Indonesia

Project for Strengthening District Health in Sulawesi

External Evaluator: Taro Tsubogo (KRI International Corp.) and Ministry of Health[1]
Field Survey: October, 2005

1. Project Profile and Japan's ODA Loan

Location of the project site

BTS building constructed by the project

1.1 Background

The Sixth Five-year Development Plan (REPERITA VI) since 1994 envisioned overall betterment of the population's health through improvement of medical facility and quality of health service. In particular, improvement of maternal and child health and eradication of infectious diseases were of primary importance. In Sulawesi Island, the quality of health service did not catch up with those of Java, an improvement of health sector was considered as necessary and urgent for the well-balanced growth of this area. Under such a situation, the Government of Indonesia requested assistance for improving health service in Sulawesi, and suggested the program consisting of 12 sub-projects to achieve service improvement. Among 12 projects, "the Project for Strengthening of Safe Blood Supply System", and other three ("Extension of Basic Health Services in Remote Areas", "Improvement of District Hospitals" and "Strengthening of Referral Service System") were selected for ODA Loan assistance.

1.2 Objectives

The project's objective was to strengthen safe supply and appropriate use of blood through establishment and improvement of Blood Transfusion Service and Hospital Blood Bank together with equipment provision, training, and conduct of the study on the regional healthcare service, and thereby contribute to

[1] "Project for Strengthening District Health Service System in Sulawesi" is jointly evaluated by Taro Tsubogo, the consultant appointed by Japan Bank for International Cooperation (JBIC) and the Ministry of Health (MoH), the executing agency of the project with facilitation by JBIC and the Directorate of Monitoring and Fund Evaluation, National Development Planning Agency (BAPPENAS).

improvement of health status in Sulawesi.

1.3 Borrower / Executing Agency

The Republic of Indonesia / Directorate General of Medical Care, Ministry of Health

1.4 Outline of Loan Agreement

Loan Amount Disbursed Amount	2,231 million yen 1,271 million yen
Exchange of Notes Loan Agreement	December, 1996 December, 1996
Terms and Conditions - Interest Rate - Repayment Period (Grace Period) - Procurement	 2.7 % p.a. (Project) 2.3 % p.a. (Consulting service) 30 years (10 years) General Untied
Final Disbursement Date	December, 2003
Main Contractors	Japanese and local companies
Consultant Contractors	PT. Yodya Karya (Indonesia), PT. Darena Prakarsa Utama (Indonesia)/ PT. Inersia Ampak (Indonesia)/ System Science Consultants Co., Ltd. (Japan), and others
Project Identification and Preparation Study, and Feasibility Study (F/S)	The Survey for Finding on the Strengthening District Health Service System in Sulawesi by Japan International Cooperation Agency (JICA), 1995 Preliminary Study by Japan Bank for International Cooperation (JBIC), 1996 Ex-post Monitoring Study by JBIC, 2005

2. Evaluation Results

2.1 Relevance

2.2.1 Relevance of the project plan at the time of appraisal

At the appraisal, the Sixth Five-year Development Plan (1994-1999) of Indonesia, known as REPELITA VI, stated the expansion of health service at the district level and improvement of people's health as one of the important goals. Health sector plan in REPELITA VI also specified that the government should improve the regional health facility and referral system, and strengthen safe blood supply system. To cope with such commitments, the government formulated the program of Strengthening District Health Service System, comprising of 12 sub-projects, for Sulawesi Island which still suffered from poor health service. Accordingly, this project, which covers the four out of twelve sub-projects, i.e. strengthening safe blood supply system and studying the feasibility of health facility and referral system development, was deemed as relevant.

2.1.2 Relevance of the project plan at the time of ex-post evaluation

The present Mid-term National Development Plan (2005-2009), in pursuit of the equitable access to the quality health and medical services, regards the improvement of health service and referral system at the district level as an important policy direction. MoH also holds the same policy direction in its Mid-term Development Plan (2005-2009) and highlights the strengthening of blood supply system as one of the essential government roles. Accordingly, this project, to strengthen safe blood supply system and study the feasibility of health facility and referral system development in Sulawesi, is still deemed as relevant.

2.2 Efficiency

2.2.1 Outputs

The project scoped i) construction and improvement of facilities of Blood Transfusion Service (BTS) in charge of blood collection, testing, processing and supply, and Hospital Blood Bank (HBB)[2] in charge of blood storage, ii) provision of medical equipment, and iii) training for staff and technician of BTS and HBB to strengthen blood supply system in particular. Comparison of planned and actual outputs of the project is summarized in Table 1, showing that there is no major change in the project outputs. Beneficiary area spreads over the five provinces in Sulawesi Island with 189,000 km^2 in size and has a population of about 15 millions in total (as of 2000 census).

