Enrolees	Number of Student Enrollees	Incremental Number of Student Enrollees	Number of Students Net of Drop-outs	Number of Students Promoted	Projected Incremental Students Completing LSE per Year	Projected LSE Graduates Finding Employment
2015	9,013	9,013	-				
2016	9,013	9,013	-				
2017	9,013	15,203	6,190	6,036	5,613		
2018	9,013	17,104	8,091	7,889	7,336		
2019	9,013	19,004	9,991	9,741	9,060		
2020	9,013	19,004	9,991	9,741	9,060	5,585	3,407
2021	9,013	19,004	9,991	9,741	9,060	7,300	4,453
2022	9,013	19,004	9,991	9,741	9,060	9,014	5,499
2023	9,013	19,004	9,991	9,741	9,060	9,014	5,499
2024	9,013	19,004	9,991	9,741	9,060	9,014	5,499
2025	9,013	19,004	9,991	9,741	9,060	9,014	5,499
2026	9,013	19,004	9,991	9,741	9,060	9,014	5,499
2027	9,013	19,004	9,991	9,741	9,060	9,014	5,499
2028	9,013	19,004	9,991	9,741	9,060	9,014	5,499
2029	9,013	19,004	9,991	9,741	9,060	9,014	5,499
2030	9,013	19,004	9,991	9,741	9,060	9,014	5,499
2031	9,013	19,004	9,991	9,741	9,060	9,014	5,499
2032	9,013	19,004	9,991	9,741	9,060	9,014	5,499
2033	9,013	19,004	9,991	9,741	9,060	9,014	5,499
2034	9,013	19,004	9,991	9,741	9,060	9,014	5,499
2035	9,013	19,004	9,991	9,741	9,060	9,014	5,499
2036	9,013	19,004	9,991	9,741	9,060	9,014	5,499
2037	9,013	19,004	9,991	9,741	9,060	9,014	5,499
2038	9,013	19,004	9,991	9,741	9,060	9,014	5,499
2039	9,013	19,004	9,991	9,741	9,060	9,014	5,499
Total	225,328	449,425	224,097	218,495	203,200	175,141	106,836

Notes:

Dropout rate under "with project" situation =	2.5%
Promotion rate under "with project" situation =	93.0%
Completion rate under "with project" situation =	99.5%
Employment rate of LSE students =	61%

10. The benefits generated from increased annual LSE student enrolment is closely related to the expected future benefits generated from increased potential income-generating capacity of LSE students. Of the projected total number of students completing LSE requirements during the period, 2020–2039 (175,141 students), a total of 106,836 students are expected to find employment.¹²

11. Current annual wage earning of workers without LSE credentials is about VND23,891,220, which is the average annual wage for jobs (e.g., security services, food delivery services, clerical services, and public/private driving services), which typically hire workers with this qualification. The expected earning of students having completed all LSE requirements was, therefore, calculated by adjusting this basic annual wage earning (VND23,891,220/year/student) by a factor of 1.1¹³ for each year of LSE completed from Grades 6–9. The resulting estimate is the value of expected annual wage earning of workers with LSE credentials, which is about VND 34,979,135 per year per student. In order to estimate the potential future annual earnings of a student without LSE credentials and one with LSE credentials, their respective annual earnings were projected over a 20-year period, the minimum number of employment years assumed in the analysis, and their corresponding NPV at a 12% discount rate was calculated. The NPV of the stream of wage

¹² This is based on a labor participation rate or 0.61 for the labor force within the ages of 15–24 years. Source: <http://www.indexmundi.com/facts/vietnam/labor-participation-rate>

¹³ Based on the findings of Psacharopoulos, G. and H.A. Patrinos. 2004.

earnings for each student was then annualized to calculate the estimated future annual earnings of a student with and without LSE credentials.¹⁴ The expected annual future earnings of a student with and without LSE credentials are VND13,717,311 and VND9,369,108, respectively (Table B2).

Table B2: Estimated Future Annual Earning of Students with vs. without LSE Credentials

Year	Average Annual Wage Without LSE	Average Annual Wage With LSE
2016		
2017		
2018		
2019		
2020	23,891,220	34,979,135
2021	23,891,220	34,979,135
2022	23,891,220	34,979,135
2023	23,891,220	34,979,135
2024	23,891,220	34,979,135
2025	23,891,220	34,979,135
2026	23,891,220	34,979,135
2027	23,891,220	34,979,135
2028	23,891,220	34,979,135
2029	23,891,220	34,979,135
2030	23,891,220	34,979,135
2031	23,891,220	34,979,135
2032	23,891,220	34,979,135
2033	23,891,220	34,979,135
2034	23,891,220	34,979,135
2035	23,891,220	34,979,135
2036	23,891,220	34,979,135
2037	23,891,220	34,979,135
2038	23,891,220	34,979,135
2039	23,891,220	34,979,135
NPV@12%	187,382,162	274,346,223
Annualized wage	9,369,108	13,717,311

Note: It is assumed that for each additional year of education, expected salary will increase by 10%.

12. Adjusting the annualized wage earnings with a shadow wage rate factor of 0.8, the economic values of VND7,495,286¹⁵ and VND10,973,849¹⁶ were estimated as the economic value of future annual wage earnings of students without and with LSE credentials, respectively, or an incremental annual earning of VND4,348,203 for a student who completed all the requirements of Grades 6–9. The total benefits accruing to the project is the total value of the incremental benefits generated by an employed LSE student over his/her 20-year employment period multiplied by the number of employed LSE students generated by the project. Over a 20-year period, students who have completed all LSE requirements and are able to find employment are projected to generate accumulated incremental income earnings of about VND3,802.13 billion in economic terms. The projected incremental benefits are presented in Table B3.

¹⁴ Annualized wage earning was obtained by dividing the NPV of projected annual wage earnings by 20 years, e.g., VND187,382,162 ÷ 20 = VND9,369,108 and VND274,346,223 ÷ 20 = VND13,717,311.

¹⁵ Calculated as VND9,369,108 x 0.8 = VND7,495,286.

¹⁶ Calculated as VND13,717,311 x 0.8 = VND10,973,849.

Table B3: Economic Benefits from Future Incremental Income

Year	Incremental Number of Students Completing LSE	Total Students With LSE Credentials Finding Employment	Projected Annual Incremental Income of Students With LSE Credentials (Financial) (VND billion)	Accumulated Incremental Income of Students With LSE Credentials (Financial) (VND billion)	Accumulated Incremental Income of Students With LSE Credentials (Economic) (VND billion)
2016					
2017					
2018					
2019					
2020	5,585	3,407	14.81	14.81	11.85
2021	7,300	4,453	19.36	34.18	27.34
2022	9,014	5,499	23.91	58.08	46.47
2023	9,014	5,499	23.91	81.99	65.60
2024	9,014	5,499	23.91	105.90	84.72
2025	9,014	5,499	23.91	129.81	103.85
2026	9,014	5,499	23.91	153.72	122.98
2027	9,014	5,499	23.91	177.63	142.11
2028	9,014	5,499	23.91	201.54	161.23
2029	9,014	5,499	23.91	225.45	180.36
2030	9,014	5,499	23.91	249.36	199.49
2031	9,014	5,499	23.91	273.27	218.62
2032	9,014	5,499	23.91	297.18	237.74
2033	9,014	5,499	23.91	321.09	256.87
2034	9,014	5,499	23.91	345.00	276.00
2035	9,014	5,499	23.91	368.91	295.13
2036	9,014	5,499	23.91	392.82	314.25
2037	9,014	5,499	23.91	416.73	333.38
2038	9,014	5,499	23.91	440.64	352.51
2039	9,014	5,499	23.91	464.55	371.64
Total	175,141	106,836	464.55	4,752.66	3,802.13
Earning of non-LSE students (VND/year) =			9,369,108		
Earning of LSE students (VND/year) =			13,717,311		
Earning increment (VND/year) =			4,348,203		
Employment rate of LSE students =			61%		
Shadow wage rate factor =			0.8		

13. **Improved management of LSE schools.** Strengthened capacity of education administrators and managers in planning and management will result in the improved efficiency of school operations and delivery of educational/instructional services in disadvantaged areas. School principals and BOET, DOET and MOET staff will receive training and support in planning and management issues, particularly in the inclusive school development planning and management of pro-poor education initiatives. MOET staff will receive in-country and overseas training in policy planning for disadvantaged groups. Learning support through supplementary instructional materials in EM languages and awareness-raising activities will likewise improve learning outcomes, lower repetition and dropout rates, and improve promotion and completion rates. The proposed project is, therefore, expected to improve cost-effectiveness by increasing capacity utilization of LSE schools, thereby reducing the unit cost of financing LSE students. In estimating the incremental benefits due to improved cost efficiency in LSE schools, the difference between the annual cost of financing one LSE student under the “without project” situation and the annual cost of one LSE student under the “with project” situation multiplied by the incremental number of students is projected over 20 years.

14. Under the “without project” situation, the annual cost of LSE schools in 2020 was estimated at about VND103.31 billion, or an average cost per LSE student of VND11.46 million per student at a total enrolment of 9,013 LSE students. At a projected annual growth rate of 10%, the cost per LSE student is expected to increase to VND70.10 million in 2039. Under the “with project” situation, the number of students in 2020 is expected to increase to 19,004, and the cost per LSE student is estimated to decrease to VND5.44 million/student/year, a reduction of

VND6.03 million/student/year. By 2039, the cost per LSE student is estimated at VND33.25 million/student/year, or a reduction of VND36.85 million/student/year (Table B4).

Table B4: Projected Economic Benefits from Improved Efficiency in LSE School Operations

Year	Without Project			With Project		Estimated Reduced Cost per LSE Student (Financial)	Financial Value of Benefits from Improved Efficiency in LSE	Economic Value of Benefits from Improved Efficiency in LSE ^b
	Total LSE Annual Cost ^a	Total Number of LSE Students	Average LSE Cost per Student (Financial)	Total Number of LSE Students	Average LSE Cost per Student (Financial)			
	[1] (VND billion)	[2]	[3] (VND million)	[4]	[5] (VND million)	[6]=[5] - [3] (VND million)	[7]=[6] × [4] (VND billion)	[8]=[7] × 0.9 (VND billion)
2016								
2017								
2018								
2019								
2020	103.31	9,013	11.46	19,004	5.44	6.03	114.52	103.07
2021	113.64	9,013	12.61	19,004	5.98	6.63	125.97	113.37
2022	125.00	9,013	13.87	19,004	6.58	7.29	138.57	124.71
2023	137.50	9,013	15.26	19,004	7.24	8.02	152.42	137.18
2024	151.25	9,013	16.78	19,004	7.96	8.82	167.67	150.90
2025	166.38	9,013	18.46	19,004	8.75	9.70	184.43	165.99
2026	183.02	9,013	20.31	19,004	9.63	10.68	202.88	182.59
2027	201.32	9,013	22.34	19,004	10.59	11.74	223.16	200.85
2028	221.45	9,013	24.57	19,004	11.65	12.92	245.48	220.93
2029	243.59	9,013	27.03	19,004	12.82	14.21	270.03	243.03
2030	267.95	9,013	29.73	19,004	14.10	15.63	297.03	267.33
2031	294.75	9,013	32.70	19,004	15.51	17.19	326.74	294.06
2032	324.22	9,013	35.97	19,004	17.06	18.91	359.41	323.47
2033	356.65	9,013	39.57	19,004	18.77	20.80	395.35	355.81
2034	392.31	9,013	43.53	19,004	20.64	22.88	434.88	391.40
2035	431.54	9,013	47.88	19,004	22.71	25.17	478.37	430.54
2036	474.69	9,013	52.67	19,004	24.98	27.69	526.21	473.59
2037	522.16	9,013	57.93	19,004	27.48	30.46	578.83	520.95
2038	574.38	9,013	63.73	19,004	30.22	33.50	636.71	573.04
2039	631.82	9,013	70.10	19,004	33.25	36.85	700.39	630.35
Total	5,916.93							5,903.15

^a Total annual LSE cost is projected to increase by about 10% every year.

^b Adjusted by SCF = 0.9

15. The total financial benefit due to the project was estimated by multiplying the reduced cost/student under the “with project” situation by the total number of students under the “with project” situation. The financial benefit from improved efficiency in LSE was estimated at about VND114.52 billion (VND103.07 billion in economic terms) in 2020 and increasing to VND700.39 billion (VND630.35 billion in economic terms) in 2039. The total economic benefit due to improved efficiency in LSE was estimated at about VND5,903.15 billion for the period, 2020–2039 (Table B4).

16. **Improved sanitation and hygienic conditions.** The World Health Organization (WHO) reported that improving water supply and sanitation can have a significant impact on human health. Potential reductions in morbidity as a result of improvements in water supply and sanitation are 80%–100% for cholera and typhoid, and 40%–50% for diarrheal diseases, dysentery, and gastroenteritis.¹⁷ The provision of sanitation facilities will, therefore, contribute to improved sanitation and hygienic practices in LSSs which will result, in turn, in improved health conditions among students. Expression of these benefits in monetary terms was based on a cost of medical treatment of VND2.6 million/person/episode and an incidence rate of gastrointestinal diseases of 0.345%,¹⁸ which is envisioned to decrease to about 0.1725% due to the project.

¹⁷ WHO. n.d. Water and Public Health, WHO Seminar Pack for Drinking-Water Quality, http://www.who.int/water_sanitation_health/dwq/en.

¹⁸ Total number of cases of diarrheal disease in 2009 in Viet Nam was estimated at 296,000. Total population of the country at that time was 85,789,573 people, or an incidence rate of 0.345%. Source: <http://en.wikipedia.org/wiki/>

17. The improved sanitation facilities in LSE schools are expected to significantly reduce the incidence of gastrointestinal diseases among all students enrolled in LSE schools in the project provinces. Disease incidence rate is expected to decline from 0.345%¹⁹ (“without project”) to 0.1725% (“with project”), or a reduction of about 50%.²⁰ The number of persons falling ill annually under the “without project” situation was estimated at 221 and assumed to experience at least two episodes a year or about 443 episodes a year. The average financial cost of medical treatment²¹ was estimated at VND2.59 million/episode²² or VND2.33 million/episode in economic terms. Total cost of medical treatment under the “without project” situation is estimated at VND1.03 billion/year. Under the “with project” situation, this is expected to decrease to VND0.62 billion/year. Thus, the total accumulated medical cost over the period, 2020–2039, is expected to decrease from VND19.10 billion (“without project”) to VND10.43 billion (“with project”) (Table B5).

Table B5: Projected Benefits from Improved Sanitation Facilities

Year	Number of students to benefit from improved sanitation facilities	Incidence rate	Without Project			Incidence rate reduced by 50%	Number of students falling sick	With Project				
			Number of students falling sick	Total number of episodes per year at 2 episodes per	Total cost of medical treatment per year (Economic) (VND)			Total cost of medical treatment per year (Economic) (VND billion)	Total number of episodes per year at 2 episodes	Total cost of medical treatment per year (Economic) (VND)	Total cost of medical treatment per year (Economic) (VND billion)	Reduced medical treatment cost (Economic) (VND billion)
2016												
2017												
2018												
2019												
2020	16,042	0.3450%	55	111	258,095,643	0.26	0.3450%	55	111	258,095,643	0.26	-
2021	32,085	0.3450%	111	221	516,191,286	0.52	0.3105%	100	199	464,572,157	0.46	0.05
2022	48,127	0.3450%	166	332	774,286,929	0.77	0.2760%	133	266	619,429,543	0.62	0.15
2023	64,170	0.3450%	221	443	1,032,382,571	1.03	0.2415%	155	310	722,667,800	0.72	0.31
2024	64,170	0.3450%	221	443	1,032,382,571	1.03	0.2070%	133	266	619,429,543	0.62	0.41
2025	64,170	0.3450%	221	443	1,032,382,571	1.03	0.1725%	111	221	516,191,286	0.52	0.52
2026	64,170	0.3450%	221	443	1,032,382,571	1.03	0.1725%	111	221	516,191,286	0.52	0.52
2027	64,170	0.3450%	221	443	1,032,382,571	1.03	0.1725%	111	221	516,191,286	0.52	0.52
2028	64,170	0.3450%	221	443	1,032,382,571	1.03	0.1725%	111	221	516,191,286	0.52	0.52
2029	64,170	0.3450%	221	443	1,032,382,571	1.03	0.1725%	111	221	516,191,286	0.52	0.52
2030	64,170	0.3450%	221	443	1,032,382,571	1.03	0.1725%	111	221	516,191,286	0.52	0.52
2031	64,170	0.3450%	221	443	1,032,382,571	1.03	0.1725%	111	221	516,191,286	0.52	0.52
2032	64,170	0.3450%	221	443	1,032,382,571	1.03	0.1725%	111	221	516,191,286	0.52	0.52
2033	64,170	0.3450%	221	443	1,032,382,571	1.03	0.1725%	111	221	516,191,286	0.52	0.52
2034	64,170	0.3450%	221	443	1,032,382,571	1.03	0.1725%	111	221	516,191,286	0.52	0.52
2035	64,170	0.3450%	221	443	1,032,382,571	1.03	0.1725%	111	221	516,191,286	0.52	0.52
2036	64,170	0.3450%	221	443	1,032,382,571	1.03	0.1725%	111	221	516,191,286	0.52	0.52
2037	64,170	0.3450%	221	443	1,032,382,571	1.03	0.1725%	111	221	516,191,286	0.52	0.52
2038	64,170	0.3450%	221	443	1,032,382,571	1.03	0.1725%	111	221	516,191,286	0.52	0.52
2039	64,170	0.3450%	221	443	1,032,382,571	1.03	0.1725%	111	221	516,191,286	0.52	0.52
Total persons =			4,096			19.10		2,236			10.43	8.67
Cost of medical treatment/person/episode (VND)=			2,590,481		(Financial)							
Cost of medical treatment/person/episode (VND)=			2,331,433		(Economic)							
SCF =			0.90									

Environmental issues in Vietnam

- ¹⁹ Total number of cases of diarrheal disease in 2009 in Viet Nam was estimated at 296,000. Total population of the country at that time was 85,789,573 people, or an incidence rate of 0.345%. Source: http://en.wikipedia.org/wiki/Environmental_issues_in_Vietnam
- ²⁰ Bunker, J.P. 2001. The Role of Medical Care in Contributing to Health Improvements within Societies. *Intl. J. Epidemiology*, 30(6):1260–1263. The author indicated that the incidence rate of respiratory diseases can be reduced by about 40% with effective medical care. WHO indicated that potential reductions in morbidity as a result of improvements in water supply and sanitation, complemented by effective awareness programs and medical services, are 80%–100% for cholera and typhoid and 40%–50% for diarrheal diseases, dysentery, and gastroenteritis.
- ²¹ Direct costs include medical treatment, medicines, laboratory tests, transportation, food, lodging, and cost of special items such as herbs. Indirect costs include lost wages due to missed work time by the patient, caregivers, and their substitutes as well as productivity losses due to nonmarket activity losses such as housework.
- ²² Fischer, T.K. *et al.* 2005. Health Care Costs of Diarrheal Disease and Estimates of the Cost-effectiveness of Rotavirus Vaccination in Viet Nam. *J. Infectious Diseases*, 192 (10):1720–1726. The cost of medical treatment per episode was expressed in 2005 financial terms, which were adjusted by an inflation rate of 3.98 to arrive at a financial cost of medical treatment per episode of VND2,590,481 in 2014 terms.

3. Estimation of Economic Costs

18. **Project investment cost.** Economic costs were at constant early 2014 prices and measured using the world price numeraire method. Specific costs estimated were project investments, operating and maintenance, and replacement costs. Local cost components, such as non-traded and labor cost components, were converted into economic values using an SCF of 0.9 and SWRF of 0.8. Foreign cost components were mainly the traded components, and their financial value was assumed to be equal to their respective economic values. The total financial capital investment cost was estimated at \$8.0 million, from which all price contingencies (\$0.36 million), taxes (\$0.64 million), and interest charges (\$0.27 million) were excluded.²³ The resulting value of \$6.73 million (or about VND141.29 billion)²⁴ served as basis for arriving at an economic investment cost of about \$6.04 million (or about VND126.87 billion) (Table B6).

Table B6: Estimation of Economic Investment Cost

Year	Cost					
	Civil Works and Equipment (VND billion)	Total Financial Cost (VND billion)	Traded Cost Component (VND billion)	Non-traded Cost Component (VND billion)	Labor Cost Component (VND billion)	Economic Cost (VND billion)
2015	6.36	6.36	0.89	4.01	0.81	5.71
2016	13.42	13.42	1.88	8.46	1.72	12.05
2017	42.39	42.39	5.93	26.70	5.43	38.06
2018	53.69	53.69	7.51	33.82	6.88	48.21
2019	24.02	24.02	3.36	15.13	3.08	21.57
2020	1.41	1.41	0.20	1.09		1.29
Total	141.29	141.29	19.75	89.22	17.93	126.89
Percent foreign exchange =				14%		
Percent local currency (non-labor) =				70%		
Percent local currency (labor) =				16%		
Standard conversion factor (on LC or non tradables) =				0.90		
Standard conversion factor (on FX or tradables) =				1.00		
Shadow wage rate factor =				0.80		

19. **Operation and maintenance cost.** The incremental annual O&M cost was assumed at 3.0% of capital investment costs. The value of the foregone wage earnings (opportunity cost) of LSE students during their enrolment was also included in the economic cost estimates. Estimates of opportunity costs of LSE students were based on the average annual salary that they would have received in jobs over a period of four years while attending LSE.

20. **Recurrent cost of LSE schools.** Estimates of the recurrent budgets for each of the four regions and the project were based on an average cost of VND5.88 million/student/year (MOET, 2013). This average cost/student/year was then multiplied by the estimated number of students to arrive at the value of recurrent cost for each region and the whole project. The estimated recurrent budgets were adjusted to their 2020 economic values and projected over a period of 20 years (2020–2039) at an annual growth rate of about 10%.

21. **Replacement cost.** Replacement of all equipment was assumed to be every five years.

22. **Opportunity cost of LSE students.** The value of wage earnings of LSE students was based on a study by Gallup (1995),²⁵ which estimated that the average wage rate of child labor

²³ Obtained from detailed cost tables.

