JICA Research on
A Multi-Sectoral Approach for
Maternal and Child Health
-Final Report-

August 2016

Japan International Cooperation Agency

Tekizaitekisho LLC

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List of abbreviations

Abbreviation	Formal name
ADB	Asian Development Bank
ANCS	Antenatal Care with Skilled Provider
BAPPEDA	Badan Perencanaan Pembangunan Daerah
BCG	Bacille de Calmette et Guérin
CCI	Composite Coverage Index
CCT	Conditional Cash Transfer
CoC	Continuum of Care
COPC	Continuum of Prevention and Care
CPNM	Care Seeking for Pneumonia
DHS	Demographic Health Survey
DPT3	Diphtheria、Pertussis、Tetanus
DPWT	Department of Public Works and Transport
EED	Environmental Enteric Disorder
FPS	Family Planning Needs Satisfied
HIV/AIDS	Human Immunodeficiency Virus/ Acquired Immunodeficiency Syndrome
IEG	Independent Evaluation Group
IMF	International Monetary Fund
LSIS	Lao Social Indicator Survey
MDGs	Millennium Development Goals
MICS	Multiple Indicator Cluster Survey
MSL	Measles Immunization
ORT	Oral Rehydration Therapy
PDM	Project Design Matrix
PMNCH	Partnership for Maternal, Neonatal and Child Health
POU	Point of Use
RMNCH	Reproductive, Maternal, Neonatal and Child Health
SBA	Skilled Birth Attendance
SDGs	Sustainable Development Goals
UHC	Universal Health Coverage
U5MR	Under five (years old) mortality rate

Summary

This research project looks at the ways in which infrastructure, water and sanitation, and education sector interventions contribute to improvements in maternal and child health and cross-sectoral efforts to holistically improve maternal and child health.

As for the research methodology, a literature review was conducted, to extract evidence, to explore the meaning and effects of a multisectoral approach. Existing studies and JICA project ex-post evaluation reports in the target sectors of infrastructure, water sanitation and education, were reviewed. The impact of sectoral interventions on maternal and child health were analyzed. The results from this analysis were then used to hypothesize on the contribution of non-health sectoral interventions on maternal and child health improvement. A field survey aimed to verify these hypotheses with the realities of JICA projects. Based on these literature review, analysis and insights from the field survey, examples of indicators are proposed for JICA to be able to monitor implementation of a comprehensive project which would also improve maternal and child health.

Maternal and child health improvement is a global issue. Although the Millennium Development Goal 4 (to reduce U5 mortality rate by one-third) and Goal 5 (reduce maternal mortality rate by one-fourth) have had a certain impact, the regional and internal regional differences in service delivery remain a serious issue. This is why even after 2015, maternal and child health remains a priority and is included again in the Sustainable Development Goals. One of the Goals focuses on the importance of universal health coverage (UHC) and the right of everyone to receive basic health and medical care. The strengthening of maternal and child health services is one such entry point to UHC. SDGs are based on the perspective that "the various problems which occur on this planet are because various problems interact and are correlated. SDGs aims to promote cross-sectoral multiple viewpoints into one effective approach to improve maternal and child health.

In extracting scientific and empirical evidence on the meaning of multisectoral approaches, we looked for evidence of non-health sectoral interventions that have contributed to improvements in maternal and child health. For example, in the case of infrastructure interventions, there was ample evidence that road construction reduced the distance and time to health facilities, which had an effect on maternal, neonatal, infant and child mortality rates. In the water and sanitation sector, there was evidence on the relationship between improvement of water and sanitation and the reduction of infant mortality rates. In addition, there was evidence that hygiene and sanitation interventions had a larger impact on maternal and child health indicators, nutritional status and child growth than water supply interventions. In the education sector, we found that short-term school health and hygiene promotion improved school-age children's nutritional situation and created a foundation for disease reduction. There was also evidence of a cause-and-effect relationship between girls' education and the improvement of future mother and child health.

Although the direct and indirect impact of the non-health sector interventions have been studied and presented, there are very few actual projects across JICA which were designed to have a multisectoral impact. There was a limitation despite some indication of an impact on maternal and child health in JICA reports due to the fact that indicators and an evaluation framework were not pre-fixed to examine the impact on maternal

and child health improvement. One of the reasons for this is said to be due to the fact that the causal effect between the differing sectoral interventions and maternal and child health is not clear, the fact that there are multiple steps needed for an intervention to demonstrate impact in maternal and child health and that there are no evaluation guidelines on how to assess the impact of a multisectoral approach.

This research project concludes that in order to realize the comprehensive perspective promoted by the SDGs, indicators which can demonstrate the impact of non-health sectoral projects on maternal and child health are necessary. Although the scope of this research project is limited, we hope we have been able to demonstrate the possibility of promoting the SDGs, by visualizing impacts on other sectors through our proposed indicators for our respective sectors of infrastructure (roads, bridges and power), water sanitation and education.

One of the results of this research project are specific indicator examples, the validity of these proposed indicators based on existing evidence as well as the path from each target sector intervention; infrastructure (roads, bridges and power), water sanitation and education and it's impact on maternal and child health. The complete Table is attached as Annex 5. In the report, we have explained how to utilize these proposed indicators at project design and formulation, project preparation, implementation and monitoring evaluation stages.

By visualizing the multisectoral approach where non-maternal and child health sector interventions have an impact on maternal and child health, we feel that, in the future, by continuing to add to these examples, that further strategic and comprehensive multisectoral maternal and child health improvement projects will be realized. The participation of those from various sectors within JICA in the process of this research, the sharing of the results of the research, as well as discussion on the multisectoral approach helped push mutual understanding within JICA. This is also one of this research project's results and we hope that this will be the catalyst for furthering the multisectoral approach beyond maternal and child health and beyond the territories of each sector.

The maternal and child health indicators proposed by this research project can be integrated in each project stage. We hope that by accumulating more experience in how multisectoral projects are planned, prepared, implemented and monitored that the multisectoral approach will be strengthened and will lead us to a nearer realization of SDGs.

1. Outline of Research

1-1. Background to Research

Improvement of maternal and child health is a global issue, with goals 4 and 5 of the Millennium Development Goals (MDGs) focusing on under-five mortality rates (U5MR) and maternal mortality rates (MMR), respectively. The goals set in 2000 aimed to reduce U5MR and MMR by one-third and one-fourth, respectively, of their 1990 levels by 2015.

In response, in 2005 the international community established the Partnership for Maternal, Newborn and Child Health (PMNCH) with the aim of accelerating improvements in maternal and child health. Maternal and child health support continued to expand with the announcement of the Global Strategy for Women's and Children's Health in 2010 at a high-level United Nations (UN) meeting. As a result, a certain effect on both the U5 child mortality rate and the maternal mortality rate was observed (U5MR fell from 90/1000 in 1990 to 43/1000 in 2012 and the maternal mortality rate from 380/10,000 to 210/10,000 in the same period). However, significant delays in the achievement of both goals 4 and 5 were noted in Sub-Saharan Africa and South Asia. In addition, even in countries where Goal 4 (U5MR) was achieved, namely Vietnam and Cambodia, regional disparities in service provision remains a serious challenge. This is said to be due to vulnerable health systems resulting from a shortage of health personnel as well as poverty and other economic and cultural factors. In addition, neonatal mortality (death before 28 days), actually accounts for 40% of U5MR, remains a major challenge. Therefore, since 2015 even these challenges have been incorporated as a priority issue in the sustainable development goals (SDGs). It has been pointed out that various development issues addressed in the SDGs are interrelated with each other. The importance of tackling these problems in a comprehensive manner, not just through one sector, is widely acknowledged as the way to these global 2030 goals.

Maternal and child health is also a cooperation priority for JICA. Based on the experience of Japan in maternal and child health improvement, JICA works to “strengthen and continue efforts and emphasize the mother-to-child continuum of care”, “contribute to mother and child universal health coverage (UHC) through the improvement of health services”, and “improve comprehensive maternal and child health beyond sector initiatives”. Nevertheless, when it comes to multi-sector cooperation and the impact of other sectoral interventions on maternal and child health, the examples are extremely limited.

1-2. Research Objectives

This research project looks at the relationship between sectoral interventions and maternal and child health improvements to determine whether interventions or measures across sectors can holistically improve maternal and child health. Based on these findings, the added value of each sector were to be visualized, and suggestions made for further high-quality project formulation. More specifically, literature was reviewed and evidence extracted and organized on the impact of sectoral interventions in infrastructure (roads, bridges and power), water and sanitation (water supply and sewerage), and education (hereinafter, the target sectors) on maternal and child health. Finally, practical guidelines on the impact of the above-mentioned non-health sector interventions on maternal and child health were drafted.

1-3. Research Methodology

This research is based on the hypothesis that infrastructure (roads, bridges and electricity), water and sanitation (water supply and sanitation development and installation), education (hereafter, target sectors) have an influence, impact or effect on maternal and child health. In order to prove this hypothesis, previous literature, including reports on previous JICA projects in the target sectors which were presumed to have had an effect on maternal and child health, were reviewed and categorized according to the relationship found or mentioned between the target sectors and maternal and child health. This insight was then used to examine on-site target sector projects implemented under the various assistant schemes (technical cooperation, loan and grant) and their positive impact on maternal and child health. The analyzed results of the literature review and field survey will be utilized as evidence for future high-quality project formulation and cooperation.

This research project consists of three steps: (1) data and literature review, (2) JICA project review and (3) analysis. Through the Step 1 review, evidence on the trends of the application of a multisectoral approach and its association with maternal and child health were extracted. Step 2, then proceeded to assess the impact of JICA's non-health sectoral interventions on maternal and child health. As Step 3, the qualitative and quantitative evidence collected through the two above-mentioned steps were then re-organized and re-analyzed in order to be able to propose a framework and relevant indicators for maternal and child health improvement through a multisectoral approach.

Therefore, the research team made presentations and held discussions with various sections within JICA when the research kicked off with its inception report, as well as during the research period with the drafts of the first and second interim reports. The research steps and the information to be collected, as well as the intended analysis, are described in the Table below.

Table 1-1. Research steps

Research steps	Objective and Content
(1) Study Step1: Review of existing literature	
Literature review I	Reviewed previous research studies, academic articles, international organization reports, extracted evidence on non-health sector (target sector) interventions that impact maternal and child health, organized evidence of relationship into Tables and Figures. Analyzed results were reported on in interim report 1.
Quantitative analysis	The association between target sector indicators and maternal and child health indicators was examined using a quantitative method, in order to assess the appropriateness of the indicators. Datasets from Indonesia's 2012 DHS and Lao PDR's 2011-2012 LSIS were used to conduct multiple logistic and linear regression analyses. Outcome variables in the analyses were maternal and child health indicators such as survival beyond 28 days after birth, the Composite Coverage Index: CCI and the (maternal and child health) Continuum of Care completion rate: CoC).
(2) Study Step2: Review of JICA projects	
Literature review II	Reviewed reports on JICA projects implemented in the past 10 years for impact on maternal and child health, extracted and organized any referral to ways in which interventions might have contributed to improved maternal and child health. JICA projects were reviewed in detail if the project design matrix (PDM) specified health indicators and mentioned an impact on maternal and child health. The relevant evaluation results and sentences were extracted and analyzed.
Literature review III	Analyzed certain FY 2015 JICA ex-post evaluation reports which were designed to also look at the maternal and child health impact, on how target sectors impacted maternal and child health.
Field survey	In Indonesia and Lao PDR[1], conducted interviews with stakeholders to further the hypothesis of what and how sectoral interventions have an effect on maternal and child health. In addition, collected and analyzed quantitative and qualitative information such as DHS datasets which could be obtained beforehand to find relationships between variables.
(3) Study Step3: Analysis in Japan	
Final report	Organized the results of steps (1) and (2) into path models, as a reference for the multisectoral (approach for) maternal and child health project design and formulation, indicator setting and for the various evaluations. The draft report was presented and final recommendations compiled.

[1] Reasons why Indonesia and Lao PDR were selected as countries for the field survey are given in chapter1-3-4.

1-3-1. Methodology of Study step 1: Literature Review I

For Literature Review I, academic journals, international organizations and other donor reports were searched for evidence on the impact of other sectoral interventions on maternal and child health[2]. The literature review process, as shown in Figure 1-1, consisted of searching the internet for academic articles and international organization reports using keywords relevant to each sector. The full text, which could be obtained free-of-charge[3], of summaries which mentioned an impact on maternal and child health were reviewed in detail. In reviewing in detail, we extracted the intervention by sector and the specific maternal and child health indicator in question, organized this information into a Table (refer to Annex 1 for the detailed Table). The databases used for this search were PubMed; for medical articles, ScienceDirect.com and Cochrane Database of Systematic Reviews; for health, medical and other sciences, and databases of Inter-American Development Bank, UNICEF, UNFPA, International Initiative for Impact evaluation (3ie) for other sectoral interventions from 1990 onwards were searched.

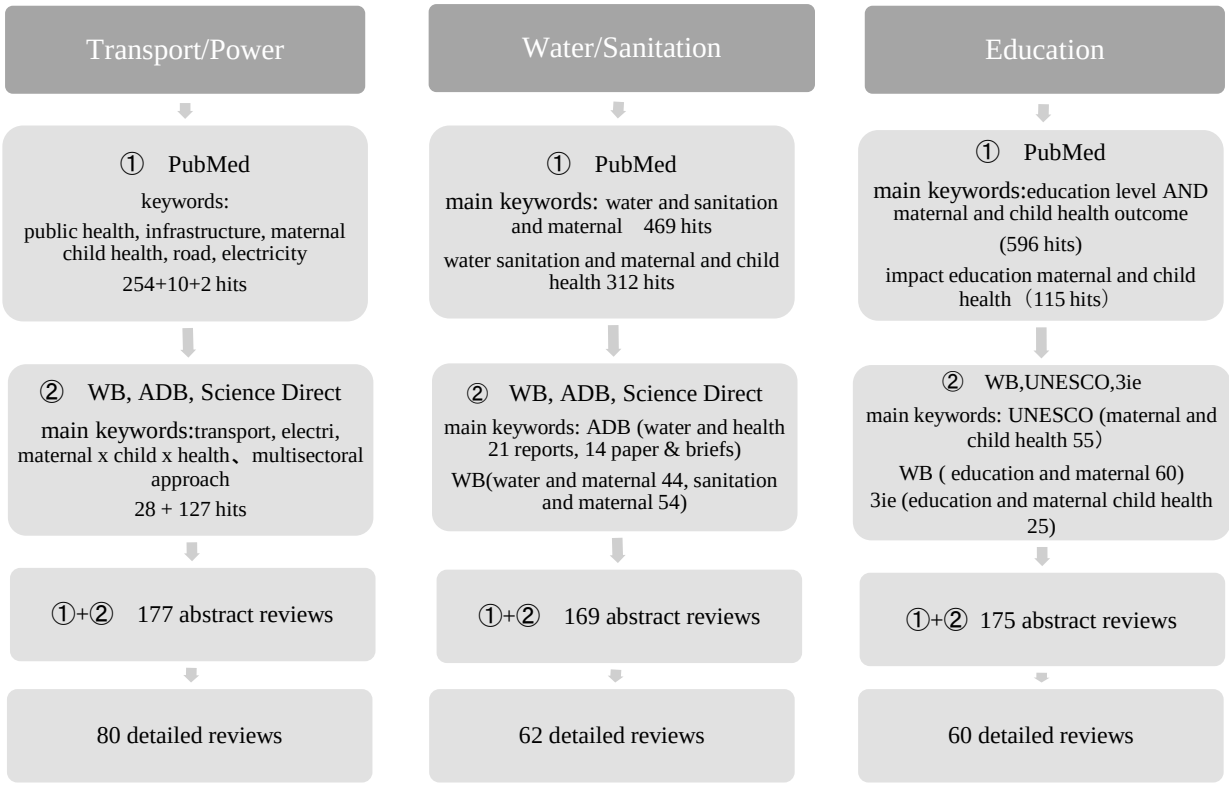
For transport (roads and bridges) and electricity, the keywords “infrastructure, road, bridge, transport, energy, electricity, maternal child health, multisector” were used to identify relevant articles from PubMed, World Bank, ADB, Science Direct databases. Out of the 177 abstracts scanned, 80 articles were identified for further detailed review.

For water and sanitation, the keywords seen in Figure 1-1 were used to search PubMed, the World Bank, Asian Development Bank, Science Direct and Cochrane Database of Systematic Reviews which produced 169 abstracts, of which 62 articles were identified as discussing impacts on maternal and child health.

For education, the keywords “education and maternal child health” were used to search UNESCO and the reports of other international organization as well as impact evaluation reports. 175 articles were listed, of which 60 were reviewed in detail.

2 The search was done by one person in charge of reviewing the sector.
3 Many articles in principle must be paid for, but in some cases Google Scholar allowed the team to obtain articles free-of-charge.

Figure 1-1. Literature review I review process



1-3-2. Methodology of Study step 1 Quantitative analysis

(1) Data

In order to examine the impact of target sector interventions on maternal and child health in the field survey countries, we conducted a quantitative data analysis. This quantitative data analysis was done to compliment the qualitative field survey results and to verify the hypothesis and validity of the indicators found in existing evidence by using datasets of the field survey countries. Specifically, we obtained the datasets for the 2012 Indonesia DHS and 2011-2012 Lao Social Indicator Survey (LSIS) and used statistical analysis software Stata13. These datasets from Demongraphic Health Surveys (DHS) and Multiple Indicator Cluster Survey) (MICS) contain maternal and child health indicators as well as other sector indicators on individuals (the woman, child and household) and is obtained, from DHS and MICS with permission, via the Internet.

(2) Indicators for maternal and child health outcomes

The maternal and child health outcome indicator “survival beyond 28 days after birth” the maternal and child health service coverage index (Composite Coverage Index: CCI) and the Continuum of Care (CoC)

completion were used as dependent variables in the regression analyses.

The CCI is an overall index composed of eight maternal and child health indicators that collectively represent the continuum of care, first mentioned in an article in the *Lancet* in 2012. WHO also uses CCI to examine equity in maternal and child health service coverage across regions and countries. In calculating CCI, the eight indicators, presented as percentage that can take between 0% and 100%, are divided into the following four stages according to the course of the continuum of care: family planning, maternal and newborn care, immunization, and case management of sick children. CCI is calculated as a weighted mean so that the indicators in the four stages can contribute equally. CCI is defined as follows:

$$1/4(\mathrm{FPS} + (\mathrm{SBA} + \mathrm{ANCS})/2 + (2 * \mathrm{DPT3} + \mathrm{MSL} + \mathrm{BCG})/4 + (\mathrm{ORT} + \mathrm{CPNM})/2),$$

where FPS is the ratio of women whose Family Planning needs are Satisfied, SBA is the ratio of women who delivered assisted by a Skilled Birth Attendant, ANCS is the ratio of women who received AnteNatal Care from a Skilled provider, DPT3 is the ratio of children who received the 3 doses of the Diphtheria-Pertussis-Tetanus vaccine, MSL is the ratio of children who received the MeaSLes vaccine, BCG is the ratio of children who received the BCG (anti-tuberculosis) vaccine, ORT is the ratio of children with diarrhea who received Oral Rehydration Therapy, and CPNM is the ratio of children with pneumonia symptoms who accessed or sought care (Care seeking for PNeuMonia). All of the eight indicators are represented as coverage within the same defined (surveyed) area (example: national or regional).

To examine the relationship between indicators in non-health sectors and maternal and child health under the multisectoral approach, ideally, indicators of health outcomes, such as maternal and child deaths, should be used. However, in addition to direct relationship between the indicators, there will be a variety of third (external) factors, such as the overall regional socioeconomic development situation, which may influence such a relationship. At the same time, international interest has been grown regarding care packages of continuous service through the life cycles of both mother and child. WHO regards the CoC[4] as a policy goal that aims to capture not only how services are being offered but also to measure how community residents understand and utilize these offered services. In addition, the CCI[5,6], which captures how mother and child access the various maternal and child health services has become used as an intermediate indicator to measure outcome or impact of offered services[7]. Both CoC and CCI are clues to understanding the impact other sectors have on maternal and child health indicators.

Therefore, we thought it necessary to use intermediate indicators, such as maternal and child health service coverage, in order to understand the mechanisms where the indicators of other sectors were associated with maternal and child health indicators in other sectors. The reason that maternal and child health process

[4] http://www.who.int/pmnch/about/continuum_of_care/en/ last accessed 31 August 2016

[5] Victora CG, Barros AJD, Axelson H, Bhutta ZA, Chopra M, França GVA, et al. How changes in coverage affect equity in maternal and child health interventions in 35 Countdown to 2015 countries: an analysis of national surveys. The Lancet. 2012; 380 (9848):1149-56.

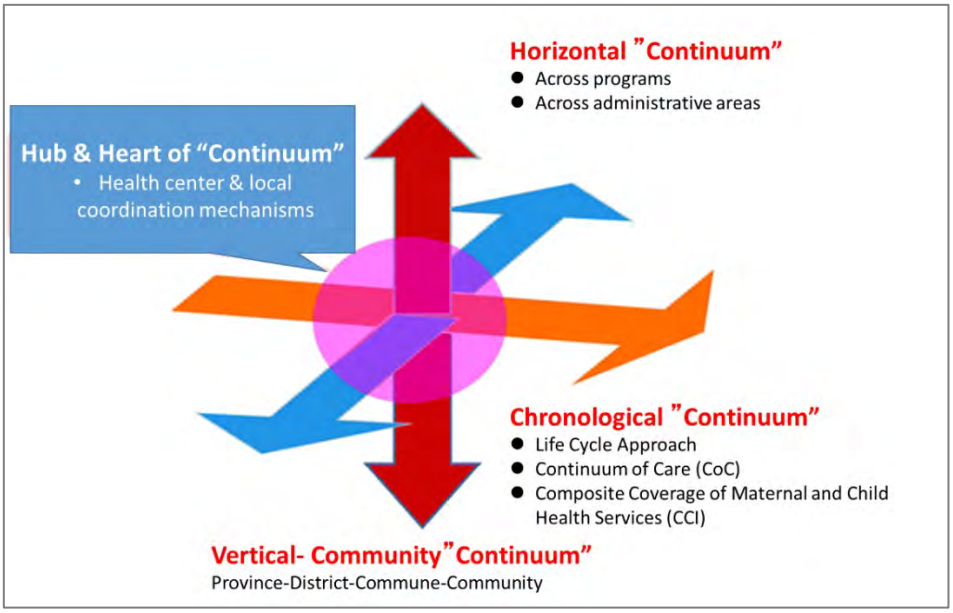
[6] Barros AJD, Victora CG. Measuring Coverage in MNCH: Determining and Interpreting Inequalities in Coverage of Maternal, Newborn, and Child Health Interventions. Madise N, ed. PLoS Medicine. 2013;10 (5):e1001390.

[7] RMNCH CCI technical notes are accessible from http://www.who.int/gho/health_equity/services/health_equity_rmnch_composite_coverage_index.pdf?ua=1. The most recent RMNCH CCI update can be found at http://www.who.int/gho/health_equity/services/rmnch_composite_coverage_index_text/en/ .

indicators such as CCI and the Maternal and Child CoC completion rate are being promoted is due to the continuity both indicators have, through the respective lifecycles of the mother and child, continuity from mother to child, continuity between the various sectors. This continuity is emphasized in the multisectoral approach so that comprehensive services can be continuously provided, and ensure continuity between the various administrative levels within a sector. The Figure 1-2 is based on a conceptual figure for a multisectoral approach in Fujita et al. (2015)[8], to which this research added the category of continuum of care based on the results of the previous research steps.

In a multisectoral approach there is a horizontal relationship between target areas and programs and a vertical axe represented by the administrative line from central to community levels. In addition there is a timeline which represents the chronological aspect. In the figure below, the blue horizontal arrow represents the horizontal, cross-sectoral and continuous approach throughout the sectors, programs and regions whereas the vertical red arrow represents longitudinal and continuous flow of services provided through the central-region-community administration. The one way orange arrow (the chronology axis) represents time, and represents the continuum of care which connect the mother and child, the chronological continuous chain of services throughout the lifecycles of both mother and child. All of these are coordinated by a hub, at the central level; the Ministry of Health, at the regional level; the regional health department, at the field level; the health center or the district health office.

Figure 1-2. Analytical Framework of the Continuum of Prevention and Care (COPC)



[8] Source: BMC Health Serv Res. 2015 Apr 24;15:176. doi: 10.1186/s12913-015-0804-5.
HIV service delivery models towards 'Zero AIDS-related Deaths': a collaborative case study of six Asia and Pacific countries.
Fujita M, Poudel KC, Green K, Wi T, Abeyewickreme I, Ghidinelli M, Kato M, Vun MC, Sopheap S, San KO, Bollen P, Rai KK, Dahal A,Bhandari D, Boas P, Yaipupu J, Sirinirund P, Saonuam P, Duong BD, Nhan do T, Thu NT, Jimba M.

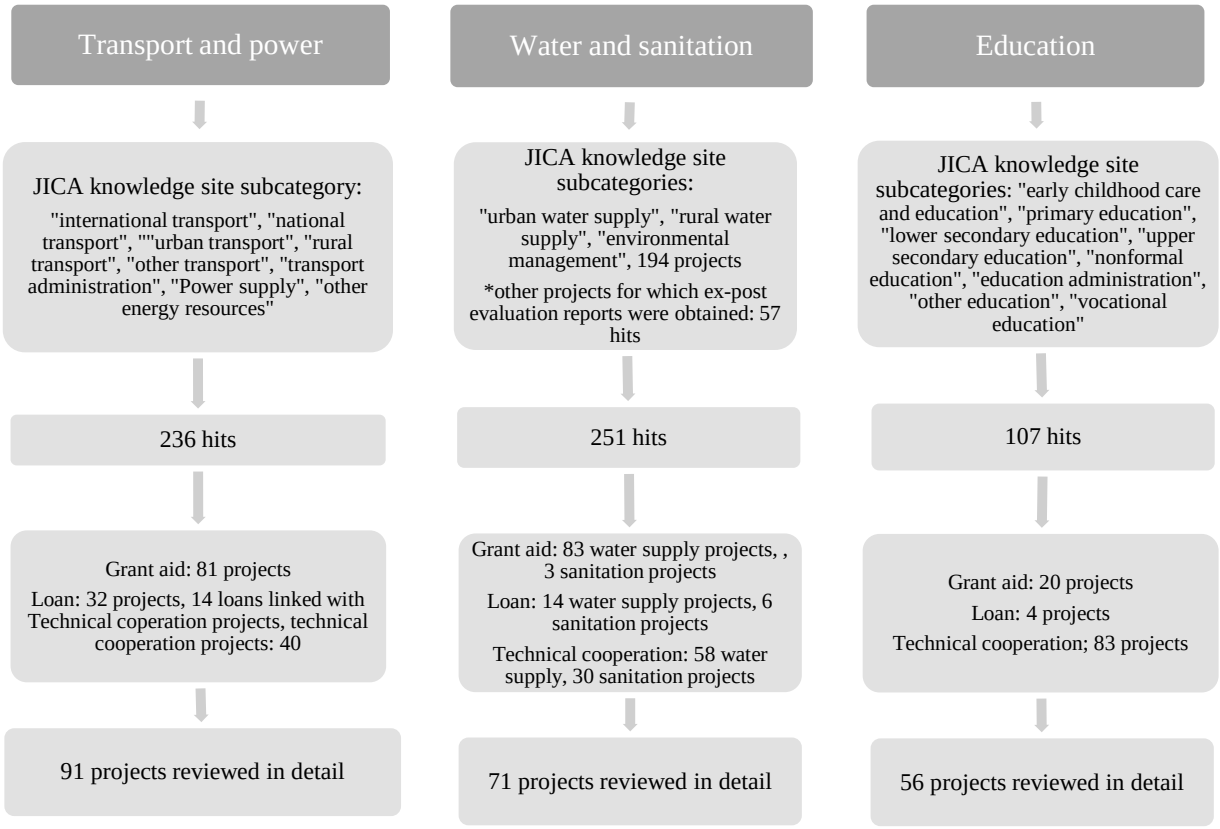
(3) Data analysis methodology

This research quantitatively examined the relationship between the target sector indicators and maternal and child health indicators. First, in order to examine the validity of the indicator, multiple linear and logistic regressions were run with the Indonesia DHS (2012) and Lao PDR LSIS (surveyed in 2011-12) datasets. The data was obtained from women 15-49 years old who had delivered in the five years previous to the survey. The dependent variables were 1) newborn survival to 28 days after childbirth and 2) CCI and CoC Completion rate. The 1) newborn survival to 28 days after childbirth and 3) CoC Completion rate are binary variables in which the individual (woman) is a unit. CCI is a continuous variable that takes a range between 0 to 100, and was calculated based on the aggregated figure of the province and municipality levels in Indonesia, so the analytical unit is not the individual but the district and municipality. Independent variables are the non-maternal and child health indicators and the individual and household attributes. Individual and household attributes include the woman's age, previous childbirth experience, urban or rural residence and household socio-economic status (five grades) based on possession of wealth assets. For the non-maternal and child health variables, the mother's education level and the father's level of education was used for education. The response to the question "Is transport an obstacle to health facility access?" was used as the transport variable. For electricity, the variable was the response to the question "Can your household use electricity?" For water sanitation, the responses to the questions on "time to water source", "clean water access" and "type of toilet- household toilet with septic tank or common toilet" were used as variables. For the multilinear and logistic regression analysis, multicollinearity was checked. The results of this quantitative analysis are described in detail in chapter 4-2.