Table 1: Summary of comparison of planned and actual outputs

Planned	Actual
1. **Strengthening of safe blood supply system**	
1) Construction and improvement of BTS / HBB a) Rehabilitation of training facility and construction of dormitory at C-BTS b) 10 new BTS buildings c) Facility improvement for 30 BTSs, H-BTSs, HBBs	a) Construction of training facility including dormitory at C-BTS b) 15 new BTS buildings c) 8 BTSs / H-BTSs, 14 HBBs
2) Provision of medical equipment for BTS / HBB a) Urgent (17 blood refrigerators, 14 mobiles) b) Non-urgent (medical equipment, etc.)	a) Done as planned b) Done almost as planned, but some items were added, deleted or revised in quantity
3) Training for staff, technician and medical doctor of BTS / HBB	Done basically as planned, but for cancellation of blood supply

[2] Explanation on the types and its abbreviations of Blood Transfusion Service and Hospital-based Blood Bank;
- Blood Transfusion Service (BTS) comprises of the following;
- Central BTS (C-BTS), located at Jakarta
- Provincial BTS (P-BTS), located at each Provincial capital
- District BTS (D-BTS), located at the districts / cities
- Hospital-based BTS (H-BTS), attached to hospitals, located at the districts where no D-BTS exists (also functioned as Hospital Blood Bank)
- Hospital Blood Bank (HBB), attached to hospitals

a) Basic blood transfusion technology b) Management of blood supply c) Effective use of blood d) Donor recruitment e) Medical equipment maintenance	management training in Japan (changed the location to Bangkok) and medical equipment maintenance training, and reduction in training duration. On the other hand, some training courses were added including training of trainers, training for supervision of local BTS, production of component blood separation, irregular anti-body screening, and etc.
4) Consulting services a) Project management service (PMS) b) Technical advisor (TA) c) Engineering services (E/S) for safe blood supply	Done as planned
2. **Engineering services for feasibility study (F/S)**	
a) F/S for extension of basic health services in remote areas b) F/S for improvement of district hospitals c) F/S for strengthening of referral service system	Done as planned

The project covered all presently existing BTSs (26) and HBBs (31) in Sulawesi by any of building construction (15 BTSs), facility improvement (8 BTSs/H-BTSs and 14 HBBs), and equipment provision (to all existing 26 BTSs/H-BTSs and 31 HBBs). Change from rehabilitation to construction of training facility for blood technician at Central-BTS (C-BTS) was decided since the existing one was burned down in 1999. Concerning the construction of BTS building, some BTSs, originally subject to facility improvement (utility installment, etc.) only, were extended to building construction, reflecting the alternation of blood supply system and assigned task of those BTSs. Variety and quantity of medical equipment procurement was also adjusted in accordance to the above alternation of blood supply system.

The training location of blood supply management for BTS directors was changed from Japan to Bangkok where the technical level of its blood supply service is similar to those in Indonesia based on recommendation by World Health Organization. Training on medical equipment maintenance was cancelled from training components of the project, but included in the service of suppliers instead. Additional training courses were suggested by Project Management Service (PMS) and Engineering Service (E/S) consultant based on finding through the site inspection and the project supervision, and deemed as necessary by MoH to achieve the better project performance.

Consulting services of the project were rendered as planned. One of them was provision of technical advices for the project implementation and the better

operation of blood supply system. Technical advisors explained the Japan's experiences in blood supply (how to deal with commercial and replacement donors, and promote donor recruitment).

2.2.2 Project period

The project was completed with a delay by 32 months in total, requiring 1.6 times of the original implementation period. Such a delay in completion is accounted for by the prolonged tender process of E/S consultant due to government administration reforms, which resultantly brought about delay in commencement of civil works and equipment procurement.

2.2.3 Project cost

Actual project cost amounted to 1,388 million Yen, resulting in a reduction from an estimated cost of 2,975 million Yen, since the project cost in Yen term largely declined due to devaluation of local currency after the economic crisis. Foreign currency portion of the project cost also decreased due to i) rearrangement of procurement (to local currency portion), ii) cancellation of some outputs and iii) international competitive bidding.

2.3 Effectiveness

The project aims to strengthen safe blood supply system and improve appropriate use of blood in Sulawesi. Firstly, blood donation is expected to be enhanced through expansion of donor recruitment activity for the purpose of collecting more blood and producing more blood products for transfusion. At the same time, blood safety needs to be assured through enhancement of voluntary donation of blood and improvement of blood screening test. Then, enhanced blood production by BTS with installment of blood bank facility at HBB leads to an improvement of supply and demand condition of blood, and reduction of time to prepare blood transfusion. Finally, expanded network of blood supply and appropriate processing of blood, coupled with sufficient skill and knowledge of those who engage in blood supply and transfusion service on appropriate use of blood, safe clinical use of blood would be promoted. Effectiveness of the project examines the extent to which these outcomes have been achieved.