²⁴ Exchange rate used is VND21,000 to \$1.00.

²⁵ Gallup, J. 1995. *The Economic Value of Children in Viet Nam*, Institutes of Economics and Sociology, Hanoi, Viet Nam..

was VND896/hour in 1995. Based on an employment rate of 50%, to provide some time for other activities that children are normally involved in, such as play time and other non-income generating activities, the adjusted average rate was estimated at VND448/hour. Adjusting for inflation, the average wage rate, in 2014 value, was estimated at about VND6,536/hour, or about VND26,144/day, for a four-hour work day, or about VND1.96 million/year. The economic value of the average wage of children, in 2014 value, was estimated by applying a SWRF of 0.8, giving a value of VND1.57 million/year. This value multiplied by the total number of students who completed LSE each year provides the total annual opportunity cost of LSE students (Table B7).

Table B7: Projected Opportunity Cost of LSE Students

Year	Incremental LSE Students	Total Annual Opportunity Cost of LSE Graduates (VND billion)	Accumulated Opportunity Cost (VND billion)	Incremental Accumulated Opportunity Cost (VND billion)
2016				
2017				
2018				
2019				
2020	5,585	8.76	8.76	8.76
2021	7,300	11.45	20.21	20.21
2022	9,014	14.14	34.35	34.35
2023	9,014	14.14	48.49	48.49
2024	9,014	14.14	53.87	53.87
2025	9,014	14.14	56.56	56.56
2026	9,014	14.14	56.56	56.56
2027	9,014	14.14	56.56	56.56
2028	9,014	14.14	56.56	56.56
2029	9,014	14.14	56.56	56.56
2030	9,014	14.14	56.56	56.56
2031	9,014	14.14	56.56	56.56
2032	9,014	14.14	56.56	56.56
2033	9,014	14.14	56.56	56.56
2034	9,014	14.14	56.56	56.56
2035	9,014	14.14	56.56	56.56
2036	9,014	14.14	56.56	56.56
2037	9,014	14.14	56.56	56.56
2038	9,014	14.14	56.56	56.56
2039	9,014	14.14	56.56	56.56
Total	175,141	274.74	1,014.11	1,014.11

Notes:

- (i) Total graduates is net of dropout, promotion, and completion rates.
- (ii) Average annual earning of a child less than 20 years old (VND/year) = 1,568,662
 Gallup (1995) estimated the average wage rate of child labor at VND896 per hour. Based on an employment rate of 50%, by providing some time for other activities that children normally are involved in such as play time and other non-income generating activities, the adjusted average wage rate is estimated at VND448 per hour. Adjusting for inflation, the average wage rate in 2014 value is estimated at about VND6,536 per hour (about VND26,144 per day) or about VND1,960,827 per year. The economic value of the average wage rate of children, in 2014 value, is estimated by applying a shadow wage rate factor (SERF) of 0.8 to arrive at a value of VND1,568,662 per year.

4. EIRR and Sensitivity Analysis

23. **EIRR calculation.** The monetized value of the benefits compared with the projected economic costs of the project yielded an EIRR value of 22.3% and a benefit-cost ratio (BCR) of 1.2 (Table B8).

Table B8: EIRR Calculation for the Central Highland Area

Year	Cost					Benefits				Net Benefits
	Investment	Operation and Maintenance	Recurrent Cost of LSE Schools	Opportunity Cost of LSE Students	Total Cost	Projected Income of LSE Students Who Completed Grade 9	Economic Value of Benefits from Improved Efficiency in LSE	Reduced Incidence of Gastro-intestinal Diseases due to Improved Sanitation Facilities	Total Benefits	
	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)
2015	5.71				5.71				-	(5.71)
2016	12.05				12.05				-	(12.05)
2017	38.06				38.06				-	(38.06)
2018	48.21				48.21				-	(48.21)
2019	21.57				21.57				-	(21.57)
2020	1.29	3.77	103.31	8.76	117.13	11.85	103.07	-	114.92	(2.21)
2021		3.77	113.64	20.21	137.62	27.34	113.37	0.05	140.77	3.15
2022	32.72	3.77	125.00	34.35	195.85	46.47	124.71	0.15	171.33	(24.51)
2023		3.77	137.50	48.49	189.76	65.60	137.18	0.31	203.09	13.32
2024		3.77	151.25	53.87	208.89	84.72	150.90	0.41	236.04	27.14
2025		3.77	166.38	56.56	226.71	103.85	165.99	0.52	270.36	43.65
2026		3.77	183.02	56.56	243.34	122.98	182.59	0.52	306.08	62.74
2027	32.72	3.77	201.32	56.56	294.37	142.11	200.85	0.52	343.47	49.10
2028		3.77	221.45	56.56	281.78	161.23	220.93	0.52	382.68	100.90
2029		3.77	243.59	56.56	303.92	180.36	243.03	0.52	423.90	119.98
2030		3.77	267.95	56.56	328.28	199.49	267.33	0.52	467.33	139.05
2031		3.77	294.75	56.56	355.08	218.62	294.06	0.52	513.19	158.12
2032	32.72	3.77	324.22	56.56	417.28	237.74	323.47	0.52	561.73	144.45
2033		3.77	356.65	56.56	416.97	256.87	355.81	0.52	613.20	196.23
2034		3.77	392.31	56.56	452.64	276.00	391.40	0.52	667.91	215.27
2035		3.77	431.54	56.56	491.87	295.13	430.54	0.52	726.18	234.31
2036		3.77	474.69	56.56	535.02	314.25	473.59	0.52	788.36	253.34
2037	32.72	3.77	522.16	56.56	615.22	333.38	520.95	0.52	854.85	239.63
2038		3.77	574.38	56.56	634.71	352.51	573.04	0.52	926.07	291.36
2039		3.77	631.82	56.56	692.15	371.64	630.35	0.52	1,002.50	310.35
									EIRR =	22.3%
									NPV (@12%) =	209.10
									BCR =	1.2

24. **Sensitivity analysis.**²⁶ The sensitivity analysis indicated that the EIRR is sensitive to changes in costs, enrolment, and efficiency in LSE school operations, as the sensitivity indicator (SI) values for these change variables are significantly greater than 1. Switching values confirmed the sensitivity of EIRR to changes in these variables (Table B9).

Table B9: EIRR Sensitivity Analysis – Central Highland Area

Change Variable	Percent Change in Variable	Recalculated EIRR	Switching Value	Sensitivity Indicator	Likely Occurrence
1. Increase in costs	20%	12.3%	21%	2.24	Medium
2. Decrease in enrolment	20%	17.8%	40%	1.01	Low
3. Increase in costs and decrease in enrolment	20%	5.8%	14%	3.69	Low
4. Delay in benefits by one year		12.2%			Low
5. Benefits from improved efficiency short by	20%	13.8%	24%	1.90	Low
6. Reduction in disease incidence short by	20%	22.2%	>100%	0.00	Low
Base EIRR =		22.3%			
Base NPV @12% =		209.1 VND billion			
Benefit-cost ratio =		1.2			

²⁶ Details of the EIRR calculation for each sensitivity analysis scenario are presented in the annex at the end of this document.

5. Distribution of Project Benefits and Costs and Poverty Impact Analysis

25. The distribution of benefits and costs among the various project stakeholders was based on estimates of incremental benefits and costs generated by project investments. All financial and economic benefits and costs were expressed in early 2014 prices and in NPV terms at a discount rate of 12% (Table B10).

Table B10: Distribution of Benefits and Costs and Poverty Impact – Central Highland Area

Present Value (@12%) (in billion VND, 2014 Price)	Financial	Economic	Difference	Distribution of Benefits and Costs				Total
	Net Present	Net Present		Population		Government		
	Value	Value		Ethnic	Non-ethnic	Central	Provincial	
	(1)	(2)	(1)-(2)	Minority ¹	Minority ²			
Incremental Benefits From³	2,891.32	2,486.60	404.72	246.88	157.84	-	-	404.72
Improved income-generating capacity potential	1,155.89	924.71	231.18	141.02	90.16			231.18
Improved efficiency of LSE schools	1,732.56	1,559.31	173.26	105.69	67.57			173.26
Improved sanitation in LSE schools	2.86	2.58	0.29	0.17	0.11			0.29
Incremental Costs	2,246.13	1,988.55	257.58	39.92	25.52	16.63	175.51	257.58
Project investment cost	150.97	135.69	15.28			13.75	1.53	15.28
Project O&M cost	31.34	28.15	3.20			2.88	0.32	3.20
Recurrent cost of LSE schools	1,736.61	1,562.95	173.66				173.66	173.66
Opportunity cost of LSE students	327.21	261.77	65.44	39.92	25.52			65.44
Net Benefits	645.19	498.05	147.14	206.96	132.32	(16.63)	(175.51)	147.14
Share of Benefits				140.65%	89.93%	-11.30%	-119.28%	100.00%
Proportion of poor ⁴				37%	12%	10%	10%	
Net benefits to the poor				75.75	16.41	(1.66)	(17.55)	72.94
Poverty Impact Ratio								0.50

¹ Ethnic population is estimated at about 61% of total population. Proportion of benefits accruing to ethnic population is based on this estimate.

² Non-ethnic population is estimated at about 39% of total population. Proportion of benefits accruing to non-ethnic is based on this estimate.

³ Based on net present value (at 12% discount rate) of incremental net benefits generated from investments under the project.

⁴ Data derived from World Bank, 2012 Viet Nam Poverty Assessment, World Bank, Ha Noi.

26. Incremental benefits will be generated through improvements in the (i) income generating capacity of LSE students of about VND231.18 billion, (ii) efficiency of LSE schools due to improved management, VND173.26 billion, and (iii) sanitation in LSE schools, VND0.29 billion. The total generated incremental benefits were estimated at about VND404.72 billion (Table B10). The distribution of benefits among EM and non-EM LSE students was estimated based on the proportion of EM and non-EM LSE students benefiting from project interventions of about 61% and 39%, respectively. Based on these proportions, the distribution of incremental benefits among EM and non-EM population was estimated at VND246.88 billion and VND157.84 billion, respectively (Table B10).

27. Incremental costs totaling VND257.58 billion were estimated based on (i) a project investment cost of about VND15.28 billion, (ii) an O&M cost of VND3.20 billion, (iii) a recurrent cost of LSE schools of VND173.66 billion, and (iv) the opportunity cost of LSE students of VND65.44 billion (Table B10).

28. The total net benefit was estimated at about VND147.14 billion. Based on the proportion of poor by EM LSE students, non-EM LSE students, central government, and provincial government, the total net benefit accruing to the poor was estimated at about VND72.94 billion. The poverty impact ratio is calculated at 0.50 (Table 10).

ATTACHMENT 1: RESULTS OF THE EIRR SENSITIVITY ANALYSIS FOR THE CENTRAL HIGHLAND AREA

Attachment Table B1: Increase in Project Costs by 20%

Year	Cost					Benefits				Net Benefits
	Investment	Operation and Maintenance	Recurrent Cost of LSE Schools	Opportunity Cost of LSE Students	Total Cost	Projected Income of LSE Students Who Completed Grade 9	Economic Value of Benefits from Improved Efficiency in LSE	Reduced Incidence of Gastro-intestinal Diseases	Total Benefits	
	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)
2015	6.85	-	-	-	6.85	-	-	-	-	(6.85)
2016	14.46	-	-	-	14.46	-	-	-	-	(14.46)
2017	45.67	-	-	-	45.67	-	-	-	-	(45.67)
2018	57.85	-	-	-	57.85	-	-	-	-	(57.85)
2019	25.88	-	-	-	25.88	-	-	-	-	(25.88)
2020	1.55	4.52	123.97	8.76	138.80	11.85	103.07	-	114.92	(23.88)
2021	-	4.52	136.37	20.21	161.10	27.34	113.37	0.05	140.77	(20.33)
2022	39.27	4.52	150.00	34.35	228.15	46.47	124.71	0.15	171.33	(56.81)
2023	-	4.52	165.00	48.49	218.02	65.60	137.18	0.31	203.09	(14.93)
2024	-	4.52	181.50	53.87	239.90	84.72	150.90	0.41	236.04	(3.86)
2025	-	4.52	199.65	56.56	260.74	103.85	165.99	0.52	270.36	9.62
2026	-	4.52	219.62	56.56	280.70	122.98	182.59	0.52	306.08	25.38
2027	39.27	4.52	241.58	56.56	341.93	142.11	200.85	0.52	343.47	1.54
2028	-	4.52	265.74	56.56	326.82	161.23	220.93	0.52	382.68	55.86
2029	-	4.52	292.31	56.56	353.40	180.36	243.03	0.52	423.90	70.51
2030	-	4.52	321.54	56.56	382.63	199.49	267.33	0.52	467.33	84.71
2031	-	4.52	353.70	56.56	414.78	218.62	294.06	0.52	513.19	98.41
2032	39.27	4.52	389.07	56.56	489.42	237.74	323.47	0.52	561.73	72.31
2033	-	4.52	427.97	56.56	489.06	256.87	355.81	0.52	613.20	124.14
2034	-	4.52	470.77	56.56	531.85	276.00	391.40	0.52	667.91	136.06
2035	-	4.52	517.85	56.56	578.93	295.13	430.54	0.52	726.18	147.25
2036	-	4.52	569.63	56.56	630.72	314.25	473.59	0.52	788.36	157.64
2037	39.27	4.52	626.60	56.56	726.95	333.38	520.95	0.52	854.85	127.90
2038	-	4.52	689.26	56.56	750.34	352.51	573.04	0.52	926.07	175.73
2039	-	4.52	758.18	56.56	819.27	371.64	630.35	0.52	1,002.50	183.23
										EIRR = 12.3%
										NPV (@12%) = 5.99

Attachment Table B2: Decrease in LSE Annual Enrolment by 20%

Year	Cost					Benefits				Net Benefits
	Investment	Operation and Maintenance	Recurrent Cost of LSE Schools	Opportunity Cost of LSE Students	Total Cost	Projected Income of LSE Students Who Completed Grade 9	Economic Value of Benefits from Improved Efficiency in LSE	Reduced Incidence of Gastro-intestinal Diseases	Total Benefits	
	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)
2015	5.71	-	-	-	5.71	-	-	-	-	(5.71)
2016	12.05	-	-	-	12.05	-	-	-	-	(12.05)
2017	38.06	-	-	-	38.06	-	-	-	-	(38.06)
2018	48.21	-	-	-	48.21	-	-	-	-	(48.21)
2019	21.57	-	-	-	21.57	-	-	-	-	(21.57)
2020	1.29	3.77	103.31	8.76	117.13	9.48	103.07	-	112.55	(4.58)
2021	-	3.77	113.64	20.21	137.62	21.87	113.37	0.05	135.30	(2.32)
2022	32.72	3.77	125.00	34.35	195.85	37.17	124.71	0.15	162.04	(33.81)
2023	-	3.77	137.50	48.49	189.76	52.48	137.18	0.31	189.97	0.21
2024	-	3.77	151.25	53.87	208.89	67.78	150.90	0.41	219.09	10.20
2025	-	3.77	166.38	56.56	226.71	83.08	165.99	0.52	249.59	22.88
2026	-	3.77	183.02	56.56	243.34	98.38	182.59	0.52	281.49	38.14
2027	32.72	3.77	201.32	56.56	294.37	113.68	200.85	0.52	315.05	20.68
2028	-	3.77	221.45	56.56	281.78	128.99	220.93	0.52	350.44	68.66
2029	-	3.77	243.59	56.56	303.92	144.29	243.03	0.52	387.83	83.91
2030	-	3.77	267.95	56.56	328.28	159.59	267.33	0.52	427.44	99.15
2031	-	3.77	294.75	56.56	355.08	174.89	294.06	0.52	469.47	114.39
2032	32.72	3.77	324.22	56.56	417.28	190.19	323.47	0.52	514.18	96.90
2033	-	3.77	356.65	56.56	416.97	205.50	355.81	0.52	561.83	144.85
2034	-	3.77	392.31	56.56	452.64	220.80	391.40	0.52	612.71	160.07
2035	-	3.77	431.54	56.56	491.87	236.10	430.54	0.52	667.15	175.28
2036	-	3.77	474.69	56.56	535.02	251.40	473.59	0.52	725.51	190.48
2037	32.72	3.77	522.16	56.56	615.22	266.71	520.95	0.52	788.17	172.95
2038	-	3.77	574.38	56.56	634.71	282.01	573.04	0.52	855.57	220.86
2039	-	3.77	631.82	56.56	692.15	297.31	630.35	0.52	928.17	236.02
										EIRR = 17.8%
										NPV (@12%) = 104.15

Attachment Table B3: Increase in Project Costs and Decrease in LSE Enrolment by 20%

Year	Cost					Benefits				Net Benefits	
	Investment	Operation and Maintenance	Recurrent Cost of LSE Schools	Opportunity Cost of LSE Students	Total Cost	Projected Income of LSE Students Who Completed Grade 9	Economic Value of Benefits from Improved Efficiency in LSE	Reduced Incidence of Gastro-intestinal Diseases	Total Benefits		
	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	
2015	6.85	-	-	-	6.85	#	-	-	-	(6.85)	
2016	14.46	-	-	-	14.46	-	-	-	-	(14.46)	
2017	45.67	-	-	-	45.67	-	-	-	-	(45.67)	
2018	57.85	-	-	-	57.85	-	-	-	-	(57.85)	
2019	25.88	-	-	-	25.88	-	-	-	-	(25.88)	
2020	1.55	4.52	123.97	8.76	138.80	9.48	103.07	-	112.55	(26.25)	
2021	-	4.52	136.37	20.21	161.10	21.87	113.37	0.05	135.30	(25.80)	
2022	39.27	4.52	150.00	34.35	228.15	37.17	124.71	0.15	162.04	(66.11)	
2023	-	4.52	165.00	48.49	218.02	52.48	137.18	0.31	189.97	(28.05)	
2024	-	4.52	181.50	53.87	239.90	67.78	150.90	0.41	219.09	(20.80)	
2025	-	4.52	199.65	56.56	260.74	83.08	165.99	0.52	249.59	(11.15)	
2026	-	4.52	219.62	56.56	280.70	98.38	182.59	0.52	281.49	0.79	
2027	39.27	4.52	241.58	56.56	341.93	113.68	200.85	0.52	315.05	(26.88)	
2028	-	4.52	265.74	56.56	326.82	128.99	220.93	0.52	350.44	23.61	
2029	-	4.52	292.31	56.56	353.40	144.29	243.03	0.52	387.83	34.44	
2030	-	4.52	321.54	56.56	382.63	159.59	267.33	0.52	427.44	44.81	
2031	-	4.52	353.70	56.56	414.78	174.89	294.06	0.52	469.47	54.69	
2032	39.27	4.52	389.07	56.56	489.42	190.19	323.47	0.52	514.18	24.76	
2033	-	4.52	427.97	56.56	489.06	205.50	355.81	0.52	561.83	72.77	
2034	-	4.52	470.77	56.56	531.85	220.80	391.40	0.52	612.71	80.86	
2035	-	4.52	517.85	56.56	578.93	236.10	430.54	0.52	667.15	88.22	
2036	-	4.52	569.63	56.56	630.72	251.40	473.59	0.52	725.51	94.79	
2037	39.27	4.52	626.60	56.56	726.95	266.71	520.95	0.52	788.17	61.22	
2038	-	4.52	689.26	56.56	750.34	282.01	573.04	0.52	855.57	105.23	
2039	-	4.52	758.18	56.56	819.27	297.31	630.35	0.52	928.17	108.91	
										EIRR =	5.8%
										NPV (@12%) =	(98.95)

Attachment Table B4: Delay in Project Benefits by One Year

Year	Cost					Benefits				Net Benefits	
	Investment	Operation and Maintenance	Recurrent Cost of LSE Schools	Opportunity Cost of LSE Students	Total Cost	Projected Income of LSE Students Who Completed Grade 9	Economic Value of Benefits from Improved Efficiency in LSE	Reduced Incidence of Gastro-intestinal Diseases	Total Benefits		
	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	
2015	5.71	-	-	-	5.71	-	-	-	-	(5.71)	
2016	12.05	-	-	-	12.05	-	-	-	-	(12.05)	
2017	38.06	-	-	-	38.06	-	-	-	-	(38.06)	
2018	48.21	-	-	-	48.21	-	-	-	-	(48.21)	
2019	21.57	-	-	-	21.57	-	-	-	-	(21.57)	
2020	1.29	3.77	103.31	8.76	117.13	-	-	-	-	(117.13)	
2021	-	3.77	113.64	20.21	137.62	11.85	103.07	-	114.92	(22.70)	
2022	32.72	3.77	125.00	34.35	195.85	27.34	113.37	0.05	140.77	(55.08)	
2023	-	3.77	137.50	48.49	189.76	46.47	124.71	0.15	171.33	(18.43)	
2024	-	3.77	151.25	53.87	208.89	65.60	137.18	0.31	203.09	(5.80)	
2025	-	3.77	166.38	56.56	226.71	84.72	150.90	0.41	236.04	9.33	
2026	-	3.77	183.02	56.56	243.34	103.85	165.99	0.52	270.36	27.01	
2027	32.72	3.77	201.32	56.56	294.37	122.98	182.59	0.52	306.08	11.71	
2028	-	3.77	221.45	56.56	281.78	142.11	200.85	0.52	343.47	61.69	
2029	-	3.77	243.59	56.56	303.92	161.23	220.93	0.52	382.68	78.76	
2030	-	3.77	267.95	56.56	328.28	180.36	243.03	0.52	423.90	95.62	
2031	-	3.77	294.75	56.56	355.08	199.49	267.33	0.52	467.33	112.26	
2032	32.72	3.77	324.22	56.56	417.28	218.62	294.06	0.52	513.19	95.92	
2033	-	3.77	356.65	56.56	416.97	237.74	323.47	0.52	561.73	144.75	
2034	-	3.77	392.31	56.56	452.64	256.87	355.81	0.52	613.20	160.56	
2035	-	3.77	431.54	56.56	491.87	276.00	391.40	0.52	667.91	176.04	
2036	-	3.77	474.69	56.56	535.02	295.13	430.54	0.52	726.18	191.15	
2037	32.72	3.77	522.16	56.56	615.22	314.25	473.59	0.52	788.36	173.14	
2038	-	3.77	574.38	56.56	634.71	333.38	520.95	0.52	854.85	220.14	
2039	-	3.77	631.82	56.56	692.15	352.51	573.04	0.52	926.07	233.92	
										EIRR =	12.2%
										NPV (@12%) =	5.27