1-3-3. Methodology of Study Step 2: Review of JICA projects

Literature review II examined the impact of JICA's other sectoral projects on maternal and child health. Information on projects implemented between FY 2005 and 2015 was analyzed for specific references to contributions to maternal and child health or any other impact on maternal and child health. The following Figure 1-3 summarizes the process for reviewing information on each sector's technical cooperation, loan and grant aid projects found through JICA's knowledge and evaluation websites. We then reviewed the PDMs and other evaluation frameworks of each project to group projects which had set a project purpose related to maternal and child health, or projects which had activities and objectives which might have had an effect on maternal and child health even if it was not explicitly mentioned in the project purpose, and finally projects which did not meet the above criteria. For projects which had an effect on maternal and child health, we compared the results with Literature Review I (Annex 1) and highlighted specific examples in which target sector interventions contributed to improvements in maternal and child health.

Figure 1-3. Literature review II review process



167 projects were listed under transport in the JICA knowledge site. These projects were subcategorized under “international transport”, “national transport”, “urban transport”, “rural transport”, “other transport” and “transport administration”. Similarly, 69 projects subcategorized under “power supply” and “other energy resources” were listed. 91 projects for which ex-post evaluation reports could be obtained were reviewed in detail.

For water and sanitation, 155 projects categorized as “urban water supply” and “rural water supply” on the JICA knowledge site, as well as 39 sanitation projects categorized under “environmental management,” or a total of 194 projects, were listed of which 14 ex-post evaluation reports could be accessed through the evaluation portal. 57 other ex-post evaluation reports for water sanitation projects were identified through the JICA library website. In total 71 projects were reviewed in detail. For loan projects, only a limited number of ex-post evaluation reports were available through JICA’s evaluation site, and therefore projects for which disbursement ended in 2005 onwards were included for consideration. These and other additional reports amounted to 57. Technical cooperation projects for which ex-post evaluation reports or terminal evaluation reports were available were analyzed in detail.

For technical cooperation projects in education, the keywords “early childhood care and education”, “primary education”, “lower secondary education”, “upper secondary education”, “informal education”, “education administration” and “other education” were used to search the JICA knowledge site and to identify

76 projects. In addition[9], some "vocational education" and "school health" technical cooperation projects were identified, along with grant and loan projects for which ex-post evaluation reports were available, bringing the total number of projects reviewed to 107. Based on literature review I results, primary and secondary facility construction projects were prioritized among the grant and loan projects. For technical cooperation projects, based on the literature review I results, school management projects that have a strong relationship with the community and girl's education and non-formal education were prioritized and 56 reports (both terminal evaluation and ex-post evaluation reports) were reviewed in detail.

1-3-4. Methodology of Study Step 2: Field Survey

(1) Methodology

The field survey countries were selected based on a mix of cooperation schemes (technical cooperation, loans and grant aid), target sectors and different socioeconomic situations in order to assess the impact of the target sector projects on maternal and child health improvement. We also wanted to extract widely applicable maternal and child health indicators, that is to a wide range of countries with different socioeconomic contexts so we chose one relatively economically developed country in the Asia region and one country from the same region with lower economic progress levels and whose indicators, had not made as much progress as expected. We specifically examined and compared socioeconomic indicators, infant mortality rates and under-5 mortality rates for the countries in the Asia region in order to identify field survey countries. As a result, two countries—Lao PDR, representing the under regional average group, and Indonesia, representing the over regional average group—were selected as the field survey countries. Then, 48 JICA projects that were implemented or finished in between 2005 and 2016 were extracted from the project longlist (by sector, scheme and cooperation period) for the two field survey countries. After examining the longlist projects to identify provinces/districts to visit to examine any possible impact of transport/electricity/water sanitation/education interventions on maternal and child health, South Sulawesi Region in Indonesia and Savannakhet Province in Lao PDR were found to have the widest range of road, bridge, electricity, water sanitation and education projects and selected as field visit candidates.

Criteria for projects were a) a balanced portfolio of the different cooperation schemes (technical cooperation, loan or grant) and b) projects that ended within the last 10 years to be able to assess impact. In the case where there were no candidates for a certain sector in the area that was to be visited, ongoing projects were included.

[9] For tertiary education, there was very little research, especially when examining developing country examples, which showed evidence of impact on maternal and child health in Literature Review I. Although we are aware that JICA supports engineering education as a main pillar in its support to the tertiary education sector, due to the fact that there was not enough evidence of impact on maternal and child health, a review of tertiary education projects was not pursued in Literature Review II.

(2) Content

For the 2 field survey countries, we examined the validity of the evidence extracted from the literature review. Then, with the intent to examine how target sector JICA projects impacted maternal and child health, we followed the methodology and key questions shown in Table 1-2 to realize the field survey. (Refer to Annex 2 for more information on the field survey itinerary and the interviewees).

Table 1-2. Methodology and Content of Field Survey

Methodology	Objective and key questions
1) Literature review of related documents (ex-ante and ex-post evaluation reports)	Project summary and results, listing of stakeholders and information to be collected
2) Interview of project stakeholders (counterparts and implementers)	Collect information on the impact on maternal and child health ・ Whether target projects had an impact on maternal and child health ・ Principles of partnership between the target and health sectors, confirmation of implementation status ・ Maintenance and management of target facilities, monitoring system, impact on surrounding areas after facility completion (whether there is an impact on maternal and child health) ・ Partnership between education and health on school health, monitoring system and methodology on how to collect data
3) Group discussions and interviews with target area residents	Collect information from beneficiaries on the impact of mother and child ・ Differences in access to health facilities as a result of road construction ・ Impact and changes on livelihoods and health before and after road rehabilitation ・ Changes in water sources for drinking and everyday use as a result of water supply services ・ Changes in living environment, sanitation and health as a result of improvements in water supply
4) Group discussions with teachers and students (for school projects)	Check the impact of maternal and child health interventions on students and community residents ・ Relationship between school health activities and student health ・ Whether community residents participate and whether there is a ripple effect in the community ・ Ministry of Health and health center partnership ・ Changes in sanitation knowledge and awareness of school stakeholders
5) Field survey (visits to completed facilities and school visits)	Confirm the completion and use of supported facilities and assess impact on health ・ Status of road rehabilitation and surrounding area access ・ Status of water supply facilities, water purification process, beneficiary communities ・ Use of school infirmary and health kits ・ Use of toilets and hand washing facilities, diseases and health situation

1-3-5. Literature Review III Methodology

Literature review III focused on the six JICA projects that were being evaluated (ex-post evaluation) in FY 2015, and which had included indicators to assess maternal and child health impact. Out of the six projects projected to be finished by end July, only two reports in infrastructure sector were obtained in time for this final report and the assessment of maternal and child health impact.

1-4. Limitations of this Research Project

This research project literature review found that realization of a multisectoral approach has been limited at the global level and that documented evidence is little. In Literature Review 2, there were no projects which purposely introduced a multisectoral perspective so the examples reviewed in detail for this research could only be minimally analyzed. Therefore, the projects of both Literature Reviews 1 and 2 were limited not only in volume but also in quality. We did not aim for a rigorous systematic review per say, but aimed to integrate the methodology of a systematic review as much as possible to have confidence in the level of evidence. This is the background to why we focused on not only clarifying the level of evidence on the association between target sector interventions and maternal and child health but also on how JICA can move forward the multisectoral approach based on obtained information.

The field survey consisted mainly of a series of interviews with sample beneficiaries of JICA projects. This is due to the fact that the projects examined had not envisioned maternal and child health impact. Therefore, we hypothesized based on the results of the literature review the impact other sectors had on maternal and child health, applied this to the JICA project context and tried to prove the hypothesis based on qualitative information. In addition, for the verification of association between sectors in the field survey countries using DHS data, as this was a cross-sectional data set, causal inferences could not be made and it was only possible to demonstrate the possible impact and whether or not there is an association between the indicators of the target sectors and maternal and child health.

2. Main Results from the Literature Reviews[10][11]

2-1. Meaning of a Multisectoral Approach

2-1-1. Definition of Multisectoral Approach

A multisectoral approach addresses the multiple cross-cutting and root causes that determine people's health, and is considered to be indispensable for effective and sustainable mother and child health[12]. There are various definitions of the multisectoral approach, such as the definition provided by the Partnership for Maternal, Neonatal and Child Health, which defines multisectoral as globally united efforts that have a substantial and wide-ranging effect on health and welfare at the local level[13].

In its policy guidelines for reproductive, maternal, newborn and child health (RMNCH), WHO shows that maternal and child health is impacted by multiple and various sectors, and not just health policy (Figure 2-1)and that maternal and child health continuum of care is the centerpiece of this conceptual framework (Figure 2-1). This demonstrates that health policy would benefit from its integration with other sectoral policies, and that this is an effective approach in improving the continuum of care from pregnancy, maternity and postpartum stages[14].

In addition, the seven points in implementing multisectoral policy are 1) comprehensive economic development (equity), 2) comprehensive social development (education and nutrition), 3) sustainable environment (water and sanitation), 4) peace and security (elimination of violence), 5) infrastructure development (ICT, roads and transport), 6) alignment with international human rights conventions and international development frameworks and 7) cross-sectoral good governance. These frameworks fit the analytical framework of this research's focus, which is the multisectoral approach. Examples on how such sectoral policies have an impact on maternal and child health service delivery and outcomes. For example, an educational policy has an impact on access to education, provision of nutrition information to school-age children, social protection and gender equity. Water and sanitation policies have an impact on universal access to safe water, follow-up studies of water-borne diseases, school, health centers and workplace sanitary condition improvement. Infrastructure policies have an impact on how roads, transport, power networks are established and widened, and for example how sanitary facilities are improved. We have found that it is effective to integrate maternal and child health in various sectoral policies.

[10] The literature mentioned in this section is listed in Annex 6

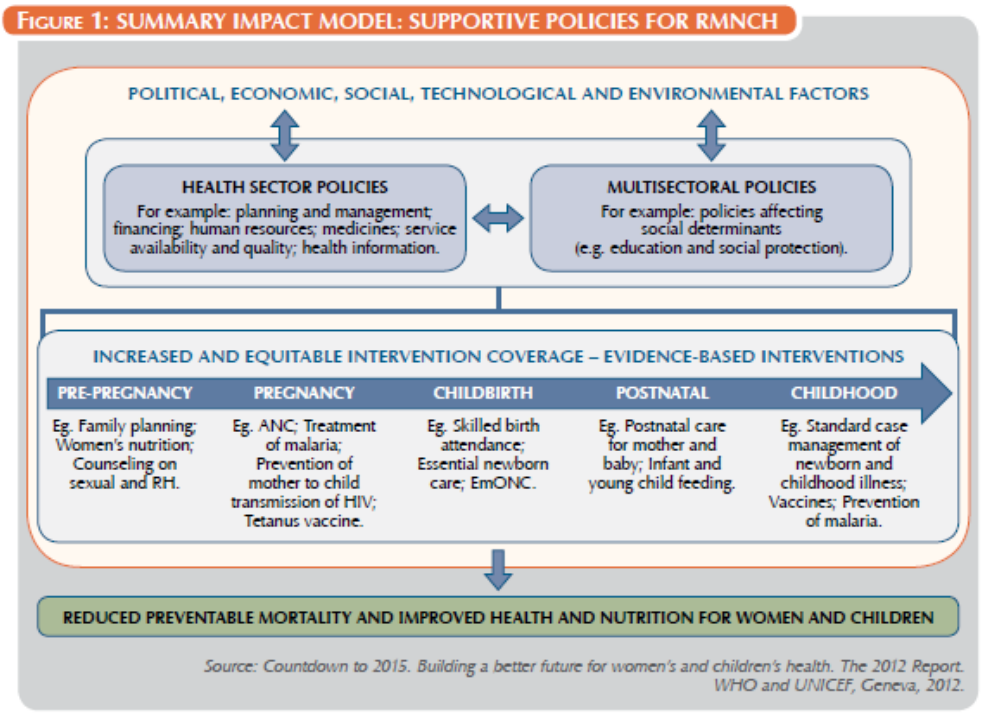
[11] In this analysis chapter, we first discuss the results of Study Step 1 (See Table 1-1 for more information on Study Steps) Literature reviews I, II and III as 2. Main results from the Literature Review. Then we discuss the field survey and quantitative data analysis results in another section due to differences between the two types of activities.

[12] Bessenecher et al., 2004

[13] WHO, 2015a

[14] WHO, 2015b

Figure 2-1 Relationship between Multisectoral Policy and Reproductive, Maternal, Newborn and Child Health (RMNCH)



2-1-2. Promotion of the Multisectoral Approach in order to Achieve the SDGs[15]

The concept of the multisectoral approach is not new. For example, the International Monetary Fund (IMF) had already started to emphasize the importance of infrastructure, water and sanitation as well as education on maternal and child health 10 years (1994) before the Millennium Development Goals were set[16]. The idea here is that health outcomes can be realized through non-health interventions and the effects of its components. For example, maternal access to clean water and education is said to have an impact on infant and child mortality rates. In addition, it is believed that the maternal mortality rate can be significantly reduced by hospital care, antenatal care and skilled birth attendance, as well as improved road networks and behavior changes at the individual and household level. Other suggestions for ensuring efficient health service access include public policy providing appropriate incentives for medical workers, procurement and distribution policy for pharmaceutical products, public health policy for population control, appropriate regulations, management of private-sector operators and other cross-sectoral coordination.

Subsequently, when year 2015 became the goal for the MDGs, reduction of the under-five mortality rate (MDG4) as well as reduction of the maternal mortality rate (MDG5) became indicators for maternal and child health. However, achieving these goals was perceived to be difficult even with the various initiatives focused on maternal and child health. Some reasons for serious regional differences in service provision are

[15] Source: A Policy Guide for Implementing Essential Interventions for Reproductive, Maternal, Newborn and Child Health (RMNCH), adapted by the research team
[16] IMF2004

said to be insufficient medical personnel, weak health systems, poverty, economic and social backgrounds. In addition, in 2012, approximately 40% of the deaths of children under the age of five were neonates (infants less than 28 days old), which means that neonatal measures remain an issue. This is one of the reasons that this issue was taken up again as a priority in the Sustainable Development Goals (SDGs).

SDGs are based on the perspective that "the various problems which occur on this planet are due to the interactions and correlation between various problems. In order to solve these problems, instead of approaching the individual problems, it is necessary to have a holistic viewpoint". In the field of maternal and child health, health in the adolescence and the pre-pregnancy stage, pregnancy and the childbirth stage, the postpartum stage and the infancy stage are all very closely related with the way in which people live and survive, which also involves a major influence from social connections to the family, community, health center and hospital.

In this research, we turned our attention to the interactive elements of each sector that promotes the SDGs, organizing these elements from a cross-sectoral multiple viewpoint into an effective approach to improve maternal and child health. Of the 17 SDGs, 13 SDGs show that by achieving sectoral Goals, there is the possibility of contributing in many different ways to the improvement of maternal and child health. Infrastructure is not only mainly concerned with Goal 9: Sustainable Cities and Communities where resilient infrastructure building for industry, technology innovation and social infrastructure is said to improve access to healthcare for mothers and children and contribute to better maternal and child health but also Goal 1: No Poverty, Goal 2: No Hunger, Goal 3: Good Health, Goal 6: Clean Water and Sanitation, Goal 7: Renewable Energy, Goal 8: Decent Work and Economic Development, Goal 10: Reduced Inequalities, Goal 11: Sustainable Cities and Communities are the sectors or goals which are the basis and have the possibility of impacting maternal and child health from multiple angles. The Water and Sanitation sector is mainly concerned with Goal 6: Clean Water and Sanitation as this would reduce the risk of various diseases and contribute to maternal and child health by securing sustainable management of water resources and accessible sanitation for all people. Power generation using water resources, which is part of Goal 7: Renewable energy, urban water and sewage systems which is part of Goal 11: Sustainable Cities and Goal 13: Climate Action also contribute in improving maternal and child health. The education sector is not only concerned with Goal 4: Quality Education but also, because education leads to human and social development, has responsibility for all other Goals as seen in Table 2-1. Finally, Goal 17: Partnerships for the Goals is about the promotion of intersectoral partnership in order to achieve the SDGs and is the Goal which embodies the multisectoral approach which is to have multiple sectoral perspectives in one activity or approach.

Table 2-1. Relationship between achievement of SDG Goals and maternal and child health promotion

Achievement of SDG Goals and the promotion of maternal and child health			Goal 1: No Poverty To end poverty of all forms everywhere, it is necessary to ensure the health of all mothers and children
Goal 2: Zero Hunger Improved nutrition for women is necessary for safe childbirth. In addition, adequate nutrition from the fetus to infant stages are not only necessary for subsequent healthy growth and development, but also reduces the risk of future NCDs.	Goal 3: Good Health and Well-Being Promoting the welfare of mother and child by ensuring a healthy lifestyle is the basis for ensuring health through all the stages of the life cycle.	Goal 4: Quality Education Ensuring that all women have access to high-quality education leads to improved health literacy [17] and the promotion of better health for women and children.	Goal 5: Gender Equality Empowered women not only protect their own health, but can also protect the health of their children.
Goal 6: Clean Water and Sanitation Safe water and sanitation reduces the risk of various diseases in the mother and child. Ensuring sustainable management and usage for water and sanitation for all contributes to the health of both mother and child.	Goal 7: Affordable and Clean Energy Ensuring access to modern energy improves the lives of mother and child. In addition, making modern energy available in all regions is essential to the provision of modern health care in all regions. Therefore, ensuring access to low-cost, reliable and sustainable modern energy for all contributes to maternal and child health.	Goal 8: Decent Work and Economic Growth Promoting decent work (suitable employment) for women empowers women and provides the economic foundation for their lives. Empowered women who have such an economic foundation can protect their health and the health of their children.	Goal 9: Industry, Innovation and Infrastructure Resilient infrastructure construction promotes better access to maternal and child health care, contributing to the health of mother and child.
Goal 10: Reduced Inequalities Maternal and child health indicators point to a gap between countries and within a country. Maternal and child health should be promoted in all regions, but more importantly, disparities should be eliminated by focusing on the health of the most vulnerable women and children.	Goal 11：Sustainable Cities and Communities An increasing number of mother and children live in urban areas, where safe town development is desired. In the event of a disaster, infants and pregnant women are placed in particularly vulnerable positions for which particular care is necessary.	（Goal 12：Responsible Consumption）	Goal 13: Climate Action Pregnant women and infants are especially affected by disasters and infectious diseases due to climate change. Therefore, the urgent measures necessary to mitigate climate change will also protect the health of mother and child.
(Goal 14: Life below water)	(Goal 15: Life on land)	(Goal 16: Peace, Justice and Strong Institutions)	Goal 17: Partnerships for the Goals The promotion of breastfeeding and appropriate complementary foods and continued efforts to protect maternal and child health through the continuum of care from pregnancy to postpartum stages requires a multisectoral approach. Therefore, maternal and child health promotion requires intersectoral cooperation.

Source：Compiled by research team based on SDGs

[17]Health literacy means the knowledge, motivation, capacity to acquire, understand, evaluate and use health information which then helps assess options and make decisions on health care, disease prevention, health promotion as well as maintaining and improving the quality of life through the lifecycle (definition by European Health Literacy Consortium)

2-1-3. Other Donors' Understanding and Use of a Multisectoral Approach

According to a report by the World Bank Independent Evaluation Group (IEG)[18], the World Bank has applied the multisectoral approach to education, health and water sanitation projects since even before 2005. 70% of primary education projects adopted between 2002 and 2014 have components aimed at strengthening education administration component, and 22% of these projects contained a nutrition component. 60 to 80% of health projects contain a component of another MDG that strengthens administration, with 10 to 30% having had an education component. The importance of water and sanitation in achieving health outcomes is well acknowledged, but there were very few projects that contained a water sanitation component. However, water and sanitation projects are being implemented in 95% of countries where health projects are being implemented, so the synergy of both sector projects is left to each country. However, the World Bank determined that, based on the available current evidence, it could not conclude whether a multisectoral approach was effective or not. Further analysis is thus necessary.

One of the main references for this research is the 2013 report by IEG called "Delivering the Millennium Development Goals to Reduce Maternal and Child Mortality," which is a holistic and systematic review of impact evaluation evidence in maternal and child health. The research which focused on the reduction of maternal and child mortality rates through skilled birth attendance was an MDG at that time. However, the extreme lack of evidence for intervention effects has become an issue. Even if an experimental intervention led to effective solutions, there is no guarantee that the same effects would be seen in a real environment. Therefore, it has been pointed out that rigorous data collection and decision-making based on monitoring, evaluation and evidence are essential to achieve SDGs and to prove the effects of an intervention.

As this research has found, there is a variety of evidence that, according to the report review, the following four points are necessary to achieve an effect with interventions: 1) where the mortality rate is high and the skilled birth attendance rate is low, an impact is highly likely if the intervention is designed and implemented properly, 2) if appropriate interventions are implemented for households with low social economic status, a stronger positive impact is obtained, 3) the main effective intervention to lower the under-five mortality rate is said to be skilled birth attendance, but by combining SBA with other interventions such as the promotion of breastfeeding and vaccination, appropriate child height and weight is possible or improved, 4) SBA and its complementary strategies have a large impact in reducing maternal mortality and neonatal mortality rates, but horizontal cross-sectoral partnership is necessary.

The review also proposes that a combination of health sector interventions is effective. Some examples given were health sector interventions which looked into both supply and demand of users, maternal education to give them a better ability to understand information on neonatal mortality risk factors, community-based service provision (participatory), or a mix of energy, water sanitation, education and governmental interventions that have an impact on infant mortality rates.

According to a research study by the ADB on the multisectoral approach in Indonesia[19], ADB has disbursed a total of $2.99 billion for 42 multisector loans between 1975 and 2008. In 1975, when the first generation multisector loan was agreed on, the mainstream approach was "integrated rural development" that

[18] WB 2007, 2015
[19] Ueda et al. 2009

combined irrigation and agriculture. In 1979, a multisector loan was approved for a holistic urban infrastructure improvement program that integrated water supply and sanitation, drainage and waste management; this became the first multisector loan for urban development. Afterwards, in 2000, a community initiative approach for regional development was tested and in 2006, an urban multisector loan with a focus on energy, education and other sectors was implemented under an umbrella infrastructure reform program. In a study of this urban multisector loan, the following issues with multisector loans were identified: 1) many delays in the original schedule, 2) difficulties in coordinating with stakeholders and the impact of decentralization, 3) lack of human and organizational capacity.

2-1-4. Japan's Experience in Multisectoralism

Post-war Japan has reduced maternal and infant mortality rates through maternal and child health promotion and infectious disease measures that included the strengthening of its health system, community health activities, and development and promotion of the mother and child health handbook. The contribution of female professionals such as practicing midwives, public health nurses through public health activities at the community and household levels is also another contributing factor to the improvement of maternal and child health. The final success factor for a multisectoral approach in Japan is said to be the maternal and child health activities within the livelihood improvement movement, which were intricately linked with the agricultural and public center activities or civic education[20].

A piece of research[21], as shown in Table 2-2, examined the reduction in the infant mortality rate from 1920-1985 in Japan, and the contribution of medical technology development by examining the time at which four medical technologies proven to reduce infant deaths and lower infant mortality rates were introduced. However, the research result indicated that the infant mortality rate was already steadily dropping even before the introduction and promotion of such effective medical technology and concluded that the infant mortality rate was due to "socio-economic development and the improvement of livelihood levels".

Table 2-2. Medical technology and infant mortality rate reduction

Cause of death	(a) first effective medical technology	(b) medical technology introduction year	(c) Percentage of mortality decline after the introduction	(d)Year when the medical technology is diffused	(e)Percentage of mortality decline after diffusion
Pneumonia, Bronchitis, Influenza	Sulfonamide	1937	58.6	1950	30.1
Gastritis, Diarrhea, Dysentry, Cholera	Sulfonamide	1950	28.9	1950	28.9
Meningitis , encephalitis	Sulfonamide	1940	28.5	1950	4.9
infant specific diseases	various	1950	56.3	1960	27.8

Source: Nishida（1996） Wagakuni no Nyujishibouritsuteika ni Iryogijutsu ga hatashita yakuwari ni tsuite (The role played by medical technology in lowering Japan's infant mortality rate) Bull.Natl.Inst.Public Health, 45 (3):1996

[20] JICA 2004a
[21] Nishida (1996)

More specifically, the introduction of national health insurance in 1961, the consolidation of a transport network ahead of the 1964 Tokyo Olympics, innovation in health system and social infrastructure were factors which contributed to the reduction of infant mortality. JICA's research[22] reported that this relationship between infrastructure and social development and the acknowledgement that infrastructure contributes to reducing poverty and achieving the MDGs led to the redefinition of infrastructure development as a service which enhances human potential capacity.

Recently, Ogasawara (2015) promoted the idea that Japan's infant mortality rate reduction led to Japan's economic development. 30-50% of East Asia's phenomenal economic growth (1965-1990) is said to be due to the reduction in the child mortality rate, the increase in the labor population due to the baby boom, reduction in the elderly dependency ratio and the lower fertility rate. In other words, the demographic dividend is said to have stimulated economic growth.

Japan's multisectoral approach is also seen in the international development field's gender promotion policy "Development Strategy for Gender Equality and Women's Empowerment" (announced in May 2016). The first basic principle of this strategy is the "promotion of women's rights," which can be achieved by providing gender responsive infrastructure and a safe community. More specifically, the development of infrastructure that considers the perspective of women, such as sidewalks and streetlights, is suggested. The second principle is "building the capacity of women and girls to reach their full potential," which can be achieved by promoting and strengthening girls' education. For this, specific measures are advocated such as the consideration of gender balance when training teachers, installation of separate toilets for girls, exterior walls for school buildings, girls' dormitories annexed to schools, improvements to the learning and school access environment, and measures to prevent kidnapping and trafficking, so as to enable girls not only to "enroll" in school but also "complete" their school education. The fifth component of the second principle, which involves improving water and sanitation (construction of school toilets and hand washing facilities), leads to increased female mobility. In the long run, by improving girl's education and completion rates, women would be able to expand their activities and their social advancement opportunities. By integrating a multisectoral perspective, women are supported by creating enabling environments and structures so that they can widen their perspectives on their own lives and pursue their potential on their own. This is thought to promote high-quality growth (inclusiveness, sustainability, toughness) that will continue to reduce poverty.

2-1-5. JICA's Policy on the Multisectoral Approach

JICA aims to realize the concept of human security, which puts people in the center. One of the basic principles in realizing this concept through its cooperation projects is to make sure that aid reaches its intended beneficiaries. There are four approaches for this, one of which is the promotion of a multisectoral approach. Problems faced by the people are placed in the center, and cross-sectoral and combined efforts are made in order to solve these problems. Such an approach that combines the many cooperation schemes within

[22] JICA2004b

a sector and that integrates development issues across sectors is considered to be important.

2-2. Relationship with Target Sectors and Maternal and Child Health Improvement (Results of Literature Review I)

Using the results of previous studies, we examined the relationship between the target sectors of infrastructure, water sanitation and education with maternal and child health improvement. For infrastructure interventions, the majority of academic studies were concentrated on the examination of effects at the community and household levels. There was considerable evidence here of the ways in which the distance to health facilities and the reduction of access time to these facilities contributed positively to health. In the water and sanitation sectors, the improvement of water quality and sanitation had an effect on nutrition and child growth. In addition, at least 4 studies[23] found that sanitation interventions had a relatively significant effect on child health compared to water supply interventions. For education, the causal effect of enrolled children and future maternal and child health has been proven. On the other hand, the causal effect relationship between intervention and outcome is not necessarily the same between the multiple studies, so it is necessary to consider whether the evidence is appropriate to each specific country and activity context, and to make sure this context is well understood.

(1) Infrastructure sector (roads, bridges and electricity)

Road and bridge construction, particularly rural roads and bridges, has been identified as resulting in improved access to health facilities and emergency obstetric care, as well as less costly medicine and vaccine transportation[24]. At the community and household level, road construction and rehabilitation brings about investment in other social infrastructure (electricity, water, toilets, irrigation and education), improvement in access to this social infrastructure and overall livelihood improvement (health improvement). There were five such studies[25]. In addition, maternal referral systems and emergency obstetric care were found to reduce maternal mortality[26]. One study found that road paving led to increased access to prenatal care[27]. The most concentrated area of studies was on the relationship between distance and prenatal, postnatal, facility delivery and Caesarian section operations rate, where 11 such articles reviewed found a relationship[28] and one study did not. There was also evidence in seven articles that the distance between health facilities affected the maternal mortality rate, neonatal mortality rate, infant mortality rate and child survival[29].

Looking at the impact of power infrastructure construction/reinforcement, one article found that health and sanitation services improved as a result of electrification and that electricity privatization led to a reduction in the frequency of low birth weight and a reduction in under-five mortality rates due to food poisoning[30].