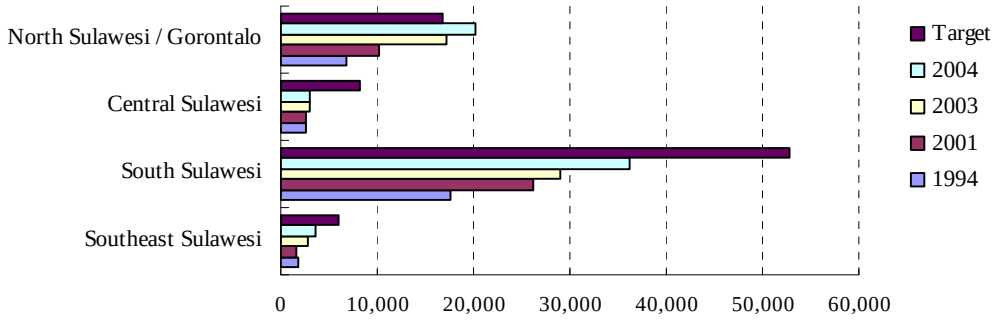
(1) Expansion of donor recruitment

(a) Donated blood amount

One of the outcomes of the project is to increase the donated blood amount through enhanced capacity of blood collection (provision of mobiles and kits for blood donation) and blood storage equipment (refrigerator). Owing to the project effort, every province has observed a steady increase of the donated blood amount (in the number of blood bag, Figure 2). It is judged however from the data below that even in the latest year (2004) only North Sulawesi / Gorontalo reach the planned target of donated blood amount. Regarding the number of donor and donation ratio (the number of donor against total population), there is no aggregated data at the provincial level.

Figure 1: Blood donation at P-BTS in North Sulawesi

Figure 2: Donated blood amount (the number of bag)



Source: MoH, Indonesian Red Cross (IRC)
Note: Since some BTSs do not report the data, the actual amount of blood bag will be more. Target amount was set for 5 years later of appraisal.

(b) Donor recruitment activity

Donor recruitment activity has been also enhanced, according to the survey for beneficiary organizations[3] (for BTS). The number of donor recruitment and campaign held outside of BTS shows a steady increase, compared to before the project completion (Table 2). Some BTSs collaborate with the external partner including NGO for donor recruitment. Though showing the steady increase, however, many BTSs still feel it necessary to employ more donor recruiters to further enhance blood collection. All BTSs subject to the survey respond that donor screening test before blood collection has been adequately conducted.

Table 2: Number of donor recruitment activity held outside of BTS

Province	2000	2001	2003	2004
BTS in N. Sulawesi	151	128	236	257

[3] The survey looks into the operational performance of the project beneficiary organizations covering nine (9) BTSs and seventeen (17) HBBs in North, South and Southeast Sulawesi. Some parts of questionnaire (e.g. on blood transfusion) for HBB were responded by the hospital which the HBB belongs to.

BTS in S. Sulawesi	6	14	50	58
BTS in SE. Sulawesi	274	301	498	684

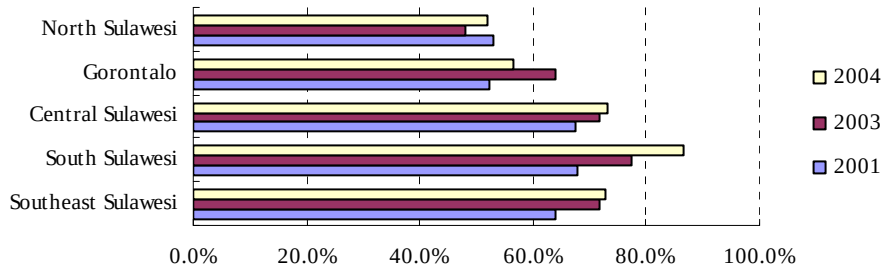
Source: Beneficiary Organization Survey

(2) Safety of blood

(a) Voluntary donation

Voluntary donation is an essential to ensure collection of safe blood and stable supply of blood. Enhancement of donor recruitment leads to selection and retention of voluntary (non-remunerated) donors from low risk population and is expected to bring about less dependency on replacement donation[4]. Compared to before the project completion, the amount of voluntary donation increases in all five provinces, and voluntary donation ratio (the amount of voluntary donation against total one) has been improved except for North Sulawesi and Gorontalo (Figure 3), where total donation grows at the higher pace than that of voluntary donation.

Figure 3: Voluntary donation ratio (%)



Source: MoH, IRC
Note: Inverse of voluntary donation ratio is considered as replacement donation ratio.

Although more voluntary donation has been observed in Sulawesi, replacement donation is still practiced in all provinces, and accounts for the relatively large portion in North Sulawesi and Gorontalo. Replacement donation is done at the occasion of shortage in blood products and request by family. Use of component blood[5] sometimes requires replacement donation, because the stock of component blood product is much smaller than the whole blood one due to its shorter storable period and smaller demand. Remunerated donation marginally exists still in Sulawesi according to visited BTSs, although the actual number is not reported.