Attachment Table B5: Benefits from Improved Efficiency Short of Target by 20%

Year	Cost					Benefits				Net Benefits
	Investment	Operation and Maintenance	Recurrent Cost of LSE Schools	Opportunity Cost of LSE Students	Total Cost	Projected Income of LSE Students Who Completed Grade 9	Economic Value of Benefits from Improved Efficiency in LSE	Reduced Incidence of Gastro-intestinal Diseases	Total Benefits	
	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)
2015	5.71	-	-	-	5.71 #	-	-	-	-	(5.71)
2016	12.05	-	-	-	12.05	-	-	-	-	(12.05)
2017	38.06	-	-	-	38.06	-	-	-	-	(38.06)
2018	48.21	-	-	-	48.21	-	-	-	-	(48.21)
2019	21.57	-	-	-	21.57	-	-	-	-	(21.57)
2020	1.29	3.77	103.31	8.76	117.13	11.85	82.45	-	94.30	(22.82)
2021	-	3.77	113.64	20.21	137.62	27.34	90.70	0.05	118.09	(19.53)
2022	32.72	3.77	125.00	34.35	195.85	46.47	99.77	0.15	146.39	(49.46)
2023	-	3.77	137.50	48.49	189.76	65.60	109.75	0.31	175.65	(14.11)
2024	-	3.77	151.25	53.87	208.89	84.72	120.72	0.41	205.86	(3.04)
2025	-	3.77	166.38	56.56	226.71	103.85	132.79	0.52	237.16	10.45
2026	-	3.77	183.02	56.56	243.34	122.98	146.07	0.52	269.57	26.22
2027	32.72	3.77	201.32	56.56	294.37	142.11	160.68	0.52	303.30	8.93
2028	-	3.77	221.45	56.56	281.78	161.23	176.75	0.52	338.50	56.72
2029	-	3.77	243.59	56.56	303.92	180.36	194.42	0.52	375.30	71.38
2030	-	3.77	267.95	56.56	328.28	199.49	213.86	0.52	413.87	85.59
2031	-	3.77	294.75	56.56	355.08	218.62	235.25	0.52	454.38	99.30
2032	32.72	3.77	324.22	56.56	417.28	237.74	258.77	0.52	497.03	79.76
2033	-	3.77	356.65	56.56	416.97	256.87	284.65	0.52	542.04	125.06
2034	-	3.77	392.31	56.56	452.64	276.00	313.12	0.52	589.63	136.99
2035	-	3.77	431.54	56.56	491.87	295.13	344.43	0.52	640.07	148.20
2036	-	3.77	474.69	56.56	535.02	314.25	378.87	0.52	693.64	158.62
2037	32.72	3.77	522.16	56.56	615.22	333.38	416.76	0.52	750.66	135.44
2038	-	3.77	574.38	56.56	634.71	352.51	458.43	0.52	811.46	176.75
2039	-	3.77	631.82	56.56	692.15	371.64	504.28	0.52	876.43	184.28
									EIRR =	13.8%
									NPV (@12%) =	32.14

Attachment Table B6: Benefits from Reduction in Disease Incidence Short of Target by 20%

Year	Cost					Benefits				Net Benefits
	Investment	Operation and Maintenance	Recurrent Cost of LSE Schools	Opportunity Cost of LSE Students	Total Cost	Projected Income of LSE Students Who Completed Grade 9	Economic Value of Benefits from Improved Efficiency in LSE	Reduced Incidence of Gastro-intestinal Diseases	Total Benefits	
	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)
2015	5.71	-	-	-	5.71 #	-	-	-	-	(5.71)
2016	12.05	-	-	-	12.05	-	-	-	-	(12.05)
2017	38.06	-	-	-	38.06	-	-	-	-	(38.06)
2018	48.21	-	-	-	48.21	-	-	-	-	(48.21)
2019	21.57	-	-	-	21.57	-	-	-	-	(21.57)
2020	1.29	3.77	103.31	8.76	117.13	11.85	103.07	-	114.92	(2.21)
2021	-	3.77	113.64	20.21	137.62	27.34	113.37	0.04	140.76	3.14
2022	32.72	3.77	125.00	34.35	195.85	46.47	124.71	0.12	171.30	(24.54)
2023	-	3.77	137.50	48.49	189.76	65.60	137.18	0.25	203.03	13.26
2024	-	3.77	151.25	53.87	208.89	84.72	150.90	0.33	235.95	27.06
2025	-	3.77	166.38	56.56	226.71	103.85	165.99	0.41	270.25	43.55
2026	-	3.77	183.02	56.56	243.34	122.98	182.59	0.41	305.98	62.64
2027	32.72	3.77	201.32	56.56	294.37	142.11	200.85	0.41	343.37	49.00
2028	-	3.77	221.45	56.56	281.78	161.23	220.93	0.41	382.58	100.80
2029	-	3.77	243.59	56.56	303.92	180.36	243.03	0.41	423.80	119.88
2030	-	3.77	267.95	56.56	328.28	199.49	267.33	0.41	467.23	138.95
2031	-	3.77	294.75	56.56	355.08	218.62	294.06	0.41	513.09	158.01
2032	32.72	3.77	324.22	56.56	417.28	237.74	323.47	0.41	561.62	144.35
2033	-	3.77	356.65	56.56	416.97	256.87	355.81	0.41	613.10	196.12
2034	-	3.77	392.31	56.56	452.64	276.00	391.40	0.41	667.81	215.17
2035	-	3.77	431.54	56.56	491.87	295.13	430.54	0.41	726.07	234.20
2036	-	3.77	474.69	56.56	535.02	314.25	473.59	0.41	788.26	253.23
2037	32.72	3.77	522.16	56.56	615.22	333.38	520.95	0.41	854.74	239.52
2038	-	3.77	574.38	56.56	634.71	352.51	573.04	0.41	925.96	291.25
2039	-	3.77	631.82	56.56	692.15	371.64	630.35	0.41	1,002.40	310.25
									EIRR =	22.2%
									NPV (@12%) =	208.80

ANNEX C: MEKONG RIVER DELTA AREA - DETAILED ECONOMIC ANALYSIS

A. The Project

1. Subproject Overview

1. The project will assist the Government of Viet Nam in creating strategic and long-term changes to further develop the country's LSE and human resources in order to sustain the achievements of the Lower Secondary Education for the Most Disadvantaged Regions Project (LSEMDRP).¹ The project will have a significant strategic impact on the three key dimensions of LSE in the most disadvantaged regions, viz., access and equity, quality and relevance, and efficiency and sustainability.

2. The proposed subproject interventions under Output 1² will contribute to increasing the number of LSE student enrollees in the project provinces. The civil works to improve and construct 100 new classrooms, 14 additional subject rooms, and 9 libraries will increase the capacity of LSE schools and attract about 4,500³ new Grade 6 student-enrollees annually. These, together with the awareness building program targeting EM communities, will encourage an additional 3,983⁴ LSE students to go to school. An additional 8,484 new students (i.e., 4,500 students plus 3,983 new students) will be enrolled yearly under the project, resulting in an average NER of about 79%, compared with 82% before the project. Dropout rates are expected to decrease from 3.4% to 2.5%, on average. Promotion and completion rates are likewise envisioned to improve from 94.7% to 97.0% and from 98.1% to 99.5%, respectively.

3. Project interventions under Output 2⁵ will improve the quality of LSE graduates, especially EM students, by providing them with better knowledge and skills in order that they may be prepared for higher education. These graduates will also have greater employability and receive higher incomes when they join the labor market. LSE graduates who do not have the opportunity to seek higher education, will join the labor market and look for opportunities for employment. With acquired improved knowledge and skills, their potential salary will be higher than that of other job-seekers who have not attended LSE. A study conducted in Viet Nam estimated that one year of education increases the average earning capacity of an individual by 11%. For students who have completed the four-year LSE requirements, this means that they have greater potential earning capacity (about 45% more) compared with those with only primary education.⁶ It is estimated that the future earnings of students who have completed LSE is about VND13.7 million/person/year compared with VND9.4 million/person/year for those who only completed primary education.⁷

4. The project will also contribute to improving the quality of planning and management of LSE schools through activities proposed under Output 3.⁸ The provision of block grants for selected EM LSSs in 28 provinces will create opportunities for initiatives and autonomy in improved resource management by these schools. This will, in turn, empower the officials and staff of

¹ ADB. 2007. *Report and Recommendation of the President to the Board of Directors*. Proposed Loan to the Socialist Republic of Viet Nam: Lower Secondary Education for the Most Disadvantaged Regions Project. Manila.

² Increased access to LSE and LSE equivalency program.

³ Based on 45 students/classroom.

⁴ This is about 1.3% of the total children in the Mekong River Delta area, who are within the age group eligible for LSE.

⁵ Decentralized learning and teaching tools developed.

⁶ Nguyen Xuan Thanh. 2006. *Estimating the Return to Education in Viet Nam: A Difference-in-Difference Approach*. This is an updated version of a research paper written by the author in December 2005 at the John F. Kennedy School of Government, Harvard University, Cambridge, MA, USA.

⁷ Consultant estimates based on interviews conducted during the PPTA.

⁸ New school clustering established.

beneficiary schools and communities, to carry out their own initiatives for improving their respective schools according to their own needs and plans, thereby establishing a strong network for cooperation and support between the schools and the communities. Consequently, this will serve as basis for a solid foundation for building a sense of pride and ownership among teachers, students, and communities and provide a framework for greater decentralization of financial management to school levels, thereby improving efficiency among LSSs. Improved efficiency in using and managing education resources is envisioned to decrease the unit cost per student from VND11.46 million/student/year to VND5.26 million/student/year, or a decrease in cost/student by about 54%.

5. The project will likewise improve project management and implementation through activities under Output 4.⁹ Training of education planners, school principals, and administrators in charge of EM education/LSE equivalency programs on project implementation will ensure that the proposed project is implemented on time and within budget.

B. Economic Analysis

1. Assumptions Used in the Economic Analysis

6. The economic analysis was carried out according to *ADB's Guidelines for Economic Analysis of Projects* (1993). The economic analysis used the following key assumptions:

- (i) Economic costs are at constant early 2014 prices and measured using world price numeraire method.
- (ii) Standard conversion factor (SCF) used was 0.9, and shadow wage rate factor (SWRF) applied was 0.8.¹⁰
- (iii) Total project capital investment cost (excluding price contingencies, fees, and taxes) is spread across the duration of project implementation of 6 years;
- (iv) Incremental operation and maintenance (O&M) costs were assumed at 3.0% of total capital cost.
- (v) Replacement of equipment was assumed to be carried out every five years.
- (vi) Recurrent cost of LSE schools for each of the four regions and the project was based on an average cost of VND5.88 million/student/year (MOET, 2013) which was adjusted to its 2020 economic value and multiplied by the estimated number of students to arrive at the value of recurrent cost for each region and the whole project.
- (vii) Opportunity cost of LSE students was based on VND1,960,827/student/year.¹¹
- (viii) Project life was assumed at 25 years.
- (ix) The number of students completing all LSE requirements was assumed to remain at their 2023 levels throughout the project life.
- (x) A discount rate of 12% was applied in the calculation of the project's economic internal rate of return (EIRR).

⁹ Project implementation and monitoring and evaluation (M&E) capacity enhanced.

¹⁰ ADB. 2013. *Report and Recommendation of the President to the Board of Directors for the Proposed Loan to the Socialist Republic of Viet Nam for the Productive Rural Infrastructure Sector Project in the Central Highlands*. Manila.

¹¹ The value of wage earnings of LSE students was based on a study by Gallup (Gallup, J. *The Economic Value of Children in Viet Nam*. 1995. Institutes of Economics and Sociology, Tran Xuan Soan, Hanoi, Viet Nam), which estimated that the average wage rate of child labor was VND896/hour in 1995. Based on an employment rate of 50%, by providing some time for other activities that children normally are involved in, such as play time and other non-income generating activities, the adjusted average rate (opportunity cost) is estimated at VND448/hour. Adjusting for inflation, the average wage rate, in 2014 value, is estimated at about VND6,536/hour or about VND26,144/day, for a four-hour work-day, or about VND1,960,827/year.

7. A standard method of cost-benefit analysis was used to calculate the EIRR, i.e., the discount rate that makes the net present value (NPV) of costs and benefits equal, which, in turn, served as the basis for determining the economic viability of project investments.

2. Quantification of Project Benefits

8. **Improved future income generating capacity of LSE graduates.** In the long term, the strengthened capacity of school administrators and teachers will produce better educated LSE students with improved life and learning skills. These students will have greater opportunities to continue on to higher education and improve their income generating capacity. For students who decide to work right after LSE, the acquired cognitive and technical skills from LSE will allow them to receive higher wages compared with those who have only completed primary education. In quantifying the benefits generated by LSE students due to the project, the annualized NPV of the future incremental income stream of the additional number of LSE students (8,483 students) was estimated over a period of 20 years, during which they were assumed to remain employed. The incremental future earnings of students having completed LSE was estimated based on the difference in the earnings of one who completed LSE, estimated at VND13.7 million/person/year, and one with only primary education, estimated at VND9.4 million/person/year.

9. It is expected that the impact of the project will start to be felt starting in 2020, when all civil works shall have been completed and the improvements in curriculum, educational materials, learning facilities, and teacher capacity shall have been implemented. As a consequence, under the project, the dropout, promotion, and completion rates are expected to improve gradually every year until the target rates of 2.5%, 97.0%, and 99.5%, respectively, are reached by 2020. The number of students to complete LSE each year is projected to increase from 5,226 students in 2020 to 8,288 students in 2022. The total incremental number of students completing LSE under the “with project” situation is estimated at 161,170 students over the 20-year period, 2020–2039 (Table C1).

Table C1: Projected Number of Students without and with the Project

Year	Without Project			With Project			
	Number of Student Enrolees	Number of Student Enrolees	Incremental Number of Student Enrolees	Number of Students Net of Drop-outs	Number of Students Promoted	Projected Incremental Students Completing LSE per Year	Projected LSE Graduates Finding Employment
2015	7,187	7,187	-				
2016	7,187	7,187	-				
2017	7,187	12,536	5,349	5,305	5,252		
2018	7,187	14,103	6,916	6,860	6,791		
2019	7,187	15,670	8,483	8,414	8,330		
2020	7,187	15,670	8,483	8,414	8,330	5,226	3,188
2021	7,187	15,670	8,483	8,414	8,330	6,757	4,122
2022	7,187	15,670	8,483	8,414	8,330	8,288	5,056
2023	7,187	15,670	8,483	8,414	8,330	8,288	5,056
2024	7,187	15,670	8,483	8,414	8,330	8,288	5,056
2025	7,187	15,670	8,483	8,414	8,330	8,288	5,056
2026	7,187	15,670	8,483	8,414	8,330	8,288	5,056
2027	7,187	15,670	8,483	8,414	8,330	8,288	5,056
2028	7,187	15,670	8,483	8,414	8,330	8,288	5,056
2029	7,187	15,670	8,483	8,414	8,330	8,288	5,056
2030	7,187	15,670	8,483	8,414	8,330	8,288	5,056
2031	7,187	15,670	8,483	8,414	8,330	8,288	5,056
2032	7,187	15,670	8,483	8,414	8,330	8,288	5,056
2033	7,187	15,670	8,483	8,414	8,330	8,288	5,056
2034	7,187	15,670	8,483	8,414	8,330	8,288	5,056
2035	7,187	15,670	8,483	8,414	8,330	8,288	5,056
2036	7,187	15,670	8,483	8,414	8,330	8,288	5,056
2037	7,187	15,670	8,483	8,414	8,330	8,288	5,056
2038	7,187	15,670	8,483	8,414	8,330	8,288	5,056
2039	7,187	15,670	8,483	8,414	8,330	8,288	5,056
Total	179,676	370,076	190,400	188,858	186,970	161,170	98,314

Notes:

Dropout rate under “with project” situation =	0.8%
Promotion rate under “with project” situation =	99.0%
Completion rate under “with project” situation =	99.5%
Employment rate of LSE students =	61%

10. The benefits generated from increased annual LSE student enrolment are closely related to the expected future benefits generated from increased potential income-generating capacity of LSE students. Of the projected total number of students completing LSE requirements during the period, 2020–2039 (155,224 students), a total of 98,314 students are expected to find employment (Table C1).¹²

11. Current annual wage earning of workers without LSE credentials is about VND23,891,220, which is the average annual wage for jobs (e.g., security services, food delivery services, clerical services, and public/private driving services), which typically hire workers with this qualification. The expected earning of students having completed all LSE requirements was, therefore, calculated by adjusting this basic annual wage earning (VND23,891,220/year/student) by a factor of 1.1¹³ for each year of LSE completed from Grades 6–9. The resulting estimate is the value of expected annual wage earning of workers with LSE credentials, which is about VND 34,979,135 per year per student. In order to estimate the potential future annual earnings of a student without LSE credentials and one with LSE credentials, their respective annual earnings were projected over a 20-year period, the minimum number of employment years assumed in the analysis, and their corresponding NPV at a 12% discount rate was calculated. The NPV of the stream of wage earnings for each student was then annualized to calculate the estimated future annual earnings of a student with and without LSE credentials.¹⁴ The expected annual future earnings of a student with and without LSE credentials are VND13,717,311 and VND9,369,108, respectively (Table C2).

Table C2: Estimated Future Annual Earning of Students with vs. without LSE Credentials

Year	Average Annual Wage Without LSE	Average Annual Wage With LSE
2016		
2017		
2018		
2019		
2020	23,891,220	34,979,135
2021	23,891,220	34,979,135
2022	23,891,220	34,979,135
2023	23,891,220	34,979,135
2024	23,891,220	34,979,135
2025	23,891,220	34,979,135
2026	23,891,220	34,979,135
2027	23,891,220	34,979,135
2028	23,891,220	34,979,135
2029	23,891,220	34,979,135
2030	23,891,220	34,979,135
2031	23,891,220	34,979,135
2032	23,891,220	34,979,135
2033	23,891,220	34,979,135
2034	23,891,220	34,979,135
2035	23,891,220	34,979,135
2036	23,891,220	34,979,135
2037	23,891,220	34,979,135
2038	23,891,220	34,979,135
2039	23,891,220	34,979,135
NPV@12%	187,382,162	274,346,223
Annualized wage	9,369,108	13,717,311

Note: It is assumed that for each additional year of education, expected salary will increase by 10%.

¹² This is based on a labor participation rate of 0.61 for the labor force within the ages of 15–24 years. Source: <http://www.indexmundi.com/facts/vietnam/labor-participation-rate>

¹³ Based on the findings of Psacharopoulos, G. and H.A. Patrinos. 2004.

¹⁴ Annualized wage earning was obtained by dividing the NPV of projected annual wage earnings by 20 years, e.g., VND187,382,162 ÷ 20 = VND9,369,108 and VND274,346,223 ÷ 20 = VND13,717,311.

12. Adjusting the annualized wage earnings with a shadow wage rate factor of 0.8, the economic values of VND7,495,286¹⁵ and VND10,973,849¹⁶ were estimated as the economic value of future annual wage earnings of students without and with LSE credentials, respectively, or an incremental annual earning of VND4,348,203 for a student who completed all the requirements of Grades 6–9. The total benefits accruing to the project is the total value of the incremental benefits generated by an employed LSE student over his/her 20-year employment period multiplied by the number of employed LSE students generated by the project. Over a 20-year period, students who have completed all LSE requirements and are able to find employment are projected to generate accumulated incremental income earnings of about VND3,501.56 billion in economic terms. The projected incremental benefits are presented in Table C3.

Table C3: Economic Benefits from Future Incremental Income

Year	Incremental Number of Students Completing LSE	Total Students With LSE Credentials Finding Employment	Projected Annual Incremental Income of Students With LSE Credentials (Financial) (VND billion)	Accumulated Incremental Income of Students With LSE Credentials (Financial) (VND billion)	Accumulated Incremental Income of Students With LSE Credentials (Economic) (VND billion)
2016					
2017					
2018					
2019					
2020	5,226	3,188	13.86	13.86	11.09
2021	6,757	4,122	17.92	31.78	25.43
2022	8,288	5,056	21.98	53.77	43.01
2023	8,288	5,056	21.98	75.75	60.60
2024	8,288	5,056	21.98	97.74	78.19
2025	8,288	5,056	21.98	119.72	95.77
2026	8,288	5,056	21.98	141.70	113.36
2027	8,288	5,056	21.98	163.69	130.95
2028	8,288	5,056	21.98	185.67	148.54
2029	8,288	5,056	21.98	207.65	166.12
2030	8,288	5,056	21.98	229.64	183.71
2031	8,288	5,056	21.98	251.62	201.30
2032	8,288	5,056	21.98	273.60	218.88
2033	8,288	5,056	21.98	295.59	236.47
2034	8,288	5,056	21.98	317.57	254.06
2035	8,288	5,056	21.98	339.55	271.64
2036	8,288	5,056	21.98	361.54	289.23
2037	8,288	5,056	21.98	383.52	306.82
2038	8,288	5,056	21.98	405.50	324.40
2039	8,288	5,056	21.98	427.49	341.99
Total	161,170	98,314	427.49	4,376.95	3,501.56
Earning of non-LSE students (VND/year) =			9,369,108		
Earning of LSE students (VND/year) =			13,717,311		
Earning increment (VND/year) =			4,348,203		
Employment rate of LSE students =			61%		
Shadow wage rate factor =			0.8		

13. **Improved management of LSE schools.** Strengthened capacity of education administrators and managers in planning and management will result in the improved efficiency of school operations and delivery of educational/instructional services in disadvantaged areas. School principals and BOET, DOET and MOET staff will receive training and support in planning and management issues, particularly in the inclusive school development planning and management of pro-poor education initiatives. MOET staff will receive in-country and overseas training in policy planning for disadvantaged groups. Learning support through supplementary instructional materials in EM languages and awareness-raising activities will likewise improve learning outcomes, lower repetition and dropout rates, and improve promotion and completion

¹⁵ Calculated as VND9,369,108 x 0.8 = VND7,495,286.