[23] Esrey et al.1991., Esrey 1996, Guzman 1968 (quoted in Dangour et al. 2013), Prendergast 2015
[24] Kunieda 2007, Lydon 2014
[25] Habibov & Fan 2008,Van de Walle et al. 2009, Feikin et al. 2009, BenYisha & Tunstall 2011, Arthur 2012
[26] Manandhar 2004, Bhutta et al.2008, Azad et al.2010, Goldie et al., 2010
[27] Mistry & Lu, 2009
[28] Hounton et al. 2008, Kesterton et al. 2010, Jacobs et al. 2012, Sychareun et al. 2013, Rossier et al. 2014, Fagbamigbe and Idemudia 2015, Johnsonet al., 2015, Karim et al. 2015, Mkandawire 2015, Shaw et al., 2015, Nguyen 2016
[29] Van den Broeck et al. 1996, Le Bacq & Rietsema 1997, Becher et al., 2004, Baird et al. 2011, Essendi et al. 2011, Kashima et al. 2012, McKinnon et al. 2014
[30] Gonzalez-Eiras et al., 2007

No evidence was extracted for the central and regional levels, but at the household level, 2 articles[31] found that electrification led to less biomass fuel use and better child health. One article found that electrification and less biomass fuel use improved maternal health[32].

(2) Water and sanitation sector

Improvements in the urban water supply and urban sewage at the central level reduced representative maternal and child health indicators such as neonatal mortality rates, infant mortality rates, under-five mortality rates and maternal mortality rates, as well as the diarrhea morbidity rate and other infections (trachoma, worms/ascariasis, schistosomiasis, etc.), while also improving child growth and having a preventive impact on nutrition and anemia. At the community level, improvement in water and sanitation reduced the under-five mortality rate[33] and diarrhea morbidity[34], with a good impact on child growth[35].

At the household level, the most effective interventions were primarily the point of use (POU) interventions, which reduced diarrhea, cholera and morbidity[36]. However, a few articles did not find a clear relation between diarrhea morbidity and water sanitation interventions[37]. A meta-analysis found that solar disinfection, water quality improvement and hand washing with soap interventions had an impact on growth among under-five girls in the weight-for-age and height-for-age categories[38].

In addition to water and sanitation infrastructure construction, hygiene promotion such as hand washing promotion was found to have had an impact on maternal and child health in 8 articles[39]. More specifically, an impact on a reduction in low birth weights among children under 24 months old[40] as well as a reduction in diarrhea risk[41] was found.

Multisectoral interventions including water and sanitation sector interventions led to a large improvement in child development[42], and Environmental Enteric Disorder prevention[43]. On the other hand, some studies did not find a clear relation between water sanitation interventions with maternal and child health outcomes such as child growth[44] [45].

(3) Education sector

Education impacts maternal and child health in two ways. The first impact is the short-term, direct impact achieved through the education of preschool age children and the training of women on nutrition, pregnancy and health improvement. Women who have been educated seem to contribute to a long-term, inter-

[31] Baker et al. 2006 and Sreeramareddy et al. 2011
[32] Page et al., 2015
[33] Newman et al., 2002, Brainerd and Menon, 2012
[34] Instituto apoyo 2000
[35] Esrey 1996
[36] Clasen et al. 2015, Gundry et al. 2004
[37] Gundry et al. 2004
[38] Dangour et al. 2013
[39] Dangour et al., 2013, Langford, 2011, Luby 2006, Ahmed et al., 1993, Oloruntoba et al, 2014, Fenn et al., 2012, Mbuya and Humphrey 2015, Hasan 1989
[40] Ahmed et al., 1993
[41] Oloruntoba et al. 2014
[42] Fenn et al. 2012 and Mbuya and Humphrey, 2015
[43] Prendergast, 2015 and Chase and Ngure, 2016
[44] Langford et al. 2011, Luby et al 2006, Schlesinger et al. 1983, Dangour et al.2013
[45] Stockholm International Water Institute, 2005

generational impact on better health, the reduction of the infant mortality rate and improved vaccination rates. The second impact is that educated women have a ripple effect impact on their families and community[46]. Preschool children who received direct health improvement assistance such as deworming tablets and iron supplements tended to have less diarrhea and skin diseases[47]. At the same time, if there are no direct nutrition interventions, some studies have shown that there is no impact on weight and other growth indicators[48]. Primary education and secondary education interventions have an impact on maternal and health outcomes such as infant mortality rates[49], maternal mortality rates[50], HIV/AIDS and malaria morbidity rates[51], birth rates and other illness prevention measures such as vaccination rates[52], as well as other process indicators such as early childbirth rates[53]. The reason given for these improvements is usually maternal education. This was first mentioned over 30 years ago who found that the education of girls led to reductions in child mortality for future mothers[54]. A large quantitative study of rigid and large cohort statistical data that nearly half of the decline in infant and under-5 mortality rates over the past 40 years was due to the increase in the education of girls[55]. In addition, it has been found that improvements in the under-five mortality rate and vaccination rate have been due to the education of more girls not only at the primary level but also at the secondary level, leading to large improvements in maternal and child health indicators[56]. School education improved the knowledge and information of future mothers, which then improved resource allocation towards the health and care of their future children, balancing food intake and having a positive effect on child growth[57]. In addition, improvements in school health education and school sanitary environments as well as the promotion of hand washing at school reduced diarrhea by one-third[58] [59]. Deworming tablet distribution has also been found to reduce worm parasite morbidity[60], which prevents infections and improves child growth. Recent research[61] points out that today's mainstream health education focuses on acquiring practical life skills in addition to knowledge.

Interventions in non-formal and vocational education mainly improve maternal literacy and lead to increased income, but also increases access to information on health and prevention measures, which have an overall positive effect in improving mother and child health. Literacy skills promote skilled birth attendance by midwives, and is considered to be an effective means of preventing HIV infection[62]. Conditional cash transfer (CCT) promotes household income, reduces under-five morbidity rates, promotes

[46] Martinez et al., 2012
[47] Martinez et al.,2012, Bobonis et al.,2002
[48] Tanner et al., 2015, Martinez et al.2012
[49] Monden and Smits 2013, Gaikou and Emmanuela 2010, Burnchi 2012, Somanathan 2008, Chou 2007
[50] Karlsen et al., 2011 Jayachandran and Lieras-Muney 2008
[51] Aslan et al., 2003, Fulman et al., 2003
[52] Desai & Alva 1998, UNESCO 2014
[53] Breiova and Duflo 2004, Osilletal 2007, Ferre 2009
[54] Schultz 1993, Caldwell 1979
[55] Gakidou et al. , 2010
[56] Gaikidou et al., 2010, UNESCO, 2014
[57] Burchi,2010
[58] The results of a systematic review were compared for number of diarrhea cases (per 100 persons) in day care facilities and schools with handwashing activities from 11 RCTs. Results found that diarrhea in the intervention group was reduced by a third. The data is from household visit and interview as well as health center records.
[59] Nwadiaro et al.,2009
[60] Miguel & Kremer, 2004
[61] Yuasa 2006
[62] Mead 1998, Alsan & Cutler, 2013, UNIGME 2014

child growth, improves food consumption rate and the calorie intake rate, with a positive effect on mother and child health as well as improving nutrition[63]. For example when Brazilian women managed finances as women generate income, the child survival rate was 20 times higher[64]. This confirms the hypothesis that female empowerment through life skill development and livelihood improvement leads to more investments in the health of the family and also verifies the fact that education has an impact on mother and child health.

2-3. JICA Target Sector Projects and their Effect on Maternal and Child Health (Results of Literature Review II and III)

2-3-1. Results of Literature review II

A list of current and past JICA projects in the target sectors which were thought to have had an impact on maternal and child health was drawn up and the assumed effect was analyzed. Overall, JICA projects which had from the very beginning aimed for multisectoral intervention effects were very few. In addition, it was found that indicators and an evaluation framework had not been fixed to examine the impact on maternal and child health improvement in the target sector projects. Currently, JICA does not have a category for multisectoral projects, and the standard or integration of a multisectoral approach is left up to the individual projects. JICA's ex-post evaluation and terminal evaluation reports were reviewed, but there were very few project PDMs which mentioned an impact on maternal and child health in JICA in its project purpose and indicators. Even if there was an effect, the effect verification was limited as the data was qualitative and obtained in interviews and limited sampling. The causal effect relationship between the project intervention and outcome indicator could be influenced by factors external to the project, but evidence of the relationship between interventions and maternal and child health indicators tended to be weak. Existing JICA reports tend to only discuss the process indicators which could have an impact on maternal and child health and mention the difficulties of proving a causal effect relationship between the intervening sector and maternal and child health outcomes.

[63] Sridhar, 2008
[64] Thomas et al.,1990

Table 2-3. Impact on Maternal and Child Health in JICA Target Sector Project

Sector	Intervention type	Main maternal and child health impact
Infrastructure	Road construction and rehabilitation (grant and loan)	・ Improvement of access to health facilities, an increased number of patients from a wider area ・ Early response to deliveries with complications ・ Shortening of ambulance transport time ・ Improved road safety ・ Reduction of maternal and infant mortality rate ・ Reduction of respiratory diseases as a result of less air pollution
	Improvement of power plant (loan)	・ Reduction of respiratory diseases as a result of less coal dust
	Electrification (grant and loan)	・ Increased study time for children ・ Reduction of household chore time due to household electronics ・ Introduction of medical equipment including vaccine refrigeration ・ Improvement of health sanitation services (waiting room environment)
Water and sanitation	Construction and rehabilitation of water supply and sewage facilities (grant or loan)	・ (reduction of water fetching time) ・ Reduction of diarrhea or water-borne diseases ・ Reduction of infant mortality rate due to diarrhea
	Water environment improvement, sewage, construction or rehabilitation of drainage facility (loan)	・ (reduction of flood damage) ・ Reduction of diarrhea morbidity ・ Reduction of trachoma, ascariasis , schistosomiasis morbidity ・ Effects on child nutrition and prevention of anemia
	Village water supply (technical cooperation or grant)	・ Reduction of water fetching time ・ Reduction of diarrhea, dysentery and skin diseases ・ Reduction of infant mortality rate caused by diarrhea
	Sanitation improvement (technical cooperation)	・ (Increase in toilet penetration rate) ・ Reduction of diarrhea risk ・ Prevention of wasting
Education	Primary and secondary school construction (grant)	・ Increase in girl enrolment rate ・ Construction of toilet sanitary facilities ・ Sanitation knowledge classes, improvement in sanitation situation, reduction in morbidity ・ Reduction in teenage pregnancies (construction of secondary school)
	Improvement of school management (technical cooperation)	・ Increase in girl enrolment rate ・ Improvement in parent's sanitation knowledge ・ School health education
	Vocational training (technical cooperation)	・ Women acquire literacy and life skills ・ Improvement of livelihoods and health

Table 2-3 shows the representative examples of interventions and their maternal and child health impact, from JICA project reports which mention these impacts or which predict such an impact[65].

In the past 10 years, there have been many large-scale lifeline projects in the transport infrastructure sector. However, there was only one community transport project and no projects in the power sector that mentioned the impact at the community, household and individual levels, whereas evidence was found in literature review I. On the other hand, the ex-post evaluation reports for projects which were categorized as comprehensive regional development and under other sectors, found a combination of interventions at multiple levels. Health facility construction promotion of immunization activities by women and community groups or investment in health and education through income generation were some activities seen in multisectoral regional development and reconstruction projects. These activities contributed to the improved access to health centers within the framework of infrastructure projects.

In the water sanitation sector, projects were carried out under the two schemes of loan and grant aid that mentioned the "reduction of water fetching time" in 22 out of 23 projects and "reduction of water-borne diseases including diarrhea" as possible effects of the project in 20 out of 23 projects (details are found in Annex 1). However, the study methodology was limited to qualitative aspects such as questionnaires and interviews. Some reports attempted to examine the morbidity of water-borne diseases using existing data but 1) there was very little information specific to the target area and 2) there was no baseline data. As a result, almost all reports noted that it was not possible to directly attribute the changes in morbidity to the project intervention.

In the education sector, only school health projects used quantitative outcome indicators to demonstrate improvements in child health and nutritional status. However, proof of the intervention effect through "process indicators," which include girls' school enrolment rate, school sanitary environment improvements, increased sanitation knowledge and promotion of sanitary activities, was found in many technical cooperation projects. All the 12 school management project reports mentioned that cooperation between the community and school was effective in promoting girl enrollment, changing parent awareness and attitudes towards the school. There are 17 grant aid school construction projects that have added the construction of sanitary facilities (toilets) but only three project reports mentioned the effect that the toilets might have on students' health. In addition, the evidence was weak, with only some documented interview results.

2-3-2. Results of Literature Review III

The results of two ex-post evaluations conducted this fiscal year (FY) 2015, in Tajikistan and Nepal, were also reviewed for their impact on maternal and child health.

In the ex-post evaluation of "The Project for the Rehabilitation of Kurgan Tyube - Dusti Road" (Phase I and II) in Tajikistan, a beneficiary study was conducted comparing the effects of the intervention by looking

[65] This Table is a resume of Annex 1 Literature review I x Literature review II x Field survey x Literature Review III, which describes the impact on maternal and child health, indicators, and lessons from previous evaluations. For more detail, refer to Annex 1.

at the periods before and after the project. This confirmed that the average time spent to get to the health center was reduced as a result of the road maintenance. However, the beneficiary study subjects were not randomly sampled[66], which means that the voices of residents who want to be heard and/or have a strong opinion on whether the project had a positive or negative impact might be reflected in the results. The evaluation report states that there is no causal effect relationship, but mentions the possibility that economic growth was promoted with the road construction, that there was an increase in the transport of a variety and volume of everyday goods, as well as an increase in cargo and passenger transport efficiency.

The ex-post evaluation of "The Project for Construction of Sindhuli Road Section (II, III)" in Nepal analyzed 18 families with children under five years old. The families were asked about their access to health facilities, antenatal and postnatal care, facility delivery, and costs related to pregnancy and childbirth. Here too, the study targets were women who were cooperative, so the possibility of over-evaluation is mentioned in the report. In the target county, approximately 90% of the respondents mentioned that the time spent on traveling to the office or hospital was shorter after the project than before the project. There is also a bias in the beneficiary study sample. In addition, there are other elements besides road maintenance, such as the country's overall economic growth rate and the access from households to the target road, to consider in concluding that the project had an impact, so the survey results alone are not enough to determine that there has been an impact.

In both projects, the evaluation study team measured and compared average traveling speed and traveling time before and after the road maintenance project, showing that better access to health and medical facilities contributed to maternal and child health improvement. However, the possibility of sampling bias and other external factors could not be eliminated or controlled so the results can only be interpreted as a possible causal effect relationship between the JICA intervention and maternal and child health.

[66] The beneficiary survey was conducted in 4 selected districts where a study was feasible and in cooperation with the Khatlon Provincial government. The municipal and district heads were visited on the specified date at their offices and interviews were conducted with adults who came to the office. The valid responses were 69, of which men 47 (or 68%) and women 22 (32%).

Table 2-4. Ex-post Evaluation Excerpts on Maternal and Child Health Impact

The Project for the Rehabilitation of Kurgan Tyube - Dusti Road (Phase I and II)			
Country	Cooperation period	Impact on maternal and child health	Main indicators
Tajikistan	Dec 2007-June 2013	The average traveling speed between Kurgan Tyube-Dusti improved significantly and the time needed to get to the market and health facilities was reduced. For pregnant women with complications, there was a possibility that the time to get to the central hospital was shortened. According to a focus group discussion with the obstetrics-gynecology doctor and nurses, deliveries with complications could be dealt with at an early stage, which might have contributed to improvements in health conditions of mother, infant and child. The rate of facility delivery in the two districts increased every year, dropped right after the project was completed, and rose again the next year. The maternal mortality rate in the two districts fell significantly in the two years after the project, from 35 deaths/100,000 to 10 deaths/100,000 women in 2015. The infant mortality rate in 2014, a year after the project, in the target area was lower than the national average and continues to fall. This is thought to be due to the fact that by using the road, access to medical facilities is improved, the number of women who prefer a facility delivery over home delivery increases, and the actual number of deliveries at medical facilities increases, leading to a decline in maternal and infant & child mortality rates[67].	Higher average safe traveling speed starting point（Kurgan Tyube）to end point (Dusti) (with the exception of the city section) Higher average traveling speed start point (Kurgan Tyube ） to end point（Dusti)（including the city section） Annual average daily traffic volume cargo transport volume
The Project for Construction of Sindhuli Road Section (II, III)			
Country	Cooperation period	Impact on maternal and child health	Main indicators and questions asked about maternal and child health
Nepal	June 2005-March 2015	According to an interview with a Dhulikhel university hospital medical doctor, after the Sidhuli road opened, there was an increase in the number of Caesarian section patients In the beneficiary survey, there was no significant change in antenatal and postnatal care visits among those who did not frequently use the Sidhuli road. However, according to the interview with a Dhulikhel university hospital medical doctor, the time spent travelling was reduced for those who did use the Sidhuli road to access antenatal and postnatal care. There were also more patients at the destination hospital to which emergency services were transferred and there was a possibility that the situation for maternal and child health had improved[68].	Indicator 1: Distance travelled（km） Indicator 2: Time required (time) Indicator 3: Number of days impassable due to natural disasters Time required to arrive at the primary health center Number of patients who had a Caesarean section

[67] For impact to be confirmed, the elements external to road rehabilitation such as the country's economic growth rate and the access from the household to the repaired road also need to be considered so it is not possible to conclude based on these results whether there was an impact or not.

[68] There are certain constraints such as sample size, sampling, other project influence in the survey, and thus the results of this study on the direct impact on maternal and child health should be interpreted with care.

3. Analytical Results of Field Survey

Based on the evidence extracted from the literature reviews and data analysis on the relationship between the target sectors and maternal and child health, we examined the relationship and the paths between interventions and maternal and child health. A longlist of 48 JICA projects from the target sectors, which were in principle implemented or finished within the last 10 years, was compiled. Then, after looking for areas that had implemented projects in all the target sectors (projects for roads or bridges, electricity, water and sanitation, and education), South Sulawesi Province in Indonesia and Savannakhet Province in Lao PDR were selected as the priority areas to visit. There were multisectoral and cross-sectoral partnerships in many of the projects surveyed, which involved the community in project formulation and preparation so that the community was widely involved in the activities. At the same time, cooperation from the education and health office with health education demonstrated the possibility of maternal and child health improvements as a result of a better sanitation and living environment. At the same time, there were very limited opportunities for partnering and information sharing regarding maternal and child health in projects which are formulated at the central and regional levels. Even if projects were predicted to have had a positive effect on maternal and child health, it was difficult to obtain specific evidence as there was no data collection or storage from the maternal and child health perspective. In the latter half of this report, we propose indicators that can be set for project design and formulation, as well as monitoring. Refer to the following Table for the results of the projects visited and surveyed.

We also examined the relationship and the path to which field interventions led to maternal and child health improvement, based on a data analysis of existing data from the literature review and the field survey. The issues and effects of each sector on maternal and child health, confirmed through the field survey, is as follows. For issues and proposals faced during the field survey, refer to Annex 3.

(1) Infrastructure (roads, bridges and power) sectors

Table 3-1. Roads, Bridges and Power Sector Projects Visited during the Field Survey

Country/region	Scheme	Project name	Cooperation period
Indonesia, South Sulawesi Province	Loan	Rural Settlement Infrastructure and Kabupaten Strategic Area	2014.2-2015.12
Lao PDR (pilot districts were Savannakhet and Vientiane)	Technical cooperation	Project for Improvement of the Road Management Capability	2011.9-2017.9
Lao PDR Bolikhamxay (Paksan substation)-Khammouane (Thakhek substation) to Savannakhet (Pakbo substation)	Loan	Greater Mekong Power Network Development Project (Lao PDR)	2005.3-2011.4
Lao PDR National highway No. 9（Senoo to Muan Phin）	Grant	The Project for Improvement of National Road No. 9 as East-West Economic Corridor of the Mekong Region	2011.8

In the infrastructure sector, road maintenance and power network projects were visited, and the Ministry of Public Works and beneficiary residents were interviewed. In Lao PDR, a rehabilitated road segment was visited, and information collected from the residents regarding the changes in road quality and from health workers on access to the health center before and after the project. As a result, we found the service supply factors that inhibit access to be the location of the facility, the number of health workers, the quality of care affecting health center access and the number of patients. Demand or beneficiary side factors inhibiting access included not being able to find transport to the health center, transportation costs, and whether there was somebody to accompany the patient to the health center or not. The impact of road construction on health meant that patient numbers rose, earlier care was possible, antenatal care visits increased, and hospital childbirth delivery increased, but this could also be due to sensitization activities and the effect of the free childbirth/delivery policy introduced in 2015. When there are several activities that could have an effect on health, running parallel at the same time, it is difficult to examine the causal effect between a specific intervention such as road construction and maternal and child health. As there are many factors that might influence access, there is always a limitation in basing a decision on one indicator, so it is important to consider this when selecting an access indicator. When examining the impact of road rehabilitation, the average time needed to reach the health facility and the distance are probably the most appropriate indicators. However, in reality, quantitative data on patient's access time to the health facility is non-existent. If the health center patient register cannot be obtained, and information on patient village origin cannot be collected, it becomes very difficult to prove that infrastructure improves health facility access using existing information.

(2) Water and sanitation sector

Table 3-2. Water and Sanitation Sector Projects Visited During the Field Survey

Country/region	scheme	Project name	Cooperation period
Indonesia/Jakarta	Grant	The Project for Urgent Reconstruction of East Pump Station of Pluit in Jakarta	2011.9-2014.10
Indonesia/South Sulawesi Province	Loan	Rural Settlement Infrastructure and Kabupaten Strategic Area	2014.2-2015.12
Lao PDR/ Vientiane	Tech. coop	Project for Urban Water Environment Improvement in Vientiane Capital	2014.10-2017.10
Lao PDR/ Vientiane	Grant	The Project for the Vientiane Water Supply Development	2006.6-2009.3
Lao PDR Savannakhet	Grant	The Project for Rehabilitation of Water Supply Facilities in Savannakhet Area	2000-2003

In the water sanitation sector, two water supply projects and two sewage projects were examined, with interviews conducted with the Ministry of Public Works, the water company and community residents. In the water supply sector, once households are connected to the water supply, the time spent on water fetching is no longer necessary. As a result, children were able to go to school. This points to the possibility that future maternal and child health improvement could be achieved through education. In the sewage sector, the facility rehabilitated with a grant in Indonesia was functioning as planned and the structure built to prevent flooding if a certain level of water is maintained was confirmed. Although the flood damage reduction indicator was

planned from the beginning of the project, objective data on whether the degree of flood damage reduction was a result of the facility and information on how flood damage reduction improved the health of surrounding residents was not available. Interviews were conducted with stakeholders, but there was no particular information which pointed to improvements in the sanitary environment. The technical cooperation project for Lao's sewage sector had a component which aimed to draft a vision on sewage optimization by constructing a sewage treatment plant, but as it is just over a year since the project started, we were unable to confirm the vision's actual contents and possible effects. As the project shapes up and the specific plans on sewage optimization are examined, if baseline information for maternal and child health indicators are collected, it might be possible to visualize cooperation results or the impact on maternal and child health.

(3) Education sector

Table 3-3. Education Sector Projects Visited During the Field Survey

Country/region	scheme	Project name	Cooperation period
Indonesia / Jakarta	Tech coop	Program for Enhancing Quality of Junior Secondary Education	2009.3-2013.3
Indonesia South Sulawesi Province	Tech coop	Integrated Program for Junior Secondary Education Improvement in South Sulawesi Province	2007.12-2010.12
Lao PDR Savannakhet	Tech coop	Supporting Community Initiatives for Primary Education Development Phase II (CIED II)	2012.9-2016.8
Lao PDR Savannakhet	Grant aid	The Project for the Improvement of School Environments in Champasack and Savannakhet Provinces	2006.6-2009.3

In the education sector, interviews were conducted with the Ministry of Education and school officials on school management and school construction projects at the primary and secondary school levels. As a result, we were able to confirm the existence of partnerships between the schools and the community health center, the existence of handwashing and toilet construction in many of the schools. In addition, we found that children passed on information on health and other sensitization activities to friends and family who had not participated in these activities, which thus confirmed the ripple effect of health education in the community. At the same time, in school visits, we found that the infirmary and health equipment was frequently not used for health education or sanitary management. Interviews with the community health department revealed that school level health and sanitation activities face the problem of a lack of sensitization and awareness raising, lack of awareness of school stakeholders concerning school health and the lack of community understanding of toilet construction and school health activities. The impact such as child health and behavior change are hard to measure due to the difficulties in collecting and obtaining data.

In an interview with the school director, we discovered that the sense of community ownership towards education had grown due to the promotion of participatory school management. If school health activities which take into consideration the health needs of school stakeholders such as teachers, students and community residents are integrated into the school activity plan, we can expect that residents and teachers will be motivated to manage their own health by preventing outbreaks and improving their nutritional status.

4 lessons learned from the field survey on the multisectoral approach are shown in the Box below. Based

on these lessons learned, we have made suggestions in Chapter 5 in realizing a multisectoral approach.

<BOX 1> Need to consider the different budget cycles (planning and execution) of the Ministries of Education and Health

(Technical cooperation: Indonesia Integrated Program for Junior Secondary Education Improvement in South Sulawesi Province-2010)

JICA had aimed from the beginning to combine projects for education and health and concentrate resources under the South Sulawesi Regional Development Program. However, when it came to implementation, the ministries of education and health could not jointly plan, manage or implement activities due to differences in budget and financial cycles. The second phase of these projects, which were written into the overall plan, were also abandoned. From this experience, the lesson learned is that information must be shared widely not only within JICA, but also with the staff of the counterpart ministry from the project design stage with coordination on the specifics of implementation and management.

<BOX 2> Promote community level partnerships within the context of highly vertical administration environments (Loan: Indonesia Rural Settlement Infrastructure and Kabupaten Strategic Area II, 2014-2015)

When the local administration is highly vertical, partnerships between central level agencies and coordination between stakeholders is costly and time consuming. In order to overcome these constraints and show the effects of partnering, we found that intersectoral partnerships at the community level were both effective and efficient. In the above-mentioned Indonesian project, we found that residents were involved from the project planning stage and that they were able to prioritize whatever was important to the community. At the community level, interventions were not by sector, but done with a multisectoral perspective involving water sanitation, roads and agriculture. The community took the initiative in identifying needs, planning and implementing. As a result, not only was project continuity ensured, but with the reduction of water fetching time, the population had more spare time, which led to increased opportunities for primary and secondary education. In other words, synergetic effects beyond a certain sector were seen.

During the field survey of this project, we found that there was a difference in the level of information , understanding due to the lack of communication in the vertical central BAPPENAS and regional BAPPEDA, as well as within the Ministry of Public Works, between the departments which are responsible for water and infrastructure respectively, or between the Province and District. We experienced firsthand the importance of mapping the various stakeholders beforehand, and drafted the multisector multilevel matrix (Annex 2) so that in further similar endeavors, information on the stakeholders and their relation to one another could be shared beforehand. An efficient and effective stakeholder analysis can be realized using such a matrix at the time of project formulation.

<BOX 3> Changing counterpart mindset to multisectoral over time（KfW：Road Infrastructure Project）

This 7th phase of the KfW grant project is currently being prepared. In the early phases, counterparts only wanted to build national roads, but in subsequent phases, rural roads, bridges, boat docks, bus terminals, all-weather (climate change adapted) roads, and WASH activities were implemented. At times, the Ministry of Agriculture and the Ministry of Finance were involved, but KfW continued working with the Ministry of Public Works and Transport (MPWT). Villagers were also involved in simple maintenance, grass cutting on road shoulder areas and cleaning of culverts. In the beginning, the Laotian counterparts were only concerned with the number of kilometers of road to be constructed. Now, outcomes such as access to market, health and education opportunities are devised in conjunction with the number of kilometers of roads. This is the result of a long-time partnership between KfW and MPWT, and demonstrates how this can change the mindset of counterparts within the MPWT.

<BOX 4>Importance of a thorough stakeholder mapping, coordination meetings by the project coordination unit and information sharing by the communication team

ADB's Integrated Citarum Water Resources Management Investment Program (ICWRMIP) provided water to 2 upper stream villages and 9 downstream villages, a sewage treatment system for 100 households, recycling of solid waste as well as hygiene education in order to prevent water basin pollution. The project was managed by the Ministries of Public Works, Health, Agriculture, Environment, BAPPENAS and Forestry based on a thorough stakeholder mapping and thought-through design of the project coordination unit. Project coordination meetings were held for an entire day every quarter. The local administration officials were invited to these meetings only when there were problems. The communication team managed the website and aimed to publish periodic newsletters. The project was the catalyst for a multisectoral, multiministerial culture and stage.

4. Study Step 3: Research Results

4-1. Overview of Literature Reviews

The research was carried out through the three steps described at the beginning of this report in a review of the literature and a field survey. We found that the various sectoral interventions had, to differing levels, an impact on maternal and child health.