[4] Replacement donation is the practice where blood is donated from family or relatives of the patient when transfusion therapy is required. In case the patient's blood does not match the family or relatives' one, the blood is replaced with the one in stock, otherwise, the family or relatives' blood is used after blood test. Replacement (and remunerated) donation practice is at a higher risk of transmitting transfusion-transmissible infections (unless capacity of blood test is sufficient), and time-consuming compared to sourcing the blood in stock.

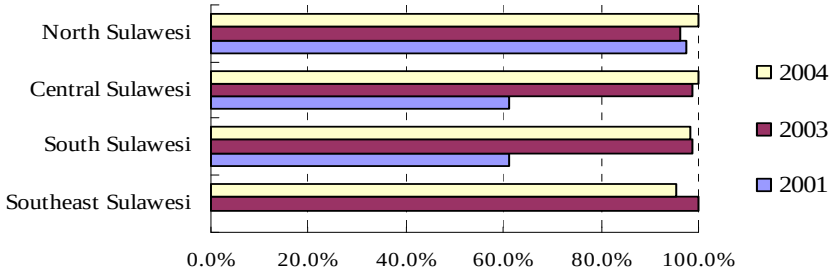
[5] Components which constitute blood shall be separately extracted, so that each specific constituent which matches the requirement of the patient be transfused. Component blood products include packed red cell (PRC), thrombocyte concentrates、plasma, and etc. On the other hand, the whole blood is in an unmodified state as it is collected.

(b) Conduct of appropriate blood test

Figure 4: Screening test at P-BTS in North Sulawesi

Safety of blood products needs to be assured in order to reduce the transmission risk of infectious diseases through blood transfusion by the conduct of appropriate blood screening test for transmittable infectious viruses (syphilis, hepatitis-B: HBV, hepatitis-C: HCV and human immunodeficiency: HIV). The project provided the necessary equipment and materials (reagents) for this purpose. According to MoH, although every province has not attained 100% of the screening ratio for reaction to all the above viruses, the ratio has been generally improved compared to before the project completion (Figure 5) despite an increase of blood collection.

Figure 5: Coverage of blood screening test against every four infectious viruses (%)



Source: MoH
Note: Data of Grontaro and Southeast Sulawesi (2001) are not available.

For the blood type, all the collected blood is screened by slide test. Irregular anti-body screening[6] is not practiced in Sulawesi except for P-BTS in South Sulawesi. Ex-post Monitoring Study by JBIC suggests that discussion on the adoption of irregular anti-body screening for specific risk group by each BTS be commenced.

(3) Blood supply condition

(a) Blood supply and its network expansion

Beneficiary survey (for BTS) reveals that as donated blood amount increases, BTSs have been able to expand production of transfusion blood and net supply of blood bag (deducting the disposed and expired blood bags from produced ones) compared to before the project completion (Table 3).

Table 3: Number of produced, disposed and expired blood (the number of bag)

Province	2000		2002		2004	
	Produced	Disposed / Expired	Produced	Disposed / Expired	Produced	Disposed / Expired

[6] Screening test to detect antibody against other blood types than ABO types. Blood with irregular anti-body is not used for transfusion, since serum with irregular anti-body becomes coagulated with blood cell of person with certain blood types. Frequency of irregular anti-body is higher for persons experiencing transfusion and pregnancy in the past.

BTS in N. Sulawesi	8,529	240	13,545	365	17,305	1,418
BTS in S. Sulawesi	27,403	606	29,611	608	36,779	1,863
BTS in SE. Sulawesi	1,515	102	1,847	97	2,672	217

Source: Beneficiary Organization Survey

Concerning the management of blood bags, all responded BTSs store and deliver blood bags in accordance to Standard Operational Procedure (SOP) prescribed by MoH (e.g. proper labeling of bags, control of storage temperature, and recording of delivery date).

Figure 6: Storage of blood bag in the refrigerator procured by the project

Supply and demand condition of blood has been also improved as a result of expanded production of blood products, according to the beneficiary survey (for HBB). Out of 17 HBBs, 35% (6 HBBs) responds that blood has been sufficiently and regularly delivered, 47% (8 HBBs) still faces shortage sometimes, and the rest with chronic shortage. HBBs which do not face chronic shortage respond that supply condition has been largely improved (71% of them) or somehow improved (29%), if comparing to the condition before (five years ago). Many HBBs explain that they are able to see the wider source of delivery and the larger volume of blood supply as a whole, and have other options to deal with shortage than replacement donation. It is therefore considered that the network of blood supply in Sulawesi has been expanded.

On the other hand, blood shortage is usually observed by HBBs in the districts (except for the provincial capitals), since D-BTSs in such area have difficulty in securing the sufficient amount of voluntary donation (partly due to the smaller population). While there are some HBBs which face chronic shortage, there is BTS which disposes 6 to 7% of total blood production on average. Supply and demand coordination among BTS and HBB at the provincial level needs to function to minimize blood disposal.