¹⁶ Calculated as VND13,717,311 x 0.8 = VND10,973,849.

rates. The proposed project is, therefore, expected to improve cost-effectiveness by increasing capacity utilization of LSE schools, thereby reducing the unit cost of financing LSE students. In estimating the incremental benefits due to improved cost efficiency in LSE schools, the difference between the annual cost of financing one LSE student under the “without project” situation and the annual cost of one LSE student under the “with project” situation multiplied by the incremental number of students is projected over 20 years.

14. Under the “without project” situation, the annual cost of LSE schools in 2020 was estimated at about VND82.38 billion, or an average cost per LSE student of VND11.46 million per student at a total enrolment of 7,187 LSE students. At a projected annual growth rate of 10%, the cost per LSE student is expected to increase to VND70.10 million in 2039. Under the “with project” situation, the number of students in 2020 is expected to increase to 15,670, and the cost per LSE student is projected to decrease to VND5.26 million/student/year, for a reduction of VND6.20 million/student/year. By 2039, the cost per LSE student is estimated at VND32.15 million/student/year, or a reduction of VND37.95 million/student/year (Table C4).

Table C4: Projected Economic Benefits from Improved Efficiency in LSE School Operations

Year	Without Project			With Project		Estimated Reduced Cost per LSE Student (Financial)	Financial Value of Benefits from Improved Efficiency in LSE	Economic Value of Benefits from Improved Efficiency in LSE ^b
	Total LSE Annual Cost ^a	Total Number of LSE Students	Average LSE Cost per Student (Financial)	Total Number of LSE Students	Average LSE Cost per Student (Financial)			
	[1] (VND billion)	[2]	[3] (VND million)	[4]	[5] (VND million)	[6]=[5] - [3] (VND million)	[7]=[6] x [4] (VND billion)	[8]=[7] x 0.9 (VND billion)
2016								
2017								
2018								
2019								
2020	82.38	7,187	11.46	15,670	5.26	6.20	97.23	87.50
2021	90.61	7,187	12.61	15,670	5.78	6.83	106.95	96.26
2022	99.68	7,187	13.87	15,670	6.36	7.51	117.65	105.88
2023	109.64	7,187	15.26	15,670	7.00	8.26	129.41	116.47
2024	120.61	7,187	16.78	15,670	7.70	9.08	142.35	128.12
2025	132.67	7,187	18.46	15,670	8.47	9.99	156.59	140.93
2026	145.94	7,187	20.31	15,670	9.31	10.99	172.24	155.02
2027	160.53	7,187	22.34	15,670	10.24	12.09	189.47	170.52
2028	176.58	7,187	24.57	15,670	11.27	13.30	208.42	187.57
2029	194.24	7,187	27.03	15,670	12.40	14.63	229.26	206.33
2030	213.66	7,187	29.73	15,670	13.64	16.09	252.18	226.96
2031	235.03	7,187	32.70	15,670	15.00	17.70	277.40	249.66
2032	258.53	7,187	35.97	15,670	16.50	19.47	305.14	274.63
2033	284.39	7,187	39.57	15,670	18.15	21.42	335.66	302.09
2034	312.83	7,187	43.53	15,670	19.96	23.56	369.22	332.30
2035	344.11	7,187	47.88	15,670	21.96	25.92	406.14	365.53
2036	378.52	7,187	52.67	15,670	24.16	28.51	446.76	402.08
2037	416.37	7,187	57.93	15,670	26.57	31.36	491.43	442.29
2038	458.01	7,187	63.73	15,670	29.23	34.50	540.58	486.52
2039	503.81	7,187	70.10	15,670	32.15	37.95	594.63	535.17
Total	4,718.14							5,011.84

^a Total annual LSE cost is projected to increase by about 10% every year.

^b Adjusted by SCF = 0.9

15. The total financial benefit due to the project was estimated by multiplying the reduced cost/student under the “with project” situation by the total number of students under the “with project” situation. The financial benefit from improved efficiency in LSE was estimated at about VND97.23 billion (VND87.50 billion in economic terms) in 2020 and increasing to VND594.63 billion (VND535.17 billion in economic terms) in 2039. The total economic benefits due to improved efficiency in LSE was estimated at about VND5,011.84 billion for the period, 2020–2039 (Table C4).

16. **Improved sanitation and hygienic conditions.** The World Health Organization (WHO) reported that improving water supply and sanitation can have a significant impact on human health. Potential reductions in morbidity as a result of improvements in water supply and sanitation are 80%–100% for cholera and typhoid, and 40%–50% for diarrheal diseases, dysentery, and gastroenteritis.¹⁷ The provision of sanitation facilities will, therefore, contribute to improved sanitation and hygienic practices in LSSs which will result, in turn, in improved health conditions among students. Expression of these benefits in monetary terms was based on a cost of medical treatment of VND2.6 million/person/episode and an incidence rate of gastrointestinal diseases of 0.345%,¹⁸ which is envisioned to decrease to about 0.1725% due to the project.

17. The improved sanitation facilities in LSE schools are expected to significantly reduce the incidence of gastrointestinal diseases among all students enrolled in LSE schools in the project provinces. Disease incidence rate is expected to decline from 0.345%¹⁹ (“without project”) to 0.1725% (“with project”), or a reduction of about 50%.²⁰ The number of persons falling ill annually under the “without project” situation was estimated at 188 and assumed to experience at least two episodes a year or about 376 episodes a year. The average financial cost of medical treatment²¹ was estimated at VND2.59 million/episode²² or VND2.33 million/episode in economic terms. Total cost of medical treatment under the “without project” situation is estimated at VND0.88 billion/year. Under the “with project” situation, this is expected to decrease to VND0.44 billion/year. Thus, the total accumulated medical cost over the period, 2020–2039, is expected to decrease from VND16.22 billion (“without project”) to VND8.85 billion (“with project”) (Table 5).

¹⁷ WHO. n.d. Water and Public Health, WHO Seminar Pack for Drinking-Water Quality, http://www.who.int/water_sanitation_health/dwq/en.

¹⁸ Total number of cases of diarrheal disease in 2009 in Viet Nam was estimated at 296,000. Total population of the country at that time was 85,789,573 people, or an incidence rate of 0.345%. Source: http://en.wikipedia.org/wiki/Environmental_issues_in_Vietnam

¹⁹ Total number of cases of diarrheal disease in 2009 in Viet Nam was estimated at 296,000. Total population of the country at that time was 85,789,573 people, or an incidence rate of 0.345%. Source: http://en.wikipedia.org/wiki/Environmental_issues_in_Vietnam

²⁰ Bunker, J.P. 2001. The Role of Medical Care in Contributing to Health Improvements within Societies. *Intl. J. Epidemiology*, 30(6):1260–1263. The author indicated that the incidence rate of respiratory diseases can be reduced by about 40% with effective medical care. WHO indicated that potential reductions in morbidity as a result of improvements in water supply and sanitation, complemented by effective awareness programs and medical services, are 80%–100% for cholera and typhoid and 40%–50% for diarrheal diseases, dysentery, and gastroenteritis.

²¹ Direct costs include medical treatment, medicines, laboratory tests, transportation, food, lodging, and cost of special items such as herbs. Indirect costs include lost wages due to missed work time by the patient, caregivers, and their substitutes as well as productivity losses due to nonmarket activity losses such as housework.

²² Fischer, T.K. *et al.* 2005. Health Care Costs of Diarrheal Disease and Estimates of the Cost-effectiveness of Rotavirus Vaccination in Viet Nam. *J. Infectious Diseases*, 192 (10):1720–1726. The cost of medical treatment per episode was expressed in 2005 financial terms, which were adjusted by an inflation rate of 3.98 to arrive at a financial cost of medical treatment per episode of VND2,590,481 in 2014 terms.

Table C5: Projected Benefits from Improved Sanitation Facilities

Year	Without Project					With Project						
	Number of students to benefit from improved sanitation facilities	Incidence rate	Number of students falling sick	Total number of episodes per year at 2 episodes per	Total cost of medical treatment per year (Economic) (VND)	Total cost of medical treatment per year (Economic) (VND billion)	Incidence rate reduced by 50%	Number of students falling sick	Total number of episodes per year at 2 episodes	Total cost of medical treatment per year (Economic) (VND)	Total cost of medical treatment per year (Economic) (VND billion)	Reduced medical treatment cost (Economic) (VND billion)
2016												
2017												
2018												
2019												
2020	13,620	0.3450%	47	94	219,125,868	0.22	0.3450%	47	94	219,125,868	0.22	-
2021	27,240	0.3450%	94	188	438,251,736	0.44	0.3105%	85	169	394,426,563	0.39	0.04
2022	40,861	0.3450%	141	282	657,377,604	0.66	0.2760%	113	226	525,902,084	0.53	0.13
2023	54,481	0.3450%	188	376	876,503,473	0.88	0.2415%	132	263	613,552,431	0.61	0.26
2024	54,481	0.3450%	188	376	876,503,473	0.88	0.2070%	113	226	525,902,084	0.53	0.35
2025	54,481	0.3450%	188	376	876,503,473	0.88	0.1725%	94	188	438,251,736	0.44	0.44
2026	54,481	0.3450%	188	376	876,503,473	0.88	0.1725%	94	188	438,251,736	0.44	0.44
2027	54,481	0.3450%	188	376	876,503,473	0.88	0.1725%	94	188	438,251,736	0.44	0.44
2028	54,481	0.3450%	188	376	876,503,473	0.88	0.1725%	94	188	438,251,736	0.44	0.44
2029	54,481	0.3450%	188	376	876,503,473	0.88	0.1725%	94	188	438,251,736	0.44	0.44
2030	54,481	0.3450%	188	376	876,503,473	0.88	0.1725%	94	188	438,251,736	0.44	0.44
2031	54,481	0.3450%	188	376	876,503,473	0.88	0.1725%	94	188	438,251,736	0.44	0.44
2032	54,481	0.3450%	188	376	876,503,473	0.88	0.1725%	94	188	438,251,736	0.44	0.44
2033	54,481	0.3450%	188	376	876,503,473	0.88	0.1725%	94	188	438,251,736	0.44	0.44
2034	54,481	0.3450%	188	376	876,503,473	0.88	0.1725%	94	188	438,251,736	0.44	0.44
2035	54,481	0.3450%	188	376	876,503,473	0.88	0.1725%	94	188	438,251,736	0.44	0.44
2036	54,481	0.3450%	188	376	876,503,473	0.88	0.1725%	94	188	438,251,736	0.44	0.44
2037	54,481	0.3450%	188	376	876,503,473	0.88	0.1725%	94	188	438,251,736	0.44	0.44
2038	54,481	0.3450%	188	376	876,503,473	0.88	0.1725%	94	188	438,251,736	0.44	0.44
2039	54,481	0.3450%	188	376	876,503,473	0.88	0.1725%	94	188	438,251,736	0.44	0.44
Total persons =	3,478					16.22		1,899			8.85	7.36

Cost of medical treatment/person/episode (VND)= 2,590,481 (Financial)

Cost of medical treatment/person/episode (VND)= 2,331,433 (Economic)

SCF = 0.90

3. Estimation of Economic Costs

18. **Project investment cost.** Economic costs were at constant early 2014 prices and measured using the world price numeraire method. Specific costs estimated were project investments, operating and maintenance, and replacement costs. Local cost components, such as non-traded and labor cost components, were converted into economic values using an SCF of 0.9 and SWRF of 0.8. Foreign cost components were mainly the traded components, and their financial value was assumed to be equal to their respective economic values. The total financial capital investment cost was estimated at \$11.03 million, from which all price contingencies (\$0.50 million), taxes (\$0.88 million), and interest charges (\$0.37 million) were excluded.²³ The resulting value of \$9.28 million (or about VND194.78 billion)²⁴ served as basis for arriving at an economic investment cost of about \$8.33 million (or about VND174.94 billion) (Table C6).

²³ Obtained from detailed cost tables.

²⁴ Exchange rate used is VND21,000 to \$1.00.

Table C6: Estimation of Economic Investment Cost

Year	Cost					
	Civil Works and Equipment	Total Financial Cost	Traded Cost Component	Non-traded Cost Component	Labor Cost Component	Economic Cost
	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)
2015	8.77	8.77	1.23	5.52	1.12	7.87
2016	18.50	18.50	2.59	11.66	2.37	16.62
2017	58.44	58.44	8.17	36.81	7.49	52.47
2018	74.02	74.02	10.35	46.63	9.49	66.47
2019	33.11	33.11	4.63	20.86	4.24	29.73
2020	1.95	1.95	0.27	1.51		1.78
Total	194.78	194.78	27.23	123.00	24.72	174.94
Percent foreign exchange =					14%	
Percent local currency (non-labor) =					70%	
Percent local currency (labor) =					16%	
Standard conversion factor (on LC or non tradables) =					0.90	
Standard conversion factor (on FX or tradables) =					1.00	
Shadow wage rate factor =					0.80	

19. **Operation and maintenance cost.** The incremental annual O&M cost was assumed at 3.0% of capital investment costs. The value of the foregone wage earnings (opportunity cost) of LSE students during their enrolment was also included in the economic cost estimates. Estimates of opportunity costs of LSE students were based on the average annual salary that they would have received in jobs over a period of four years while attending LSE.

20. **Recurrent cost of LSE schools.** Estimates of the recurrent budgets for each of the four regions and the project were based on an average cost of VND5.88 million/student/year (MOET, 2013). This average cost/student/year was then multiplied by the estimated number of students to arrive at the value of recurrent cost for each region and the whole project. The estimated recurrent budgets were adjusted to their 2020 economic values and projected over a period of 20 years (2020–2039) at an annual growth rate of about 10%.

21. **Replacement cost.** Replacement of all equipment was assumed to be every five years.

22. **Opportunity cost of LSE students.** The value of wage earnings of LSE students was based on a study by Gallup (1995),²⁵ which estimated that the average wage rate of child labor was VND896/hour in 1995. Based on an employment rate of 50%, to provide some time for other activities that children are normally involved in, such as play time and other non-income generating activities, the adjusted average rate was estimated at VND448/hour. Adjusting for inflation, the average wage rate, in 2014 value, was estimated at about VND6,536/hour, or about VND26,144/day, for a four-hour work day, or about VND1.96 million/year. The economic value of the average wage of children, in 2014 value, was estimated by applying a SWRF of 0.8, giving a value of VND1.57 million/year. This value multiplied by the total number of students who completed LSE each year provides the total annual opportunity cost of LSE students (Table C7).

²⁵ Gallup, J. 1995. *The Economic Value of Children in Viet Nam*, Institutes of Economics and Sociology, Hanoi, Viet Nam.

Table C7: Projected Opportunity Cost of LSE Students

Year	Incremental LSE	Total Annual	Accumulated	Incremental
	Students	Opportunity Cost of LSE Graduates	Opportunity Cost	Accumulated Opportunity Cost
		(VND billion)	(VND billion)	(VND billion)
2016				
2017				
2018				
2019				
2020	5,226	8.20	8.20	8.20
2021	6,757	10.60	18.80	18.80
2022	8,288	13.00	31.80	31.80
2023	8,288	13.00	44.80	44.80
2024	8,288	13.00	49.60	49.60
2025	8,288	13.00	52.01	52.01
2026	8,288	13.00	52.01	52.01
2027	8,288	13.00	52.01	52.01
2028	8,288	13.00	52.01	52.01
2029	8,288	13.00	52.01	52.01
2030	8,288	13.00	52.01	52.01
2031	8,288	13.00	52.01	52.01
2032	8,288	13.00	52.01	52.01
2033	8,288	13.00	52.01	52.01
2034	8,288	13.00	52.01	52.01
2035	8,288	13.00	52.01	52.01
2036	8,288	13.00	52.01	52.01
2037	8,288	13.00	52.01	52.01
2038	8,288	13.00	52.01	52.01
2039	8,288	13.00	52.01	52.01
Total	161,170	252.82	933.28	933.28

Notes:

- (i) Total graduates is net of dropout, promotion, and completion rates.
- (ii) Average annual earning of a child less than 20 years old (VND/year) = 1,568,662
 Gallup (1995) estimated the average wage rate of child labor at VND896 per hour. Based on an employment rate of 50%, by providing some time for other activities that children normally are involved in such as play time and other non-income generating activities, the adjusted average wage rate is estimated at VND448 per hour. Adjusting for inflation, the average wage rate in 2014 value is estimated at about VND6,536 per hour (about VND26,144 per day) or about VND1,960,827 per year. The economic value of the average wage rate of children, in 2014 value, is estimated by applying a shadow wage rate factor (SERF) of 0.8 to arrive at a value of VND1,568,662 per year.

4. EIRR and Sensitivity Analysis

23. **EIRR calculation.** The monetized value of the benefits compared with the projected economic costs of the project yielded an EIRR value of 19.6% and a benefit-cost ratio (BCR) of 1.2 (Table C8).

Table C8: EIRR Calculation for the Mekong River Delta Area

Year	Cost					Benefits				Net Benefits
	Investment	Operation and Maintenance	Recurrent Cost of LSE Schools	Opportunity Cost of LSE Students	Total Cost	Projected Income of LSE Students Who Completed Grade 9	Economic Value of Benefits from Improved Efficiency in LSE	Reduced Incidence of Gastro-intestinal Diseases due to Improved Sanitation Facilities	Total Benefits	
	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)
2015	7.87				7.87				-	(7.87)
2016	16.62				16.62				-	(16.62)
2017	52.47				52.47				-	(52.47)
2018	66.47				66.47				-	(66.47)
2019	29.73				29.73				-	(29.73)
2020	1.78	5.19	82.38	8.20	97.55	11.09	87.50	-	98.59	1.04
2021		5.19	90.61	18.80	114.61	25.43	96.26	0.04	121.73	7.12
2022	45.28	5.19	99.68	31.80	181.95	43.01	105.88	0.13	149.03	(32.93)
2023		5.19	109.64	44.80	159.64	60.60	116.47	0.26	177.33	17.69
2024		5.19	120.61	49.60	175.41	78.19	128.12	0.35	206.65	31.25
2025		5.19	132.67	52.01	189.87	95.77	140.93	0.44	237.14	47.27
2026		5.19	145.94	52.01	203.14	113.36	155.02	0.44	268.82	65.68
2027	45.28	5.19	160.53	52.01	263.01	130.95	170.52	0.44	301.91	38.90
2028		5.19	176.58	52.01	233.78	148.54	187.57	0.44	336.55	102.77
2029		5.19	194.24	52.01	251.44	166.12	206.33	0.44	372.89	121.45
2030		5.19	213.66	52.01	270.86	183.71	226.96	0.44	411.11	140.25
2031		5.19	235.03	52.01	292.23	201.30	249.66	0.44	451.40	159.16
2032	45.28	5.19	258.53	52.01	361.02	218.88	274.63	0.44	493.95	132.93
2033		5.19	284.39	52.01	341.59	236.47	302.09	0.44	539.00	197.41
2034		5.19	312.83	52.01	370.03	254.06	332.30	0.44	586.79	216.77
2035		5.19	344.11	52.01	401.31	271.64	365.53	0.44	637.61	236.30
2036		5.19	378.52	52.01	435.72	289.23	402.08	0.44	691.75	256.03
2037	45.28	5.19	416.37	52.01	518.85	306.82	442.29	0.44	749.55	230.69
2038		5.19	458.01	52.01	515.21	324.40	486.52	0.44	811.36	296.15
2039		5.19	503.81	52.01	561.01	341.99	535.17	0.44	877.60	316.59
									EIRR =	19.6%
									NPV (@12%) =	179.66
									BCR =	1.2

24. **Sensitivity analysis.**²⁶ The sensitivity analysis indicated that the EIRR is sensitive to changes in costs, enrolment, and efficiency in LSE school operations, as the sensitivity indicator (SI) values for these change variables are significantly greater than 1. Switching values confirmed the sensitivity of EIRR to changes in these variables (Table C9).

Table C9: EIRR Sensitivity Analysis – Mekong River Delta Area

Change Variable	Percent Change in Variable	Recalculated EIRR	Switching Value	Sensitivity Indicator	Likely Occurrence
1. Increase in costs	20%	12.1%	21%	1.91	Medium
2. Decrease in enrolment	20%	15.9%	37%	0.94	Low
3. Increase in costs and decrease in enrolment	20%	7.3%	13%	3.14	Low
4. Delay in benefits by one year		12.0%			Low
5. Benefits from improved efficiency short by	20%	13.4%	24%	1.58	Low
6. Reduction in disease incidence short by	20%	19.6%	>100%	0.00	Low
Base EIRR =		19.6%			
Base NPV @12% =		179.7 VND billion			
Benefit-cost ratio =		1.2			

²⁶ Details of the EIRR calculation for each sensitivity analysis scenario are presented in the annex at the end of this document.

5. Distribution of Project Benefits and Costs and Poverty Impact Analysis

25. The distribution of benefits and costs among the various project stakeholders was based on estimates of incremental benefits and costs generated by project investments. All financial and economic benefits and costs were expressed in early 2014 prices and in NPV terms at a discount rate of 12% (Table C10).

Table C10: Distribution of Benefits and Costs and Poverty Impact – Mekong River Delta Area

Present Value (@12%) (in billion VND, 2014 Price)	Financial		Economic	Difference	Distribution of Benefits and Costs				Total
	Net Present	Net Present	Value		Population		Government		
	Value	Value		Ethnic	Non-ethnic	Central	Provincial		
	(1)	(2)	(1)-(2)	Minority ¹	Minority ²				
Incremental Benefits From³	2,538.78	2,178.36	360.42	117.86	242.56	-	-	360.42	
Improved income-generating capacity potential	1,065.38	852.30	213.08	69.68	143.40			213.08	
Improved efficiency of LSE schools	1,470.96	1,323.87	147.10	48.10	99.00			147.10	
Improved sanitation in LSE schools	2.43	2.19	0.24	0.08	0.16			0.24	
Incremental Costs	1,937.87	1,713.59	224.27	19.72	40.58	22.95	141.03	224.27	
Project investment cost	208.41	187.32	21.09			18.98	2.11	21.09	
Project O&M cost	43.21	38.80	4.41			3.97	0.44	4.41	
Recurrent cost of LSE schools	1,384.77	1,246.29	138.48				138.48	138.48	
Opportunity cost of LSE students	301.48	241.18	60.30	19.72	40.58			60.30	
Net Benefits	600.91	464.77	136.14	98.14	201.98	(22.95)	(141.03)	136.14	
Share of Benefits				72.09%	148.36%	-16.86%	-103.59%	100.00%	
Proportion of poor ⁴				18%	16%	10%	10%		
Net benefits to the poor				17.86	32.52	(2.30)	(14.10)	33.98	
Poverty Impact Ratio								0.25	

¹ Ethnic population is estimated at about 32.7% of total population. Proportion of benefits accruing to ethnic population is based on this estimate.