For example, in the infrastructure interventions, we found many articles and evidence that pointed out that road construction and rehabilitation reduced the distance and time spent to get to the health center, which then had an impact on maternal mortality and neonatal mortality rates as well as infant and child mortality rates. In the water and sanitation sector, improvement of water and sanitation had a relationship with nutrition and child growth. At least four studies showed that sanitation (hygiene) had a relatively larger impact on child health compared with water supply. Finally, for education, school health and sanitation activities created the foundation for reductions in morbidity rates and improvements in the nutrition of enrolled children in the short term. In the medium to longer term, a causal effect relationship proved that girl's education had an impact on women and children's health improvement. Although many patterns on the impact on maternal and child health were found in literature review I, literature reviews II and III did not find a variety of impacts[69]. This means that when JICA formulates projects in the targeted or other sectors in the future, the evidence base becomes stronger when indicators and data collection mechanisms that consider the possible impact on maternal and child health are included, enabling better verification of the relationship.

Despite the trend in favor of multisectoralism, individual sectors continued to establish project purposes, but in the end they alone were not enough to improve maternal and child health indicators. From this experience, the SDGs, which were fixed in 2016, made sure that a holistic perspective was integrated and promoted a multisectoral approach. A report that analyzed the factors that led to the reduction in infant and child mortality between 1920 and 1985 in Japan found that there was a larger contribution from non-maternal and child health sectors such as the socioeconomic development and improvement of living standards as mentioned above[70]. Another report argued that infant and child mortality rates were reduced as a result of infrastructure such as roads, water and sanitation, poverty reduction and social development[71].

We have found through the process of reviewing the literature and visiting field sites that the target sectors and other sectoral interventions can contribute in improving maternal and child health. In this chapter, we focus on the formulation of indicators at the time of project design and formulation for multisectoral projects (target sector x maternal and child health sector).

[69] Refer to Annex 1
[70] Nishida, 1996
[71] JICA, 2004

4-2. Results of Data Analysis for Field Survey Countries

4-2-1. Verification of the Relationship between Indicators

Using 2012 DHS Indonesia and 2011/12 LSIS Lao PDR datasets, we conducted a quantitative analysis to verify the impact of target sector cooperation in the field survey countries, on maternal and child health. The maternal and child health outcome indicators chosen in the analysis were "survival beyond 28 days after birth," "maternal and child Continuum of Care completion rate (CoC)" and "Composite Coverage Index (CCI)". Table 4-1 shows the situation of maternal and child health continuum of care at the national level. The CCI in Indonesia in 2012 was 69.2%, whereas the CCI in Lao PDR in 2011-12 was 38.4%. Major factors contributing to such a more than 30 percentage point difference in CCI between the two countries is unmet needs in family planning and pneumonia care seeking and case management. Table 4-2 shows that there is such a more than 40 point difference the CoC completion rate between the two countries. This is because of the large intercountry difference in the coverage such services as antenatal care, skilled birth attendance and postnatal care, all of which are components of the CoC completion rate. Areas where maternal and child continuum of care is achieved have a higher CoC, whereas in areas which have problems in any of the component indicators of maternal and child continuum of care, the CoC becomes lower. CoC is an indicator which focuses on the continuum of care before and after delivery. CCI is, however, a more comprehensive indicator that captures supply and demand for services including the pre-pregnancy to delivery period for the mother and then the child. As the CCI has more components, when CCI and CoC is compared, the comparison between Indonesia and Lao PDR shows that the CCI is smaller than the CoC.

Table 4-1. The Components of CCI and Estimates

Indicator	Abbreviation	Definition	Indonesia 2012	Lao PDR 2011 -12
Family Planning				
Family Planning Needs Satisfied	FPS	Of the women who are currently married, and women who do not intend to give birth in the next two years, the ratio of women whose family planning needs are met	51.4%	18.4%
Antenatal and postnatal care				
Antenatal Care with Skilled Provider	ANCS		95.4%	48.6%
Skilled Birth Attendance	SBA	Of the deliveries within 5 years of the survey, the percentage of women who received assistance by a skilled birth attendant	81.1%	40.8%
Vaccination				

Measles	MSL	Of children aged 12 to 23 months, the percentage of children who received the measles vaccine	69.2%	49.8%
Diphtheria, Pertussis, Tetanus third dose	DPT3	Of children aged 12 to 23 months, the percentage of children who received the 3 doses of diphtheria, pertussis and tetanus	77.5%	72.9%
BCG	BCG	Of children aged 12 to 23 months, the percentage of children who received the anti-tuberculosis (BCG) vaccine	86.5%	91.2%
Care-seeking for sick children				
Oral Rehydration Therapy	ORT	Of children under 5 years old and who had diarrhea symptoms in the 2 weeks preceding the survey, the percentage of children who received oral rehydration therapy at a health facility.	40.3%	35.1%
Care Seeking for Pneumonia	CPNM	Of children under 5 years old and who were suspected to have pneumonia or had coughing and respiratory problems in the 2 weeks preceding the survey, the percentage of children who went to the health facility for care	83.0%	14.2%
CCI			**69.2%**	**38.4%**

Table 4-2. Indicators which compose CoC and their Estimates

Indicators which compose CoC	Indonesia 2012	Lao PDR 2011−12
Received antenatal care four times or more	84.4%	34.7%
Delivery attended by a skilled birth attendant	81.1%	40.8%
Received first postnatal care within 2 days of delivery	77.1%	31.5%
Maternal and Child Health Continuum of Care Completion Rate（CoC）	63.6%	20.3%

Three analyses were conducted as part of the quantitative analysis to examine the relationship between target sector interventions and maternal and child health outcomes using 2012 Indonesia DHS data. The dependent variable “survival beyond 28 days after birth” was used as an outcome maternal and child health indicator in a logistic regression analysis. The results are shown in Table 4-3. In the multiple logistic regression analysis, mothers who had completed secondary education and households which used a septic tank toilet were associated with improved survival beyond 28 days after birth at 0.1% statistical significance level. When comparing the children of mothers who had not completed primary education with the children of mothers who had completed secondary education, children whose mothers had completed secondary education were more likely to survive beyond 28 days after birth (adjusted odds ratio: 1.81). Children who lived in households which used a septic tank toilet were more likely to survive beyond 28 days after birth compared to children of households which had to use common toilets (reference is households with septic tank toilets, adjusted odds ratio: 0.80). Improved maternal education level and household septic tank toilet use were also statistically associated with improved survival beyond 28 days after birth.

Table 4-3.Logistic Regression Results（dependent variable- survival beyond 28 days after birth）

（2012 Indonesia DHS, n=22,277）

	Unadjusted covariates				Covariates adjusted			
	Odds ratio	95% confidence interval			Adjusted Odds ratio	95% confidence interval		
Age (reference：19 yrs and younger)								
20 – 34 yrs	0.77	[	0.35	1.71]	0.50	[	0.22	1.09]
35 yrs and older	0.19***	[	0.08	0.42]	0.10***	[	0.05	0.22]
Births（base：1 child）								
2nd child	1.55**	[	1.41	1.71]	1.91***	[	1.71	2.14]
3rd child	1.45**	[	1.33	1.58]	2.63***	[	2.35	2.95]
4th child	1.12	[	0.94	1.32]	3.01***	[	2.53	3.59]
Urban resident	1.34***	[	1.18	1.53]	1.05	[	0.93	1.17]
Social economic situation (reference：poorest quintile)								
Below average/poor	1.18	[	0.99	1.40]	1.06	[	0.88	1.28]
Average/middle class	1.22**	[	1.05	1.43]	0.91	[	0.73	1.13]
Above average/rich	1.51*	[	1.24	1.83]	1.00	[	0.80	1.24]
Richest quintile	1.75*	[	1.43	2.14]	0.93	[	0.71	1.22]
Education sector								
Maternal education (reference：not educated)								
Finished primary	1.34	[	0.89	2.02]	1.15	[	0.87	1.53]
Finished secondary	2.89***	[	1.84	4.56]	1.81***	[	1.28	2.56]
Tertiary level	5.69***	[	3.57	9.07]	3.64***	[	2.30	5.77]
Paternal education level reference：not educated)								
Finished primary	1.22	[	0.86	1.73]	0.94	[	0.72	1.22]
Finished secondary	2.28***	[	1.53	3.39]	1.11	[	0.83	1.48]
Tertiary level	3.70***	[	2.35	5.81]	1.27	[	0.79	2.04]
Unknown	0.70	[	0.24	2.03]	0.63	[	0.22	1.83]

Infrastructure sector										
Problems accessing health facilities	0.88	[	0.76	1.02	]	1.12	[	0.99	1.26	]
Have household electricity	1.10	[	0.86	1.40	]	0.86	[	0.67	1.10	]
Water sanitation sector										
Time to water source (Unit: 10 min)	1.02	[	0.98	1.07	]	1.03	[	0.98	1.09	]
Access to clean water	1.28***	[	1.14	1.44	]	1.05	[	0.93	1.19	]
Sanitation (base: toilet with sewage treatment)										
Toilet with septic tank)	0.83*	[	0.70	0.99	]	1.01	[	0.84	1.23	]
Common toilet	0.72***	[	0.62	0.83	]	0.80*	[	0.67	0.97	]
Other	0.65***	[	0.55	0.76	]	0.87	[	0.73	1.04	]

Bold figures*: Significant at 5% level. ** significant at 1% level, *** significant at 0.1% level. Used a confidence interval estimation considering the cluster effect.

Table 4-4 presents the results of a logistic regression analysis with the CoC as the dependent variable. In the multiple logistic regression model adjusting for variables related to female and household socio-economic situations, the infrastructure, water sanitation and education indicators were associated with improved CoC (with the exception of the indicator on toilet type). For example, we can see from Table 4-4 that as maternal and paternal education levels rise, the possibility of achieving CoC is statistically higher. For example, as compared to mothers who have not completed primary education, mothers who have completed primary education were more likely to complete CoC (adjusted odds ratio: 1.79) at 1% significance level. Similarly, mothers whose husbands have completed primary education, as compared to not completed primary education, were more likely to achieve CoC (adjusted odds ratio: 2.11) at 0.1% significance level. For infrastructure, if a household had an access problem to health facilities, the CoC tended to be lower (adjusted odds ratio: 0.58) at 0.1% significance level. Likewise, if a household had access to electricity, the CoC tended to be higher (adjusted odds ratio: 1.87) at 0.1% significance level. For water and sanitation, if a household had access to clean water, the CoC tended to be higher (adjusted odds ratio: 1.21) at 1% significance level. If the time to the water source was longer in a household, the CoC tended to be lower (adjusted odds ratio: 0.95) at 5% significance level. The adjusted odds ratio for each indicator is closer to 1, compared to the unadjusted model, which suggests the possibility that the magnitude of association between indicators is weakened by the existence of covariates.

Table 4-4. Logistic Regression Results (dependent variable：CoC)
(2012 Indonesia DHS、n=14,145)

	Unadjusted covariates				Covariates adjusted			
	Odds ratio	95%	confidence interval		Adjusted Odds ratio	95%	confidence interval	
Age (base：19 yrs and younger)								
20 – 34 yrs	1.77***	[1.40	2.24	]	1.56**	[1.14	2.12	]
35 yrs and older	1.78***	[1.39	2.28	]	2.34***	[1.69	3.23	]
Births (reference：1 child)								
2nd child	0.94	[0.86	1.03	]	0.90***	[0.80	1.00	]
3rd child	0.71***	[0.63	0.80	]	0.66***	[0.58	0.76	]
4th child	0.41***	[0.35	0.48	]	0.47***	[0.39	0.55	]
Urban resident	3.04***	[2.57	3.60	]	1.41***	[1.26	1.57	]
Social economic situation (reference：poorest quintile)								
Below average/poor	2.86***	[2.45	3.34	]	1.70***	[1.45	1.99	]
Average/middle class	4.67***	[3.76	5.80	]	2.24***	[1.78	2.82	]
Above average/rich	6.95***	[5.51	8.75	]	2.86***	[2.20	3.73	]
Richest quintile	9.87***	[7.49	13.00	]	3.27*	[2.34	4.56	]
Education sector								
Maternal education (reference：not educated)								
Finished primary	3.91***	[1.97	7.77	]	1.79**	[1.16	2.75	]
Finished secondary	10.36***	[5.14	20.88	]	2.46***	[1.58	3.85	]
Tertiary level	22.41***	[10.75	46.70	]	2.85***	[1.71	4.77	]
Paternal education level (reference：not educated)								
Finished primary	4.50***	[2.46	8.24	]	2.11***	[1.46	3.05	]
Finished secondary	10.80***	[5.92	19.70	]	2.55***	[1.79	3.63	]
Tertiary level	22.55***	[12.11	41.99	]	2.84***	[1.92	4.20	]
Unknown	3.13***	[1.37	7.16	]	0.92	[0.38	2.19	]

Infrastructure sector									
Problems accessing health facilities	0.47***	[	0.40	0.56	]	0.58***	[	0.49	0.69	]
Have household electricity	6.69***	[	4.90	9.13	]	1.87***	[	1.51	2.33	]
Water sanitation sector									
Time to water source (Unit : 10 min)	0.80***	[	0.73	0.87	]	0.95*	[	0.90	1.00	]
Potable water	2.89***	[	2.35	3.55	]	1.21**	[	1.04	1.40	]
toilet (with septic tank)	0.39***	[	0.31	0.50	]	0.97	[	0.81	1.15	]
Common toilet	0.42***	[	0.34	0.51	]	1.00	[	0.85	1.18	]
Other toilet	0.21***	[	0.17	0.28	]	0.83	[	0.68	1.01	]

Bold figures* : Significant at 5% level. ** significant at 1% level, *** significant at 0.1% level. Used a confidence interval estimation considering the cluster effect.

Table 4-5 presented the results of a linear regression analysis was run with CCI as a dependent variable and maternal and child health indicators. The unit of analysis is a district, not an individual, because the CCI represents the coverage of maternal and child health services at the district level. In this analysis, the Indonesia DHS dataset was aggregated at the district level. According to the multiple linear regression analysis, among indicators regarding infrastructure, water sanitation and education, improved maternal and paternal education levels, the rate of households with favorable access to a health facility, and household electrification rate were statistically associated with improved CCI. A point increase in maternal primary education completion rate was associated with a 0.21 point increase in CCI at 0.1% significance level. A point increase in paternal primary education completion rate was associated with a 0.21 point increase in CCI at 1% significance level. A point increase in the percentage of households with problems in accessing health facilities was associated with a 0.13 point decrease in CCI at 0.1% significance level. A point increase in household electrification rate was associated with a 0.16 point increase in CCI at 5% significance level. However, CCI had a negative association with urban residents (partial regression coefficient: -0.05 at 0.1% level), paternal secondary education completion rate (partial regression coefficient: -0.10 at 5% significance level) and households which used septic tank toilets (partial regression coefficient: -0.06 at 1% significance level).

Table 4-5. Linear Regression Results（dependent variable：CCI）

(2012 Indonesia DHS, n=460)

	Unadjusted covariates				Covariates adjusted			
	regression coefficient	95% confidence interval			partial regression coefficient	95% confidence interval		
Average age (yrs)	0.03***	[0.02	0.04	]	0.00	[0.00	0.01	]
Urban residents (%)	0.15***	[0.11	0.18	]	-0.05***	[-0.08	-0.02	]
Socio-economic status（1−5）	0.10***	[0.08	0.12	]	0.08***	[0.06	0.10	]
Mother's primary school completion rate (%)	0.63***	[0.55	0.72	]	0.23***	[0.10	0.36	]
Mother's secondary school completion rate (%)	0.28***	[0.21	0.35	]	0.03	[-0.05	0.11	]
Father's primary school completion rate (%)	0.85***	[0.72	0.97	]	0.21**	[0.05	0.37	]
Father's secondary school completion rate (%)	0.21***	[0.14	0.28	]	-0.10*	[-0.18	-0.02	]
% with access problems to health facilities	-0.32***	[-0.43	-0.22	]	-0.13***	[-0.19	-0.07	]
Household electrification rate (%)	0.48***	[0.40	0.57	]	0.16*	[0.09	0.24	]
Average time to water source (unit：10 min)	-0.09***	[-0.13	-0.05	]	-0.01	[-0.03	0.01	]
Potable water rate (%)	0.25***	[0.20	0.30	]	-0.01	[-0.05	0.03	]
Toilet with septic tank (%)	0.22***	[0.14	0.31	]	-0.06***	[-0.11	-0.02	]

Bold figures*： Significant at 5% level. ** significant at 1% level, *** significant at 0.1% level. Used a confidence interval estimation considering the cluster effect.

The Table below is a summary of the analysis of target sector interventions and maternal and child health indicator relationship using the Indonesia DHS and Lao PDR LSIS datasets. By examining the data of the target countries, in a simple non-adjusted analysis, many non-maternal and child health sector indicators are statistically associated with maternal and child health indicators such as survival beyond 28 days after birth, CoC and CCI. When examining the association with mortality or death, we found that statistical validity was lost for many of the non-maternal and child health sector indicators when adjusted. The analysis does not indicate causal inference, but points to the possibility that the maternal and child health service coverage rate is influenced by the development of other sectors.

Table 4-6. Sector Data from the DHS/LSIS

Examples of Maternal and Child Health Indicators and Analytical Results

Main indicators	Analytical results Outcome: positive statistical significance for child survival beyond 28 days afterbirth Refer to Table 4-3	Analytical results Outcome: CoC completion, CCI positive statistical significance Refer to Table 404 and 4-5	Data collection means
Education: Female education levels	Yes	Yes	Household level survey (individual, before and after intervention), education administration data (by region and change over years)
Education: Partner's (husband's) education level	No (yes with simple regression)	Yes	
Road: Answer to question "Is the lack of transport means to the health facility an obstacle to accessing this health facility?" (or "does the village have an access road?")	No (yes with simple regression)	Yes	Household level survey (individual level, before and after intervention, GIS data- change over years)
Electricity: Does your household have (access to) electricity?	No (yes with simple regression)	Yes	Household level survey (individual, before and after intervention), water administration data (by region and change over years)
Water sanitation: Does your household have access to clean water?	No (yes with simple regression)	Only when CoC is the dependent variable	
Water sanitation: What kind of toilet do you have? Toilet with septic tank or common toilet?	No (yes with simple regression)	Only when CoC is the dependent variable	Household income level survey (individual and before and after intervention)

4-2-2. Potential for DHS/MICS Data Analysis

By using data from DHS and MICS and running them through multiple linear regression and logistic regression, we are able to examine the national trends of maternal and child health indicators in the target countries.

However, in order to analyze the development situation in each non-health sector, we need to extract indicators on transport infrastructure, water and sanitation and education access at the household and individual levels. However, the indicators differed between the DHS and MICS datasets and there were some difference in indicators found in the datasets so they are not always directly comparable.

When predicting the ripple effects of an intervention or project in another sector on maternal and child health using data, we must first of all examine the regional differences in the maternal and child health outcome indicator. By comparing the target regions of a project or intervention with a neighboring region, or a region in a similar socioeconomic development situation which is not an intervention region, we can predict the impact of a program or intervention. Even if it is just comparing the regional and district aggregated data before and after the project, we can compare the difference in maternal and child health indicators for the project target area and the comparison/control area. Once detailed output data on the project intervention or other sector information on access improvement by region is obtained, further detailed analysis can be conducted.

4-2-3. Fixing Indicators Based on the Paths to Improve Maternal and Child Health

Based on the literature review, field survey and the analysis, we created Table 4-7, which shows possible paths from target sector interventions to maternal and child health outcomes and indicators. Not all the individual paths from intervention to maternal and child health outcomes are backed by solid evidence, but where possible we have listed evidence that points to a relationship and the level of reliability of this evidence. We consider the evidence level to be very strong if it comes from a systematic review or meta-analysis (in other words if it is objective and reliable), strong if the evidence is based on a limited sample or country, but was a quantitative analysis which uses impact evaluation methodology, and finally average if the evidence is based on a rapid quantitative analysis or the results of a qualitative study or the relationship between input and output was weak. The timing of the data collection is, in principle, to be started before the project kicks off, but as it takes time for the impact to emerge, it will be difficult to confirm impact within the project implementation period. Therefore, we suggest that outcome indicator data be collected for three to five years after the project is complete.

A representative example of an infrastructure sector path would be type 1-2, which shows that road and bridge construction or rehabilitation contributes in reducing the emergency transport time for mother and child, and contributes to increased facility deliveries, as well as safe deliveries. Suggested process indicators to monitor this path would be the distance and access time to hospitals where Caesarian section operations could be carried out. Suggested outcome indicators were the number (or ratio) of mothers and children transported by ambulance or whom delivered at a health facility as well as the number of Caesarian section operations. For a representative example of water sanitation intervention to maternal and child health, type 2-2 shows that an improved water and sanitation environment reduces water-borne diseases (cholera, typhoid, hepatitis), lowers morbidity and improves health. In addition, previous experience has shown that the under-five mortality rate due to diarrhea-induced dehydration can be lowered, and water-borne diseases (trachoma, ascariasis, schistosomiasis) can be reduced through sanitation education. From this, we suggest specific process indicators such as the population who can use improved water sources, number of households which use simple toilets, the number of participants and health and sanitation education and the implementation of promotion activities, and other indicators for behavior changes. The suggested outcome indicators are morbidity of diarrhea and other water-borne diseases in the target area and the morbidity of water-preventable diseases. A representative example of an education sector path would be type 3-1, in which the path of improving primary and secondary education quality leads to improved health in adolescent girls, which would in turn lead to better survival rates for their future children. Multiple previous studies have shown that acquiring proper information and knowledge on health, pregnancy and childbirth through health education in school improves adolescent health and reduces the risk of teenage pregnancies and childbirth and HIV infection. As a result, access to education and access to health education as well as the content (quality) are suggested as process indicators, with the number of adolescent childbirths and infectious diseases used as outcome indicators.

More specifically, at the project design stage, referring to Table 4-7 and with advice from maternal and

child health specialist, indicators which will be used to measure maternal and child impact can be selected and the baseline can be set before the project starts. The impact of sectoral interventions on maternal and child health can be verified by monitoring these indicators for a few years after project completion. For example, in road and bridge construction, measure the maternal continuum of care completion rate using existing data or a field survey, clarify whether the target area has access problems which influence maternal continuum of care completion rate, if there are problems of access, plan and implement the project so that access problems will be resolved. If the CoC completion rate is measured as an impact indicator a few years after project completion, it will be possible to examine whether road and bridge construction had an impact on maternal and child health. In regards to the CCI, since data for care seeking for pneumonia (CPNM) and ORT for children with diarrhea symptoms (ORT) is only obtainable at the household level, it would be difficult to calculate the CCI without existing household level data such as DHS and MICS.

The paths shown in Table 4-7 are established based on evidence found in previous studies, the field survey or the quantitative analysis. Some of such evidence may imply a direct association between input and outcome, or may validate only part of the paths in the overall picture of interrelationship between indicators. This is why some intermediate paths were established based on assumptions made in this research project. We note that for paths to be valid, external validity should be carefully examined; that is, evidence was established under certain conditions in the research areas where the evidence was created. Such conditions need to be met so that paths will also be realized in the target project area. The direction of a path presented here may not be valid elsewhere. When considering the paths, we must take into consideration the validity and appropriateness as well as the various socioeconomic and environmental factors in the target project area.

Table 4-7. Paths from Sector Interventions to Maternal and Child Health Impact, Indicators by Model and Evidence

model	Target sector activities (inputs)	Target sector (infrastructure water sanitation, education) Process indicators	Impact on maternal and child health (predicted path from sector intervention to maternal health outcome)	Maternal and child health outcome indicators	Means of obtaining indicators	Evidence	
						Source	Level[72]
Infrastructure (roads, bridges, power) sector							
1-1	Road and bridge construction (rehabilitation)	・Road construction (rehabilitation) distance（km） ・Road paving distance（km） ・Bridge construction section (area name- area name) ・Mapping of social infrastructure in areas around road and bridge	→Improvement in access to maternal and child health services (less costly transport) →Rise in antenatal and postnatal care rate →Identification of high-risk mothers, Increase in number of safe child births	・Number and ratio of ANC and PNC patients ・Health service coverage rate（CCI）	・Health administration and centers in target areas	UNFPA, 2004 ADB, 2010 Ansari et al., 2004 Mistry et al., 2009	△
1-2	Road and bridge construction (rehabilitation)	・Distance from central point in constructed road to mid-level hospital where Caesarian section operations are possible (km) ・Access time from central point in constructed road to mid-level hospital where Caesarian section operations are possible (min)	→ Reduction in mother and child emergency transfer time → An increase in facility deliveries, increased safe child birth	・Number of women and children transported by ambulance ・Number and ratio of facility delivery ・Number of Caesarian section operations (background factor analysis) ・Number of patients transported with ambulance, number of patients whom called the ambulance ・Number of deaths after being transported by ambulance	Health administration and centers in target areas	Manandhar, 2004 Lao field survey	○
1-3	Road and bridge construction (rehabilitation)	・Distance of road construction (rehabilitation) (km) ・Distance of road paving（km） ・Bridge construction/rehabilitation section (from xx to xx, km)	→Improvement in access from health facilities, Home visits of neonates and postpartum mothers (increased postnatal care checkups) → Improvement of neonatal survival rate, Realization of mother and child continuum of care	・Number of times the public health nurse visits households, the number of households visited	Health administration and centers in target areas	Paterson, 2004	
1-4	Road and bridge	・Reduction in market access time	→ Economic activation, Increased disposable income	・Number of health facility users	Health administration	Field survey (Lao PDR and	△

[72] 2012 Indonesia DHS data analysis results (Refer to Tables 4-3, 4-4, 4-5 covariate adjusted) *** statistically significant at 0.1% level, ** statistically significant at 1% level, * statistically significant at 5% level

	construction (rehabilitation)	Increase in household disposable income	→Increased investment in mother and child health (disease prevention), including transport to health centers, medicine and other expenses →Extension of health life expectancy	・ Vaccination rate ・ Maternal and child health continuum of care (CoC) completion rate	and centers in target areas Village, district and province	Indonesia)	
1-5	Electricity stabilization through construction of efficient energy facilities	・Type of household electrical appliance and number ・Refrigerator penetration rate, number of breakdown times ・TV penetration rate, number of breakdown times	→ Household electrical appliances, lower household chore burden on females and female children →Protection of maternity	・ Number of food poisoning cases and rate ・ Number of low birthweight babies and rate	Health administration and centers in target areas	Gonzalez-Eiras et al., 2007	○
1-6	Electricity stabilization	・ Maintenance of appropriate volume ・ Appropriate voltage ・ SAIDI (System Average Interruption Duration Index) total of all customer power outage time/ number of customers ・ Reduction in area and time of power outage due to failures	→ Increase in facility delivery and Caesarian section operations , Improvement in vaccination rates → Reduction in maternal and child infectious diseases	・Facility delivery rates ・Vaccination rates ・CCI of target province and district ・Number and changes in number of patients from the target area	Health administration and centers in target areas	Mfenyana, 2006 Osrin et al., 2011	○
1-7	Electricity stabilization	・ Increase in electricity supply and reduction in power outages ・ Changes in health facility equipment (increased use of electricity dependent equipment) ・ Increased number of health facilities with electricity run refrigerators	→Introduction of electric and medical equipment in health facilities, Improved service quality and efficiency →Better access to health center, Child and female vaccination opportunities → Reduction in vaccine-preventable infectious diseases	・ Number of out-patients ・ Vaccination rate change in the target area ・ Vaccine-preventable disease morbidity rates	・ Health administration and centers in target areas	Walley and McDonald, 1991	△
1-8	Promotion of low-cost, low carbon and low-risk energy, Less biomass fuel	Household biomass fuel use	→Increase in child birthweight, fewer respiratory diseases, improvement in maternal anemia , Newborn, pregnant and postpartum women health improvement	・ Ratio of low-birth weight children ・ Respiratory disease infection ・ Number of mothers diagnosed as anemic	・ Health administration and centers in target areas	Baker et al., 2006 Sreeradmareddy et al., 2011 Page et al., 2015	○

model	Target sector activities (inputs)	Target sector (infrastructure water sanitation, education) Process indicators	Impact on maternal and child health (predicted path from sector intervention to maternal health outcome)	Maternal and child health outcome indicators	Means of obtaining indicators	Evidence	
						Source	Level
Water sanitation sector							
2-1	Improvement in water and sanitation environment	· Population who can use the improved water source · Number of rural water supply facilities	→ Reduction of female and female children's water fetching time, reduction of household chore burden, time creation → Enlargement of educational opportunity → (Future) maternal and child health improvement	· Number of health and physical education classes, content, health committees and health club activities	· Education in the target area	JICA grant and loan water and sanitation project construction and rehabilitation, ex-post evaluation reports, Indonesia field survey	○
2-2	Improvement in water and sanitation environment	· Increase in target population who can use improved water source · Increase in rural water supply facilities · Improvement in water supply facility efficiency rate · Number of households which use simple toilets	→Reduction of water-borne infectious diseases(cholera, typhoid, hepatitis) → Reduction of morbidity, improvement in health, reduction of U5 mortality rate due to dehydration	· Morbidity due to water-borne diseases and diarrhea in the target area	· Health administration and centers in target areas	Granados and Sanchez, 2013 Gunther et al., 2010 Esrey, et al., 1991 Indonesia field survey	◎
2-3	Improvement in water and sanitation environment	· Number of households with infants and children (under 24 months) which have received hygiene education · Number of households with infants and children which have adapted hygienic behavior and manners	→Hygiene education → Enteric environment disorder prevention →Improvement of nutrition and anemia prevention	· Infant and child growth · Rate of low-weight infants and children	· Health administration and centers in target areas	Chase and Ngure, 2016 Prendergast, 2015	△
2-4	Improvement in water and sanitation environment	· Hygiene education, promotional hygiene activities, participants · Specific behavior change activities (elimination of open air defecation, handwashing)	→Hygiene education →reduction of water-borne preventable diseases (trachoma, Ascariasis , schistosomiasis) →Improvement of community health	· Morbidity due to water-borne preventable diseases (trachoma, Ascariasis , schistosomiasis)	· Health administration and centers in target areas	Esrey, et al., 1991	○

model	Target sector activities (inputs)	Target sector (infrastructure water sanitation, education) Process indicators	Impact on maternal and child health (predicted path from sector intervention to maternal health outcome)	Maternal and child health outcome indicators	Means of obtaining indicators	Evidence	
						Source	Level
Education sector							
3-1	Improvement of primary and secondary education quality	・Enrolment rate and completion rate for female children ・Drop-out rate for female children ・Health education and adolescent education class frequency and time ・Health education and curriculum and content of adolescent education	→Expansion of access to knowledge and information →Reduction of teenage pregnancies and childbirth, risk of infection, increase in SBA births →Improvement of adolescent female health and child survival rate	・Teenage childbirth rate ・Increase in SBA assisted deliveries ・ANC and PNC consultation rate, U5 mortality rate, Maternal and child health continuum of care (CoC) completion rate ・Reduction in HIV and STD infection rates (especially for 10-19 year olds) ・Number of smokers and drug addicts	・Ministry of Education Statistics office（EMIS） ・District education office ・Ministry of Health and district health office	Alsan et al.,2013 Ferre , 2009 Osill et al., 2007 Burchi, 2012	◎
3-2	Improvement in primary and secondary education access	・Increased school health activities and time ・Time spent on nutrition counselling ・Promotion of handwashing activities ・Toilet and sanitary facility installation rate ・Toilet use situation ・Utilization situation of basic handwashing facilities	→Improvements in school sanitation environment → Improvement in hygiene and nutrition, prevention of infectious diseases →Improvement of hygiene and health of school-aged children	・Number and ratio of poorly development children ・Number of school-aged children who had diarrhea episodes ・Parasite infection rate ・Rate of anemic children	・Ministry of Education Statistics office（EMIS） ・District education office ・Ministry of Health and district health office	Nwadiaro et al., 2005 Miguel et al., 2004	◎
3-3	Expansion of non-formal education and training	・Number of trainees ・Trainee completion rate and employment rate ・Changes in income ・Investment amount and rate of in nutrition and health care ・Number of participants (in informal education and training program on health)	→ Expansion of information access, increased economic power and income → Investment in maternal and child health → Improvement in family nutrition, early access to care, and disease prevention → Improvement in women's health, increased child survival rate	・ANC and PNC consultation rate, U5 mortality rate, ・Maternal and child health continuum of care (CoC) completion rate ・Ratio of malnourished children ・Ratio of stunted children ・Ratio of anemic women and children	・Annual plan and achievement of basic technical training institution ・Ministry of Health and district health office ・Follow-up survey of former trainees	Thomas et al. (1990) Sridhar (2008) JICA Project completion report for Improvement of Basic Skills and Vocational Training in South Sudan 2 (2009)	△

5. Overall research results

5-1. Suggestions on how to improve maternal and child health through a multisectoral approach

The international community set the goal to achieve the SDGs which aim to eliminate poverty and realize sustainable development, by 2030. However, it has been pointed out that individual sectors alone cannot tackle the development issues. Therefore, a comprehensive approach across sectors is being promoted to solve issues and achieve the fixed goals. This research project focused on maternal and child health, organizing the relationship between the achievement of the various SDGs and maternal and child health improvement in Table 2-1, which helped renew acknowledgement of the meaning of a multisectoral approach and the impact of intersectoral partnership.