(b) Reduction of time to prepare transfusion blood

With blood storage facility (refrigerator) and sufficient equipment for cross-matching test in HBB, hospitals become able to promptly respond to emergency cases which require blood transfusion. Referring to the beneficiary survey (for HBB), out of 17 HBBs, 59% (10 HBBs) becomes able to largely

shorten the time to prepare for blood transfusion after the project completion, 24% (4 HBBs) shortens some, and the rest with no reportable change. Aside form time saving, many HBBs see the lesser load of the patients' family and hospital staff (saving of time and cost of fetching blood bag from BTS nearby) as an important effect.

(4) Clinical use of blood

(a) Number of blood transfusion

Through an improvement of blood supply condition, more clinical use of blood is expected. According to the beneficiary survey (for hospital), all hospitals (15 hospitals) which report the data respond that the number of blood transfusion increases in the recent years (Table 4). HBBs have a view that many people are informed that the hospitals with HBB are able to promptly prepare safe transfusion blood, and may choose to visit such hospitals.

Table 4: Number of blood transfusion in the hospital (the number of patient)

Province	2001	2003	2004
Hospitals in N. Sulawesi	3,661	5,336	5,888
Hospitals in S. Sulawesi[7]	1,463	2,586	5,114

Source: Beneficiary Organization Survey

(b) Production of component blood

Component blood use leads to more efficient blood use than the whole blood. One unit of blood can be separated into components such as red cell concentrates, plasma and so on to meet the needs of more than one patient[8]. The project, through the necessary equipment provision and training for component preparation, supported enhancement of production of component blood.

Beneficiary survey (for BTS) reveals that the production of component blood is enhanced in terms of both quantity and its ratio against the whole blood compared to before (Table 5). Component blood is basically produced on demand and popular in the urban hospitals. On the hospital side, out of 17 hospitals, 59% (10 hospitals) practices component blood transfusion. Number of component transfusion also increase, but the component therapy is only seen in the large hospitals (A and B-class hospitals according to the government criteria).

Table 5: Production of component blood and its ratio against the whole blood (the number of bag)

[7] The survey reports fewer patients in the hospitals in S. Sulawesi than N. Sulawesi. It is because surveyed hospitals in S. Sulawesi include many smaller ones in terms of bed capacity, and many patients receive transfusion at private hospitals where no HBB are installed.

[8] Component blood use has other advantage over the whole blood use in reducing an occurrence of adverse transfusion reaction (the recipient can be treated with the right components).

Province	2000			2003			2004		
	Whole	Comp.	Ratio	Whole	Comp.	Ratio	Whole	Comp.	Ratio
BTS in N. Sulawesi	6,238	2,291	26.9 %	8,354	5,191	38.3 %	10,909	6,396	37.0 %
BTS in S. Sulawesi	23,541	3,862	14.1 %	19,786	8,736	30.6 %	27,523	9,256	25.2 %
BTS in SE. Sulawesi	1,515	0	0.0 %	2,244	254	10.2 %	2,343	329	10.2 %

Source: Beneficiary Organization Survey

Use of component blood in rural hospital is still rare, since the production capacity of D-BTS is still limited and the shorter storable period is bottleneck to the larger supply. Lack of recognition by the rural hospitals also accounts for the lesser clinical use of component blood.

(5) Effects of training

Effectiveness of the project also examines how and to which extent the trainings during the project strengthen the capacity of BTS and HBB staffs involved in blood supply system and enhance the skill and knowledge concerning appropriate use of blood.

Major training courses during the project and the number of trainee are shown in Table 6. Training on basic blood transfusion technology in particular received most popularity, hearing from BTS and HBB presents a view that this training through fostering of qualified technicians was helpful in preparation for expansion and start of the service of BTS and HBB within the short term. However, this course did not cover all the technicians expecting to attend. Hearing at site also reveals that its expansion to cover more trainees was desired.

Table 6: Major trainings and their trainee

Type of training	Main target	No. of trainee
Donor recruitment	Donor recruiter (chief / technician of BTS)	84 persons
Safe blood supply system management	Chief / technician of BTS and HBB	68 persons
Basic blood transfusion technology (for BTS) and its refresher course	Blood technician of BTS	40 persons From 8 BTSs
Blood component separation	Blood technician of P-BTS	8 persons
Basic blood transfusion technology (for HBB)	Blood technician of HBB	90 persons
Symposium on rational use of	Clinician (practitioner) of	541

blood	hospital	persons

Source: MoH

Beneficiary survey (both for BTS and HBB) indicates the level of satisfaction with training course and retention of its trainee with the result shown in Table 7. Positive effects of training courses are generally recognized and the trainees are mostly retained at work. As positive changes after the training, the survey identifies i) increase in voluntary donation, ii) proper management of blood bags, and record-keeping (on blood type, test result, date of processing, and storage and delivery) and, iii) raised awareness and practice for blood test and processing in accordance with SOP and the resultant decrease in human error.