² Non-ethnic population is estimated at about 67.3% of total population. Proportion of benefits accruing to non-ethnic is based on this estimate.

³ Based on net present value (at 12% discount rate) of incremental net benefits generated from investments under the project.

⁴ Data derived from World Bank, 2012 Viet Nam Poverty Assessment, World Bank, Ha Noi.

26. Incremental benefits will be generated through improvements in the (i) income generating capacity of LSE students of about VND213.08 billion, (ii) efficiency of LSE schools due to improved management, VND147.10 billion, and (iii) sanitation in LSE schools, VND0.24 billion. The total generated incremental benefits were estimated at about VND360.42 billion (Table C10). The distribution of benefits among EM and non-EM LSE students was estimated based on the proportion of EM and non-EM LSE students benefiting from project interventions of about 32.7% and 67.3%, respectively. Based on these proportions, the distribution of incremental benefits among EM and non-EM population was estimated at VND117.86 billion and VND242.56 billion, respectively (Table C10).

27. Incremental costs totaling VND224.27 billion were estimated based on (i) a project investment cost of about VND21.09 billion, (ii) an O&M cost of VND4.41 billion, (iii) a recurrent cost of LSE schools of VND138.48 billion, and (iv) the opportunity cost of LSE students of VND60.30 billion (Table C10).

28. The total net benefit was estimated at about VND136.14 billion. Based on the proportion of poor by EM LSE students, non-EM LSE students, central government, and provincial government, the total net benefit accruing to the poor was estimated at about VND33.98 billion. The poverty impact ratio was calculated at 0.25 (Table C10).

ATTACHMENT 1: RESULTS OF THE SENSITIVITY ANALYSIS FOR THE MEKONG RIVER DELTA AREA

Attachment Table C1: Increase in Project Costs by 20%

Year	Cost					Benefits				Net Benefits
	Investment	Operation and Maintenance	Recurrent Cost of LSE Schools	Opportunity Cost of LSE Students	Total Cost	Projected Income of LSE Students Who Completed Grade 9	Economic Value of Benefits from Improved Efficiency in LSE	Reduced Incidence of Gastro-intestinal Diseases	Total Benefits	
	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)
2015	9.45	-	-	-	9.45	-	-	-	-	(9.45)
2016	19.94	-	-	-	19.94	-	-	-	-	(19.94)
2017	62.97	-	-	-	62.97	-	-	-	-	(62.97)
2018	79.76	-	-	-	79.76	-	-	-	-	(79.76)
2019	35.68	-	-	-	35.68	-	-	-	-	(35.68)
2020	2.14	6.23	98.85	8.20	115.42	11.09	87.50	-	98.59	(16.83)
2021	-	6.23	108.74	18.80	133.77	25.43	96.26	0.04	121.73	(12.04)
2022	54.34	6.23	119.61	31.80	211.98	43.01	105.88	0.13	149.03	(62.96)
2023	-	6.23	131.57	44.80	182.61	60.60	116.47	0.26	177.33	(5.27)
2024	-	6.23	144.73	49.60	200.57	78.19	128.12	0.35	206.65	6.09
2025	-	6.23	159.20	52.01	217.44	95.77	140.93	0.44	237.14	19.70
2026	-	6.23	175.12	52.01	233.36	113.36	155.02	0.44	268.82	35.46
2027	54.34	6.23	192.64	52.01	305.21	130.95	170.52	0.44	301.91	(3.30)
2028	-	6.23	211.90	52.01	270.14	148.54	187.57	0.44	336.55	66.41
2029	-	6.23	233.09	52.01	291.33	166.12	206.33	0.44	372.89	81.56
2030	-	6.23	256.40	52.01	314.64	183.71	226.96	0.44	411.11	96.48
2031	-	6.23	282.04	52.01	340.28	201.30	249.66	0.44	451.40	111.12
2032	54.34	6.23	310.24	52.01	422.82	218.88	274.63	0.44	493.95	71.13
2033	-	6.23	341.27	52.01	399.50	236.47	302.09	0.44	539.00	139.49
2034	-	6.23	375.39	52.01	433.63	254.06	332.30	0.44	586.79	153.16
2035	-	6.23	412.93	52.01	471.17	271.64	365.53	0.44	637.61	166.44
2036	-	6.23	454.22	52.01	512.46	289.23	402.08	0.44	691.75	179.29
2037	54.34	6.23	499.65	52.01	612.22	306.82	442.29	0.44	749.55	137.32
2038	-	6.23	549.61	52.01	607.85	324.40	486.52	0.44	811.36	203.51
2039	-	6.23	604.57	52.01	662.81	341.99	535.17	0.44	877.60	214.79
										EIRR = 12.1%
										NPV (@12%) = 2.72

Attachment Table C2: Decrease in LSE Annual Enrolment by 20%

Year	Cost					Benefits				Net Benefits
	Investment	Operation and Maintenance	Recurrent Cost of LSE Schools	Opportunity Cost of LSE Students	Total Cost	Projected Income of LSE Students Who Completed Grade 9	Economic Value of Benefits from Improved Efficiency in LSE	Reduced Incidence of Gastro-intestinal Diseases	Total Benefits	
	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)
2015	7.87	-	-	-	7.87	-	-	-	-	(7.87)
2016	16.62	-	-	-	16.62	-	-	-	-	(16.62)
2017	52.47	-	-	-	52.47	-	-	-	-	(52.47)
2018	66.47	-	-	-	66.47	-	-	-	-	(66.47)
2019	29.73	-	-	-	29.73	-	-	-	-	(29.73)
2020	1.78	5.19	82.38	8.20	97.55	8.87	87.50	-	96.38	(1.17)
2021	-	5.19	90.61	18.80	114.61	20.34	96.26	0.04	116.64	2.03
2022	45.28	5.19	99.68	31.80	181.95	34.41	105.88	0.13	140.42	(41.53)
2023	-	5.19	109.64	44.80	159.64	48.48	116.47	0.26	165.21	5.57
2024	-	5.19	120.61	49.60	175.41	62.55	128.12	0.35	191.02	15.61
2025	-	5.19	132.67	52.01	189.87	76.62	140.93	0.44	217.99	28.12
2026	-	5.19	145.94	52.01	203.14	90.69	155.02	0.44	246.15	43.01
2027	45.28	5.19	160.53	52.01	263.01	104.76	170.52	0.44	275.72	12.71
2028	-	5.19	176.58	52.01	233.78	118.83	187.57	0.44	306.84	73.06
2029	-	5.19	194.24	52.01	251.44	132.90	206.33	0.44	339.67	88.23
2030	-	5.19	213.66	52.01	270.86	146.97	226.96	0.44	374.37	103.51
2031	-	5.19	235.03	52.01	292.23	161.04	249.66	0.44	411.14	118.91
2032	45.28	5.19	258.53	52.01	361.02	175.11	274.63	0.44	450.17	89.16
2033	-	5.19	284.39	52.01	341.59	189.18	302.09	0.44	491.70	150.12
2034	-	5.19	312.83	52.01	370.03	203.25	332.30	0.44	535.98	165.96
2035	-	5.19	344.11	52.01	401.31	217.31	365.53	0.44	583.28	181.97
2036	-	5.19	378.52	52.01	435.72	231.38	402.08	0.44	633.90	198.18
2037	45.28	5.19	416.37	52.01	518.85	245.45	442.29	0.44	688.18	169.33
2038	-	5.19	458.01	52.01	515.21	259.52	486.52	0.44	746.48	231.27
2039	-	5.19	503.81	52.01	561.01	273.59	535.17	0.44	809.20	248.19
										EIRR = 15.9%
										NPV (@12%) = 82.94

Attachment Table C3: Increase in Project Costs and Decrease in LSE Enrolment by 20%

Year	Cost					Benefits				Net Benefits
	Investment	Operation and Maintenance	Recurrent Cost of LSE Schools	Opportunity Cost of LSE Students	Total Cost	Projected Income of LSE Students Who Completed Grade 9	Economic Value of Benefits from Improved Efficiency in LSE	Reduced Incidence of Gastro-intestinal Diseases	Total Benefits	
	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)
2015	9.45	-	-	-	9.45 #	-	-	-	-	(9.45)
2016	19.94	-	-	-	19.94	-	-	-	-	(19.94)
2017	62.97	-	-	-	62.97	-	-	-	-	(62.97)
2018	79.76	-	-	-	79.76	-	-	-	-	(79.76)
2019	35.68	-	-	-	35.68	-	-	-	-	(35.68)
2020	2.14	6.23	98.85	8.20	115.42	8.87	87.50	-	96.38	(19.04)
2021	-	6.23	108.74	18.80	133.77	20.34	96.26	0.04	116.64	(17.13)
2022	54.34	6.23	119.61	31.80	211.98	34.41	105.88	0.13	140.42	(71.56)
2023	-	6.23	131.57	44.80	182.61	48.48	116.47	0.26	165.21	(17.39)
2024	-	6.23	144.73	49.60	200.57	62.55	128.12	0.35	191.02	(9.55)
2025	-	6.23	159.20	52.01	217.44	76.62	140.93	0.44	217.99	0.54
2026	-	6.23	175.12	52.01	233.36	90.69	155.02	0.44	246.15	12.79
2027	54.34	6.23	192.64	52.01	305.21	104.76	170.52	0.44	275.72	(29.49)
2028	-	6.23	211.90	52.01	270.14	118.83	187.57	0.44	306.84	36.70
2029	-	6.23	233.09	52.01	291.33	132.90	206.33	0.44	339.67	48.34
2030	-	6.23	256.40	52.01	314.64	146.97	226.96	0.44	374.37	59.73
2031	-	6.23	282.04	52.01	340.28	161.04	249.66	0.44	411.14	70.86
2032	54.34	6.23	310.24	52.01	422.82	175.11	274.63	0.44	450.17	27.35
2033	-	6.23	341.27	52.01	399.50	189.18	302.09	0.44	491.70	92.20
2034	-	6.23	375.39	52.01	433.63	203.25	332.30	0.44	535.98	102.35
2035	-	6.23	412.93	52.01	471.17	217.31	365.53	0.44	583.28	112.11
2036	-	6.23	454.22	52.01	512.46	231.38	402.08	0.44	633.90	121.44
2037	54.34	6.23	499.65	52.01	612.22	245.45	442.29	0.44	688.18	75.96
2038	-	6.23	549.61	52.01	607.85	259.52	486.52	0.44	746.48	138.63
2039	-	6.23	604.57	52.01	662.81	273.59	535.17	0.44	809.20	146.39
EIRR =										7.3%
NPV (@12%) =										(94.01)

Attachment Table C4: Delay in Project Benefits by One Year

Year	Cost					Benefits				Net Benefits
	Investment	Operation and Maintenance	Recurrent Cost of LSE Schools	Opportunity Cost of LSE Students	Total Cost	Projected Income of LSE Students Who Completed Grade 9	Economic Value of Benefits from Improved Efficiency in LSE	Reduced Incidence of Gastro-intestinal Diseases	Total Benefits	
	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)
2015	7.87	-	-	-	7.87	-	-	-	-	(7.87)
2016	16.62	-	-	-	16.62	-	-	-	-	(16.62)
2017	52.47	-	-	-	52.47	-	-	-	-	(52.47)
2018	66.47	-	-	-	66.47	-	-	-	-	(66.47)
2019	29.73	-	-	-	29.73	-	-	-	-	(29.73)
2020	1.78	5.19	82.38	8.20	97.55	-	-	-	-	(97.55)
2021	-	5.19	90.61	18.80	114.61	11.09	87.50	-	98.59	(16.01)
2022	45.28	5.19	99.68	31.80	181.95	25.43	96.26	0.04	121.73	(60.23)
2023	-	5.19	109.64	44.80	159.64	43.01	105.88	0.13	149.03	(10.61)
2024	-	5.19	120.61	49.60	175.41	60.60	116.47	0.26	177.33	1.93
2025	-	5.19	132.67	52.01	189.87	78.19	128.12	0.35	206.65	16.79
2026	-	5.19	145.94	52.01	203.14	95.77	140.93	0.44	237.14	34.00
2027	45.28	5.19	160.53	52.01	263.01	113.36	155.02	0.44	268.82	5.81
2028	-	5.19	176.58	52.01	233.78	130.95	170.52	0.44	301.91	68.13
2029	-	5.19	194.24	52.01	251.44	148.54	187.57	0.44	336.55	85.11
2030	-	5.19	213.66	52.01	270.86	166.12	206.33	0.44	372.89	102.03
2031	-	5.19	235.03	52.01	292.23	183.71	226.96	0.44	411.11	118.88
2032	45.28	5.19	258.53	52.01	361.02	201.30	249.66	0.44	451.40	90.38
2033	-	5.19	284.39	52.01	341.59	218.88	274.63	0.44	493.95	152.36
2034	-	5.19	312.83	52.01	370.03	236.47	302.09	0.44	539.00	168.97
2035	-	5.19	344.11	52.01	401.31	254.06	332.30	0.44	586.79	185.48
2036	-	5.19	378.52	52.01	435.72	271.64	365.53	0.44	637.61	201.89
2037	45.28	5.19	416.37	52.01	518.85	289.23	402.08	0.44	691.75	172.90
2038	-	5.19	458.01	52.01	515.21	306.82	442.29	0.44	749.55	234.34
2039	-	5.19	503.81	52.01	561.01	324.40	486.52	0.44	811.36	250.35
EIRR =										12.0%
NPV (@12%) =										1.14

Attachment Table C5: Benefits from Improved Efficiency Short of Target by 20%

Year	Cost					Benefits				Net Benefits
	Investment	Operation and Maintenance	Recurrent Cost of LSE Schools	Opportunity Cost of LSE Students	Total Cost	Projected Income of LSE Students Who Completed Grade 9	Economic Value of Benefits from Improved Efficiency in LSE	Reduced Incidence of Gastro-intestinal Diseases	Total Benefits	
	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)
2015	7.87	-	-	-	7.87 #	-	-	-	-	(7.87)
2016	16.62	-	-	-	16.62	-	-	-	-	(16.62)
2017	52.47	-	-	-	52.47	-	-	-	-	(52.47)
2018	66.47	-	-	-	66.47	-	-	-	-	(66.47)
2019	29.73	-	-	-	29.73	-	-	-	-	(29.73)
2020	1.78	5.19	82.38	8.20	97.55	11.09	70.00	-	81.09	(16.46)
2021	-	5.19	90.61	18.80	114.61	25.43	77.00	0.04	102.48	(12.13)
2022	45.28	5.19	99.68	31.80	181.95	43.01	84.70	0.13	127.85	(54.10)
2023	-	5.19	109.64	44.80	159.64	60.60	93.18	0.26	154.04	(5.60)
2024	-	5.19	120.61	49.60	175.41	78.19	102.49	0.35	181.03	5.62
2025	-	5.19	132.67	52.01	189.87	95.77	112.74	0.44	208.95	19.09
2026	-	5.19	145.94	52.01	203.14	113.36	124.02	0.44	237.82	34.68
2027	45.28	5.19	160.53	52.01	263.01	130.95	136.42	0.44	267.80	4.79
2028	-	5.19	176.58	52.01	233.78	148.54	150.06	0.44	299.03	65.25
2029	-	5.19	194.24	52.01	251.44	166.12	165.07	0.44	331.63	80.19
2030	-	5.19	213.66	52.01	270.86	183.71	181.57	0.44	365.72	94.85
2031	-	5.19	235.03	52.01	292.23	201.30	199.73	0.44	401.46	109.23
2032	45.28	5.19	258.53	52.01	361.02	218.88	219.70	0.44	439.02	78.01
2033	-	5.19	284.39	52.01	341.59	236.47	241.67	0.44	478.58	136.99
2034	-	5.19	312.83	52.01	370.03	254.06	265.84	0.44	520.33	150.31
2035	-	5.19	344.11	52.01	401.31	271.64	292.42	0.44	564.51	163.20
2036	-	5.19	378.52	52.01	435.72	289.23	321.67	0.44	611.33	175.61
2037	45.28	5.19	416.37	52.01	518.85	306.82	353.83	0.44	661.09	142.23
2038	-	5.19	458.01	52.01	515.21	324.40	389.22	0.44	714.06	198.85
2039	-	5.19	503.81	52.01	561.01	341.99	428.14	0.44	770.57	209.56
									EIRR =	13.4%
									NPV (@12%) =	29.42

Attachment Table C6: Benefits from Reduction in Disease Incidence Short of Target by 20%

Year	Cost					Benefits				Net Benefits
	Investment	Operation and Maintenance	Recurrent Cost of LSE Schools	Opportunity Cost of LSE Students	Total Cost	Projected Income of LSE Students Who Completed Grade 9	Economic Value of Benefits from Improved Efficiency in LSE	Reduced Incidence of Gastro-intestinal Diseases	Total Benefits	
	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)
2015	7.87	-	-	-	7.87 #	-	-	-	-	(7.87)
2016	16.62	-	-	-	16.62	-	-	-	-	(16.62)
2017	52.47	-	-	-	52.47	-	-	-	-	(52.47)
2018	66.47	-	-	-	66.47	-	-	-	-	(66.47)
2019	29.73	-	-	-	29.73	-	-	-	-	(29.73)
2020	1.78	5.19	82.38	8.20	97.55	11.09	87.50	-	98.59	1.04
2021	-	5.19	90.61	18.80	114.61	25.43	96.26	0.04	121.72	7.11
2022	45.28	5.19	99.68	31.80	181.95	43.01	105.88	0.11	149.00	(32.95)
2023	-	5.19	109.64	44.80	159.64	60.60	116.47	0.21	177.28	17.64
2024	-	5.19	120.61	49.60	175.41	78.19	128.12	0.28	206.58	31.18
2025	-	5.19	132.67	52.01	189.87	95.77	140.93	0.35	237.05	47.18
2026	-	5.19	145.94	52.01	203.14	113.36	155.02	0.35	268.73	65.60
2027	45.28	5.19	160.53	52.01	263.01	130.95	170.52	0.35	301.82	38.81
2028	-	5.19	176.58	52.01	233.78	148.54	187.57	0.35	336.46	102.68
2029	-	5.19	194.24	52.01	251.44	166.12	206.33	0.35	372.80	121.36
2030	-	5.19	213.66	52.01	270.86	183.71	226.96	0.35	411.02	140.16
2031	-	5.19	235.03	52.01	292.23	201.30	249.66	0.35	451.31	159.08
2032	45.28	5.19	258.53	52.01	361.02	218.88	274.63	0.35	493.86	132.84
2033	-	5.19	284.39	52.01	341.59	236.47	302.09	0.35	538.91	197.32
2034	-	5.19	312.83	52.01	370.03	254.06	332.30	0.35	586.71	216.68
2035	-	5.19	344.11	52.01	401.31	271.64	365.53	0.35	637.52	236.21
2036	-	5.19	378.52	52.01	435.72	289.23	402.08	0.35	691.66	255.94
2037	45.28	5.19	416.37	52.01	518.85	306.82	442.29	0.35	749.46	230.60
2038	-	5.19	458.01	52.01	515.21	324.40	486.52	0.35	811.27	296.06
2039	-	5.19	503.81	52.01	561.01	341.99	535.17	0.35	877.51	316.50
									EIRR =	19.6%
									NPV (@12%) =	179.41

ANNEX D: NORTH CENTRAL AND CENTRAL COASTAL AREA - DETAILED ECONOMIC ANALYSIS

A. The Project

1. Subproject Overview

1. The project will assist the Government of Viet Nam in creating strategic and long-term changes to further develop the country's LSE and human resources in order to sustain the achievements of the Lower Secondary Education for the Most Disadvantaged Regions Project (LSEMDRP).¹ The project will have a significant strategic impact on the three key dimensions of LSE in the most disadvantaged regions, viz., access and equity, quality and relevance, and efficiency and sustainability.

2. The proposed subproject interventions under Output 1² will contribute to increasing the number of LSE student enrollees in the project provinces. The civil works to improve and construct 350 new classrooms, 35 additional subject rooms, and 23 libraries will increase the capacity of LSE schools and attract about 15,750³ new Grade 6 student-enrollees annually. School conditions will be more conducive with the construction of eight segregated toilet/bathroom facilities. These, together with a targeted awareness building program will encourage an additional 16,971⁴ LSE students to attend school. Dropout rates, on average, are expected to decrease from 1.0% to 0.8%. Promotion and completion rates are likewise envisioned to improve from 97.6% to 99.0% and from 98.2% to 99.5%, respectively. An additional 32,721 new students will be enrolled yearly under the project, resulting in an average NER of about 95%, compared with 92% before the project.

3. Project interventions under Output 2⁵ will improve the quality of LSE graduates, especially EM students, by providing them with better knowledge and skills in order that they may be prepared for higher education. These graduates will also have greater employability and receive higher incomes when they join the labor market. LSE graduates who do not have the opportunity to seek higher education, will join the labor market and look for opportunities for employment. With acquired improved knowledge and skills, their potential salary will be higher than that of other job-seekers who have not attended LSE. A study conducted in Viet Nam estimated that one year of education increases the average earning capacity of an individual by 11%. For students who have completed the four-year LSE requirements, this means that they have greater potential earning capacity (about 45% more) compared with those with only primary education.⁶ It is estimated that the future earnings of students who have completed LSE is about VND13.7 million/person/year compared with VND9.4 million/person/year for those who only completed primary education.⁷

¹ ADB. 2007. *Report and Recommendation of the President to the Board of Directors. Proposed Loan to the Socialist Republic of Viet Nam: Lower Secondary Education for the Most Disadvantaged Regions Project*. Manila.