The importance of multisectoralism and partnerships across different sectors has already been mentioned in many research reports. In this research, through interviews with other donors we have found that the effect of external factors such as partnerships between other government agencies and their respective structures, commitment, communication and other complexities such as staff time spent moving from one place to another, and other time-related constraints, as well as structural reforms, needs to be considered when taking a multisectoral approach.

In applying the multisectoral approach, as we collected data during the field survey and conducted interviews with stakeholders, we found that information and coordination between different sectors and the various levels (central, province, region and community levels) were insufficient. Based on this lesson learned, in order to understand the role and responsibilities of the various level stakeholders and to be able to efficiently collect information in future studies and project formulation, we drafted a template proposed as Annex 4 Multilevel Multisector Matrix. When expanding on the synergistic effect of multilateral interventions, we cannot emphasize enough the importance of the horizontal and vertical links in each sector and within the country. For example, when developing the river basin, many actors from the Ministry of Environment, the Ministry of Health, which is responsible for the health of residents who are affected by flooding, and the Urban Development Department must be included. It is also important for the Development Agency, which manages the regional development plan, to participate. On the other hand, it is also necessary to keep lobbying specific government agencies to develop capacity and change their mentality and behavior, taking time to reduce poverty through road construction. The latter is also a multisectoral approach. However, such an approach is costly in terms of coordination, and this is not easy to realize in development aid project frameworks, which require results from limited inputs within a short time frame. Therefore, we have come to the conclusion that it is important to create a system which would maintain and strengthen the vertical and horizontal connections. For this, data needs to be collected and analyzed at the grassroots level, strengthening sharing (culture), and the creation of a system which can flexibly meet the needs of the site, preparation for various risks and taking responsibility for prevention.

Health problems arise from a multitude of factors, which makes it difficult for the traditional health administration to cover as routine, simply by raising awareness and changing behavior. Therefore, plans

should be implemented by staff from each sector and each level from the perspective of prevention and control, and based on what is necessary and what can be done to address development risks, disaster risks, and health risks.

5-2. Proposed Maternal and Child Health Indicators to Promote a Multisectoral Approach

Through this research project, we organized extracted information as predicted path from target sector intervention to maternal and child health improvement and corresponding indicators (Table 4-7). Then we proposed standard indicators in Table 5-1 in order to facilitate the use of the paths and indicators in existing target sector project frameworks. In addition to the existing standard indicators by development issue (Development strategic objective, Mid-term objective, Indicators at a program goal level, Mid-term sub-target, Overall goals, Project purposes and indicator examples) we have described the research project results, the impact on maternal and child health (Predicted path from intervention to maternal and child health outcome, Indicators, Evidence level) in the right half of the Table. We aim to demonstrate the potential of accomplishing two objectives simultaneously, that is the realization of the target sector goal or project purpose and improvement of maternal and child health, by integrating maternal and child health goals and indicators within the target sector's existing development issue framework.

Table 5-1 shows the path from each sectoral intervention to maternal and child health outcomes as well as some indicator examples to be used as a reference and to be able to demonstrate the effect or impact a project has on maternal and child health. There will be a multitude of factors and a multitude of effects that these factors will have for the path to be established or for the outcome, but the vision to fix indicators which measure the effect or impact on maternal and child health objectives and results in the non-health sectors is first priority. In addition, by monitoring these indicators from before and through implementation as well as for a certain period after completion, it will be possible to determine whether the multisectoral approach functioned.

On the point of to what extent maternal and child health indicators should be integrated to demonstrate standard project impact, there is no standard answer as project purposes, scope and scale differ. However, we propose as one standard, paths which are relatively short from intervention to maternal and child health outcome, and where the evidence which supports the path is strong, there is a reasonable chance that the project will have an impact on and improve maternal and child health. In this case, proposed indicators should be actively integrated and fixed. Or if there is evidence that achieving a target sector overall goal will contribute to maternal and child health (such as the promotion of enrolment and learning if the child is healthy), a synergetic effect can be expected between the target sector and maternal and child health field. In this case, we suggest that both sectors' indicators should be fixed as an impact.

Table 5-1. Standard Indicators for a Multisectoral Approach to Maternal and Child Health Improvement

＜Standard indicators for a technical cooperation project＞

Infrastructure (roads, bridges and power) sector standard indicator reference					Research results (impact on maternal and child health)		
Development strategic objective	**Mid-term objective**	**Indicators at a program goal level**	**Mid-term sub-target**	**Overall goals Project purposes and indicator examples**	**Predicted path from intervention to maternal and child health outcome**	**Indicators**	**Evidence level**
Infrastructure 1 3. Toward Balanced Development of a Whole Country	3-1. Improvement of Road Transport	(2) Road maintenance rate by standard (%) (3) Length of standard roads (Km) (4) Total highway length (Km) (5) Road pavement rate (%)	3-1-1. Improvement and Development of Trunk Road System 3-1-2. Strengthening of Road Maintenance System	(overall goal of road development, project purpose) ・ Development of National Road Networks and Major Trunk Road Networks (national roads and regional roads) lead to higher road pavement rates ・ Development of High Standard trunk Road (highway) networks High-standard total road length (km) and high-standard road maintenance rate (km) ・ Elimination of Missing Links ・ Road rehabilitation, maintenance	Type 1-2 Road and bridge construction (rehabilitation) → Reduction in mother and child emergency transfer time → An increase in facility deliveries →Increased safe child birth	Type 1-2 ・ Number of women and children transported by ambulance ・ Number and ratio of facility delivery ・ Number of Caesarian section operations (background factor analysis) ・ Number of patients transported with ambulance, number of patients whom called the ambulance ・ Number of deaths after being transported by ambulance	○
Infrastructure 2 Low-cost, low carbon and low risk energy supply	Improvement of energy access Efficient power transmission	(1) household electrification rate (%)	・ Extension of transmission lines ・ Utilization of renewable energy from off-grid electrification ・ power system maintenance (including enhancement and stabilization) Distribution network maintenance (smart installation)	Policies and procedures to promote, operate and maintain rural electrification projects which extend transmission lines and promote renewable energy, are formulated, and technical capacity strengthened, (output), through support for capacity building of stakeholder Ministries responsible for planning and implementing rural electrification programs in the country, (outcome) contribute to the improvement of electrification rate through renewable energy promotion and the extension of transmission lines (impact). 1. Indicator examples of overall goal (basic) (1) village electrification rate X% will be achieved by YY, (2) household electrification rate X% will be achieved by 20YY.	Type 1-8 Promotion of low-cost, low carbon and low-risk energy →Less biomass fuel → Increase in child birthweight, fewer respiratory diseases, improvement in maternal anemia Newborn, pregnant and postpartum women health improvement	Type 1-8 ・ Household biomass fuel use ・ Ratio of low-birth weight children ・ Respiratory disease infection ・ Number of mothers diagnosed as anemic ・ Households have access to electricity ・ Target area CCI ・ Target area CoC	Type 1-8 ○ Household electrification rate and CCI* Household electrification rate and CoC***

Water sanitation sector standard indicator reference					Research results (impact on maternal and child health)		
Development strategic objective	**Mid-term objective**	**Indicators at a program goal level**	**Mid-term sub-target**	**Overall goals/Project purposes and indicator examples**	**Predicted path from intervention to maternal and child health outcome**	**Indicators**	**Evidence level**
Water sanitation 2. Water supply with consideration for efficiency, safety and stability 4. Water environment conservation	2-3 Securing of water quality for water supply (water sources and drinking water) 4-2 Promotion of proper treatment of sewage through establishment of sewage treatment facilities 4-3 Promotion of water environment conservation in public water areas	(2) Proper establishment of a water quality monitoring plan in the target area (3) Water quality monitoring is (4)Population ratio that has access to (improved) sanitation facilities (6) Ratio of population who can access safe water	2-4-6 Effective water supply <rural water> 4-1-4 Formulation of environmental standards 4-1-5 Appropriate execution of regulations 4-2-1 Establishment of centralized sewage treatment facilities 4-3-2 Prevention of degradation in water quality	To strengthen the system for operating and maintaining the rural water supply project in the target county, (outcome) By improving the development plan planning and coordinating function of the provincial officials engaged in the operation and maintenance of the rural water supply project and the provincial officials who give guidance about the rural water supply in the county (output) Thereby contributing to the improvement of the rural water supply service in the target county. (impact) 1. Indicator examples of overall goal (Basic) (1) Increase in the population that can continue to use improved water sources (2) Increase in the number of water supply facilities in villages To enable the Environment Authority's Water Quality Analysis Laboratory to provide accurate monitoring information on discharged water (industrial wastewater and household effluent) and natural water (rivers, lakes, sea area) in province, (outcome) By enabling the analysts of the Environment Authority's Water Quality Analysis Laboratory to carry out the sampling and analysis of dirty water independently and constructing a highly reliable database on water resources and industrial wastewater, (output) Thereby contributing to the strengthening of the capacity to manage the compliance with the water discharge standards law in the target country. (impact) 1. Indicator examples of overall goal (2) Increase in the number of factories that achieve water standard values 2. Indicator examples of project purpose (2) Increase in the number of inspection items to be analyzed	Reduction in water-borne diseases (such as diarrhea and Guinea worm) Type 2-2 Improvement of water and sanitation environment →Reduction of water-borne infectious diseases(cholera, typhoid, hepatitis) →Reduction of morbidity, improvement in health, reduction of U5 mortality rate due to dehydration	・Continuum of care completion rate（CoC）	◎ Access to Safe water and CoC **

Education sector standard indicator reference					Research results (impact on maternal and child health)		
Development strategic objective	**Mid-term objective**	**Indicators at a program goal level**	**Mid-term sub-target**	**Overall goals/Project purposes and indicator examples**	**Predicted path from intervention to maternal and child health outcome**	**Indicators**	**Evidence level**
Education 1 5. Improvement of education management	5-2.Strengthening of educational administration systems	(1) Results of third-party evaluation by ministries and agencies in charge of administrative auditing (2) Proportion of the educational budget per capita to GNP per capita (3) Progress of the national implementation plan (action plan)	5-2-6 Improvement of school management performance (Strengthening the functions of school management committees（COGES）)	By strengthening the functions of school management committees（COGES）, reflecting community needs in school management, building collaborative relationships with schools, and strengthening the capacity of local educational administration for improvement of school management, (Output) To ensure improvement of school management, (Outcome) Thereby contributing to improvement of learning environment. (Impact) 1. Indicator examples of overall goal (Basic) (1) Number of distributed textbooks (2) Number of prepared teaching aids (3) Number of newly-employed teachers (4) Attendance of teachers (5) Number of class hours (6) Time for work at home on parents' watch 2. Indicator examples of project purpose (Basic) (1) Implementation (Completion) rate of school activity programs (2) Number of participants in meetings for formulation of school activity programs (Supplementary) (1) Frequency of meetings for formulation of school activity programs *<school health activities>*[73] *Indicator examples* *(1) enrolment rate and completion rate (by gender)* *(2) dropout rate (by gender)* *(3) Frequency and time of health and puberty education* *(4) Health education, puberty education curriculum content and situation*	Type 3-1 Improvement of primary and secondary education quality → Expansion of access to knowledge and information → Reduction of teenage pregnancies and childbirth, risk of infection, increase in SBA births →Improvement of adolescent female health and child survival rate	・ Teenage childbirth rate ・ Antenatal care and postnatal care ratio,Increase in SBA assisted deliveries, CoC completion rate (CoC) ・ Reduction in HIV and STD infection rates (especially for 10-19 year olds) ・ Number of smokers and drug addicts	◎ Education level and CoC（***）

[73] Added school health activities to the standard indicator reference, including process indicators found in Table 4-7

＜Maternal and Child Health Improvement through a Multisectoral Approach Standard Indicators for Grant Aid＞

Development strategic objectives	**Mid-term objectives**	**Sub-targets of mid-term objectives**	**Types of infrastructures**	**Standard indicators**		**Maternal and child health indicators**	**Predicted path from intervention to maternal and child health outcome**	**Evidence level**
5. Toward sustainable rural development and improvement of rural life (rural transportation)[74]	Improvement of rural transportation infrastructure	Provision of basic transportation infrastructure and services to secure civil minimum	Rural roads and bridges (domestic)	Operation and effect indicators	・ Annual average daily traffic(AADT) (vehicles/day, vehicles/12 hours)	Precondition is that medical equipment is properly used as a result of stable electricity supply. ・ Access time to health facilities for the target area residents ・ Number of patients referred from lower level health facilities (person/year) ・ Number of users of referral hospitals and frequency of use ・ Number of facility deliveries ・ Number of times antenatal care is received ・ Number of postnatal care checkups (at home) ・ CoC by health facility in the target area ・ Aggregate of each health facility CoC in the target area Note: in the case where it is difficult to ask about access time, tally the records (resident of XX village) in the health register	Type 1-1 Road and bridge construction (rehabilitation) → Improvement in access to maternal and child health services (less costly transport) → Rise in antenatal and postnatal care rate → Identification of high-risk mothers →Increase in number of safe child births	△
				Effect indicators	・ Time Saving (hours) ・ Average Velocity Increase (km/hour) Decrease of Annual Traffic Impassability Dates due to Disaster (days/year) An improvement in access to social infrastructure (schools, health centers, etc.) (people/day)			

[74]We omitted efficiency focused transport and water supply interventions as well as urban interventions where it is difficult to separate contributions and impact, based on the results of the field survey and data analysis. We have kept indicators which can be realistically monitored.

Development strategic objectives	Mid-term objectives	Sub-targets of mid-term objectives	Types of infrastructures	Standard indicators		Maternal and child health indicators	Predicted path from intervention to maternal and child health outcome	Evidence level
Sustainable safe water supply	Improvement of access to rural water		Well digging, wells and hand pump (level 1) construction and repair Wells, pumps, common water taps, water tank (level 2) construction and repair	Operation indicators	· A reduction in waterborne diseases · The percentage of the population supplied with water (%) · The percentage of functional facilities	· Reduction of water-borne diseases	Type 2-2 Improvement of water and sanitation environment →Reduction of water-borne infectious diseases(cholera, typhoid, hepatitis) →Reduction of morbidity, improvement in health, reduction of U5 mortality rate due to dehydration	◎
				Effect indicators	· A reduction in the water fetching time · The distance to water sources Population benefiting from the improvement in the water supply situation · The school enrollment ratio · An increase in the employment ratio for women			

Development strategic objectives	Mid-term objectives	Sub-targets of mid-term objectives	Types of infrastructures	Standard indicators		Maternal and child health indicators	Predicted path from intervention to maternal and child health outcome	Evidence level
Reduction of educational disparities	Reducing gender disparities	Achieving gender-sensitive school education	Developing facilities by giving consideration to female students (separate toilets for men and women, hygienic water supply areas, accommodation, etc.)	Operation and effect indicators	(1) The number and percentage of female students at the project's target schools (the gender ratio) (2) The number of students enrolled at the project's target schools (3) Satisfaction levels of male and female students regarding school toilets and hygiene .	Process indicators · Increase in school health activities and hours spent on school health · Number of hours spent on nutrition counselling · Realization of handwashing with soap · Rate of toilet and sanitary facility introduction · Toilet use situation · Utilization of basic handwashing facilities Maternal and child health indicators · Number and ratio of stunted children · Number of diarrhea cases in school age children · Worm infection rate · Ratio of anemic children	Type 3-2 Improvement in primary and secondary education access → Improvements in school sanitation environment → Improvement in hygiene and nutrition, prevention of infectious diseases → Improvement of hygiene and health of school-aged children	◎

5-3. Notes on Realizing a Multisectoral Approach

Armed with the evidence extracted through this research, we listed some points to consider when designing, implementing and evaluating multisectoral projects (maternal and child health with other target sectors) along the lines of a project cycle. In the Table below, "Notes on realizing a multisectoral approach", based on the issues identified from the field survey and the lessons learned from other donor's multisectoral project implementation, we made suggestions. In the "Notes on the utilization of maternal and child health indicators" in the same Table below, we propose specific ways to measure the impact of target sectors on maternal and child health in Chapters 4 and 5.

Table 5-2. Notes on Realizing a Multisectoral Approach and the Utilization of Maternal and Child Health Indicators

Project cycle	Notes on realizing a multisectoral approach and utilization of maternal and child health indicators
Design and preparation	(Notes on realizing a multisectoral approach) ・ Confirm where the proposed project is situated and whether it is in line with the counterpart country's development policy and plan. In countries where the line ministry culture is strong, determine whether intersectoral partnering is the more effective and appropriate strategy to solving development issues. For example, it might be necessary to examine the alignment with other aid organizations, the existing partnering policy with other sectors, or the impact of previous multisectoral interventions. ・ Conduct a stakeholder analysis and confirm the role (tasks), where and how the coordinating body will function, the administrative line from central level to community level, and the connections across agencies and line ministries, as described in lessons learned 2 on p. 35. A multisectoral and multilevel matrix has been prepared to assist understanding of the various stakeholders at the preparatory stage, and to be able to integrate at implementation stage (Annex 2). ・ The different budgeting cycles between the line ministries and regional administration should be taken into account so that inputs and activities can be coordinated in a timely fashion. (From lessons learned example 1. p.35) ・ As there are multiple organizations involved in achieving a multisectoral approach, and because each stakeholder has a large stake in the project, various factors will affect the project. As a result, the intended project impact at the end of the project should be examined carefully. Confirmation should also be made as to whether the conditions from output to project purpose are acknowledged by all sectoral stakeholders. ・ All external conditions and other conditions (such as the counterpart institutional arrangements) across the sectors should be examined by all the stakeholders, for anything that could inhibit the achievement of the project purpose and with the intent to share a common understanding of the appropriate indicators and targets.
	(Notes on the utilization of maternal and child health indicators)

	・ Discuss at project design stage, how the target sector intervention would impact maternal and child health, fix the path or hypothesis between intervention and impact (refer to Tables 4-7 and Table 5-1) and indicators upon examination of the relationship between the overall goal and project purpose, the existence and strength of the evidence, as well as time constraints. ・ Integrate the perspective of maternal and child continuum of care, utilize indicators such as the Continuum of Care completion rate (CoC) and the Composite Coverage Index (CCI) to analyze issues, and examine where (which stage of the process) it is most effective to concentrate resources in order to achieve maternal and child health. ・ Collect baseline indicators from the project preparatory stage (preliminary survey). Examine the possibility of utilizing Ministry of Health, health center data as well as DHS and MICS data. Discuss possibility of fixing alternative indicators if data is not easily obtained.
Implementation	(Notes on realizing a multisectoral approach) ・ When implementing a project which covers multiple sectors and institutions, a proper follow-up should be done so that budgets are allocated appropriately and in a timely fashion. This will ultimately help prevent any risk of activity implementation due to delays. (From lessons learned example 1. p.35) ・ Promote the sharing of data and information held by each sector. Information sharing across sectors (horizontal) and within sectors from the central to community level (vertical), linking horizontally and vertically, and having a place where such mechanisms can be put in place is key. (From lessons learned example 4. p.36)
	(Notes on the utilization of maternal and child health indicators) ・ Integrate as an activity in the project PDM the collection of data from the health sector before the project joint coordinating committee to monitor the impact of target sector interventions on maternal and child health by clarifying what indicator data needs to be collected from the start.
Monitoring & Evaluation	(Notes on realizing a multisectoral approach) ・ Multisectoral projects will have multiple sectoral purposes in one package/project. Therefore the evaluation framework will have to be set with a multiple perspective by acknowledging all the activities, their output results and outcomes. With the involvement of multiple and various actors, we must keep in mind that a direct intervention will have a third/ripple effect. ・ To ensure effective and efficient data collection, there will be a need to concentrate information and data in a coordinating hub of the multisectoral project. Data and information from different ministries will also not be directly comparable at all times due to different data collection timing and different age groups, for example. This potential difficulty must be kept in mind, especially when it comes to analyzing the data. (From lessons learned : data difference in districts and health districts, intervention sector section and health district, difference in population denominator)
	(Notes on the utilization of maternal and child health indicators) ・ By comparing the output and outcome indicators of the target sectors and maternal and child health indicators, it may be possible to demonstrate the improvement in

	maternal and child health as a result of the project intervention. (However, the rigor of the impact will depend on the evaluation methodology. ・ A comprehensive maternal and child health situation can be assessed by monitoring the maternal and child Continuum of Care completion rate (CoC) and the Composite Coverage Index (CCI). By comparing before and after figures, the project's impact on the continuum of care can be evaluated. ・ When there are multiple stages in the paths from intervention to maternal and child health outcome, there might be difficulties in demonstrating the quantitative impact within the project period. This is why we suggest outcome indicator data continue to be collected 3 to 5 years after the project is completed.

5-4. The three levels of improving maternal and child health through a multisectoral approach

Based on the results of this research, we found we could categorize multisectoral approaches for maternal and child health into 3 levels. Level 1 is about incorporating activities which have a synergetic effect as a result of partnership with the health sector within the framework of another sector project. Level 2 is about concentrating inputs in the particular target area, by implementing various sectoral projects in order to improve the socioeconomic situation of the entire region. Level 3 is about having 1 multisectoral goal and conducting cross-sectoral activities to realize this goal. Table 5-3 shows 3 levels of a multisectoral approach for maternal and child health improvement, its methodology and examples.

Table 5-3. The three levels of a multisectoral approach for maternal and child health improvement

Level	Methodology	Example
1	Each non-health sector project keeps its main project purpose but integrates a maternal and child health monitoring or outcome indicator aiming to have a positive effect on maternal and child health or gender.	・ By fixing the number of school health activities as an indicator, such activities by the project were promoted (JICA Integrated Program for Junior Secondary Education Improvement in South Sulawesi Province) ・ The relationship between improvement of road access, facility delivery rate and infant mortality rate was verified through the ex-post evaluation (JICA Tajikistan The Project for the Rehabilitation of Kurban Tyube-Dusti Road) ・ Electrification of health facility had an impact on health (JICA Ghana Rural Electrification Grant Aid Project) ・ 15 out of 17 projects showed that grant and loan water supply & sewage facility improvement projects demonstrated that water-borne diseases including diarrhea was reduced. ・ After the rural water supply facility was completed, diarrhea, dysentery, skin diseases were reduced (Myanmar The Project on Rural Water Supply Technology in the Central Dry Zone)
2	Other sector projects are implemented in the same target area of a maternal and child health project, each aiming to achieve their respective project purpose but which have the potential of	・ Better access to better health care is achieved through Lao PDR The Project for Improvement of National Road No. 9 as East-West Economic Corridor of the Mekong Region and the Greater Mekong Power Network Development Project

	synergy for better results	・ Student health improved through school health partnership between Nepal School Health and Nutrition project and Support for Improvement of Primary School Management SISM ・ Indonesia PRIMA-K (community health) and PRIMA-P (education) implemented under the South Sulawesi Regional Development Program ・ Vietnam Small-scale Pro poor infrastructure Development Project (2) –loan had a water sanitation, road and power combined intervention. The water supply intervention reduced skin and eye diseases, the power intervention resulted in improved health and nutrition, according to a beneficiary study.
3	Multiple development goals are included in multiple sectors, with horizontal links and possible effects	・ The project coordination unit of the ADB Indonesia Integrated Citarum Water Resources Management Investment Program (ICWRMIP) was placed under the Ministries of Public Works, Health, Agriculture, Environment, Forestry and BAPPENAS.

Level 3 projects have multiple development goals within the project and are the specific realization of multisectoral SDGs. These projects aim to achieve holistic objectives which cover multiple sectors which entail a higher coordination cost, so is a possible approach for relatively long-term, and large-scale projects. On the other hand, the level 1 approach aims to improve maternal and child health by integrating maternal and child perspectives in each sectoral intervention and can be realized in relatively small projects. It is expected that these 3 levels will be utilized to consider an appropriate multisectoral intervention taking into consideration the counterpart's and JICA's policy priorities, implementation structure and expected results.

5-5. Towards a Multisectoral Implementation Partnership

One of the characteristics of this research project process was that from the inception to the draft final report, oral presentations were made with the submission of each draft report from the field survey and the analytical results. Discussions were held with related departments within JICA, and country offices, as well as other stakeholders, their feedback reflected in further research content or analytical methodology as well as the final draft of each report.

As for specific inputs from the related departments, for example, the Evaluation Department from its perspective of measuring, monitoring and evaluating non-health sector interventions on maternal and child health, shared its experience of sampling surveys in various countries. The Infrastructure and Peacebuilding Department Gender Division shared its experience of studying the impact of a multisectoral intervention in a Malawi rural water supply project pointing out the difficulties of obtaining information from other sectors at project preparatory stages. Keeping this in mind, the field survey team attempted to get the education and health officials in one meeting, well aware of the strong vertical line ministry division. The Global Environment Department provided additional information on water supply and sanitation projects in Lao PDR and Indonesia, an overview on the water supply sector in Lao PDR as well as advice on process and outcome indicators from a specialized perspective. The Human Development Department Education Group

also provided information which guided the direction of the research. For example, in the school management improvement project, where community residents and the school work together to improve the educational environment, we learned that in some community meetings that school health is discussed and that whe considering the community environment and how community residents can get involved with education at the local level, that the examination of the relationship between education and health needs is important. The senior advisor from the Human Development Department Health Group ensured that the research methodology was rigorous and advised on various topics from the quantitative analysis methodology to how to effectively show the results of the data analysis. Various comments and inputs were received on the research plan and analysis from the Indonesia office, Lao PDR office and experts in the field. In addition, they provided us with information and data which is difficult to obtain externally and coordinated with local institutions as well as providing logistical arrangement support before and during the field survey. A summary of the comments received from related departments and stakeholders during the research period, can be found in reference document.