Table 7: Satisfaction with training course and retention of its trainee

	No. of BTS/HBB recognizing positive effects	No. of BTS/HBB in which trainees continuously work
Donor recruitment	7 / 8	7 / 8
Blood supply system management	2 / 5	4 / 5
Blood transfusion technology (BTS)	7 / 8	8 / 8
Blood component separation	4 / 4	4 / 4
Blood transfusion technology (HBB)	11 / 12	9 / 12

Source: Beneficiary Organization Survey
Note: Figure in left = the number of BTS/HBB which responded “yes” to each question / Figure in right = the number of BTS/HBB whose technicians attended training courses.

The project constructed new training facility with dormitory attached to C-BTS in Jakarta. It accommodates 60 newcomers per year and offers them one-year training course on blood transfusion technology and grant them certification. In parallel, the half-year refresher course is provided to around ten blood technicians per one course. However, the capacity does not satisfy total annual needs for training blood technicians in Indonesia.

Figure 7: Trainees at the training facility of C-BTS

(6) Follow-up for the study result of Engineering Service

Feasibility studies for extension of basic health service in remote areas and so on were also carried under the Engineering Service component, and proposed projects are presently processed by MoH to list them in the project pipeline of the National Development Planning Agency (BAPPENAS).

2.4 Impact

(1) Improvement of health condition in Sulawesi

The project is expected to reduce blood transmittable virus infection and maternal mortality by strengthening safe and prompt blood supply system. In analyzing the impact on virus infection rate, however, MoH has only kept the data on the result of screening test for the donated blood, but the infection rate based on the random sampling was not available for the evaluation. Concerning maternal mortality rate as well, the recent data at the provincial level is not available. Accordingly, it is judged as impossible to explain the contribution of the project to the improvement of these ratios.

A trend of the fatalities due to delayed blood transfusion can be observed as one of the impacts. Although the data is limited to six hospitals (in South Sulawesi), all the six hospitals see the reduction of such fatalities (Table 8), and explain that the establishment of HBB has contributed to reducing mortality cases due to the delay of blood transfusion to the patients.

Table 8: Trend of the number of fatalities due to delay in blood transfusion

	2000	2002	2003	2004
6 hospitals in S. Sulawesi	65	58	22	5

Source: Beneficiary Organization Survey

(2) Initiatives arisen through the project

Through the project experience, two notable actions were initiated. Firstly, some BTSs in collaboration with the stakeholders (Indonesian Red Cross: IRC, the local government and parliament, religious society, and NGO) launched the regular advocacy activity to continuously recruit more voluntary donors. Secondly, the provincial government of North Sulawesi established the provincial Blood Transfusion Committee (BTC), comprising of the local government (health department), the provincial IRC, BTSs, hospitals, medical school and pharmaceutical companies, to discuss issues concerning donor recruitment, supply and demand coordination of blood, staffing of BTS, budgeting, and provision of equipment and reagents annually. Similar discussion body was also formed in South Sulawesi, and is to be institutionalized to BTC.

(3) Environmental and social impacts

Medical waste and expired blood are mostly disposed in a proper manner. Beneficiary survey (both for BTS and HBB) reports that 88% of total samples (23 BTSs / HBBs) conduct waste disposal following SOP, and the rest (3 BTSs / HBBs) does not follow. Expired blood and other liquid wastes are treated with disinfectants in septic tank. Medical equipments and other solid wastes are incinerated. Concerning land acquisition, there was no problem and no relocation of the existing residents was required.

(4) Collaboration with Japan International Cooperation Agency (JICA)

The project envisaged to have coordination with technical assistance project by JICA in the pursuit of health service improvement in Sulawesi. The project, in pursuit of realizing provision of prompt blood transfusion service, addressed the one of the major factors for maternal mortality that is delay in proper obstetric treatment in hospital, while JICA implemented "Project for Strengthening of District Health Service System in South Sulawesi" (1997-2002) to contribute to reduction of maternal mortality, through human resource development of health service staff and medical equipment provision. Therefore, the collaboration was observed.

2.5 Sustainability

2.5.1 Executing Agency

Each local government has a responsibility to supervise and ensure adequate operation of P-BTS and D-BTS[9] in accordance with SOP, and each BTS executes service operation of blood collection, testing, processing and delivery. Operation of hospital-based BTS (H-BTS) and HBB are managed as one of the hospital services by each hospital under the supervision of the government concerned.

2.5.1.1 Technical Capacity

(1) Technical capacity of staff and technician

According to the beneficiary survey, most BTSs and HBBs have operational manuals related to their tasks, and are satisfied with the skill and knowledge of their technicians. Some HBBs state however that there are some doctors and nurses who are not familiar with the maximum transfusion limit, and that their technicians attach less importance to the conduct of cross-matching test in accordance to the required procedure.

(2) Continuity of training

Beneficiary survey indicates that BTSs and HBBs have needs for training such as the refresher course of blood transfusion technology, component blood separation, donor recruitment, cross-matching test at hospital, and irregular anti-body screening. However, training opportunity after the project has been rarely offered in Sulawesi since the budget is very limited. Although the project trained technicians of P-BTS in North and South Sulawesi as trainers to extend and continue the training after the project, limited budget confines their activity to sporadic field supervision over D-BTS.