² Increased access to LSE and LSE equivalency program.

³ Based on 45 students/classroom.

⁴ This is about 1.6% of the total children in the North Central and Central Coastal area, who are within the age group eligible for LSE.

⁵ Decentralized learning and teaching tools developed.

⁶ Nguyen Xuan Thanh. 2006. *Estimating the Return to Education in Viet Nam: A Difference-in-Difference Approach*. This is an updated version of a research paper written by the author in December 2005 at the John F. Kennedy School of Government, Harvard University, Cambridge, MA, USA.

⁷ Consultant estimates based on interviews conducted during the PPTA.

4. The project will also contribute to improving the quality of planning and management of LSE schools through activities proposed under Output 3.⁸ The provision of block grants for selected EM LSSs in 28 provinces will create opportunities for initiatives and autonomy in improved resource management by these schools. This will, in turn, empower the officials and staff of beneficiary schools and communities, to carry out their own initiatives for improving their respective schools according to their own needs and plans, thereby establishing a strong network for cooperation and support between the schools and the communities. Consequently, this will serve as basis for a solid foundation for building a sense of pride and ownership among teachers, students, and communities and provide a framework for greater decentralization of financial management to school levels, thereby improving efficiency among LSSs. Improved efficiency in using and managing education resources is envisioned to decrease the unit cost per student from VND5.45 million/student/year to VND7.0 million/student/year, or a decrease in cost/student by about 52%.

5. The project will likewise improve project management and implementation through activities under Output 4.⁹ Training of education planners, school principals, and administrators in charge of EM education/LSE equivalency programs on project implementation will ensure that the proposed project is implemented on time and within budget.

B. Economic Analysis

1. Assumptions Used in the Economic Analysis

6. The economic analysis was carried out according to ADB's *Guidelines for Economic Analysis of Projects* (1993). The economic analysis used the following key assumptions:

- (i) Economic costs are at constant early 2014 prices and measured using world price numeraire method.
- (ii) Standard conversion factor (SCF) used was 0.9, and shadow wage rate factor (SWRF) applied was 0.8.¹⁰
- (iii) Total project capital investment cost (excluding price contingencies, fees, and taxes) is spread across the duration of project implementation of 6 years;
- (iv) Incremental operation and maintenance (O&M) costs were assumed at 3.0% of total capital cost.
- (v) Replacement of equipment was assumed to be carried out every five years.
- (vi) Recurrent cost of LSE schools for each of the four regions and the project was based on an average cost of VND5.88 million/student/year (MOET, 2013) which was adjusted to its 2020 economic value and multiplied by the estimated number of students to arrive at the value of recurrent cost for each region and the whole project.
- (vii) Opportunity cost of LSE students was based on VND1,960,827/student/year.¹¹

⁸ New school clustering established.

⁹ Project implementation and monitoring and evaluation (M&E) capacity enhanced.

¹⁰ ADB. 2013. *Report and Recommendation of the President to the Board of Directors for the Proposed Loan to the Socialist Republic of Viet Nam for the Productive Rural Infrastructure Sector Project in the Central Highlands*. Manila.

¹¹ The value of wage earnings of LSE students was based on a study by Gallup (Gallup, J. *The Economic Value of Children in Viet Nam*. 1995. Institutes of Economics and Sociology, Tran Xuan Soan, Hanoi, Viet Nam), which estimated that the average wage rate of child labor was VND896/hour in 1995. Based on an employment rate of 50%, by providing some time for other activities that children normally are involved in, such as play time and other non-income generating activities, the adjusted average rate (opportunity cost) is estimated at VND448/hour. Adjusting for inflation, the average wage rate, in 2014 value, is estimated at about VND6,536/hour or about

- (viii) Project life was assumed at 25 years.
- (ix) The number of students completing all LSE requirements was assumed to remain at their 2023 levels throughout the project life.
- (x) A discount rate of 12% was applied in the calculation of the project's economic internal rate of return (EIRR).

7. A standard method of cost-benefit analysis was used to calculate the EIRR, i.e., the discount rate that makes the net present value (NPV) of costs and benefits equal, which, in turn, served as the basis for determining the economic viability of project investments.

2. Quantification of Project Benefits

8. **Improved future income generating capacity of LSE graduates.** In the long term, the strengthened capacity of school administrators and teachers will produce better educated LSE students with improved life and learning skills. These students will have greater opportunities to continue on to higher education and improve their income generating capacity. For students who decide to work right after LSE, the acquired cognitive and technical skills from LSE will allow them to receive higher wages compared with those who have only completed primary education. In quantifying the benefits generated by LSE students due to the project, the annualized NPV of the future incremental income stream of the additional number of LSE students (32,721 students) was estimated over a period of 20 years, during which they were assumed to remain employed. The incremental future earnings of students having completed LSE was estimated based on the difference in the earnings of one who completed LSE, estimated at VND13.7 million/person/year, and one with only primary education, estimated at VND9.4 million/person/year.

9. It is expected that the impact of the project will start to be felt starting in 2020, when all civil works shall have been completed and the improvements in curriculum, educational materials, learning facilities, and teacher capacity shall have been implemented. As a consequence, under the project, the dropout, promotion, and completion rates are expected to improve gradually every year until the target rates of 0.8%, 99.0%, and 99.5%, respectively, are reached by 2020. The number of students to complete LSE each year is projected to increase from 21,061 students in 2020 to 31,971 students in 2023. Total incremental number of students completing LSE under the project is estimated at 623,048 students over the 20-year period, 2020–2039 (Table D1).

Table D1: Projected Number of Students without and with the Project

Year	Without Project			With Project		Estimated Reduced Cost per LSE Student (Financial)	Financial Value of Benefits from Improved Efficiency in LSE	Economic Value of Benefits from Improved Efficiency in LSE ^b
	Total Annual LSE Cost ^a	Total Number of LSE Students	Average LSE Cost per Student (Financial)	Total Number of LSE Students	Average LSE Cost per Student (Financial)			
	[1] (VND billion)	[2]	[3] (VND million)	[4]	[5] (VND million)	[6]=[5] - [3] (VND million)	[7]=[6] × [4] (VND billion)	[8]=[7] × 0.9 (VND billion)
2016								
2017								
2018								
2019								
2020	340.50	29,707	11.46	62,428	5.45	6.01	375.04	337.54
2021	374.55	29,707	12.61	62,428	6.00	6.61	412.55	371.29
2022	412.00	29,707	13.87	62,428	6.60	7.27	453.80	408.42
2023	453.20	29,707	15.26	62,428	7.26	8.00	499.18	449.26
2024	498.52	29,707	16.78	62,428	7.99	8.80	549.10	494.19
2025	548.37	29,707	18.46	62,428	8.78	9.68	604.01	543.61
2026	603.21	29,707	20.31	62,428	9.66	10.64	664.41	597.97
2027	663.53	29,707	22.34	62,428	10.63	11.71	730.85	657.77
2028	729.89	29,707	24.57	62,428	11.69	12.88	803.94	723.55
2029	802.88	29,707	27.03	62,428	12.86	14.17	884.33	795.90
2030	883.16	29,707	29.73	62,428	14.15	15.58	972.77	875.49
2031	971.48	29,707	32.70	62,428	15.56	17.14	1,070.04	963.04
2032	1,068.63	29,707	35.97	62,428	17.12	18.85	1,177.05	1,059.34
2033	1,175.49	29,707	39.57	62,428	18.83	20.74	1,294.75	1,165.28
2034	1,293.04	29,707	43.53	62,428	20.71	22.81	1,424.23	1,281.80
2035	1,422.34	29,707	47.88	62,428	22.78	25.10	1,566.65	1,409.99
2036	1,564.58	29,707	52.67	62,428	25.06	27.60	1,723.32	1,550.98
2037	1,721.03	29,707	57.93	62,428	27.57	30.37	1,895.65	1,706.08
2038	1,893.14	29,707	63.73	62,428	30.33	33.40	2,085.21	1,876.69
2039	2,082.45	29,707	70.10	62,428	33.36	36.74	2,293.73	2,064.36
Total	19,501.99							19,332.56

^a Total annual LSE cost is projected to increase by about 10% every year.

^b Adjusted by SCF = 0.9

10. The benefits generated from increased annual LSE student enrolment is closely related to the expected future benefits generated from increased potential income-generating capacity of LSE students. Of the projected total number of students completing LSE requirements during the period, 2020–2039 (623,048 students), a total of 380,059 students are expected to find employment.¹²

11. Current annual wage earning of workers without LSE credentials is about VND23,891,220, which is the average annual wage for jobs (e.g., security services, food delivery services, clerical services, and public/private driving services), which typically hire workers with this qualification. The expected earning of students having completed all LSE requirements was, therefore, calculated by adjusting this basic annual wage earning (VND23,891,220/year/student) by a factor of 1.1¹³ for each year of LSE completed from Grades 6–9. The resulting estimate is the value of expected annual wage earning of workers with LSE credentials, which is about VND 34,979,135 per year per student. In order to estimate the potential future annual earnings of a student without LSE credentials and one with LSE credentials, their respective annual earnings were projected over a 20-year period, the minimum number of employment years assumed in the analysis, and their corresponding NPV at a 12% discount rate was calculated. The NPV of the stream of wage earnings for each student was then annualized to calculate the estimated future annual earnings of a student with and without LSE credentials.¹⁴ The expected annual future earnings of a student with and without LSE credentials are VND13,717,311 and VND9,369,108, respectively (Table D2).

¹² This is based on a labor participation rate of 0.61 for the labor force within the ages of 15–24 years. Source: <http://www.indexmundi.com/facts/vietnam/labor-participation-rate>

¹³ Based on the findings of Psacharopoulos, G. and H.A. Patrinos. 2004.

¹⁴ Annualized wage earning was obtained by dividing the NPV of projected annual wage earnings by 20 years, e.g., VND187,382,162 ÷ 20 = VND9,369,108 and VND274,346,223 ÷ 20 = VND13,717,311.

Table D2: Estimated Future Annual Earning of Students with vs. without LSE Credentials

Year	Average Annual Wage Without LSE	Average Annual Wage With LSE
2016		
2017		
2018		
2019		
2020	23,891,220	34,979,135
2021	23,891,220	34,979,135
2022	23,891,220	34,979,135
2023	23,891,220	34,979,135
2024	23,891,220	34,979,135
2025	23,891,220	34,979,135
2026	23,891,220	34,979,135
2027	23,891,220	34,979,135
2028	23,891,220	34,979,135
2029	23,891,220	34,979,135
2030	23,891,220	34,979,135
2031	23,891,220	34,979,135
2032	23,891,220	34,979,135
2033	23,891,220	34,979,135
2034	23,891,220	34,979,135
2035	23,891,220	34,979,135
2036	23,891,220	34,979,135
2037	23,891,220	34,979,135
2038	23,891,220	34,979,135
2039	23,891,220	34,979,135
NPV@12%	187,382,162	274,346,223
Annualized wage	9,369,108	13,717,311

Note: It is assumed that for each additional year of education, expected salary will increase by 10%.

12. Adjusting the annualized wage earnings with a shadow wage rate factor of 0.8, the economic values of VND7,495,286¹⁵ and VND10,973,849¹⁶ were estimated as the economic value of future annual wage earnings of students without and with LSE credentials, respectively, or an incremental annual earning of VND4,348,203 for a student who completed all the requirements of Grades 6–9. The total benefit accruing to the project is the total value of the incremental benefits generated by an employed LSE student over his/her 20-year employment period multiplied by the number of employed LSE students generated by the project. Over a 20-year period, students who have completed all LSE requirements and are able to find employment are projected to generate accumulated incremental income earnings of about VND13,210.2 billion in economic terms. The projected incremental benefits are presented in Table D3.

¹⁵ Calculated as VND9,369,108 x 0.8 = VND7,495,286.

¹⁶ Calculated as VND13,717,311 x 0.8. = VND10,973,849.

Table D3: Economic Benefits from Future Incremental Income

Year	Incremental Number of Students Completing LSE	Total Students With LSE Credentials Finding Employment	Projected Annual Incremental Income of Students With LSE Credentials (Financial) (VND billion)	Accumulated Incremental Income of Students With LSE Credentials (Financial) (VND billion)	Accumulated Incremental Income of Students With LSE Credentials (Economic) (VND billion)
2016					
2017					
2018					
2019					
2020	19,372	11,817	51.38	51.38	41.11
2021	25,348	15,462	67.23	118.62	94.89
2022	31,325	19,108	83.09	201.70	161.36
2023	31,325	19,108	83.09	284.79	227.83
2024	31,325	19,108	83.09	367.87	294.30
2025	31,325	19,108	83.09	450.96	360.77
2026	31,325	19,108	83.09	534.05	427.24
2027	31,325	19,108	83.09	617.13	493.71
2028	31,325	19,108	83.09	700.22	560.17
2029	31,325	19,108	83.09	783.30	626.64
2030	31,325	19,108	83.09	866.39	693.11
2031	31,325	19,108	83.09	949.47	759.58
2032	31,325	19,108	83.09	1,032.56	826.05
2033	31,325	19,108	83.09	1,115.65	892.52
2034	31,325	19,108	83.09	1,198.73	958.99
2035	31,325	19,108	83.09	1,281.82	1,025.45
2036	31,325	19,108	83.09	1,364.90	1,091.92
2037	31,325	19,108	83.09	1,447.99	1,158.39
2038	31,325	19,108	83.09	1,531.08	1,224.86
2039	31,325	19,108	83.09	1,614.16	1,291.33
Total	608,566	371,225	1,614.16	16,512.77	13,210.22
Earning of non-LSE students (VND/year) =			9,369,108		
Earning of LSE students (VND/year) =			13,717,311		
Earning increment (VND/year) =			4,348,203		
Employment rate of LSE students =			61%		
Shadow wage rate factor =			0.8		

13. **Improved management of LSE schools.** The strengthened capacity of education administrators and managers in planning and management will result in the improved efficiency of school operations and delivery of educational/instructional services in disadvantaged areas. School principals and BOET, DOET and MOET staff will receive training and support in planning and management issues, particularly in the inclusive school development planning and management of pro-poor education initiatives. MOET staff will receive in-country and overseas training in policy planning for disadvantaged groups. Learning support through supplementary instructional materials in EM languages and awareness-raising activities will likewise improve learning outcomes, lower repetition and dropout rates, and improve promotion and completion rates. The proposed project is, therefore, expected to improve cost-effectiveness by increasing capacity utilization of LSE schools, thereby reducing the unit cost of financing LSE students. In estimating the incremental benefits due to improved cost efficiency in LSE schools, the difference between the annual cost of financing one LSE student under the “without project” situation and the annual cost of one LSE student under the “with project” situation multiplied by the incremental number of students is projected over 20 years.

14. Under the “without project” situation, the annual cost of LSE schools in 2020 was estimated at about VND340.50 billion, or an average cost per LSE student of VND11.46 million per student at a total enrolment of 29,707 LSE students. At a projected annual growth rate of 10%, the cost per LSE student is expected to increase to VND70.10 million in 2039. Under the “with project” situation, the number of students in 2020 is expected to increase to 62,428 students, and the cost per LSE student is projected to decrease to VND5.45 million/student/year, a

reduction of VND6.01 million/student/year. By 2039, the cost per LSE student is estimated at VND33.36 million/student/ year, a reduction of VND36.74 million/student/year (Table D4).

Table D4: Projected Economic Benefits from Improved Efficiency in LSE School Operations

Year	Without Project			With Project		Estimated Reduced Cost per LSE Student (Financial)	Financial Value of Benefits from Improved Efficiency in LSE	Economic Value of Benefits from Improved Efficiency in LSE ^b
	Total LSE Annual Cost ^a	Total Number of LSE Students	Average LSE Cost per Student (Financial)	Total Number of LSE Students	Average LSE Cost per Student (Financial)			
	[1] (VND billion)	[2]	[3] (VND million)	[4]	[5] (VND million)	[6]=[5] - [3] (VND million)	[7]=[6] x [4] (VND billion)	[8]=[7] x 0.9 (VND billion)
2016								
2017								
2018								
2019								
2020	340.50	29,707	11.46	62,428	5.45	6.01	375.04	337.54
2021	374.55	29,707	12.61	62,428	6.00	6.61	412.55	371.29
2022	412.00	29,707	13.87	62,428	6.60	7.27	453.80	408.42
2023	453.20	29,707	15.26	62,428	7.26	8.00	499.18	449.26
2024	498.52	29,707	16.78	62,428	7.99	8.80	549.10	494.19
2025	548.37	29,707	18.46	62,428	8.78	9.68	604.01	543.61
2026	603.21	29,707	20.31	62,428	9.66	10.64	664.41	597.97
2027	663.53	29,707	22.34	62,428	10.63	11.71	730.85	657.77
2028	729.89	29,707	24.57	62,428	11.69	12.88	803.94	723.55
2029	802.88	29,707	27.03	62,428	12.86	14.17	884.33	795.90
2030	883.16	29,707	29.73	62,428	14.15	15.58	972.77	875.49
2031	971.48	29,707	32.70	62,428	15.56	17.14	1,070.04	963.04
2032	1,068.63	29,707	35.97	62,428	17.12	18.85	1,177.05	1,059.34
2033	1,175.49	29,707	39.57	62,428	18.83	20.74	1,294.75	1,165.28
2034	1,293.04	29,707	43.53	62,428	20.71	22.81	1,424.23	1,281.80
2035	1,422.34	29,707	47.88	62,428	22.78	25.10	1,566.65	1,409.99
2036	1,564.58	29,707	52.67	62,428	25.06	27.60	1,723.32	1,550.98
2037	1,721.03	29,707	57.93	62,428	27.57	30.37	1,895.65	1,706.08
2038	1,893.14	29,707	63.73	62,428	30.33	33.40	2,085.21	1,876.69
2039	2,082.45	29,707	70.10	62,428	33.36	36.74	2,293.73	2,064.36
Total	19,501.99							19,332.56

^a Total annual LSE cost is projected to increase by about 10% every year.

^b Adjusted by SCF = 0.9

15. The total financial benefit due to the project was estimated by multiplying the reduced cost/student under the “with project” situation by the total number of students under the “with project” situation. The financial benefit from improved efficiency in LSE was estimated at about VND375.04 billion (VND337.54 billion in economic terms) in 2020 and increasing to VND2,293.73 billion (VND2,064.36 billion in economic terms) in 2039. The total economic benefit due to improved efficiency in LSE was estimated at about VND19,332.56 billion for the period, 2020–2039 (Table D4).

16. **Improved sanitation and hygienic conditions.** The World Health Organization (WHO) reported that improving water supply and sanitation can have a significant impact on human health. Potential reductions in morbidity as a result of improvements in water supply and sanitation are 80%–100% for cholera and typhoid, and 40%–50% for diarrheal diseases, dysentery, and gastroenteritis.¹⁷ The provision of sanitation facilities will, therefore, contribute to improved sanitation and hygienic practices in LSSs which will result, in turn, in improved health conditions among students. Expression of these benefits in monetary terms was based on a cost of medical treatment of VND2.6 million/person/episode and an incidence rate of

¹⁷ WHO. n.d. Water and Public Health, WHO Seminar Pack for Drinking-Water Quality, http://www.who.int/water_sanitation_health/dwq/en.

gastrointestinal diseases of 0.345%,¹⁸ which is envisioned to decrease to about 0.1725% due to the project.

17. The improved sanitation facilities in LSE schools are expected to significantly reduce the incidence of gastrointestinal diseases among all students enrolled in LSE schools in the project provinces. Disease incidence rate is expected to decline from 0.345%¹⁹ (“without project”) to 0.1725% (“with project”), or a reduction of about 50%.²⁰ The number of persons falling ill annually under the “without project” situation was estimated at 725 and assumed to experience at least two episodes a year or about 1,450 episodes a year. The average financial cost of medical treatment²¹ was estimated at VND2.59 million/episode²² or VND2.33 million/episode in economic terms. Total cost of medical treatment under the “without project” situation is estimated at VND3.38 billion/year. Under the “with project” situation, this is expected to decrease to VND1.69 billion/year. Thus, the total accumulated medical cost over the period, 2020–2039, is expected to decrease from VND62.55 billion (“without project”) to VND34.15 billion (“with project”) (Table D5).

¹⁸ Total number of cases of diarrheal disease in 2009 in Viet Nam was estimated at 296,000. Total population of the country at that time was 85,789,573 people, or an incidence rate of 0.345%. Source: http://en.wikipedia.org/wiki/Environmental_issues_in_Vietnam

¹⁹ Total number of cases of diarrheal disease in 2009 in Viet Nam was estimated at 296,000. Total population of the country at that time was 85,789,573 people, or an incidence rate of 0.345%. Source: http://en.wikipedia.org/wiki/Environmental_issues_in_Vietnam

²⁰ Bunker, J.P. 2001. The Role of Medical Care in Contributing to Health Improvements within Societies. *Intl. J. Epidemiology*, 30(6):1260–1263. The author indicated that the incidence rate of respiratory diseases can be reduced by about 40% with effective medical care. WHO indicated that potential reductions in morbidity as a result of improvements in water supply and sanitation, complemented by effective awareness programs and medical services, are 80%–100% for cholera and typhoid and 40%–50% for diarrheal diseases, dysentery, and gastroenteritis.

²¹ Direct costs include medical treatment, medicines, laboratory tests, transportation, food, lodging, and cost of special items such as herbs. Indirect costs include lost wages due to missed work time by the patient, caregivers, and their substitutes as well as productivity losses due to nonmarket activity losses such as housework.

²² Fischer, T.K. *et al.* 2005. Health Care Costs of Diarrheal Disease and Estimates of the Cost-effectiveness of Rotavirus Vaccination in Viet Nam. *J. Infectious Diseases*, 192 (10):1720–1726. The cost of medical treatment per episode was expressed in 2005 financial terms, which were adjusted by an inflation rate of 3.98 to arrive at a financial cost of medical treatment per episode of VND2,590,481 in 2014 terms.