From this experience, many stakeholders realized or experienced firsthand the importance of partnering, by promoting the sharing of information between JICA's maternal and child health team as well as related sectors, in order to realize a multisectoral approach. We conclude that this active internal discussion is another fruit of this research project.

Annexes

Annex1.Literature Review1×Literature Review2×Field Survey ×Literature Review3 Results

Annex2. Field Survey Itinerary and List of Interviewees

Annex3. Field Survey Results

Annex4. Multilevel Multisector Matrix Example

Annex5. Standard Indicators and Representative Lessons Learned with Reference Examples

Annex6. List of Reference Literature

Annex 1 Results of Literature review I（previous studies）× Literature II（JICA project reports）×Field Survey×Literature Review III（FY 2015 Impact Evaluation Review）

(1) Infrastructure (road, bridge and power)

		Previous studies (literature review I)			JICA project report (Literature review II & III)		Field Survey
Type		**Mother and child health (MCH) evidence**	**Main source(s)[1]**		**Interventions**	**MCH impact**	
Central level, large scale infrastructure (national highways, power plants)	1	Highway and power plant construction projects construct a health center and support the improvement of the health of local residents	No literature identified	1	Costa Rica Pirris Hydroelectric Power Development Project	The Project donated materials for health center construction, provided water tanks for 54 communities	No health center built by highway and power plant construction projects
				2	Philippines Metro Cebu Development Project (3) Cebu South Coastal Road	Health-nutrition points constructed by the Project.	
	2	Rural roads, rural bridges, provincial roads help improve access to hospitals and emergency obstetric care, as well as keeping vaccine transportation costs down	Kunieda, 2007 Lydon, 2014	3	Sri Lanka The Project for the Construction of a New Highway Bridge at Manampitiya	Time of emergency transportation of critical patients was reduced to 20 minutes, from 40-50 minutes. The Project bridge over the railway tracks helped reduce emergency transportation time of critical patients by 20-30 minutes to 20 minutes.	Road improves access to emergency obstetric care (Lao National Road no. 9)
				2	Philippines Arterial Road Links Development Project (VI)	Outpatients to the Tacloban city hospital increased each year. Over half came from Samar Province as a result of improved road conditions.	Phine hospital staff mention that rehabilitated road (Lao National Road No. 9) facilitated vaccine transportation
					Nepal The Project for Construction of Sindhuli Road Section II & III	According to a beneficiary study, if one used the Sindhuli Road, there was a reduction in travel time to the health center for antenatal and postnatal care. The hospital which receives emergency patients saw a large increase in patients after the road was constructed, leading to the possibility that the road might have contributed to improving maternal and child health.	
					Kyrgystan The Project for the Rehabilitaiton of Kurgan Tyube-	Road rehabilitation smoothed road traffic flow, reduced travel time and for delivery by pregnant women with complications, the possibly reduced travel time to the central hospital. This project	

[1] Authors and year in Bold font indicate a systematic review or meta-analysis

					Dusti Road (Phase 1 & 2)	improved access to health services and enabled early treatment for complicated deliveries, possibly contributing to the improvement of maternal and child health.	
	3	Electrification reduces coal dust reduction and eventually respiratory diseases	No literature identified	3	Philippines Calaca 1 Coal-fired Thermal Power Plant Environmental Improvement	According to the doctor, the coal dust problem peaked in the late 1990s and the respiratory disease patients under the clinic's care peaked around 2000. Nurses also mentioned coal dust reduction. Despite lack of precise data, the number of respiratory diseases fell after the Project. Other reasons why health improved could be also due to the health missions sent to the villages, community health budget doubling in the past 10 years, the increased number of health staff.	Electrification in Lao Savannakhet Province was too long ago for a before-after comparaison
	4	Roads improve access (nurses make home visits, community visits health facilities)	No literature identified	4	Vietnam National Highway No. 18 Improvement Project (1) (2)	The medical level in the Cho Bai Cha district is not very advanced, so with the improvement of National Highway No. 18 and bridge, community residents' acesss to Hanoi became easier and many patients from Cho Bai Cha starting using services in Hanoi. At the same time, according to a beneficiary survey, the district hospital access was also improved with the Highway.	
	5	Sidewalk installation leads to pedestrian safety and health improvement	No literature identified	5	Palao The Project for the Rehabilitation of Arterial Roads in the Metropolitan Area	According to a rapid beneficiary survey, 94.3% of respondents replied that the pedestrian sidewalk drastically or simply improved safety. Walkers and joggers also increased with some respondees noting that tourists increased in central Koror.	
	6	Air pollution and consequently respiratory diseases are reduced as a result of the toll road	ADB, 2010	6	Tunisia Rades-La Goulette Bridge Construction Project	The number of respiratory disease patients was fixed as an indicator but data could not be obtained through the Project website.	
	7	Stable electricity leads to more studying time for children, more household consumer electronics and less household chore burden for women and children	No literature identified		Georgia Power Rehabilitation Project	The Project ensured that electricity was available at night, enabling more study time at home for children and with more women purchasing household electronics, to be alleviated of household chores. The women then used their free time to generate income and contribute to the household budget (a tertiary effect).	

	8	Road construction activates socioeconomic life, corrects regional disparities and expands market	No literature identified		Tajikistan The Project for the Rehabilitation of Kurgan Tyube - Dusti Road (Phase I and II)	The Project enabled a smooth road transport, reducing transport costs and activating truck logistics, which then helped distribute goods to target area shops. The increased variety and volume of goods may be a result of the project.	
	9	Road renovation leads to improved access to health facilities, better antenatal and postnatal care, facility deliveries all contribute in reducing maternal mortality and infant mortalities	No literature identified		Tajikistan The Project for the Rehabilitation of Kurgan Tyube - Dusti Road (Phase I and II)	The maternal mortality rate for the 2 districts, fell from 35 per 100,000 to 10 per 100,000 two years after the project in 2015. Infant mortality rate fell under the national average in 2014, one year after the Project and continues to fall. There is also the possibility that the travel time to antenatal and postnatal care was reduced as a result of the Project.	
Regional roads (rural roads[2]) Urban and rural power/ energy	1	Electrification improves health sanitation services	Gonzalez-Eiras et al. 2007	1	Ghana The Project for Rural Electrification	The Project enabled the introduction of electricity and related medical equipment including a refrigerator for medicines and vaccines. Night consultations and vaccine campaigns also became possible, which were particularly welcomed by the local residents. The clinic staff themselves mentioned that the vaccines were better managed, and that with electrification they were able to purchase a fan and a TV, improving the waiting room environment. On the other hand, a reduction of kerosene lamp smoke was thought to contribute to better health, but beneficiaries mostly did not realize the smoke reduction effect, probably because they were not particularly aware of the kerosene lamp smoke damage risks in the first place.	
	2	Privatization of power companies leads to less low-birth weight babies as a result of less food poisoning and a reduction in under 5 mortality rate.	Gonzalez-Eiras et al., 2007	2	No project identified		
	3 n	There is no association between road pavement, parasite infection disease occurrence and dengue fever reduction	Gonzalez-Navarro and Quintana-Domeque, 2010 Turley et al., 2013	3	No project identified		
	4	There is a high association between distance from main urban	Miyake et al., 2002 Miyake et al., 2010	4	No project identified		

[2]According to van de Walle, 2009 road projects attract investment. Changes in expenditures, has an important meaning when thinking about data and impact measurement. The benefits of a rural road are from the fact that geographical, community and household characteristics interact. The location of the road, is typically based on these characteristics.

		roads and various disease morbidity	Samra, 2013				
	5	There is an association between pregnant woman's residency near a highway in the third trimester and autism (no association between residency at birth and the highway)	Volk et al., 2011	5	No project identified		
community level	1	Social infrastructure investment (electricity, water, sanitation, irrigation and education) improves access and a better lifestyle (healthy lifestyle)	Habibov, 2008 van de Walle, 2009 Feikin, 2009 BenYisha, 2011 Arthur, 2012	1	No project identified		Spearman correlation analysis done with Lao Census 2015 data
	2p	Emergency transport for pregnant and postpartum women, emergency obstetric care reduces the maternal mortality rate	Manandhar, 2004 Bhutta et al., 2008 Azad et al.,2010 Goldie et al., 2010	2	No project identified No project identified		
	2n	There is no association between maternal mortality rate reduction and emergency transport for pregnant and postpartum women, and emergency obstetric care	Maine et al., 1996 Ronsmans et al., 1997				
	3	Road construction (pavement) promotes the access to and use of antenatal care	Mistry et al., 2009	3	Tajikistan The Project for the Rehabilitation of Kurgan Tyube - Dusti Road (Phase I and II)	The Project could have contributed in reduced travel time to antenatal and postnatal care.	
					Nepal The Project for Construction of Sindhuli Road Section II & III	According to a beneficiary study, if one used the Sindhuli Road, there was a reduction in travel time to the health center for antenatal and postnatal care. The hospital which receives emergency patients saw a large increase in patients after the road was constructed, leading to the possibility that the road might have contributed to improving maternal and child health.	
	4	There is no association between road pavement and parasite infection and morbidity	Turley et al., 2013	4	No project identified		
	5	Community participation (community transport and referral system) promotes the use of preventive health care (such as	Wang et al.,1997 Broegaard et al., 2011 Olayo et al., 2014 Josyula et al., 2015	5	No project identified		

		antenatal care, facility delivery, water treatment, use of toilets, insecticide-treated bednet use and vaccination)				
	6p	Positive association between distance and infant mortality rate	Becher et al., 2004	6	No project identified	
	6n	Inverse relationship between distance to capital and infant mortality rate	Foley and Vongsak, 1991			
	7	Relationship between distance to the hospital and hospitalization rate	Moisi et al, 2011	7	No project identified	
Household level	1	Health due to water sanitation and electrification, as well as promotion of facility delivery	Mfenyana, 2006 Osrin et al., 2011	1	No project identified	
	2	Health service use is promoted through lower transportation costs	Ansari et al., 2004	2	No project identified	
	3	Distance from health facility has an effect on maternal mortality rate, neonatal mortality rate, infant mortality rate and child survival	(positive) Van den Broeck, 1996 Le Bacq and Rietsema, 1997 Becher et al., 2004 Baird et al., 2011 Essendi et al., 2011 Kashima et al., 2012 McKinnon et al., 2014 (negative) Sartorius et al., 2010 De Muylder, 1990 Bell et al., 2008 Ombok et al., 2010 Frolich et al., 2014	3	No project identified	
	4	Socioeconomic status, distance from health facility is associated with antenatal care, revisits, facility delivery and Caesarian section operation rate	(positive) Hounton et al., 2008 Kesterton, 2010 Jacobs et al., 2012 Sychareun, 2013 Rossier, 2014 Fagbamigbe and Idemudia, 2015 Johnson et al., 2015 Karim, 2015 Mkandawire, 2015	4	No project identified	

			Shaw et al., 2015 Nguyen, 2016 (negative) Prudhomme, 2013				
	5	Socioeconomic status, distance to health facility and river is associated with malaria infection	Custodio, 2009 Magahlhaes et al., 2012	5	No project identified		
	6	Predicting factors of neonatal checkup and follow-up participation	Paterson, 2004	6	No project identified		
	7	Proportional relationship between wealth status and child growth (height, weight)	Mohsena et al., 2010 Sychareun, 2013 Shaw et al., 2015	7	No project identified		
	8 n	No association between socioeconomic status, distance to health facility and access time	Moisi et al., 2010 Sartorius, 2011 O'Meara et al., 2014 Okwaraji et al., 2015	8	No project identified		
	9	Socioeconomic status and distance from health facility, predicts unhealthy and unvaccinated child. Proportional relationship	Font et al, 2002 Ndiritu et al., 2006 Muula et al., 2009 Ndirangu, 2009 Danis et al., 2010	9	No project identified		
	1 0	Association between household geographical situation and disease	Ombok et al., 2010	1 0	No project identified		
	1 1	Child health improves (increased birthweight, reduction in respiratory diseases)as biomass fuel use is reduced as a result of electrification	Baker et al., 2006 Sreeramareddy et al., 2011	1 1	No project identified		
	1 2	Maternal health improves (reduction of anemia) as biomass fuel use is reduced as a result of electrification	Page et al., 2015	1 2	No project identified		
	1 3	No health risk from transmission lines electromagnetic waves	No literature identified	1 3	Paraguay Electricity Transmission and Distribution Project	In order to address the concerns of an opposition movement on the health risks of electromagnetic waves, experts from WHO and AMRO/PAHO were invited to an international conference organized by the Project. As a result of this conference, the Environmental Agency created the Electromagnetic Protection Standard in 2007 and started conducting Environment Impact Assessments.	

Individual level (knowledge, belief, feeling) Behavior change	1	Distance from childbirth delivery facility does not influence behavior	Parkhurst and Sengooba, 2009	1	No project identified		
	2	Distance from health facility influences vaccination behavior	Danis et al., 2010	2	No project identified		
	3	Trigger for behavior change with information from radio and TV	No literature identified	3	China Broadcasting Project	Weather forecasts, travel information, market information, business law, real estate law, civil law), crime prevention, food safety, health information and government information were some examples of information which people acquired through TV and radio. Such information was helpful in solving familial and community problems, and had other positive effects according to a beneficiary survey.	
					Uganda The Project for Improvement of the Medium Wave Radio Broadcasting Network	According to the Ministry of Health, the Uganda Broadcasting Corporation promotes health and medical programs, with the medium wave radio playing a role in raising the national knowledge level on medicine and health. It is an important tool in communicating to the people, details of medical and health campaigns. The medium wave radio can play a particularly important role with its wide coverage when sudden outbreaks (such as Ebola hemorrhagic fever and Marburg fever) which are frequent in the country, to inform the population on the outbreak position and patient information, as well as medical team response. In addition, there were comments on the fact that the Project enabled efficient and reliable information dissemination on family planning, regional medical centers, vaccination and the mother and child program.	
	4	If transportation costs are perceived to be expensive, there is no health service demand	Sychareun, 2013		No project identified		
Other (combination of various levels of interventions)	1	Multisectoral intervention (agriculture related MDG, environment, business development, education, infrastructure, health etc) leads to IMR reduction	Pronyk, et al., 2012	1	No project identified		
	2	Universal health coverage and comprehensive PHC system building through a multisectoral	Martins, 2014	2	No project identified		

		approach realizes continuum of care					
	3	Health facilities are constructed as part of a regional promotion policy	No literature identified	3	Uzbekistan Tashguzar-Kumkurgan New Railway Construction Project	A new railway station and related facilities, stores and factories were constructed for the newly employed residents. In addition, education ,health and sports facilities were constructed. Health- in addition to the economic impact, access to health facilities improved. Education- a secondary school building was constructed with 216 students studying at the school at the time of the evaluation. The new school was built in the middle of 4 villages which shortened school commuting time.	
	4	Women's and community groups conduct health prevention activities	No literature identified	4	Sri Lanka Tsunami Affected Area Recovery and Takeoff Project	According to the counterparts, women's group activities had an impact on household sanitation improvement through increased sanitary health consciousness, increased consciousness on nutrition, utilization of government provided health services (vaccination) and the improving the woman's status within the household.	
					Philippines Local Governance and Rural Empowerment Project for Davao Region	Knowledge and techniques on small-scale water supply acquired through the Project are being applied to the fishing union, cooperatives and health related activities.	
					Cambodia Capacity Development of Provincial Rural Development in Northeastern Provinces	The pilot project improved transportation, health and sanitation for the residents of 2 provinces. In Ratanakiri Province Veun Sai District, in order to prevent cholera and diarrhea, common wells were constructed with accompanying health sensitization as pilot activities, which led to community-based maintenance activities including rota cleaning.	
	5	Project improved individual income and people were able to invest in health and education	No literature identified	5	Indonesia Small Scale Irrigation Management Project Indonesia Project Type Sector Loan for Water Resources Development (2)	69.9% or 167 beneficiaries surveyed replied that health and sanitation improved and 68.6% or 164 persons replied that enrollment in school improved as a result of the Project. The Project enabled the community to earn income which is thought to have contributed to medical and school expenses.	
					Indonesia Small	Health and education environments were,	

					Scale Irrigation Management Project	improved, according to a beneficiary survey. 62.3% and 58.2% of beneficiaries said that the health sanitation and education environment respectively improved as a result of the Project intervention. It helped open up their childrens' education opportunities, and a better income as a result of the Project enabled parents to buy medicines, pay for transportation to health care and pay for school expenses.	
	6	Zoonotic Infection Prevention based on One Health concept[3]	No literature identified	6	Indonesia The Project for Improvement of Animal Health Laboratories for Diagnoses of Avian Influenza and Other Major Diseases of Animals	An example of agriculture and health partnership to prevent outbreaks of avian influenza under a national strategy against avian influenza in Indonesia.	
	7	Rural roads and rural bridge construction as part of a multisectoral approach improves access to health facilities	ADB,2010	7	Philippines Mindanao Sustainable Settlement Area Development Project	Sanitary and education facilities as well as access to social infrastructure was improved through the Project. The Project mainly supported market roads and bridges in order to reduce produce transport time and cost, improve market access and farmer income. As farmer incomes grew, their livelihoods improved, regional economies were activated.	
	8	Health and sanitation improvement and satisfaction felt by beneficiaries	No literature identified	8	Philippines Agno River Flood Control Project (Phase 2 & 2B)	The beneficiary survey found that for all aspects related to the living environment, safety during floods, health and sanitation, over 95% of beneficiaries thought "there was a great or average improvement" as a result of the Project.	
					Philippines The Laoag River Basin Flood Control and Sabo Project	Over 90% of beneficiaries replied that all aspects related to the living environment, safety during floods, health and sanitation, greatly (or simply) improved as a result of the Project.	
					Philippines Plantation Development Project	Data on 9 indicators for education, health, water supply and sanitation was collected from the Census and Statistical offices etc to analyze trends and validity. However, it was extremely difficult to quantitatively analyze causal effect of most indicators.	

[3]One Health is based on the concept that in order for human, animal and environmental health to be maintained, all the elements are necessary and that there must be a close partnership between stakeholders to maintain and promote health

	9	Electrification with radio & TV facilitates health information and enables children to study at night	No literature identified	9	Vietnam Rural Infrastructure Development and Living Standard Improvement	Residents who benefited from electrification of their houses or shops, used various electronic appliances from TV to mobile phones. 98% of residents responded that their living standards had improved. More specifically, this meant that they were able to obtain information on health, that agriculture and commerce income grew, facilitation of communication with the mobile phone, the agriculture labor burden was lessened and that children's study environment improved.	

【Water and Sanitation】

		Previous studies (literature review I)			JICA project report (Literature review II & III)		Field Survey
Type		**Mother and child health (MCH) evidence**	**Main source(s)[4]**		**Interventions**	**Type**	
Central level or urban water and sanitation	1a	Reduction of U5MR[5], IMR[6], MMR[7] Reduction of neonatal mortality rate, IMR	Cheng et al., 2012, Pinzon-Flores et al., 2015 Gamper-Rabindran et al, 2010, Galiani et al., 2005, Goncalves, 2014	1	No project identified		The Project for the Vientiane Water Supply Development The Project for Rehabilitation of Water Supply Facilities in Savannakhet Area No data was available for the MCH indicators mentioned on the far left column.
	1b	Reduction of U5MR attributable to infectious disease Reduction of U5MR	Granados and Sanchez, 2013				
	2	Reduction of diarrhea prevalence rate of and reduction of child mortality risk Reduction of diarrhea, trachoma, ascariasis, schistosomiasis prevalence rates	Gunther et al., 2010 Esrey, et al., 1991	2a	17 projects (either grant aid or yen loan) targeting construction or rehabilitation of water and/or sanitation facilities (15 projects reported a reduction of water-borne diseases, while four projects concluded that the relationship between the Project and reduced rate of water-borne diseases was unclear	▪Reduction of water fetching time (17 Projects) ▪Reduction of diarrhea and/or water-borne diseases (15 Projects)	"The Project for the Vientiane Water Supply Development" « The Project for Rehabilitation of Water Supply Facilities in Savannakhet Area" No data was available for the MCH indicators mentioned on the far left column
				2b	Tanzania The Project for Zanzibar Urban Water Supply Development I & II (Grant: 2006-2010), and other three similar Projects	Comparing control and target areas, no association was found between the Project and water-borne diseases (4 Projects)	

[4] Authors and year in Bold font indicate a systematic review or meta-analysis
[5] Under 5 years mortality rate
[6] Infant mortality rate
[7] Maternal mortality rate

	3	Reduction of prevalence rate of diarrhea, trachoma, ascariasis, schistosomiasis, as a result of the improvement of water and sanitation	Esrey, et al., 1991	3a	Sri Lanka Greater Colombo Flood Control and Environment Improvement Project II & III (Loan: 1994-2005)	No quantitative data was available regarding prevalence of diseases caused by flooding, hence no statistical analysis was done. In terms of prevalence of dengue fever, which prevalence rate is relatively high among residents living alongside the drainage, no significant reduction was confirmed in terms of numbers of admitted dengue fever patients before and after the Project.	No project identified
				3b	Indonesia Semarang Power Plant Rehabilitation and Gasification Project (Loan: 2008-2016)	According to an interview with beneficiaries, there were mosquito lava found in the drainage because the water level in Semarang river was too high even during dry season, and that children were prone to illness before the Project. It was reported that after the Project no water remained in the drainage and mosquitos were reduced, and the illness was also reduced[8]	No project identified
	4	Improvement of water and sanitation affects nutrition and prevention of anemia	Chase and Ngure, 2016	4	No project identified		No project identified
	5	Improvement of sanitation shows more results than improvement of water for child health (such as mortality rate, growth, prevalence rate etc.)	Esrey et al., 1991	5	No project identified		No project identified
	6	No literature identified		6a	Pakistan Karachi Water Supply Improvement Project (Loan: 1994-2006)	A clear impact could not be deduced from the beneficiary survey. Since the Project did not cover the distribution network, it is not realistic to expect water quality improvement at the point of use or livelihood standard improvement.	No project identified

[8] From unpublished document by JICA expert

				6b	China Yichang Environmental Improvement Project(Loan: 2003-2010)	There is no clear association between the Project and the improvement of health conditions of the local people.	
Community level	1	Reduction of IMR or U5MR	Instituto Apoyo, 2000, Newman et al, 2002, Brainerd and Menon, 2012	1	No project identified		No project identified
	2	Reduction of diarrhea through improvement of water project	Instituto Apoyo, 2000	2a	6 projects (either grant aid or yen loan) targeting construction or rehabilitation of water and/or sanitation facilities	▪Reduction of water fetching time and the effective use of time saved as a result (5 Projects) ▪Reduction of diarrhea and/or water-borne diseases (5 Projects)	Indonesia "Improvement of District Health Management Capacity in South Sulawesi Province Project (PRIMA-K)" In one of the target communities in Barru District, South Sulawesi Province, dissemination of community-led total sanitation (CLTS) contributed to a reduction of water-borne diseases in 3 out of 4 villages.
				2b	Myanmar The Project on Rural Water Supply Technology in the Central Dry Zone(TC: 2006-2009)	▪Reduction of water fetching time ▪Reduction of diarrheal, dysentery, and/or dermatological diseases	
	3	Reduction of diarrhea prevalence rate of diarrhea, positive impact on growth by improvement of sanitation	Esrey, 1996	3	Ethiopia The Project for Water Supply in Southern Nations, Nationalities and Peoples' Regional State (Grant: 2005-2008)	▪Almost 50% of beneficiaries responded that IMR and U5MR was reduced (qualitative research method,)	No project identified
	4n	Sanitation intervention did not affect child growth (height and weight)	Guzman 1968 (quoted in Dangour et al., 2013)	4	No project identified		No project identified
	5n	Water and sanitation interventions did not affect the rate of underweight children	Schlesinger 1983 (quoted in Dangour et al., 2013)	5	No project identified		No project identified
	6	Improved water quality reduced arsenic poisoning	No literature identified	6	Bangladesh Project for Sustainable Arsenic Mitigation under the Integrated Local Government System in Jassore (TC: 2005-2008)	Improvement of water quality reduced the increase rate of arsenic poisoning (expected results within PDM)	No project identified
Household level intervention	1	Intervention of POU (point of use) is widely effective for prevention of diarrheal disease	Clasen et al., 2015	1	No project identified		No project identified

	2	Water treatment at household level (such as boiling) and the improvement of POU reduced cholera, but did not affect the diarrhea prevalence rate	Gundry et al., 2004	2	Mozambique The Project for Sustainable Water Supply, Sanitation and Hygiene Promotion in Zambezia Province (TC: 2007-2011)	Water-borne diseases declined in all but one district. The district where there was a rise in diarrhea cases, was the district where the ratio of households which conduct handwashing was highest.	No project identified
	3	Improvement of water quality (including solar disinfection) and provision of soap contributed to improving weight-for-age and height-for-age） of under 5 year old girls. However, the same intervention did not have a significant influence for under 5 year old boys	Dangour et al., 2013	3	No project identified		No project identified
	4	Toilet promotion did not translate into better MCH outcomes	No literature identified	4	Ethiopia The Water Sector Capacity Development Project in Southern Nations, Nationalities and People's Region (TC: 2007-2011)	Toilets increased from 76,5% (2008) to 93.6% (2011)（Tentative findings from impact review conducted by the Project） however, no further discussion regarding the impact of increased toilet on MCH	No project identified
	5	Promotion of hand hygiene did not significantly affect child growth	Langford, 2011, Luby, 2004 (quoted in Dangour et al., 2013)	5	No project identified		No project identified
	6	Improvement of water quality (through use of coagulants, chlorination or soap and coagulants) did not significantly affect child growth	Luby, 2006	6	No project identified		No project identified
	7	Handwashing and chlorination behavioral change occurred but an association with diarrheal reduction was not analyzed	No literature identified	7	Peru The Project for Institutional Reinforcement of Water Supply and Sanitation in North Area of Peru (TC: 2009-2013)	▪Residents acquired knowledge on and the custom to wash hand s and chlorinate water ▪Although target sites reported a reduction in diarrhea, it was not possible to prove that this was attributable to the Project	Integrated Plan for Junior Secondary Education Improvement in South Sulawesi Province in the Republic of Indonesia（PRIMA-P） shows the example of hygiene education implemented in close collaboration between school and the local community.
Awareness raising	1	Hygiene promotion lead to reduction of under-weight babies under 24 months	Ahmed et al., 1993	1	No project identified		No project identified

（especially hand hygiene）	2	Hygiene intervention (hand washing with soap) lead to the reduction of risk of diarrheal disease	Oloruntoba et al., 2014	2a	Ethiopia The Water Sector Capacity Development Project in Southern Nations, Nationalities and People's Region (TC: 2007-2011)	As a result of the awareness raising and the intervention by the Project, handwashing became common even in rural areas, where handwashing was not common before the Project.	No project identified
				2b	Bolivia Project for improvement of potable water system in south east zone of Cochabamba city (Proyecto de Mejoramiento del Sistema de Agua Potable en la Zona Sudeste de la Ciudad de Cochabamba) (Grant: 2009-2012)	Community meetings were held to sensitize the residents on how to save water, the importance of sanitary management, how to have a sanitary environment with minimal water, before water distribution commenced.The majority of beneficiaries replied that sanitary environment improved as a result of the Project.	No project identified
	3	Unsanitary living environment may cause environmental enteric disorder (EED)）(hypothesis)	Prendergast, 2015 Chase and Ngure, 2016	3	No project identified		No project identified
	4	Behavioral change (hand washing) was observed but no evidence that led to better MCH	No literature identified	4	Rwanda "Project on Improvement of Water Supply and Sanitation in the Southern Part of the Eastern Province"(TC: 2007-2010）, and two other projects	Improved hand washing behavior was observed, however no further analysis as to whether this behavioral change influenced MCH (in addition, one of the Project reports mentioned nothing about the behavioral change in sanitation)	No project identified
Others (combination of various interventions)	1a	Improved water quantity, sanitation and hand hygiene largely contributed to the improvement of height-for-age z score	Fenn et al., 2012	1	No project identified		No project identified
	1b	Baby-WASH interventions (improvement of water and sanitation, handwashing with soap, food hygiene) prevented stunting	Mbuya and Humphrey, 2015				
	1c	Improvement of sanitation, quality and quantity of water, and promotion of hand hygiene did not affect child growth (average weight, average height, height for age z scores)	Hasan, 1989 (quoted in Dangour et al., 2013)				
	2a	11 variables including water and sanitation reduced IMR	Terra de Aouza A. C., et al, 1999	2	No project identified		No project identified

	2b	Multi-sectoral interventions (agriculture, environment, business development, education infrastructure, health) reduced IMR	Pronyk, et al., 2012				
	3	Several factors such as low maternal education, lack of toilets, adequate disposal of child feces, household with more than two under 5 children, age of children etc. were identified as risk factors for child diarrhea	Sinmegn MT, 2014	3	No project identified		No project identified
	4		No literature identified	4a	Vietnam Small-scale ProPoor Infrastructure Development Project II, combination of various sectors such as water and sanitation, road and electricity, and two other projects	▪ Increased water quantity contributed to the reduction of dermatosis and ophthalmopathy (qualitative information) ▪	Indonesia Rural Settlement Infrastructure and Kabupaten Strategic Area shows that the improvement of water services contributed to the reduction of water fetching time of children, increasing educational opportunities for children who were in charge of water fetching.