(3) Record-keeping of blood service

[9] Under the former Decree of MoH (No. 478/1990) and Government Regulation (No. 18/1980), IRC (or authorized entities by MoH) was responsible for blood transfusion service as service implementer, and the government was at the position to subsidize its operation upon necessity. The present Decree of MoH (No. 1457/2003) stipulates that the local government has a mandatory in establishment and operation of blood transfusion service.

Beneficiary survey indicates that all BTSs (9 BTSs) record the data on blood collection, donor, screening test, blood production and delivery. However, they still need to improve the record-keeping so that some recording items such as incidence of side-effect during blood donation are added. Almost all HBBs (16 out of 17 HBBs) also record the supply and stock of blood bags, but only the half of them records an occurrence of blood shortage.

2.5.1.2 Operation and Maintenance System

(1) Staffing of BTS and HBB

Almost all BTSs and HBBs chronically face under-staffing, an appropriate division of work is not structured as a result. Blood technicians of BTS are mostly engaged in both services of donor recruitment and blood test / production. In addition, it is usual that the directors of BTS concurrently hold another position as a hospital doctor and that most technicians of HBB are laboratory staff of hospital at the same time. The ex-post monitoring study by JBIC suggests that the full-time personnel be placed.

(2) Role and responsibility of the government and IRC

Government: each local government is mandated to ensure that its BTS be sufficiently staffed and equipped through financial support. However, support by the local government is usually in the form of assignment of government employees (e.g. public hospital doctor, concurrently assigned as the director of BTS) and their salary payment, and substantial staff replenishment is rare. Equipment provision is limited and done by a few local governments[10]. The central government is responsible for the planning of blood policy, standardization of blood service, and also renders financial assistance to BTS through IRC.

IRC: IRC also coordinates the activity of each BTS and monitors its service through periodic report from BTS and field supervision. IRC, with the financial assistance by the central government, provides BTS with support for training and equipment. It is however observed that the role of IRC becomes rather obscure, as the local government becomes more involved in the supervision over BTS operation.

HBB is a part of units in hospital, and its operation is managed under the entire management system of hospital. Some HBBs receive supports for training of their staff and reagent supply from BTS nearby.

2.5.1.3 Financial Status

[10] P-BTS in South Sulawesi is the only one model seen in Indonesia, where the local (provincial) government directly oversees its service operation through subsidizing budget for the whole operational expenses.

BTSs generally face the service operation with limited operational budget. C-BTS estimates the reasonable service cost per bag to be Rp. 252,000 (to ensure BTS operation in sufficiently accordance with SOP) or Rp. 135,000 (to ensure the operation at the minimum level enabling to procure the necessary reagents, and so on). On the other hand, the revenue comes from sales of blood bags to HBB / hospital and patients who directly visit BTS. Price (called as service cost) per one bag ranges from Rp. 100,000 to Rp. 110,000 in Sulawesi, to be approved by the local government upon proposal from the local branch of IRC.

Therefore, BTS finds it difficult to finance the replacement of equipment, replenishment of full-time staff, continuous use of quality reagents, and training for staff. Furthermore, financial support by the local government is mostly in the form of salary payment for the government employee, and equipment provision and staff training are rarely financed. The central government, through IRC, subsidizes reagents (for HIV and HCV), equipment (none for Sulawesi after the project), and training activity.

The form of financial management of HBB has two kinds, one is financially separated from hospital management and the other is directly budgeted by hospital. In both cases, however, operational budget of HBB is limited and financial status is similar to that of BTS as is stated above.

2.5.2 Operation and Maintenance Status

Figure 8: Equipment in use at one HBB

Beneficiary survey indicates that equipment procured by the project is mostly well utilized, but that around half of respondents have one or two equipments in malfunction. Unstable power supply damages the electric equipment in most cases. Breakdown of equipment is to be reported to the local government and branch of IRC (in case of BTS) and to hospital (in case of HBB). However, corresponding action is rarely taken due to limited budget.

According to the beneficiary survey, reagents supplied by the project are already consumed. 4 BTSs out of 9 BTSs respond that reagents seem to be in short supply. BTS (and some HBBs which do not receive reagent supply from BTS nearby) needs to continuously bear the cost of reagents from now on. It is noted however that even if BTS is able to procure the required amount of reagents, their quality may be lowered (the lower unit price), affecting the performance of blood test due to less virus sensitivity of the lower quality reagents.

3. Feedback

3.1 Lessons Learned

Blood supply system itself strengthened in the project is considered as not complex, and applicable enough to other regions and countries. However, the gap between reasonable O&M cost and price of blood indicates that the budgetary support is critical for the sustainable O&M of blood supply system. When the similar system is to be developed, however, it is important and more effective to ensure the policy and budgetary commitment of the central and local governments, to support the establishment of the committee responsible for blood supply coordination, to plan the cross-visit for sharing the best practices among BTSs, to confirm the reporting system to equipment supplier, to review the financial plan and the reasonable pricing of blood supply service, and to at least secure the budget for continuous supply of re-agents and maintenance of medical equipment, at the planning phase of the project.