Table D5: Projected Benefits from Improved Sanitation Facilities

Year	Without Project						With Project					
	Number of students to benefit from improved sanitation facilities	Incidence rate	Number of students falling sick	Total number of episodes per year at 2 episodes per	Total cost of medical treatment per year (Economic) (VND)	Total cost of medical treatment per year (Economic) (VND billion)	Incidence rate reduced by 50%	Number of students falling sick	Total number of episodes per year at 2 episodes	Total cost of medical treatment per year (Economic) (VND)	Total cost of medical treatment per year (Economic) (VND billion)	Reduced medical treatment cost (Economic) (VND billion)
2016												
2017												
2018												
2019												
2020	52,538	0.3450%	181	363	845,251,753	0.85	0.3450%	181	363	845,251,753	0.85	-
2021	105,077	0.3450%	363	725	1,690,503,506	1.69	0.3105%	326	653	1,521,453,155	1.52	0.17
2022	157,615	0.3450%	544	1,088	2,535,755,259	2.54	0.2760%	435	870	2,028,604,207	2.03	0.51
2023	210,153	0.3450%	725	1,450	3,381,007,012	3.38	0.2415%	508	1,015	2,366,704,908	2.37	1.01
2024	210,153	0.3450%	725	1,450	3,381,007,012	3.38	0.2070%	435	870	2,028,604,207	2.03	1.35
2025	210,153	0.3450%	725	1,450	3,381,007,012	3.38	0.1725%	363	725	1,690,503,506	1.69	1.69
2026	210,153	0.3450%	725	1,450	3,381,007,012	3.38	0.1725%	363	725	1,690,503,506	1.69	1.69
2027	210,153	0.3450%	725	1,450	3,381,007,012	3.38	0.1725%	363	725	1,690,503,506	1.69	1.69
2028	210,153	0.3450%	725	1,450	3,381,007,012	3.38	0.1725%	363	725	1,690,503,506	1.69	1.69
2029	210,153	0.3450%	725	1,450	3,381,007,012	3.38	0.1725%	363	725	1,690,503,506	1.69	1.69
2030	210,153	0.3450%	725	1,450	3,381,007,012	3.38	0.1725%	363	725	1,690,503,506	1.69	1.69
2031	210,153	0.3450%	725	1,450	3,381,007,012	3.38	0.1725%	363	725	1,690,503,506	1.69	1.69
2032	210,153	0.3450%	725	1,450	3,381,007,012	3.38	0.1725%	363	725	1,690,503,506	1.69	1.69
2033	210,153	0.3450%	725	1,450	3,381,007,012	3.38	0.1725%	363	725	1,690,503,506	1.69	1.69
2034	210,153	0.3450%	725	1,450	3,381,007,012	3.38	0.1725%	363	725	1,690,503,506	1.69	1.69
2035	210,153	0.3450%	725	1,450	3,381,007,012	3.38	0.1725%	363	725	1,690,503,506	1.69	1.69
2036	210,153	0.3450%	725	1,450	3,381,007,012	3.38	0.1725%	363	725	1,690,503,506	1.69	1.69
2037	210,153	0.3450%	725	1,450	3,381,007,012	3.38	0.1725%	363	725	1,690,503,506	1.69	1.69
2038	210,153	0.3450%	725	1,450	3,381,007,012	3.38	0.1725%	363	725	1,690,503,506	1.69	1.69
2039	210,153	0.3450%	725	1,450	3,381,007,012	3.38	0.1725%	363	725	1,690,503,506	1.69	1.69
Total persons =	13,414					62.55		7,323			34.15	28.40
Cost of medical treatment/person/episode (VND): (Financial)												
Cost of medical treatment/person/episode (VND): (Economic)												
SCF = 0.90												

18. **Improved climate change resiliency in typhoon-affected coastal areas.** The project will introduce a new curriculum for disaster management education to help students and their families and communities cope with the increasingly adverse impacts of climate change in the typhoon-affected coastal areas. It will also construct more durable school buildings that can withstand strong typhoons and floods and serve as shelters for residents during such climate events. These interventions will improve the capacity of residents to prepare for, and cope with, these natural calamities, thereby preventing, or at least minimizing the risks to life and property resulting from the strong typhoons that pass through the coastal region every year.

19. The project provinces in the typhoon-affected coastal region experience an average of about six natural disasters a year caused by strong typhoons, strong winds, and floods, with the average annual cost of damages estimated at about VND14.75 billion per typhoon²³ in financial terms. The total financial cost of these damages is estimated at about VND88.48 billion per year or about VND79.63 billion per year, in economic terms. Under the “with project” situation, the interventions are expected to improve the capacity of communities to cope with the destructive impacts of natural calamities, thereby reducing economic losses due to the loss of life and damages to property by about 50% or about VND 39.82 billion/year in economic terms (Table D6).

²³ Based on data provided by MOET, it was estimated that an average of 20 classrooms are damaged each year due to natural calamities (e.g., typhoons, strong winds, and floods). At a cost of VND737,352,000 per classroom, the total cost of damage is about VND14.75 billion/year.

Table D6: Projected Benefits from Increased Climate Change Resilience

Year	Without Project			With Project	
	Number of typhoons per year	Cost of typhoon damage per typhoon (Financial) (VND billion)	Total cost of typhoon damage per year (Financial) (VND billion)	Total cost of typhoon damage per year (Economic) (VND billion)	Total cost of typhoon damage per year (Economic) (VND billion)
2016					
2017					
2018					
2019					
2020	6	14.75	88.48	79.63	39.82
2021	6	14.75	88.48	79.63	39.82
2022	6	14.75	88.48	79.63	39.82
2023	6	14.75	88.48	79.63	39.82
2024	6	14.75	88.48	79.63	39.82
2025	6	14.75	88.48	79.63	39.82
2026	6	14.75	88.48	79.63	39.82
2027	6	14.75	88.48	79.63	39.82
2028	6	14.75	88.48	79.63	39.82
2029	6	14.75	88.48	79.63	39.82
2030	6	14.75	88.48	79.63	39.82
2031	6	14.75	88.48	79.63	39.82
2032	6	14.75	88.48	79.63	39.82
2033	6	14.75	88.48	79.63	39.82
2034	6	14.75	88.48	79.63	39.82
2035	6	14.75	88.48	79.63	39.82
2036	6	14.75	88.48	79.63	39.82
2037	6	14.75	88.48	79.63	39.82
2038	6	14.75	88.48	79.63	39.82
2039	6	14.75	88.48	79.63	39.82
Total			1,769.64	1,592.68	796.34

Note: Under "with project" situation typhoon damage is assumed to be reduced by 50%
SCF = 0.90

3. Estimation of Economic Costs

20. **Project investment cost.** Economic costs were at constant early 2014 prices and measured using the world price numeraire method. Specific costs estimated were project investments, operating and maintenance, and replacement costs. Local cost components, such as non-traded and labor cost components, were converted into economic values using an SCF of 0.9 and SWRF of 0.8. Foreign cost components were mainly the traded components, and their financial value was assumed to be equal to their respective economic values. The total financial capital investment cost was estimated at \$36.99 million, from which all price contingencies (\$1.66 million), taxes (\$2.96 million), and interest charges (\$1.26 million) were excluded.²⁴ The resulting value of \$31.11 million (or about VND653.23 billion)²⁵ served as basis for arriving at an economic investment cost of about \$27.94 million (or about VND586.68 billion) (Table D7).

²⁴ Obtained from detailed cost tables.

²⁵ Exchange rate used is VND21,000 to \$1.00.

Table D7: Estimation of Economic Investment Cost

Year	Cost					
	Civil Works and Equipment	Total Financial Cost	Traded Cost Component	Non-traded Cost Component	Labor Cost Component	Economic Cost
	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)
2015	29.40	29.40	4.11	18.52	3.77	26.40
2016	62.06	62.06	8.67	39.10	7.95	55.72
2017	195.97	195.97	27.39	123.46	25.12	175.97
2018	248.23	248.23	34.70	156.38	31.82	222.90
2019	111.05	111.05	15.52	69.96	14.23	99.72
2020	6.53	6.53	0.91	5.06		5.97
Total	653.23	653.23	91.31	412.48	82.89	586.68
Percent foreign exchange =					14%	
Percent local currency (non-labor) =					70%	
Percent local currency (labor) =					16%	
Standard conversion factor (on LC or non tradables) =					0.90	
Standard conversion factor (on FX or tradables) =					1.00	
Shadow wage rate factor =					0.80	

21. **Operation and maintenance cost.** The incremental annual O&M cost was assumed at 3.0% of capital investment costs. The value of the foregone wage earnings (opportunity cost) of LSE students during their enrolment was also included in the economic cost estimates. Estimates of opportunity costs of LSE students were based on the average annual salary that they would have received in jobs over a period of four years while attending LSE.

22. **Recurrent cost of LSE schools.** Estimates of the recurrent budgets for each of the four regions and the project were based on an average cost of VND5.88 million/student/year (MOET, 2013). This average cost/student/year was then multiplied by the estimated number of students to arrive at the value of recurrent cost for each region and the whole project. The estimated recurrent budgets were adjusted to their 2020 economic values and projected over a period of 20 years (2020–2039) at an annual growth rate of about 10%.

23. **Replacement cost.** Replacement of all equipment was assumed to be every five years.

24. **Opportunity cost of LSE students.** The value of wage earnings of LSE students was based on a study by Gallup (1995),²⁶ which estimated that the average wage rate of child labor was VND896/hour in 1995. Based on an employment rate of 50%, to provide some time for other activities that children are normally involved in, such as play time and other non-income generating activities, the adjusted average rate was estimated at VND448/hour. Adjusting for inflation, the average wage rate, in 2014 value, was estimated at about VND6,536/hour, or about VND26,144/day, for a four-hour work day, or about VND1.96 million/year. The economic value of the average wage of children, in 2014 value, was estimated by applying a SWRF of 0.8, giving a value of VND1.57 million/year. This value multiplied by the total number of students who completed LSE each year provides the total annual opportunity cost of LSE students (Table D8).

²⁶ Gallup, J. 1995. *The Economic Value of Children in Viet Nam*, Institutes of Economics and Sociology, Hanoi, Viet Nam.

Table D8: Projected Opportunity Cost of LSE Students

Year	Incremental LSE	Total Annual	Accumulated	Incremental
	Students	Opportunity Cost of LSE Graduates	Opportunity Cost	Accumulated Opportunity Cost
		(VND billion)	(VND billion)	(VND billion)
2016				
2017				
2018				
2019				
2020	19,372	30.39	30.39	30.39
2021	25,348	39.76	70.15	70.15
2022	31,325	49.14	119.29	119.29
2023	31,325	49.14	168.43	168.43
2024	31,325	49.14	187.18	187.18
2025	31,325	49.14	196.55	196.55
2026	31,325	49.14	196.55	196.55
2027	31,325	49.14	196.55	196.55
2028	31,325	49.14	196.55	196.55
2029	31,325	49.14	196.55	196.55
2030	31,325	49.14	196.55	196.55
2031	31,325	49.14	196.55	196.55
2032	31,325	49.14	196.55	196.55
2033	31,325	49.14	196.55	196.55
2034	31,325	49.14	196.55	196.55
2035	31,325	49.14	196.55	196.55
2036	31,325	49.14	196.55	196.55
2037	31,325	49.14	196.55	196.55
2038	31,325	49.14	196.55	196.55
2039	31,325	49.14	196.55	196.55
Total	608,566	954.63	3,523.71	3,523.71

Notes:

- (i) Total graduates is net of dropout, promotion, and completion rates.
- (ii) Average annual earning of a child less than 20 years old (VND/year) = 1,568,662
 Gallup (1995) estimated the average wage rate of child labor at VND896 per hour. Based on an employment rate of 50%, by providing some time for other activities that children normally are involved in such as play time and other non-income generating activities, the adjusted average wage rate is estimated at VND448 per hour. Adjusting for inflation, the average wage rate in 2014 value is estimated at about VND6,536 per hour (about VND26,144 per day) or about VND1,960,827 per year. The economic value of the average wage rate of children, in 2014 value, is estimated by applying a shadow wage rate factor (SERF) of 0.8 to arrive at a value of VND1,568,662 per year.

4. EIRR and Sensitivity Analysis

25. **EIRR calculation.** The monetized value of the benefits compared with the projected economic costs of the project yielded an EIRR value of 20.9% and a benefit-cost ratio (BCR) of 1.2 (Table D9).

Table D9: EIRR Calculation for the North Central and Central Coastal Area

Year	Cost				Benefits						Net Benefits
	Investment	Operation and Maintenance	Recurrent Cost of LSE Schools	Opportunity Cost of LSE Students	Total Cost	Projected Income of LSE Students Who Completed Grade 9	Economic Value of Benefits from Improved Efficiency in LSE	Reduced Incidence of Gastro-intestinal Diseases due to Improved Sanitation Facilities	Climate Change Resiliency	Total Benefits	
	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)
2015	26.40				26.40					-	(26.40)
2016	55.72				55.72					-	(55.72)
2017	175.97				175.97					-	(175.97)
2018	222.90				222.90					-	(222.90)
2019	99.72				99.72					-	(99.72)
2020	5.97	17.42	340.50	30.39	394.28	41.11	337.54	-	39.82	418.46	24.18
2021		17.42	374.55	70.15	462.12	94.89	371.29	0.17	39.82	506.17	44.05
2022	173.08	17.42	412.00	119.29	721.79	161.36	408.42	0.51	39.82	610.11	(111.69)
2023		17.42	453.20	168.43	639.05	227.83	449.26	1.01	39.82	717.93	78.88
2024		17.42	498.52	187.18	703.12	294.30	494.19	1.35	39.82	829.66	126.54
2025		17.42	548.37	196.55	762.35	360.77	543.61	1.69	39.82	945.89	183.54
2026		17.42	603.21	196.55	817.19	427.24	597.97	1.69	39.82	1,066.72	249.53
2027	173.08	17.42	663.53	196.55	1,050.59	493.71	657.77	1.69	39.82	1,192.98	142.39
2028		17.42	729.89	196.55	943.86	560.17	723.55	1.69	39.82	1,325.23	381.37
2029		17.42	802.88	196.55	1,016.85	626.64	795.90	1.69	39.82	1,464.05	447.20
2030		17.42	883.16	196.55	1,097.14	693.11	875.49	1.69	39.82	1,610.11	512.97
2031		17.42	971.48	196.55	1,185.45	759.58	963.04	1.69	39.82	1,764.13	578.67
2032	173.08	17.42	1,068.63	196.55	1,455.68	826.05	1,059.34	1.69	39.82	1,926.90	471.22
2033		17.42	1,175.49	196.55	1,389.46	892.52	1,165.28	1.69	39.82	2,099.30	709.84
2034		17.42	1,293.04	196.55	1,507.01	958.99	1,281.80	1.69	39.82	2,282.30	775.29
2035		17.42	1,422.34	196.55	1,636.32	1,025.45	1,409.99	1.69	39.82	2,476.95	840.63
2036		17.42	1,564.58	196.55	1,778.55	1,091.92	1,550.98	1.69	39.82	2,684.41	905.86
2037	173.08	17.42	1,721.03	196.55	2,108.09	1,158.39	1,706.08	1.69	39.82	2,905.98	797.89
2038		17.42	1,893.14	196.55	2,107.11	1,224.86	1,876.69	1.69	39.82	3,143.06	1,035.95
2039		17.42	2,082.45	196.55	2,296.42	1,291.33	2,064.36	1.69	39.82	3,397.20	1,100.77
										EIRR =	20.9%
										NPV (@12%) =	710.52
										BCR =	1.2

26. **Sensitivity analysis.**²⁷ The sensitivity analysis indicated that the EIRR is sensitive to changes in costs, enrolment, and efficiency in LSE school operations, as the sensitivity indicator (SI) values for these change variables are significantly greater than 1. Switching values confirmed the sensitivity of EIRR to changes in these variables (Table D10).

Table D10: EIRR Sensitivity Analysis – North Central and Central Coastal Area

Change Variable	Percent Change in Variable	Recalculated EIRR	Switching Value	Sensitivity Indicator	Likely Occurrence
1. Increase in costs	20%	12.0%	20%	2.11	Medium
2. Decrease in enrolment	20%	16.9%	39%	0.96	Low
3. Increase in costs and decrease in enrolment	20%	6.3%	13%	3.48	Low
4. Delay in benefits by one year		12.1%			Low
5. Benefits from improved efficiency short by	20%	13.9%	25%	1.68	Low
6. Reduction in disease incidence short by	20%	20.9%	>100%	0.00	Low
7. Benefits from climate change resiliency short by	20%	20.4%	>100%	0.11	Low
Base EIRR =		20.9%			
Base NPV @12% =		710.5 VND billion			
Benefit-cost ratio =		1.2			

5. Distribution of Project Benefits and Costs and Poverty Impact Analysis

27. The distribution of benefits and costs among the various project stakeholders was based on estimates of incremental benefits and costs generated by project investments. All financial

²⁷ Details of the EIRR calculation for each sensitivity analysis scenario are presented in the annex at the end of this document.

and economic benefits and costs were expressed in early 2014 prices and in NPV terms at a discount rate of 12% (Table D11).

Table D11: Distribution of Benefits and Costs and Poverty Impact – North Central and Central Coastal Area

Present Value (@12%) (in billion VND, 2014 Price)	Financial Net Present Value	Economic Net Present Value	Difference (1)-(2)	Distribution of Benefits and Costs				Total
				Population		Government		
				Ethnic Minority ¹	Non-ethnic Minority ²	Central	Provincial	
(1)	(2)	(1)-(2)						
Incremental Benefits From³	10,029.62	8,625.09	1,404.53	380.63	1,023.90	-	-	1,404.53
Improved income-generating capacity potential	4,015.71	3,212.57	803.14	217.65	585.49			803.14
Improved efficiency of LSE schools	5,674.07	5,106.66	567.41	153.77	413.64			567.41
Improved sanitation in LSE schools	9.38	8.44	0.94	0.25	0.68			0.94
Climate change resiliency	330.46	297.41	33.05	8.96	24.09			33.05
Incremental Costs	7,740.75	6,851.85	888.90	61.62	165.75	80.24	581.30	888.90
Project investment cost	735.22	660.85	74.37			66.93	7.44	74.37
Project O&M cost	144.92	130.13	14.79			13.31	1.48	14.79
Recurrent cost of LSE schools	5,723.80	5,151.42	572.38				572.38	572.38
Opportunity cost of LSE students	1,136.82	909.45	227.36	61.62	165.75			227.36
Net Benefits	2,288.87	1,773.24	515.64	319.01	858.16	(80.24)	(581.30)	515.64
Share of Benefits				61.87%	166.43%	-15.56%	-112.73%	100.00%
Proportion of poor ⁴				27%	13%	10%	10%	
Net benefits to the poor				86.13	111.56	(8.02)	(58.13)	131.54
Poverty Impact Ratio								0.26

¹ Ethnic population is estimated at about 27.1% of total population. Proportion of benefits accruing to ethnic population is based on this estimate.

² Non-ethnic population is estimated at about 72.9% of total population. Proportion of benefits accruing to non-ethnic is based on this estimate.

³ Based on net present value (at 12% discount rate) of incremental net benefits generated from investments under the project.

⁴ Data derived from World Bank, 2012 Viet Nam Poverty Assessment, World Bank, Ha Noi.

28. Incremental benefits will be generated through improvements in the (i) income generating capacity of LSE students of about VND803.14 billion, (ii) efficiency of LSE schools due to improved management, VND567.14 billion, (iii) sanitation in LSE schools, VND0.94 billion, and (iv) climate change resiliency, VND33.05 billion. The total generated incremental benefits were estimated at about VND1,404.53 billion (Table D11). The distribution of benefits among EM and non-EM LSE students was estimated based on the proportion of EM and non-EM LSE students benefiting from project interventions of about 27.1% and 72.9%, respectively. Based on these proportions, the distribution of incremental benefits among EM and non-EM population was estimated at VND380.63 billion and VND1,023.90 billion, respectively (Table D11).

29. Incremental costs totaling VND888.90 billion were estimated based on (i) a project investment cost of about VND74.37 billion, (ii) an O&M cost of VND14.79 billion, (iii) a recurrent cost of LSE schools of VND572.38 billion, and (iv) the opportunity cost of LSE students of VND227.36 billion (Table D11).

30. The total net benefit was estimated at about VND515.64 billion. Based on the proportion of poor by EM LSE students, non-EM LSE students, central government, and provincial government, the total net benefit accruing to the poor was estimated at about VND131.54 billion. The poverty impact ratio was calculated at 0.26 (Table D11).