【Education】

		Previous studies (literature review I)			JICA project report (Literature review II & III)		Field Survey
Type		**Mother and child health (MCH) evidence**	**Main source(s)[9]**		**Interventions**	**Type**	
Pre-school education	1	〈Effects on pre-school children〉 ▪ Health condition improved especially motor function and social behavior. Problem-solving ability and cognitive ability also improved. ▪ Reduction of diarrhea and skin disease problem thorough hand washing activities ▪ Distribution of anthelmintic and iron supplementation increase the 4-6-year-olds of body weight and reduce the severe anemia. ▪ No nutrition improvement observed when there's no nutrition components in pre-school.	Martinez et al., 2013 Cheng et al., 2012 Bobonis et al., 2002 UNESCO, 2014 **Leroya et al.,2012**	1	Niger "Support to the improvement of school management through Community Participation in Niger (School for all) Phase 2" (TC:2007-2012) (Management and dissemination of community kindergarten through the school management committee)	▪Community based pre-school promoted girls' enrollment in primary education ▪ In the region where school management committees were successfully established, residents voluntarily established and managed community based pre-schools.	No project identified
	2	〈Effects on mothers and families〉 ▪ Distribution of nutritional supplements to the mother and child improve the children's body age height ratio. ▪ The possibility of enrollment of siblings is high, participation of parents is increased and their perspectives on child bearing are transformed. Also employment rate of parents is promoted.	**Tanner et al., 2015** Martinez et al.,2013		No project identified	No project identified	No project identified
Primary and secondary education	1	<Girls' education1> Education for future mothers reduce the under-five child mortality rate. ▪ An extra year of girls'education reduces infant mortality by 5 to 10 percent. ▪ The survival rate drastically improved in South Asia for	Schultz, 1993 Caldwell, 1979 Gakidou & Emmanuela, 2010 Monden et al.,2012 Burchi, 2012 Chou,2007 Somanathan, 2008 Breieova et al., 2004	1	9 projects (either grant aid or yen loan) concerned with construction or rehabilitation of primary schools 8 projects (either grant aid or yen loan) for construction or rehabilitation of secondary schools	▪ Improvement of primary and secondary education enrollment rate affect the health of future mothers and children ▪ Improvement of primary completion rate and transition rate to secondary affect the	Confirmed increase in female enrolment and completion rate in target district from EMIS data Regression analysis with DHS▪ LSIS indicated there is statistically significant relationship between

[9] Authors and year in Bold font indicate a systematic review or meta-analysis

		girls who have educated mothers. ▪ An increase in educated women contributed in reducing by 51% (of the total 8.2M) under-five child mortality between 1970-2009. ▪ Universal primary education for girls would reduce child mortality by 15 % and universal secondary education would reduce child mortality by 49 %.	Bhalotra et al., 2013 UNESCO, 2014、Gene 2016 Monden & Smits, 2012 Hill et al., 1995		12 school based management projects (TC) targeting increase in access to education	health of future mothers and children	mother's education and child survival, CCI, and CoC
	2	< Girls' education 2> Increased Women's Education Lowers Maternal Mortality ▪ Universal primary education for girls would reduce MMR by 70%. ▪ Women with six or fewer years of schooling had 2 to 2.7 times the risk of dying during child-birth than women with twelve years of education.	Karlsen、2011 Jayachandran et al., 2008 Gene 2016, UNESCO, 2014	2	Same as above	Same as above	Regression analysis with DHS▪ LSIS indicated there is a statistically significant relationship between mother's education and CCI and CoC
	3	< Girls 'education 3> Better-educated mothers are more concerned about prevention of diseases, and as a result, have healthier children. ▪If all women completed primary school, the number of children receiving an DPT3 would increase 10 percent, and it would increase 43 percent if all girls completed secondary school. ▪ An extra year of mothers' education reduce under5 mortality rate of pneumonia by 14% ▪ If all women in developing country completed primary education, the under 5 mortality rate caused by diarrhea would reduce 8%, and it would reduce 30% if completed secondary school.	Desai et al.,1998 Burchi, 2012 Gene 2016, UNESCO, 2014 Derek, 2013 Agnes et al.,2010	3	17 projects (either grant aid or yen loan) targeting for construction of primary/secondary schools and sanitation facilities	▪ Toilets and improved school health environment by the water supply and drainage facilities installed. ▪ Conducted basic hygiene training, including facilities and toilet maintenance through the"soft-component (of hard infrastructure)". As a result, morbidity was reduced.(Ethiopia) ▪ Implementation of health education using the school supported by community. (Vietnam) ▪ Hand-washing habits of students improved(Mongolia) School became clean and hygienic (Nicaragua) ▪ 61% of parents answered "reduction of water-borne diseases,", 60% answered	No project identified

		▪ An extra year of mother's education increase height and weight for age of their children				"improvement of hygiene" (Burkina Faso)	
	4	< Girls' education 4> Education for future mothers reduce rates of HIV/AIDS and Malaria ▪Secondary education completion helps to reduce HIV/AIDS infection rates ▪The odds of children carrying malaria parasites is 22 percent lower if their mothers have a primary education and 36 percent lower if their mothers have a secondary education, compared with women who have no education.	Aslan et al., 2013 Fullman et al., 2003 Gene 2016, UNESCO, 2014	4	Mozambique "The Project for Construction of Secondary Schools"(Grant:2009-2012)	▪ According to an interview with the school director, teenage pregnancies have decreased	Confirmed increase in female enrolment and completion rate in target district from EMIS data
	5	<Reproductive Health > Adolescent health education for reproductive age affect early marriage, early childbearing, birth rate and sustainable family planning. ▪ An extra year of girls' education reduce birth rate of 0.26 point. ▪ An extra year of girls' education reduce early childbearing by 10%.	Breieova et al., 2004 Osill et al., 2007 Ferre, 2009 UNESCO, 2014	5	Indonesia "Integrated Plan for Junior Secondary Education Improvement in South Sulawesi Province"(TC: 2007ー2010)	▪"The number of health education activities registered" is set in the PDM performance indicators. Health education activities increased through the project. (Indonesia)	According to teachers, adolescent education and physical education are not actively implemented in schools. The data of Lao LSIS indicated that 40% of 15-19-year-old teenage mothers have no education.
	6	<School health > School health education, such as hand-washing and hygiene knowledge is to improve health condition and infection prevention of students ▪Hand washing activities in school decrease the incidence of diarrhea in 1/3. ▪Distribution of anthelmintic agent in primary school is effective in improving attendance and the health status of students ▪improvements in hand hygiene resulted in reductions in gastrointestinal illness of 31% and reductions in respiratory illness of 21%	**Nwadiaro et al., 2005** Miguel & Kremer, 2004 Anjali, 2014	6	Nepal "The Project for Support for Improvement of School Management"(TC: 2008-2011) Nepal "School Health and Nutrition Project" (TC:2008-2012) Niger "Support to the improvement of school management through Community Participation in Niger (School for all) Phase 2"(TC:2007-2012) Laos "Supporting Community Initiatives for Primary Education Development in the Southern Provinces"(TC:2007-2011)	▪ Collaboration of education and health project. ▪In the school project, health improvement such as a decrease in parasite prevalence was observed. ▪An increase in schools carrying out daily school cleaning, the percentage of school-aged children with clean nails increased. ▪Toilet construction, health and hygiene environment improvement (school cleaning, drinking water supply, such as medicine cabinet installation)	School health is mainly handwashing and cleaning, hygiene education. Contrary to the top-down school health policy, bottom-up school and community led activities based on health needs from the community were not realized Some stakeholders mentioned the lack of community understanding towards school health. Interviews with students found that the content of health education was discussed between students and their families.

					Yemen “Broadening Regional Initiative for Developing Girls' Education Program (BRIDGE)” (TC：2006-2008)	were realized under school activity plan. (Niger , Laos) ▪ The living environment improved through school cleaning activities. Parents gain knowledge of public health through students. (Ripple effect on the household level) (Yemen)	
	7	<School Health > School based mental health program contributed to improving health knowledge and attitudes of students, parents, friends, and residents.	Rahmana et al., 1998	7	Indonesia ”Program for Enhancing Quality of Junior Secondary Education”(TC：2009-2013)	▪ Implement health and mental care program at the time of Aceh earthquake disaster. Student health conditions are tracked through trauma counseling and health checkups.	No project identified
	8	<School feeding > ▪ School meals is effective in weight gain and improved nutrition of students. ▪ No impact on growth and nutrition of students ▪ Results for weight and height were mixed.	Buttenheim et al.,2011 **Kristjansson et al., 2006** Singh, 2008 **Greenhalgh et al., 2007** Kitchen et al. 2010		Laos ”Supporting Community Initiatives for Primary Education Development in the Southern Provinces”(TC：2007-2011)	▪ School feeding was implemented as part of school activities.	No project identified
Non-formal education and training	1	<Literacy> Literate mothers would increase access to health services, infection prevention, and improve the health of children ▪ A literate mother is 23 percent more likely to have a skilled attendant present during birth, which significantly increases the chances of a child survival. ▪ The greater the difference between the men and women of the literacy rate, HIV infection rate become high.	Clasen et al., 2015 Mead, 1998 UNIGME, 2014 Le Vine et al., 2009	1	Pakistan “Pakistan The Punjab Literacy promotion project , phase2” (TC：2007-2010) 「Non-Formal Education Promotion Project」(TC：2011-14) Mexico “The project for improvement of life of women in Marginalized communities in urban zone of Chiapas state” (TC：2005-2008)	▪ Collaboration among non-formal education, formal education, health, the multi-sector agencies, such as community development cooperation. An increase in awareness for education became a call to action for water and sanitation, health, welfare, and public administration. ▪ Literacy classes and skills training were implemented as part of a capacity development program for women. Training related to health and nutrition, etc., have contributed to the attainment of life skills.	No project identified

	2	<Skills development[10]> Increase in household income would improve the nutritional status of mother and child	Thomas et al., 1990 Sridhar , 2008	2	Southern Sudan "Project for Improvement of Basic Skills and Vocational Training Phase 2"（TC：2010-2013）and other three basic skills and vocational training projects	▪Follow up survey for trainees confirmed that employment led to the improvement of livelihoods. 88% of graduates mentioned a better diet, and 80% responded that they had better medical care	No project identified
	3	Awareness activities affect the health behavior of the women and residents Implementation of regular health meetings had an influence on under 5 mortality rate, antenatal and post-natal care, skilled attendant birth, and hygienic care	Manadhar et al., 2004 Tripathy et al., 2010	3	Mexico "The project for improvement of life of women in Marginalized communities in urban zone of Chiapas state"（TC：2005-2008）	▪ Literacy classes and skills training are implemented as part of a capacity development program for women. Training related to health and nutrition, etc., have contributed to the attainment of life skills	Health department in Barru (Indonesia) indicated the lack of awareness programs for behavior change.

[10] Skill development is the process of training and acquiring top level techniques so that the individual or the group can exert these skills through economic activities.

Annex 2. List of interviewees and itinerary of field survey

Interviewees

1．Directorate General of Human Settlements, Ministry of Public Works

Mr. Hendarko Rudi Susanto, Head of PMU, Director for Human Settlement

Ms. Airyn Saputri Harahap, Head of Section Rural Settlements Region II, Directorate General of Human Settlement

Mr. Yudi, Director of RISE II Project

Mr. Andreas Budi Irawan, head of sub-projects

Mr. Kim Suk Rae, CMMC (Consultant for RISE II Project)

Mr. Nishikawa, Project Formulation Advisor, JICA Indonesia office

2．Site Visit: Pluit Pump Station (North Jakarta)

Mr. Joko, Coordinator of Pump Keepers, Pulit Pump Station

3．Directorate General of Water Resources, Ministry of Public Works and Housing

Ir. Heru Setiawan, Deputy Director for sub Directorate of cooperation

Ms. Ari Setyorini, Head section of bilateral cooperation

Mr. Danang Akhsanal Darojat, Staff of bilateral cooperation

4．BAPPEDA (Makassar)

Mr. Akira Okuyama, Regional Development Policy Advisor for Sulawesi Region

5．BAPEDDA + Dept. of Public Works, Jeneponto District (Jeneponto)

Ms. Ginawaty Palelengi, Head of Jeneponto District Advisor

Ms. Iswari, Secretary of Public Works (Jeneponto District Office)

Mr. Hawemansyah, Head of Social Economy Section (Bappeda)

Mr. Anang Budi Gunawan, Bappenas

Mr. Supranto Nadek, CSCCT RISE II

Mr. Subandi, CMMC

Mr. Baso Badulla, RISE II Project

6．Visit to the target community (Taroang、Arungkeke、Binamu), Jeneponto

1）Taroang sub-district maternal and child health post（Posyandu）

Muhammad Nasir –Head of Taroang Village

Ms. Yuki – Posyandu Staff (Nutrition)

Ms. Murni – Posyandu Staff (Midwife)

2） Arungkeke District Palaja village (water tower)

Mr. Sukri, Water facility coordinator

Ms. Sumiati, Community (user)

3） Drying floor in Arungkeke

Ms. Dg Caya, Seaweed Farmer

Ms. Sitti Saliha, Seaweed Farmer

4） Binamu sub-district（Sapanang village）

Mr. Rahman, Facilitator RISE Binamu District

5） Health post（Arungkeke village）

Ms. Suratmi Hartini, Midwife

Ms. Lindri Yuni Wijayanti, Midwife

Ms. Ridawati, Midwife

7. Ministry of Health, Barru District

Mr. Muhammad Sukri , coordinator of PRIMA-K in Barru

Mr. Andi P., Sanitatian, Head of sanitarian section in Ministry of Health Barru

Ms. Lina

Mr. Abdul Kadir, Contact person, also worked for PRIMA K in his sub-district

8. Barru District, health center（Puskesmas）

Ms. Wati, midwife（Bidan Desa）

9. Barru district junior secondary school (SMPN) 1 Barru

Mr. Lukman, Principal of the School

Mr. H. Abdullah Rahim, Coordinator of PRIMA-P in Barru District

Mr. Latuoakal, Facilitator PRIMA K, school advisor

Mr. Abdul Kadir, District Facilitator

10. Ministry of Health Office, Barru District

Mr. Andi Pananrang, Sanitarian head of coordinator Health Office Barru District

11. Palakka sub-district health center（Puskesmas）

Ms. Winda, Palakka health center, hygiene officer

Ms. Risnawati, nurse

Mr. Armin Arif, Palakka health center, hygiene officer (simple toilet)

12. Galun village（PRIMA-K project site village）

Mr. Muhammad Nasir, simple toilet enterpreneur

Ms. Halimah, Mr. Nasir's wife

13. ADB (water sector)

Ms. Helena Lawira、Water Sector Project Officer, Indonesia Resident Mission

14. JICA Indonesia Office

Mr. Mikiya Saito, JICA Indonesia office deputy representative

Mr. Iman Seno Adji, Program Officer, Water Resources and Disaster Management, JICA Indonesia Office

15. Nursing Project #1 Expert Interview

Ms. Ikuko Seki, Chief Advisor・Nursing Administration

Lao PDR

1. Health Advisor, JICA expert

Dr. Hiromi Obara, Ministry of Health Advisor（2016.3-）

Dr. Takayuki Shimizu, Chief Advisor, Improving Quality of Health Care Services Project（2016.4-）

2. JICA Lao office

Mr. Phouthaphone VORABOUTH, Infrastructure Specialist, JICA Laos Office

Mr. Toru Ogura, Project Formulation Advisor, JICA Laos Office

3. Vientiane Province Phonhong District DPWT

Mr. Vilat, Vientiane Public Works Head of Department

Mr.Korlakan, Vientiane Province Public Works Department

Mr.Suphaivan, Phonhone District Public Works Health of Office

4. Water Dept. of the Ministry of Public Works (MPWT)

Mr. Phomma Veoravanh, Director General, DWS, MPWT

Dr. Xaypaxa Liengsone, Director of Sanitation Division, Department of Water Supply, MPWT

Mr. Bounthavy Vilaysone, Deputy of Water Supply Division, DWS

5. KfW

Mr. Lorenz Gessner, KfW Office Director

Ms. Thavivanh Phanakhone, Project Coordinator

6. Site visit: Chinaimo Water Purification Plant

Mr. Sisamone Kongmany, Project Management Division(PM), Master of Science on Urban Environment Management (AIT), NAMPAPA NAKHONE LUANG

Mr. Khamfueng Manivanh, Acting Deputy of Director of Chinaimo water supply facility

Mr. Thongdee Bounyaluk, Deputy of Director of Chinaimo water supply facility

Mr. Poukao Insomphou, Project Management Division(PM), NAMPAPA NAKHONE LUANG

7. Ministry of Education (MOES), Dept. of Planning and Cooperation

Mr. Anoupheng Keovongsa, Director of Division, Department of Planning, Project Management Division, Ministry of Education and Sports (MOES)

Mr. Mixaykone Wannachith, Deputy Director General, Planning Department, MOES

Mr. Khampaseuth Thawmmavong, Technical Staff, Project Management Division, MOES

8. Sisattanark District Hospital

Dr. Buathong Sinarmbounhueng, Deputy of head office, Sisattanark District Hospital (SDH)

Dr. Phannouvong Phophansy, Head of Administration department, SDH

Dr. Noy Souliyaseng, Outpatient Department, SDH

Dr. Khampout Soulavong, Obstetrics and gynecology, SDH

9. Nam Napa Savannakhet (water company)

Mr. Phandola Khounemeuangchanh, Deputy Director, Savannakhet Water Supply State Owned Enterprize (Nam Pa Pa Savannakhet)

10. Dept. of Education, Savannakhet province, Provincial Education Service (PES)

Mr. Thavone Sixiengmay, Deputy Director, Savannekhet Proivince Education Service Department (PES)

Ms. Phonexay Xanavongxay, Deputy Head, Kaysone District Education Office

11. Samakki Primary School supported by CIED

Ms. Keoduangchay Keoduangthong, School Princple, Samakki Primary School

Ms. Vedsavanh Chouangmany, Deputy Principle, Samakki Primary School

12. Dept. of PublicWorks in Savannakhet province

Mr. Xayyasene, Ministry of Public Works Road Management chief clerk

13. Atsaphangthong District hospital

Ms. Soupharb Insisiengmay, Head of Public Health Office, Atsaphangthong District

Mr. Phousone Poubandon, Deputy Head of Public Health Office, Atsaphangthong District

14. Atsaphangthong sub-district Dong Hen village

Mr. SengPhed KhodVongKod, Head of Dong-Hen Villlage, Atsaphangthong District

15. Phine sub-district Vern-Hong-Kham village

Ms. Phouthong Xayyalard, Head of Vern-Hong-Kham Villlage, Phine District

Ms. Phouthong Khodsimeuang, Deputy Head of Vern-Hong-Kham Villlage, Phine District

16. Phine District hospital

Mr. Ounheuan Soutchaleurn, Head of Public Health Office, Phine District

17. Pakbo Sub station

Mr. Phoumy Phomviset, Head of Pakbo Sub-Station

Mr. Bounthao Keosisano, Head of Security Section, Pakbo Sub-Station

Field Survey Schedule

29 May (Sun)		11:45 Lv. Japan (GA875) 17:15 Ar. Jakarta 18:30～ JICA office visit (if necessary)	
30 May (Mon)	10:00 14:30 16:00	Survey and interview project ＃4 ● Directorate General of Human Settlements, Ministry of Public Works Site visit (#2): Pluit Pump Station (#2) Survey and interview project ＃2 ● Interview : Directorate General of Water Resources of Ministry of Public Works; *Waste Water Management , Public Works Department, Provincial Government of DKI Jakarta ⇒ canceled	2 nights Jakarta
31 May (Tues)	14:30	09:40 Lv. Jakarta, 13:10 Ar. Makassar (GA608) PM Survey and interview project ＃4 ● Meeting with JICA Expert (BAPPEDA)	3 nights in Makassar, Sulawesi
1 June (Wed)	6:30	Survey and interview project＃4 Day Trip to Jeneponto Province ● Interview: Related local authorities in Bone Province ● Visit to target communities of Project #4 (actual project sites such as community level road, bridge, or water & sanitation) ● FGD: local people from target communities in Bone	
2 June (Thurs)	7:00	Survey and interview project＃5 Day trip to Barru Province ● Interview: Related local authorities in target province (Barru Province) ● FGD: local people from target communities in Barru	
3 June (Fri)	 14:00 15:00	09:55 Lv. Makassar, 11:15 Ar. Jakarta (GA641) Interview with international partners ● Interview: ADB officers in charge of water, sanitation, transport and energy projects Survey and interview project ＃2 ● Interview : Staff in charge of the Project, JICA Laos Office ＊Waste Water Management , Public Works Department, Provincial Government of DKI Jakarta ⇒ canceled	2 nights Jakarta,
4 June (Sat)	10:00	Survey and interview project ＃1 ● Interview: JICA Experts (nursing competency project)	
5 June (Sun)		12:35 Lv. Jakarta via Bangkok (TG434) 20:45 Ar. Vientiane (TG574)	4 nights Vientiane
6 June (Mon)	9:00 10:30 15:30	Survey and Interview project #7 ● Interview: JICA experts (road improvement project) Survey and interview on project #6 ● Interview with JICA expert (Mr. Shimizu, Ms. Obara) Survey and Interview project #7 ● FGD: local people (beneficiaries) of the Project (Phonehong District, Vientiane Province)	

7 June (Tues)	9:00 11:00 11:00 14:00	Visit/interview project #9 ● Interview: Water Dept. of the Ministry of Public Works Visit/interview project #8 ● Interview: JICA experts (urban water environment) Interview with KfW Visit/interview project #9 ● Visit: Chinaimo Water Purification Plant (#9)	
8 June (Wed)	9:00 14:00	Visit/interview project #12 ● Interview: Ministry of Education (MOES) Dept. of Planning and Cooperation on project #12 Visit/interview project #9 ● Interview: Health facility in target area (Sisattanark District Hospital (SDH)	
9 June (Thurs)	6:30 15:00	AM Road travel to Savannakhet PM Survey and interview #10 ● Interview: Nam Napa Savannakhet (Water company in SVK) ● FGD: Local people (beneficiaries) of project #10	3 nights Savannakhet
10 June (Fri)	9:00 10:45 14:00	Visit/interview project #11 ● Interview: Dept. of Education of Savannakhet Province, Provincial Educational Service (PES) ● Interview: District level education authority, ● Visit school supported by CIED and interview with school director (#11) Visit/interview project #14 ● Dept. of Public Works in Savannakhet province	
11 June (Sat)	8:30	Visit/interview project #14 ● FGD: local people (beneficiaries) of project #14 ● Visit to health facilities alongside the rehabilitated road	
12 June (Sun)	7:30	Return to Vientiane (via road)	1 night Vientiane
13 June (Mon)	9:00 10:00 PM	Administrative process ● Payment to rental car company, etc. Meeting with local consultant for follow-up data etc. Report writing 20:00 Lv. Vientiane via Hanoi (VN920)	
14 June (Tue)		07:35 Ar. Tokyo/Narita Int'l (VN310)	

Annex 3：Results of field survey

Table 1. Roads, bridges and power sector field survey results

Scheme	Project	Cooperation Period	Field Survey results	Suggestions addressing issues	Intervention (input) sectors→ path to MCH outputs （Refer to Table 4-2）
Loan	Indonesia Rural Settlement Infrastructure and Kabupaten Strategic Area	2014-2015	・Site visit of a short farm road and interview with residents but could not confirm the effect on health. of the small-scale infrastructure project (farm road construction). (issues) ・Bridge construction is by nature far from accessible making it difficult to monitor and grasp the real situation ・If agricultural roads are short, the beneficiaries can be limited	partner with community organizations and establish a monitoring system with the to be able to better grasp the number of users, to count access to each social infrastructure being monitored, to understand how access has improved	Type 1-1 Road and bridge construction (rehabilitation) → Improvement in access to maternal and child health services (less costly transport)→Rise in antenatal and postnatal care rate → Identification of high-risk mothers→Increase in number of safe child births Type 1-4 Road and bridge construction (rehabilitation) → Economic activation →Increased disposable income → Increased investment in mother and child health (disease prevention), including transport to health centers, medicine and other expenses →Extension of health life expectancy
Tech. coop	Lao PDR Project for Improvement of the Road Management Capability	2011-2017	- As the rehabilitated distance was short, the effect of the short distance could not be separated from the overall effect. - rehabilitation ＝ reduction in traveling time, increase in economic activity could not be measured and is based on qualitative information (issues) - shortness of rehabilitated distance, difficulty in separating effects - non-existence of social service (such as health and education facilities) mapping by road management office	- decide tracer households, before project implementation, within and outside the 5 km radius of the road in order to measure access time before and after the project - measure only construction as rehabilitation effect can not be easily measured - integrate social infrastructure mapping within the project, discuss the map with community organizations to implement the project plan	Type 1-1 Road and bridge construction (rehabilitation) → Improvement in access to maternal and child health services (less costly transport)→Rise in antenatal and postnatal care rate → Identification of high-risk mothers→Increase in number of safe child births
Loan	Lao PDR Greater Mekong Power Network Development Project (Lao PDR)	2005-2011	-The power network development is in reality a supplement to an existing network. Stabilized electricity might have led to increased C-section operations. -Health information system made possible as a result of stable electricity	・Fix as process indicator,the penetration rate of household electrical appliances such as the refrigerator to assess the effect of a power sector intervention.	Type 1-5 Electricity stabilization through construction of efficient energy facilities →Household electrical appliances → Lower household chore

			-Unable to examine whether stable electricity supply led to more TVs and radios (issues) - Need to examine data collection and measurement methods to verify TV and radio installation - Need to work with officials who have access to the health information system in order to obtain number of C-section operations and to calculate the rate of difference. In addition, need to have access to the denominator population figure to calculate the rate.	・ Fix multiple process indicators to prove the association between intervention and outcome.	burden on females and female children → Protection of maternity
Grant	Lao PDR The Project for Improvement of National Road No. 9 as East-West Economic Corridor of the Mekong Region	2011	・ Perhaps due to the fact that access time to the hospital was reduced as a result of road rehabilitation, the frequency of outpatient visits increased, early cure became possible and the recovery time also was shortened. (from an interview with Atsaphangthong district hospital) ・ According to an interview with the Phine district hospital, vaccines and emergency transport of pregnant women were no longer a problem. ・ The quantitative effect of access improvement to the health center as a result of the road rehabilitation could not be examined. (issues) ・ Rehabilitation = reduction of transfer time, increase in economic activity could not be measured and is based on qualitative information ・ shortness of rehabilitated distance, difficulty in separating effects ・ National Road no. 9 seems to have contributed to the Special Economic Zone and increased distribution activity, however the data on health service use and access was not available	- decide tracer households, before project implementation, within and outside the 5 km radius of the road in order to measure access time before and after the project - measure only construction as rehabilitation effect can not be easily measured - integrate social infrastructure mapping within the project, discuss the map with community organizations to implement the project plan	Type 1-1 Road and bridge construction (rehabilitation) → Improvement in access to maternal and child health services (less costly transport) →Rise in antenatal and postnatal care rate → Identification of high-risk mothers →Increase in number of safe child births Type 1-2 Road and bridge construction (rehabilitation) →Reduction in mother and child emergency transfer time → An increase in facility deliveries →Increased safe child birth