ATTACHMENT 1: RESULTS OF THE EIRR SENSITIVITY ANALYSIS FOR THE NORTH CENTRAL AND CENTRAL COASTAL AREA

Attachment Table D1: Increase in Project Costs by 20%

Year	Cost					Benefits					Net Benefits
	Investment	Operation and Maintenance	Recurrent Cost of LSE Schools	Opportunity Cost of LSE Students	Total Cost	Projected Income of LSE Students Who Completed Grade 9	Economic Value of Benefits from Improved Efficiency in LSE	Reduced Incidence of Gastro-intestinal Diseases	Climate Change Resiliency	Total Benefits	
	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)
2015	31.68	-	-	-	31.68	-	-	-	-	-	(31.68)
2016	66.87	-	-	-	66.87	-	-	-	-	-	(66.87)
2017	211.17	-	-	-	211.17	-	-	-	-	-	(211.17)
2018	267.48	-	-	-	267.48	-	-	-	-	-	(267.48)
2019	119.66	-	-	-	119.66	-	-	-	-	-	(119.66)
2020	7.16	20.91	408.60	30.39	467.06	41.11	337.54	-	39.82	418.46	(48.59)
2021	-	20.91	449.46	70.15	540.51	94.89	371.29	0.17	39.82	506.17	(34.34)
2022	207.70	20.91	494.40	119.29	842.30	161.36	408.42	0.51	39.82	610.11	(232.19)
2023	-	20.91	543.84	168.43	733.17	227.83	449.26	1.01	39.82	717.93	(15.25)
2024	-	20.91	598.23	187.18	806.31	294.30	494.19	1.35	39.82	829.66	23.35
2025	-	20.91	658.05	196.55	875.51	360.77	543.61	1.69	39.82	945.89	70.38
2026	-	20.91	723.85	196.55	941.31	427.24	597.97	1.69	39.82	1,066.72	125.40
2027	207.70	20.91	796.24	196.55	1,221.40	493.71	657.77	1.69	39.82	1,192.98	(28.41)
2028	-	20.91	875.86	196.55	1,093.32	560.17	723.55	1.69	39.82	1,325.23	231.91
2029	-	20.91	963.45	196.55	1,180.91	626.64	795.90	1.69	39.82	1,464.05	283.14
2030	-	20.91	1,059.80	196.55	1,277.25	693.11	875.49	1.69	39.82	1,610.11	332.86
2031	-	20.91	1,165.77	196.55	1,383.23	759.58	963.04	1.69	39.82	1,764.13	380.89
2032	207.70	20.91	1,282.35	196.55	1,707.51	826.05	1,059.34	1.69	39.82	1,926.90	219.39
2033	-	20.91	1,410.59	196.55	1,628.04	892.52	1,165.28	1.69	39.82	2,099.30	471.26
2034	-	20.91	1,551.65	196.55	1,769.10	958.99	1,281.80	1.69	39.82	2,282.30	513.19
2035	-	20.91	1,706.81	196.55	1,924.27	1,025.45	1,409.99	1.69	39.82	2,476.95	552.68
2036	-	20.91	1,877.49	196.55	2,094.95	1,091.92	1,550.98	1.69	39.82	2,684.41	589.47
2037	207.70	20.91	2,065.24	196.55	2,490.40	1,158.39	1,706.08	1.69	39.82	2,905.98	415.58
2038	-	20.91	2,271.77	196.55	2,489.22	1,224.86	1,876.69	1.69	39.82	3,143.06	653.84
2039	-	20.91	2,498.94	196.55	2,716.40	1,291.33	2,064.36	1.69	39.82	3,397.20	680.80
											EIRR = 12.0%
											NPV (@12%) = 3.27

Attachment Table D2: Decrease in LSE Annual Enrolment by 20%

Year	Cost					Benefits					Net Benefits
	Investment	Operation and Maintenance	Recurrent Cost of LSE Schools	Opportunity Cost of LSE Students	Total Cost	Projected Income of LSE Students Who Completed Grade 9	Economic Value of Benefits from Improved Efficiency in LSE	Reduced Incidence of Gastro-intestinal Diseases	Climate Change Resiliency	Total Benefits	
	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)
2015	26.40	-	-	-	26.40	-	-	-	-	-	(26.40)
2016	55.72	-	-	-	55.72	-	-	-	-	-	(55.72)
2017	175.97	-	-	-	175.97	-	-	-	-	-	(175.97)
2018	222.90	-	-	-	222.90	-	-	-	-	-	(222.90)
2019	99.72	-	-	-	99.72	-	-	-	-	-	(99.72)
2020	5.97	17.42	340.50	30.39	394.28	32.88	337.54	-	39.82	410.24	15.96
2021	-	17.42	374.55	70.15	462.12	75.91	371.29	0.17	39.82	487.19	25.07
2022	173.08	17.42	412.00	119.29	721.79	129.09	408.42	0.51	39.82	577.84	(143.96)
2023	-	17.42	453.20	168.43	639.05	182.26	449.26	1.01	39.82	672.36	33.31
2024	-	17.42	498.52	187.18	703.12	235.44	494.19	1.35	39.82	770.80	67.68
2025	-	17.42	548.37	196.55	762.35	288.61	543.61	1.69	39.82	873.73	111.38
2026	-	17.42	603.21	196.55	817.19	341.79	597.97	1.69	39.82	981.27	164.08
2027	173.08	17.42	663.53	196.55	1,050.59	394.96	657.77	1.69	39.82	1,094.24	43.65
2028	-	17.42	729.89	196.55	943.86	448.14	723.55	1.69	39.82	1,213.19	269.33
2029	-	17.42	802.88	196.55	1,016.85	501.31	795.90	1.69	39.82	1,338.72	321.87
2030	-	17.42	883.16	196.55	1,097.14	554.49	875.49	1.69	39.82	1,471.49	374.35
2031	-	17.42	971.48	196.55	1,185.45	607.66	963.04	1.69	39.82	1,612.21	426.76
2032	173.08	17.42	1,068.63	196.55	1,455.68	660.84	1,059.34	1.69	39.82	1,761.69	306.01
2033	-	17.42	1,175.49	196.55	1,389.46	714.01	1,165.28	1.69	39.82	1,920.80	531.34
2034	-	17.42	1,293.04	196.55	1,507.01	767.19	1,281.80	1.69	39.82	2,090.50	583.49
2035	-	17.42	1,422.34	196.55	1,636.32	820.36	1,409.99	1.69	39.82	2,271.86	635.54
2036	-	17.42	1,564.58	196.55	1,778.55	873.54	1,550.98	1.69	39.82	2,466.03	687.48
2037	173.08	17.42	1,721.03	196.55	2,108.09	926.71	1,706.08	1.69	39.82	2,674.30	566.21
2038	-	17.42	1,893.14	196.55	2,107.11	979.89	1,876.69	1.69	39.82	2,898.09	790.98
2039	-	17.42	2,082.45	196.55	2,296.42	1,033.06	2,064.36	1.69	39.82	3,138.93	842.51
											EIRR = 16.9%
											NPV (@12%) = 345.94

Attachment Table D3: Increase in Project Costs and Decrease in LSE Enrolment by 20%

Year	Cost					Benefits					Net Benefits
	Investment	Operation and Maintenance	Recurrent Cost of LSE Schools	Opportunity Cost of LSE Students	Total Cost	Projected Income of LSE Students Who Completed Grade 9	Economic Value of Benefits from Improved Efficiency in LSE	Reduced Incidence of Gastro-intestinal Diseases	Climate Change Resiliency	Total Benefits	
	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)
2015	31.68	-	-	-	31.68 #	-	-	-	-	-	(31.68)
2016	66.87	-	-	-	66.87	-	-	-	-	-	(66.87)
2017	211.17	-	-	-	211.17	-	-	-	-	-	(211.17)
2018	267.48	-	-	-	267.48	-	-	-	-	-	(267.48)
2019	119.66	-	-	-	119.66	-	-	-	-	-	(119.66)
2020	7.16	20.91	408.60	30.39	467.06	32.88	337.54	-	39.82	410.24	(56.81)
2021	-	20.91	449.46	70.15	540.51	75.91	371.29	0.17	39.82	487.19	(53.32)
2022	207.70	20.91	494.40	119.29	842.30	129.09	408.42	0.51	39.82	577.84	(264.46)
2023	-	20.91	543.84	168.43	733.17	182.26	449.26	1.01	39.82	672.36	(60.81)
2024	-	20.91	598.23	187.18	806.31	235.44	494.19	1.35	39.82	770.80	(35.51)
2025	-	20.91	658.05	196.55	875.51	288.61	543.61	1.69	39.82	873.73	(1.77)
2026	-	20.91	723.85	196.55	941.31	341.79	597.97	1.69	39.82	981.27	39.96
2027	207.70	20.91	796.24	196.55	1,221.40	394.96	657.77	1.69	39.82	1,094.24	(127.16)
2028	-	20.91	875.86	196.55	1,093.32	448.14	723.55	1.69	39.82	1,213.19	119.87
2029	-	20.91	963.45	196.55	1,180.91	501.31	795.90	1.69	39.82	1,338.72	157.81
2030	-	20.91	1,059.80	196.55	1,277.25	554.49	875.49	1.69	39.82	1,471.49	194.23
2031	-	20.91	1,165.77	196.55	1,383.23	607.66	963.04	1.69	39.82	1,612.21	228.98
2032	207.70	20.91	1,282.35	196.55	1,707.51	660.84	1,059.34	1.69	39.82	1,761.69	54.18
2033	-	20.91	1,410.59	196.55	1,628.04	714.01	1,165.28	1.69	39.82	1,920.80	292.75
2034	-	20.91	1,551.65	196.55	1,769.10	767.19	1,281.80	1.69	39.82	2,090.50	321.40
2035	-	20.91	1,706.81	196.55	1,924.27	820.36	1,409.99	1.69	39.82	2,271.86	347.59
2036	-	20.91	1,877.49	196.55	2,094.95	873.54	1,550.98	1.69	39.82	2,466.03	371.08
2037	207.70	20.91	2,065.24	196.55	2,490.40	926.71	1,706.08	1.69	39.82	2,674.30	183.91
2038	-	20.91	2,271.77	196.55	2,489.22	979.89	1,876.69	1.69	39.82	2,898.09	408.86
2039	-	20.91	2,498.94	196.55	2,716.40	1,033.06	2,064.36	1.69	39.82	3,138.93	422.53
											EIRR = 6.3%
											NPV (@12%) = (361.31)

Attachment Table D4: Delay in Project Benefits by One Year

Year	Cost					Benefits					Net Benefits
	Investment	Operation and Maintenance	Recurrent Cost of LSE Schools	Opportunity Cost of LSE Students	Total Cost	Projected Income of LSE Students Who Completed Grade 9	Economic Value of Benefits from Improved Efficiency in LSE	Reduced Incidence of Gastro-intestinal Diseases	Climate Change Resiliency	Total Benefits	
	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)
2015	26.40	-	-	-	26.40	-	-	-	-	-	(26.40)
2016	55.72	-	-	-	55.72	-	-	-	-	-	(55.72)
2017	175.97	-	-	-	175.97	-	-	-	-	-	(175.97)
2018	222.90	-	-	-	222.90	-	-	-	-	-	(222.90)
2019	99.72	-	-	-	99.72	-	-	-	-	-	(99.72)
2020	5.97	17.42	340.50	30.39	394.28	-	-	-	-	-	(394.28)
2021	-	17.42	374.55	70.15	462.12	41.11	337.54	-	39.82	418.46	(43.66)
2022	173.08	17.42	412.00	119.29	721.79	94.89	371.29	0.17	39.82	506.17	(215.62)
2023	-	17.42	453.20	168.43	639.05	161.36	408.42	0.51	39.82	610.11	(28.94)
2024	-	17.42	498.52	187.18	703.12	227.83	449.26	1.01	39.82	717.93	14.81
2025	-	17.42	548.37	196.55	762.35	294.30	494.19	1.35	39.82	829.66	67.31
2026	-	17.42	603.21	196.55	817.19	360.77	543.61	1.69	39.82	945.89	128.70
2027	173.08	17.42	663.53	196.55	1,050.59	427.24	597.97	1.69	39.82	1,066.72	16.13
2028	-	17.42	729.89	196.55	943.86	493.71	657.77	1.69	39.82	1,192.98	249.12
2029	-	17.42	802.88	196.55	1,016.85	560.17	723.55	1.69	39.82	1,325.23	308.38
2030	-	17.42	883.16	196.55	1,097.14	626.64	795.90	1.69	39.82	1,464.05	366.91
2031	-	17.42	971.48	196.55	1,185.45	693.11	875.49	1.69	39.82	1,610.11	424.66
2032	173.08	17.42	1,068.63	196.55	1,455.68	759.58	963.04	1.69	39.82	1,764.13	308.44
2033	-	17.42	1,175.49	196.55	1,389.46	826.05	1,059.34	1.69	39.82	1,926.90	537.44
2034	-	17.42	1,293.04	196.55	1,507.01	892.52	1,165.28	1.69	39.82	2,099.30	592.29
2035	-	17.42	1,422.34	196.55	1,632.32	958.99	1,281.80	1.69	39.82	2,282.30	645.98
2036	-	17.42	1,564.58	196.55	1,778.55	1,025.45	1,409.99	1.69	39.82	2,476.95	698.40
2037	173.08	17.42	1,721.03	196.55	2,108.09	1,091.92	1,550.98	1.69	39.82	2,684.41	576.32
2038	-	17.42	1,893.14	196.55	2,107.11	1,158.39	1,706.08	1.69	39.82	2,905.98	798.87
2039	-	17.42	2,082.45	196.55	2,296.42	1,224.86	1,876.69	1.69	39.82	3,143.06	846.63
											EIRR = 12.1%
											NPV (@12%) = 7.73

Attachment Table D5: Benefits from Improved Efficiency Short of Target by 20%

Year	Cost					Benefits					Net Benefits
	Investment	Operation and Maintenance	Recurrent Cost of LSE Schools	Opportunity Cost of LSE Students	Total Cost	Projected Income of LSE Students Who Completed Grade 9	Economic Value of Benefits from Improved Efficiency in LSE	Reduced Incidence of Gastro-intestinal Diseases	Climate Change Resiliency	Total Benefits	
	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)
2015	26.40	-	-	-	26.40	#	-	-	-	-	(26.40)
2016	55.72	-	-	-	55.72	-	-	-	-	-	(55.72)
2017	175.97	-	-	-	175.97	-	-	-	-	-	(175.97)
2018	222.90	-	-	-	222.90	-	-	-	-	-	(222.90)
2019	99.72	-	-	-	99.72	-	-	-	-	-	(99.72)
2020	5.97	17.42	340.50	30.39	394.28	41.11	270.03	-	39.82	350.95	(43.32)
2021	-	17.42	374.55	70.15	462.12	94.89	297.03	0.17	39.82	431.91	(30.21)
2022	173.08	17.42	412.00	119.29	721.79	161.36	326.74	0.51	39.82	528.42	(193.37)
2023	-	17.42	453.20	168.43	639.05	227.83	359.41	1.01	39.82	628.07	(10.98)
2024	-	17.42	498.52	187.18	703.12	294.30	395.35	1.35	39.82	730.82	27.70
2025	-	17.42	548.37	196.55	762.35	360.77	434.89	1.69	39.82	837.16	74.82
2026	-	17.42	603.21	196.55	817.19	427.24	478.38	1.69	39.82	947.12	129.94
2027	173.08	17.42	663.53	196.55	1,050.59	493.71	526.21	1.69	39.82	1,061.43	10.84
2028	-	17.42	729.89	196.55	943.86	560.17	578.84	1.69	39.82	1,180.52	236.66
2029	-	17.42	802.88	196.55	1,016.85	626.64	636.72	1.69	39.82	1,304.87	288.02
2030	-	17.42	883.16	196.55	1,097.14	693.11	700.39	1.69	39.82	1,435.01	337.87
2031	-	17.42	971.48	196.55	1,185.45	759.58	770.43	1.69	39.82	1,571.52	386.07
2032	173.08	17.42	1,068.63	196.55	1,455.68	826.05	847.47	1.69	39.82	1,715.03	259.35
2033	-	17.42	1,175.49	196.55	1,389.46	892.52	932.22	1.69	39.82	1,866.25	476.78
2034	-	17.42	1,293.04	196.55	1,507.01	958.99	1,025.44	1.69	39.82	2,025.94	518.93
2035	-	17.42	1,422.34	196.55	1,636.32	1,025.45	1,127.99	1.69	39.82	2,194.95	558.63
2036	-	17.42	1,564.58	196.55	1,778.55	1,091.92	1,240.79	1.69	39.82	2,374.22	595.67
2037	173.08	17.42	1,721.03	196.55	2,108.09	1,158.39	1,364.87	1.69	39.82	2,564.77	456.68
2038	-	17.42	1,893.14	196.55	2,107.11	1,224.86	1,501.35	1.69	39.82	2,767.72	660.61
2039	-	17.42	2,082.45	196.55	2,296.42	1,291.33	1,651.49	1.69	39.82	2,984.32	687.90
EIRR =											13.9%
NPV (@12%) =											130.99

Attachment Table D6: Benefits from Reduction in Disease Incidence Short of Target by 20%

Year	Cost					Benefits					Net Benefits
	Investment	Operation and Maintenance	Recurrent Cost of LSE Schools	Opportunity Cost of LSE Students	Total Cost	Projected Income of LSE Students Who Completed Grade 9	Economic Value of Benefits from Improved Efficiency in LSE	Reduced Incidence of Gastro-intestinal Diseases	Climate Change Resiliency	Total Benefits	
	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)
2015	26.40	-	-	-	26.40	#	-	-	-	-	(26.40)
2016	55.72	-	-	-	55.72	-	-	-	-	-	(55.72)
2017	175.97	-	-	-	175.97	-	-	-	-	-	(175.97)
2018	222.90	-	-	-	222.90	-	-	-	-	-	(222.90)
2019	99.72	-	-	-	99.72	-	-	-	-	-	(99.72)
2020	5.97	17.42	340.50	30.39	394.28	41.11	337.54	-	39.82	418.46	24.18
2021	-	17.42	374.55	70.15	462.12	94.89	371.29	0.14	39.82	506.14	44.02
2022	173.08	17.42	412.00	119.29	721.79	161.36	408.42	0.41	39.82	610.01	(111.79)
2023	-	17.42	453.20	168.43	639.05	227.83	449.26	0.81	39.82	717.72	78.67
2024	-	17.42	498.52	187.18	703.12	294.30	494.19	1.08	39.82	829.39	126.27
2025	-	17.42	548.37	196.55	762.35	360.77	543.61	1.35	39.82	945.55	183.20
2026	-	17.42	603.21	196.55	817.19	427.24	597.97	1.35	39.82	1,066.38	249.19
2027	173.08	17.42	663.53	196.55	1,050.59	493.71	657.77	1.35	39.82	1,192.64	142.05
2028	-	17.42	729.89	196.55	943.86	560.17	723.55	1.35	39.82	1,324.89	381.03
2029	-	17.42	802.88	196.55	1,016.85	626.64	795.90	1.35	39.82	1,463.71	446.86
2030	-	17.42	883.16	196.55	1,097.14	693.11	875.49	1.35	39.82	1,609.77	512.63
2031	-	17.42	971.48	196.55	1,185.45	759.58	963.04	1.35	39.82	1,763.79	578.34
2032	173.08	17.42	1,068.63	196.55	1,455.68	826.05	1,059.34	1.35	39.82	1,926.56	470.88
2033	-	17.42	1,175.49	196.55	1,389.46	892.52	1,165.28	1.35	39.82	2,098.96	709.50
2034	-	17.42	1,293.04	196.55	1,507.01	958.99	1,281.80	1.35	39.82	2,281.96	774.95
2035	-	17.42	1,422.34	196.55	1,636.32	1,025.45	1,409.99	1.35	39.82	2,476.61	840.29
2036	-	17.42	1,564.58	196.55	1,778.55	1,091.92	1,550.98	1.35	39.82	2,684.08	905.53
2037	173.08	17.42	1,721.03	196.55	2,108.09	1,158.39	1,706.08	1.35	39.82	2,905.64	797.55
2038	-	17.42	1,893.14	196.55	2,107.11	1,224.86	1,876.69	1.35	39.82	3,142.72	1,035.61
2039	-	17.42	2,082.45	196.55	2,296.42	1,291.33	2,064.36	1.35	39.82	3,396.86	1,100.43
EIRR =											20.9%
NPV (@12%) =											709.57

Attachment Table D7: Benefits from Climate Resilience Short of Target by 20%

Year	Cost				Benefits					Net Benefits	
	Investment	Operation and Maintenance	Recurrent Cost of LSE Schools	Opportunity Cost of LSE Students	Total Cost	Projected Income of LSE Students Who Completed Grade 9	Economic Value of Benefits from Improved Efficiency in LSE	Reduced Incidence of Gastro-intestinal Diseases	Climate Change Resiliency		Total Benefits
	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)	(VND billion)
2015	26.40	-	-	-	26.40 #	-	-	-	-	-	(26.40)
2016	55.72	-	-	-	55.72	-	-	-	-	-	(55.72)
2017	175.97	-	-	-	175.97	-	-	-	-	-	(175.97)
2018	222.90	-	-	-	222.90	-	-	-	-	-	(222.90)
2019	99.72	-	-	-	99.72	-	-	-	-	-	(99.72)
2020	5.97	17.42	340.50	30.39	394.28	41.11	337.54	-	31.85	410.50	16.22
2021	-	17.42	374.55	70.15	462.12	94.89	371.29	0.17	31.85	498.21	36.09
2022	173.08	17.42	412.00	119.29	721.79	161.36	408.42	0.51	31.85	602.14	(119.65)
2023	-	17.42	453.20	168.43	639.05	227.83	449.26	1.01	31.85	709.96	70.91
2024	-	17.42	498.52	187.18	703.12	294.30	494.19	1.35	31.85	821.70	118.58
2025	-	17.42	548.37	196.55	762.35	360.77	543.61	1.69	31.85	937.92	175.57
2026	-	17.42	603.21	196.55	817.19	427.24	597.97	1.69	31.85	1,058.75	241.57
2027	173.08	17.42	663.53	196.55	1,050.59	493.71	657.77	1.69	31.85	1,185.02	134.43
2028	-	17.42	729.89	196.55	943.86	560.17	723.55	1.69	31.85	1,317.26	373.40
2029	-	17.42	802.88	196.55	1,016.85	626.64	795.90	1.69	31.85	1,456.09	439.24
2030	-	17.42	883.16	196.55	1,097.14	693.11	875.49	1.69	31.85	1,602.15	505.01
2031	-	17.42	971.48	196.55	1,185.45	759.58	963.04	1.69	31.85	1,756.16	570.71
2032	173.08	17.42	1,068.63	196.55	1,455.68	826.05	1,059.34	1.69	31.85	1,918.94	463.25
2033	-	17.42	1,175.49	196.55	1,389.46	892.52	1,165.28	1.69	31.85	2,091.34	701.88
2034	-	17.42	1,293.04	196.55	1,507.01	958.99	1,281.80	1.69	31.85	2,274.33	767.32
2035	-	17.42	1,422.34	196.55	1,636.32	1,025.45	1,409.99	1.69	31.85	2,468.98	832.67
2036	-	17.42	1,564.58	196.55	1,778.55	1,091.92	1,550.98	1.69	31.85	2,676.45	897.90
2037	173.08	17.42	1,721.03	196.55	2,108.09	1,158.39	1,706.08	1.69	31.85	2,898.02	789.93
2038	-	17.42	1,893.14	196.55	2,107.11	1,224.86	1,876.69	1.69	31.85	3,135.09	1,027.98
2039	-	17.42	2,082.45	196.55	2,296.42	1,291.33	2,064.36	1.69	31.85	3,389.23	1,092.81
										EIRR =	20.4%
										NPV (@12%) =	676.77