Table 2. Water sanitation sector field survey results

Scheme	Project	Cooperation Period	Field Survey results	Suggestions addressing issues	Intervention (input) sectors→ path to MCH outputs （Refer to Table 4-2）
Grant	Indonesia- The Project for Urgent Reconstruction of East Pump Station of Pluit in Jakarta	2011-2014	・ The pump rehabilitation structure and function, seemed to have contributed to reducing flood damage but objective information on whether surrounding areas' hygenic environment and water-borne disease morbidity had changed, was not		Type 2-2 Improvement of water and sanitation environment → Reduction of water-borne infectious diseases (cholera, typhoid, hepatitis) → Reduction of morbidity, improvement in health,

			accessible		reduction of U5 mortality rate due to dehydration
Loan	Indonesia- Rural Settlement Infrastructure and Kabupaten Strategic Area	2014-2015	・ Resident decided small-scale water 住 related infrastructure led to increased education opportunities for children who had to fetch water previously. (issue) ・ The quantitative effect of the increase in educational opportunities from reduced water-fetching time could not be shown.	Monitoring which supplements qualitative information such as target area primary education completion rate and secondary education enrolment rate trends, data held by the local education office, is ideal. Interview from time to time, the education office and schools in the area, whether the water fetching time reduction has contributed to widening educational opportunities, as part of monitoring efforts.	Type 2-1 Improvements in water and sanitation environment →Reduction of female and female children's water fetching time → Reduction of household chore burden, time creation → Enlargement of educational opportunity →(Future) maternal and child health improvement
Tech. coop	Indonesia-Project for Improvement of District Health Management capacity in South Sulawesi Province (PRIMA-K)[1]	2010-2014	・ We were able to confirm from the local health center data, a reduction in water-borne diseases as a result of toilet introduction and promotion. ・ There was a positive effect of the project which emphasized not only infrastructure but also behavior change for better sanitation. (issue) ・ In the villages which eliminated open defecation, data such as the number of diarrhea cases for the project period was obtained. At the same time, data on other diseases such as trachoma, Ascariasis , schistosomiasis was found possibly due to the fact that may not exist in the area.	Check before the project starts, what information is collected on what water-borne disease, what disease is frequently identified in the area.	Type 2-2 Improvement of water and sanitation environment → Reduction of water-borne infectious diseases (cholera, typhoid, hepatitis) → Reduction of morbidity, improvement in health, reduction of U5 mortality rate due to dehydration Type 2-4 Water and sanitation environment improvement→Hygiene education→reduction of water-borne preventable diseases (trachoma, Ascariasis , schistosomiasis) → improvement of community health
Tech. coop	Lao PDR- Project for Urban Water Environment Improvement in Vientiane Capital	2014 2017	・ A plan for proper sewage treatment was being drafted at the time of the interview, so it was too early to confirm the content and implementation structure (for example who will manage the sewage treatment facility) .	For the water environment improvement project, if baseline data is taken, the effect of a sewage treatment facility on the sanitary environment in the target area and other effects on maternal and child health can be verified.	Type 2-2 Improvement of water and sanitation environment → Reduction of water-borne infectious diseases (cholera, typhoid, hepatitis) → Reduction of morbidity, improvement in health, reduction of U5 mortality rate due to dehydration
Grant	Lao PDR- The Project for the Vientiane Water Supply Development	2006-2009	・ The water supply project envisioned increased water supply but the local residents continue to buy bottled drinking water so		Type 2-2 Improvement of water and sanitation environment → Reduction of water-

[1] Visited and analyzed the data of the target village as there were water sanitation interventions, despite it being a health sector project.

			the impact or changes on health could not be verified. (issue) ・ The potable water volume and quality was expected as a result of improved water supply, but the piped water in the area is not used for drinking or cooking. The residents continue to buy bottled water. Therefore, it was not possible to verify the causal effect between improved water supply services and water-borned diseases.		borne infectious diseases (cholera, typhoid, hepatitis) → Reduction of morbidity, improvement in health, reduction of U5 mortality rate due to dehydration
Grant	Lao PDR- The Project for Rehabilitation of Water Supply Facilities in Savannakhet Area	2000-2003	・ Unable to verify how potable water quality improved as a result of water supply infrastructure. Tap water isused for washing and cleaning. Potable water is purchased bottled so it was not possible to verify the impact or changes on health.		Type 2-2 Improvement of water and sanitation environment → Reduction of water-borne infectious diseases (cholera, typhoid, hepatitis) → Reduction of morbidity, improvement in health, reduction of U5 mortality rate due to dehydration

Table 3. Education sector field survey results

Scheme	Project	Cooperation Period	Field Survey results	Suggestions addressing issues	Intervention (input) sectors→ path to MCH outputs （Refer to Table 4-2）
Tech. coop	Indonesia- Program for Enhancing Quality of Junior Secondary Education	2009- 2013	・ The interview with Ministry officials was postponed and then cancelled. ・ Project which focused on teacher training and teaching methodology improvement. Therefore low level (weak) relationship with the health sector and community		Type 3-1 Improvement of primary and secondary education quality →Expansion of access to knowledge and information →Reduction of teenage pregnancies and childbirth, risk of infection, increase in SBA births → Improvement of adolescent female health and child survival rate
Tech. coop	Indonesia- Integrated Program for Junior Secondary Education Improvement in South Sulawesi Province	2007- 2010	The planned synergy between secondary education and community health projects did not occur as the budgetary (and planning) cycles differed. There was evidence of ripple effect of school hygiene and health activities from student to student, student to family There was a partnership between school and the health center through the realization	Collect over a certain period, data on maternal education, whether the mother received proper antenatal and prenatal care, whether their children were fully vaccinated and cross analyze with secondary school enrolment rate.	Type 3-1 Improvement of primary and secondary education quality →Expansion of access to knowledge and information →Reduction of teenage pregnancies and childbirth, risk of infection, increase in SBA births → Improvement of adolescent female health

			of health education classes The participatory school management improvement model contributed in building a good relationship between the community and school (issue) ・ Difficulty in obtaining data and information on the content and quality of school health and puberty (sex) education in secondary schools		and child survival rate
Tech. coop	Lao PDR-Supporting Community Initiatives for Primary Education Development Phase II (CIED II)	2012- 2016	・ Access to primary education improved (ownership of village education committee towards school education, improves), however data which shows that education has a direct effect on maternal and child health was not collected. ・ Impact of school health activities on attitude and behavior change and student health could not be assessed. (issues) ・ The national school health policy has been formulated. Limited opportunities for bottom-up health education where parents (residents) and teachers can discuss health issues or infectious disease control. ・ Lack of data on direct impact on student health.	Monitor content and frequency of health activities realized through school activity plans. Monitor joint school and health center activity records Fix school level monitoring indicators such as school health records, student absentee days due to illness	Type 3-2 Improvement in primary and secondary education access → Improvements in school sanitation environment → Improvement in hygiene and nutrition, prevention of infectious diseases → Improvement of hygiene and health of school-aged children
Grant	Lao PDR-The Project for the Improvement of School Environments in Champasack and Savannakhet Provinces	2010.- 2012	Education levels of girls (future mothers) and child-bearing age women has risen in target areas. Toilets and handwashing sanitary facilities are an indicator of the Ministry of Education's "Education Quality Standards" (issue) ・ Difficulty in identifying causal effect relationship between sanitary facilities and health improvement	Monitoring indicators feasible at school level such as child health records kept at school, absentee rate by student, should be decided. If health records of school-age children exist at health center, analyze and utilize as evidence.	Type 3-2 Improvement in primary and secondary education access → Improvements in school sanitation environment → Improvement in hygiene and nutrition, prevention of infectious diseases → Improvement of hygiene and health of school-aged children

Annex 4. Multisectoral multilevel matrix

Table 1. Lao PDR multisectoral multilevel matrix

LAO PDR	Local administration	Transport	Power	Water/Sanitation	Education	Health
Central	Prime Minister's office	Ministry of Public Works and Transport MPWT	Ministry of Energy and Mines Department of Energy Promotion and Development Electricité du Laos EDL	Ministry of Public Works and Transport MPWT Department of water supply	Ministry of Education and Sports (MOES)	Ministry of Health (MOH)
Province	Provincial Governor	Provincial Department of Public Works and Transport DPWT Urban roads-Urban Development Administration Authority	Provincial Department of Energy and Mines substation	Provincial Department of Public Works and Transport DPWT Nampapa (water supply state owned enterprise) Provincial Health Department	Provincial Education and Sports Service (PESS)	Provincial Department of Health Provincial Hospital
District	District Governor	Office of Public Works and Transport		District Water Supply Office District Health Office	District Education and Sports Bureau (DESB)	Public Health Office, District Hospital
Sub-district/commune						Health center, health clinic
Village	Chief of Village			Village water committees (WATSAN committee)	Village Education Development Committee VEDC	Health post, dispensary

Table 2. Indonesia multisectoral multilevel matrix

INDONESIA	Local administration	Transport	Power	Water/Sanitation	Education	Health
Central	Cabinet			BAPPENAS		
		Ministry of Public Works and Housing MPWH		Ministry of Public Works	Ministry of National Education MONE	Ministry of Health
Province			BAPPEDA Province Office			
		Department of Public Works		Department of Public Works		
District			BAPPEDA District Office			
		Office of Public Works and Transport		District Water Supply Office District Health Office	MONE District office	Ministry of Health District Office
Sub-district/commune						Peskesmas (community health center)
Village	Community-based organizations				Board of Education (School Committee)	Posyandu (health centre for maternity & baby) Pustu (health centre for all)

Annex 5. Standard Indicators

Table 1 ：Maternal and child health improvement through a multisectoral approach Standard indicators for a technical cooperation project

Infrastructure (roads, bridges and power) sector standard indicator reference					Research results (impact on maternal and child health)		
Development strategic objective	**Mid-term objective**	**Indicators at a program goal level**	**Mid-term sub-target**	**Overall goals Project purposes and indicator examples**	**Predicted path from intervention to maternal and child health outcome**	**Indicators**	**Evidence level**
Infrastructure 1 3. Toward Balanced Development of a Whole Country	3-1. Improvement of Road Transport	（2）Road maintenance rate by standard (%) （3）Length of standard roads（Km） （4）Total highway length（Km） （5）Road pavement rate（%）	3-1-1. Improvement and Development of Trunk Road System 3-1-2. Strengthening of Road Maintenance System	(Model for strengthening of road and bridges maintenance) Understanding of roads and bridge maintenance, maintenance and management cycle, periodic checks, data-based planning, improvement of technical level of routine work (output) to strengthen road and bridge maintenance system (outcome) and contribute in improving periodic maintenance and management of roads and bridges (impact). Standard indicator examples) 1.Overall goal indicator (basic) （1） reduction in road network damage （2）Satisfaction of road users （3）Road damage indicators（IRI[1], and crack ratio etc.） （4）Degree of roads and bridges improvement (XX% reduction in number of bridges and total road length which has not been maintained according according to an inspection manual). (overall goal of road development, project purpose) ・ Development of National Road Networks and Major Trunk Road Networks (national roads and regional roads) lead to higher road pavement rates	Type 1-1 Road and bridge construction (rehabilitation) → Improvement in access to maternal and child health services (less costly transport) →Rise in antenatal and postnatal care rate → Identification of high-risk mothers →Increase in number of safe child births Type 1-2 Road and bridge construction (rehabilitation) →Reduction in mother and child emergency transfer time →An increase in facility deliveries →Increased safe child birth Type 1-3 Road and bridge construction (rehabilitation) → Improvement in access from health facilities → Home visits of neonates and	Type 1-1 ・ Number and ratio of ANC and PNC patients ・ Health service coverage rate（CCI） ・ Number of maternal deaths and cause of death Type 1-2 ・ Number of women and children transported by ambulance ・ Number and ratio of facility delivery ・ Number of Caesarian section operations (background factor analysis) ・ Number of patients	△ ○

[1] IRI(International Roughness Index) is an international measurement which indicates the flatness of the road surface

				· Development of High Standard trunk Road (highway) networks High-standard total road length (km) and high-standard road maintenance rate (km) · Elimination of Missing Links · Road rehabilitation, maintenance	postpartum mothers (increased postnatal care checkups) →Improvement of neonatal survival rate →Realization of mother and child continuum of care Type 1-4 Road and bridge construction (rehabilitation) →Economic activation →Increased disposable income → Increased investment in mother and child health (disease prevention), including transport to health centers, medicine and other expenses →Extension of health life expectancy	transported with ambulance, number of patients whom called the ambulance · Number of deaths after being transported by ambulance Type 1-3 · Number of times the public health nurse visits households, the number of households visited · Continuum of care completion rate（CoC） · Composite coverage index（CCI） Type 1-4 · Number of health facility users · Vaccination rate · Maternal and child health continuum of care (CoC) completion rate	

Infrastructure 2 Low-cost, low carbon and low risk energy supply	Improvement of energy access Efficient power transmission	（1）household electrification rate（%）	▪ Extension of transmission lines ▪ Utilization of renewable energy from off-grid electrification ▪ power system maintenance (including enhancement and stabilization) ▪ Distribution network maintenance (smart installation)	Policies and procedures to promote, operate and maintain rural electrification projects which extend transmission lines and promote renewable energy, are formulated, and technical capacity strengthened, (output), through support for capacity building of stakeholder Ministries responsible for planning and implementing rural electrification programs in the country, (outcome) contribute to the improvement of electrification rate through renewable energy promotion and the extension of transmission lines (impact). 1 . Indicator examples of overall goal (basic) (1) village electrification rate X% will be achieved by YY, (2) household electrification rate X% will be achieved by YY (supplementary)(1) Application of the model developed by the project to ensure electrification through renewable energy to XX public facilities, community center and other small and medium business hub facilities. 2.Indicator examples of project purpose (basic) (1) Power generation using renewable energy X% constructed during the project period, is operating appropriately (2)The joint Ministerial annual plan is implemented and the planned electrification rate is achieved. (4) Public facilities, community center and SME hub facilities under the pilot project reduces energy expenditures by XX%. (5) Users of public facilities, community center and SME hub facilities under the pilot project, satisfaction on energy use rises. (6) Renewable energy facilities and equipment introduced as a result of the project, are appropriately used and maintained.	Type 1-5 Electricity stabilization through construction of efficient energy facilities → Household electrical appliances →Lower household chore burden on females and female children → Protection of maternity Type 1-6 Electricity stabilization → Increase in facility delivery and Caesarian section operations → Improvement in vaccination rates Type 1-7 Electricity stabilization → Introduction of electric equipment in health facilities →Improved service quality and efficiency → Better access to health center →Child and female vaccination opportunities →Measures against vaccine-preventable infectious diseases Type 1-8 Promotion of low-	Type 1-5 ・Household electrification rate ・Type of household electrical appliance and number ・Refrigerator penetration rate, number of breakdown times ・TV penetration rate, number of breakdown times ・Number of low birthweight babies and rate ・Number of food poisoning cases and rate Type 1-6 ・Maintenance of appropriate volume ・Appropriate voltage ・SAIDI (System Average Interruption Duration Index) total of all customer power outage time/ number of customers ・Reduction in area and time of power outage due to failures ・Facility delivery rates ・Vaccination rates ・CCI of target province and district ・Number and changes in number of patients from the target area Type 1-7 ・Increase in electricity supply and reduction in power outages ・Changes in health facility equipment (increased use of electricity dependent equipment) ・Increased number of health facilities with electricity run refrigerators ・Number of out-patients	Type 1-5 ○ Type 1-6○ Type 1-7 △ Type 1-8 ○ Household electrification rate and CCI* Household electrification rate and CoC***

					cost, low carbon and low-risk energy →Less biomass fuel →Increase in child birthweight, fewer respiratory diseases, improvement in maternal anemia → Newborn, pregnant and postpartum women health improvement	・Vaccination rate change in the target area ・Vaccine-preventable disease morbidity rates Type 1-8 ・Household biomass fuel use ・Ratio of low-birth weight children ・Respiratory disease infection ・Number of mothers diagnosed as anemic ・Households have access to electricity ・Target area CCI ・Target area CoC	

Water sanitation sector standard indicator reference					Research results (impact on maternal and child health)		
Development strategic objective	**Mid-term objective**	**Indicators at a program goal level**	**Mid-term sub-target**	**Overall goals/Project purposes and indicator examples**	**Predicted path from intervention to maternal and child health outcome**	**Indicators**	**Evidence level**
Water sanitation 2. Water supply with consideration for efficiency, safety and stability 4. Water environment conservation	2-3 Securing of water quality for water supply (water sources and drinking water) 4-2 Promotion of proper treatment of sewage through establishment of sewage treatment facilities 4-3 Promotion of water environment conservation in public water areas	(1) Establishment of a sewage management plan that includes sewage and sanitation facilities (2) Proper establishment of a water quality monitoring plan in the target area (3) Water quality monitoring is (4)Population ratio that has access to (improved) sanitation facilities (5) Rate of improvement of residents' sanitation and hygiene practice (elimination of open defecation, encouragement of hand washing) (6) Ratio of population who can access safe water	2-4-6 Effective water supply <rural water> 4-1-4 Formulation of environmental standards 4-1-5 Appropriate execution of regulations 4-2-1 Establishment of centralized sewage treatment facilities 4-3-2 Prevention of degradation in water quality	To strengthen the system for operating and maintaining the rural water supply project in the target county, (outcome) By improving the development plan planning and coordinating function of the provincial officials engaged in the operation and maintenance of the rural water supply project and the provincial officials who give guidance about the rural water supply in the county (output) Thereby contributing to the improvement of the rural water supply service in the target county. (impact) 1. Indicator examples of overall goal (Basic) (1) Increase in the population that can continue to use improved water sources (2) Increase in the number of water supply facilities in villages 2. Indicator examples of project purpose (Basic) (2) Number of rural water supply plans submitted to (or approved by) provincial assemblies with the support of the Ministry of Water, basic water offices, and provincial administrative offices (3) Number of rural water supply facilities operated and maintained according to the guidelines and manuals prepared in the project. (Proposed model description) To strengthen relevant government offices' capacities for sector policy and improve/construct sewerage facilities (outcome) By proposing various plans for	Reduction in water-borne diseases (such as diarrhea and Guinea worm) Type 2-2 Improvement of water and sanitation environment → Reduction of water-borne infectious diseases(cholera, typhoid, hepatitis) →Reduction of morbidity, improvement in health, reduction of U5 mortality rate due to dehydration	・Continuum of care completion rate (CoC)	◎ Acces to Safe water and CoC **

				improvement/construction of sewerage (output) Thereby contributing to the strengthening of the administrative system for sustainable maintenance of sewage system. (impact) Indicator example of overall goal: Establishment of a sewage law Indicator example of project purpose (2) Preparation of a sewerage construction plan (3) Development of a sewerage maintenance system (4) Preparation of a sanitation facilities management plan To enable the Environment Agency's Water Quality Analysis Laboratory to provide accurate monitoring information on discharged water (industrial wastewater and household effluent) and natural water (rivers, lakes, sea area) in X province, (outcome) By enabling the analysts of the Environment Agency's Water Quality Analysis Laboratory to carry out the sampling and analysis of dirty water independently and constructing a highly reliable database on water resources and industrial wastewater, (output) Thereby contributing to the strengthening of the capacity to manage the compliance with the water discharge standards law in the target country. (impact) 1. Indicator examples of overall goal (2) Increase in the number of factories that achieve water standard values 2. Indicator examples of project purpose (2) Increase in the number of inspection items to be analyzed			

	2-4 Equitable water supply	(1) Rate of improvement of residents' sanitation and hygiene practice (elimination of open defecation, encouragement of hand washing)	Effective water supply <rural water>	To improve residents' sanitation and hygiene practice and lifestyle, (outcome) By strengthening the government's sanitary and hygiene education and the dissemination system for the residents in the target area, (output) Thereby contributing to the reduction of water-borne diseases in the target area. (impact) 1. Indicator examples of overall goal (Basic) Morbidity of diarrhea in the target community 2. Indicator examples of project purpose (Basic) (1) Water associations' activity implementation rate (2) Ratio of available water supply facilities (3) Toilet penetration rate	Type 2-4 Water and sanitation environment improvement →Hygiene education →reduction of water-borne preventable diseases (trachoma, Ascariasis , schistosomiasis)→ improvement of community health	・Morbidity due to diarrhea and water-borne preventable diseases (trachoma, Ascariasis , schistosomiasis) in target areas	○
2. Water supply with consideration for efficiency, safety and stability	2-2 Increase in supply by development of water resource 2-4 Equitable water supply	(1) Ratio of population who can access safe water (2) Number of labor hours per day for water fetching (3) Reduction in water-borne diseases (such as diarrhea and Guinea worm)	1-2-1 Study and management of groundwater potential 2-2-1 Groundwater development	To increase human resources for groundwater development, (outcome) By providing technical training in groundwater development, (output) Thereby contributing to improvement in access to water supply facilities whose sources are groundwater. (impact) 1. Indicator examples of overall goal (Basic) (1) The national water supply coverage reaches the government's target (XX% in the country; YY% in rural areas) in the year of ○● (2) The annual number of wells successfully dug (or the number of groundwater supply facilities) increases from XX in the year ○ to YY by the year ●.	Type 2-1 Improvements in water and sanitation environment → Reduction of female and female children's water fetching time → Reduction of household chore burden, time creation → Enlargement of educational opportunity →(Future) maternal and child health improvement	・Population who can use the improved water source ・Number of rural water supply facilities ・Number of health and physical education classes, content, health committees and health club activities ・Water fetching time ・Household chore time ・Enrolment and repetition rates	○

Education sector standard indicator reference					Research results (impact on maternal and child health)		
Development strategic objective	**Mid-term objective**	**Indicators at a program goal level**	**Mid-term sub-target**	**Overall goals/Project purposes and indicator examples**	**Predicted path from intervention to maternal and child health outcome**	**Indicators**	**Evidence level**
Education 1 5. Improvement of education management	5-2.Strengthening of educational administration systems	(1) Results of third-party evaluation by ministries and agencies in charge of administrative auditing (2) Proportion of the educational budget per capita to GNP per capita (3) Progress of the national implementation plan (action plan)	5-2-6 Improvement of school management performance (Strengthening the functions of school management committees （COGES）)	By strengthening the functions of school management committees （COGES）, reflecting community needs in school management, building collaborative relationships with schools, and strengthening the capacity of local educational administration for improvement of school management, (Output) To ensure improvement of school management, (Outcome) Thereby contributing to improvement of learning environment. (Impact) 1. Indicator examples of overall goal (Basic) (1) Number of distributed textbooks (2) Number of prepared teaching aids (3) Number of newly-employed teachers (4) Attendance of teachers (5) Number of class hours (6) Time for work at home on parents' watch 2. Indicator examples of project purpose (Basic) (1) Implementation (Completion) rate of school activity programs (2) Number of participants in meetings for formulation of school activity programs (Supplementary) (1) Frequency of meetings for formulation of school activity programs *<school health activities>*[2] *Indicator examples* *(1) enrolment rate and completion rate*	Type 3-1 Improvement of primary and secondary education quality →Expansion of access to knowledge and information → Reduction of teenage pregnancies and childbirth, risk of infection, increase in SBA births →Improvement of adolescent female health and child survival rate	・ Teenage childbirth rate ・ Antenatal care and postnatal care ratio,Increase in SBA assisted deliveries, CoC completion rate (CoC) ・ Reduction in HIV nd STD infection rates (especially for 10-19 year olds) ・ Number of smokers and drug addicts	◎ Education level and CoC (***)

[2] Added school health activities to the standard indicator reference, including process indicators found in Table 4-7

				(by gender) *(2) dropout rate (by gender)* *(3) Frequency and time of health and puberty education* *(4) Health education, puberty education curriculum content and situation*			
Education 2* Poverty reduction of the socially vulnerable population	Livelihoods of graduates improves Promotion of female social and economic self-reliance	(1) Expansion of basic vocational training for the socially vulnerable (2) Employment rate of graduates (by gender)	(1) Development of a basic vocational training program (2) The number of trainees who acquired basic vocational skills (by gender)	By conducting basic vocational training for the socially vulnerable, employment opportunities of these socially vulnerable including women increases, generating income. (Overall goal) ・ Employment rate, business start-up rate of graduates ・ Livelihoods of graduates improve (before and after average income, between non-graduates and graduates) ・ Improved situation of lives, health and nutrition of graduates (Project purpose) ・ Realization of basic vocational training curriculum (times) ・ Number of basic vocational training graduates(by gender)	Type 3-3 Expansion of non-formal education and training → Expansion of information access, increased economic power and income → Investment in maternal and child health → Improvement in family nutrition, early access to care, and disease prevention, SBA deliveries and improvement in women's health, increased child survival rate	・ANC and PNC consultation rate ・Delivery assisted by SBAs ・CoC ・U5 mortality rate ・Ratio of malnourished children ・Ratio of stunted children ・Ratio of anemic women and children	△ Socioeconomic situation and CoC (***)

*Education 2 model was drafted by the research team as there were no existing vocational training models in the Development Issues Chart and the Standard Indicators Reference.

Table 2：Maternal and child health improvement through a multisectoral approach Standard indicators for grant aid

Development strategic objectives	**Mid-term objectives**	**Sub-targets of mid-term objectives**	**Types of infrastructures**	**Standard indicators**		**Maternal and child health indicators**	**Predicted path from intervention to maternal and child health outcome**	**Evidence level**
5. Toward sustainable rural development and improvement of rural life (rural transportation)[3]	Improvement of rural transportation infrastructure	Provision of basic transportation infrastructure and services to secure civil minimum	Rural roads and bridges (domestic)	Operation and effect indicators	・ Annual average daily traffic(AADT) (vehicles/day, vehicles/12 hours)	<u>Precondition is that medical equipment is properly used as a result of stable electricity supply.</u> ・ Access time to health facilities for the target area residents ・ Number of patients referred from lower level health facilities (person/year) ・ Number of users of referral hospitals and frequency of use ・ Number of facility deliveries ・ Number of times antenatal care is received ・ Number of postnatal care checkups (at home) ・ CoC by health facility in the target area ・ Aggregate of each health facility CoC in the target area Note: in the case where it is difficult to ask about access time, tally the records (resident of XX village) in the health register	Type 1-1 Road and bridge construction (rehabilitation) → Improvement in access to maternal and child health services (less costly transport) → Rise in antenatal and postnatal care rate → Identification of high-risk mothers →Increase in number of safe child births	△
				Effect indicators	・ Time Saving (hours) ・ Average Velocity Increase (km/hour) Decrease of Annual Traffic Impassability Dates due to Disaster (days/year) An improvement in access to social infrastructure (schools, health centers, etc.) (people/day)			

[3]We omitted efficiency focused transport and water supply interventions as well as urban interventions where it is difficult to separate contributions and impact, based on the results of the field survey and data analysis. We have kept indicators which can be realistically monitored.

		Enhancement of transportation safety and reliability	Roads and bridges (safety)	Effect indicators	・ Decrease of Annual Traffic Impassability Dates due to Disaster (days/year)	Type 1-2 and 1-4 Recognition of ambulance services rises and emergency transport is used appropriately ・ Number of maternal and child emergency transport, number of ambulances within the target area and target hospitals ・ Average transportation time by ambulance ・ Number of requests for ambulance dispatch (pregnant and postpartum women and under 5 year old children) ・ Deaths after emergency transport Note: verify the number of recorded ambulance trips with recorded number of arrivals at hospital. Type 1-4 ・number of health facility users ・complete vaccination rate ・maternal and child health continuum of care completion rate（CoC）	Type 1-2 Road and bridge construction (rehabilitation) → Reduction in mother and child emergency transfer time →An increase in facility deliveries →Increased safe child birth	○
Toward balanced development of a whole country (national transportation)	Improvement of road transportation	Improvement and development of trunk road system	Trunk roads and bridges (domestic)	Operation and effect indicators	・ Annual average daily traffic(AADT)(vehicles/day, vehicles/24 hours) ・ Time saving (hours) ・ Average Velocity Increase (km/hour) ・ Decrease of Annual Traffic Impassability Dates due to Disaster (days/year)		Type 1-4 Road and bridge construction (rehabilitation) → Economic activation → Increased disposable income → Increased investment in mother and child health (disease prevention), including transport to health centers, medicine and other expenses →Extension of health life expectancy	△

Development strategic objectives	Mid-term objectives	Sub-targets of mid-term objectives	Types of infrastructures	Standard indicators		Maternal and child health indicators	Predicted path from intervention to maternal and child health outcome	Evidence level
Sustainable supply of safe water	Improving access to water supply services in rural areas		Digging of wells The construction and rehabilitation of wells and hand pumps (level 1) The construction and rehabilitation of wells, pumps, communal taps and elevated water tanks (level 2)	Operation indicators	· Population supplied with water (number of people) · The water supply amount (m3/day) · The water supply hours (hours)	· Reduction in water-fetching time	Type 2-1 Improvements in water and sanitation environment →Reduction of female and female children's water fetching time → Reduction of household chore burden, time creation → Enlargement of educational opportunity → (Future) maternal and child health improvement	○
				Effect indicators	· A reduction in waterborne diseases · The percentage of the population supplied with water (%) · The percentage of functional facilities · A reduction in the water fetching time · The distance to water sources Population benefiting from the improvement in the water supply situation · The school enrollment ratio · An increase in the employment ratio for women	· Reduction of water-borne diseases	Type 2-2 Improvement of water and sanitation environment → Reduction of water-borne infectious diseases(cholera, typhoid, hepatitis) →Reduction of morbidity, improvement in health, reduction of U5 mortality rate due to dehydration	◎

Development strategic objectives	Mid-term objectives	Sub-targets of mid-term objectives	Types of infrastructures	Standard indicators		Maternal and child health indicators	Predicted path from intervention to maternal and child health outcome	Evidence level
The reduction of educational disparities	Reducing gender disparities	Achieving gender-sensitive school education	Developing facilities by giving consideration to female students (separate toilets for men and women, hygienic water supply areas, accommodation, etc.)	Operation and effect indicators	(1) The number and percentage of female students at the project's target schools (the gender ratio) (2) The number of students enrolled at the project's target schools (3) Satisfaction levels of male and female students regarding school toilets and hygiene .	Process indicators ・Increase in school health activities and hours spent on school health ・Number of hours spent on nutrition counselling ・Realization of handwashing with soap ・Rate of toilet and sanitary facility introduction ・Toilet use situation ・Utilization of basic handwashing facilities Maternal and child health indicators ・Number and ratio of stunted children ・Number of diarrhea cases in school age children ・Worm infection rate ・Ratio of anemic children	Type 3-2 Improvement in primary and secondary education access →Improvements in school sanitation environment → Improvement in hygiene and nutrition, prevention of infectious diseases → Improvement of hygiene and health of school-aged children	◎

Annex 6. Reference list

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Chapter 2

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