3.2 Recommendations

Expansion of blood supply network:

BTS which faces shortage in blood donation is recommended to strengthen the collaboration with the organizations such as schools and work place to which many people attend, the local parliament, and other influential groups, in order to expand the basis of blood donation. Furthermore, the provincial government is recommended to take an initiative in leading the provincial committee for blood transfusion and facilitating the coordination on blood supply (for reduction of disposed blood) and donor recruitment among BTS, hospital, IRC and the local government.

The role of government:

Since the government regulation is to be revised to ensure that stable and quality service for blood transfusion be rendered as one of the health and medical services under the government responsibility, the central government is recommended to further facilitate the local governments so that each BTS evenly receive support by the local government, sufficient budget allocation with reasonable pricing of blood in particular, and sustainably render its service in accordance to the standard.

The local government and hospital are also recommended to check the status of medical waste disposal for all BTS and HBB, and take the counter-measures for those which do not practice waste disposal in accordance to SOP.

The ex-post monitoring study by JBIC also recommends both BTS and HBB to improve their operation (such as extension of the scope of data management

concerning blood donor and screening test), which requires the follow-up monitoring by the central and local government.

Comparison of Original and Actual Scope

Items	Original	Actual
(1) Outputs		
1) Strengthening of safe blood supply system		
a) Construction and improvement for BTS and HBB	a) Training facility rehabilitation / dormitory construction at C-BTS b) 10 new BTS buildings c) Facility improvement for 30 BTSs, H-BTSs, HBBs	a) Training facility construction including dormitory at C-BTS b) 15 new BTS buildings c) Facility improvement for 22 BTSs, H-BTSs, HBBs
b) Provision of medical equipment for BTS and HBB	(Urgent procurement) a) 17 blood refrigerators d) 4 blood collecting mobiles c) 4 ambulances for transporting d) 6 mobiles for campaign (Non-urgent procurement) Medical equipment, icelined refrigerator, materials, reagents, mobiles, office furniture	(Urgent procurement) Done as planned (Non-urgent procurement) Done almost as planned, but some items were added, deleted or revised in quantity
c) Training for staff, technician and medical doctor	- Blood transfusion technology - Blood collection - Management of blood supply - Effective use of blood - Donor recruitment - Medical equipment maintenance	Done basically as planned, but for cancellation of blood supply management training in Japan (changed to Bangkok) and equipment maintenance, and reduction in training duration. Some courses were added.
d) Consulting services	- Project management services (405 M/M) - Technical advisor (8 M/M) - Engineering services for safe blood supply (294 M/M)	Done as planned (437 M/M) (8 M/M) (288.5 M/M)
2) Engineering services for feasibility study (F/S) of strengthening of district health referral system	- Extension of basic health services in remote areas - Improvement of district hospitals - Strengthening of referral health service system (16 M/M)	Done as planned (27 M/M)
(2) Project Period		
L/A	Dec. 1996	Dec. 1996
Selection of consultant	Jul. 1996 - Jun. 1997	May. 1997 - Jan. 2000
Consulting services	Jul. 1997 - Mar. 2001	Sep. 1997 - Dec. 2003

Urgent procurement		
(Tender / selection)	Jul. 1996 - Dec. 1996	Jan. 1997 - Nov. 1997
(Procurement)	Dec. 1996 - Mar. 1997	Dec. 1997 - Mar. 1998
Construction works		
(Tender / selection)	Apr. 1998 - Aug. 1999	Aug. 2000 - Apr. 2001
(Implementation)	Aug. 1999 - Aug. 2000	Feb. 2001 - Nov. 2002
Non-urgent procurement		
(Tender / selection)	Apr. 1998 - Nov. 1999	Feb. 2001 - Nov. 2002
(Procurement)	Sep. 1999 - Aug. 2000	Oct. 2001 - Jul. 2003
Training		
(Tender / selection)	May. 1999 - Jun. 1999	Aug. 1999 -Apr. 2000 Aug. 2002 - Dec. 2002
(Implementation)	Sep. 1999 - Aug. 2000	Oct. 1999 - Aug. 2000 Jan. 2003 - Sep. 2003
Engineering service for F/S	Jul. 1997 - Aug. 1997	Jun. 2000 - Sep. 2000
Completion	Apr. 2001	Dec. 2003
(3) Project Cost		
Foreign currency	1,056 million Yen	529 million Yen
Local currency	1,919 million Yen (41,714 million Rp.)	859 million Yen (68,709 million Rp.)
Total	2,975 million Yen	1,388 million Yen
- ODA loan portion -	2,231 million Yen	1,271 million Yen
Exchange rate	1 Rp. =0.046 Yen (as of Apr. 1996)	1 Rp. =0.013 Yen (Average year 1996-2003)

Reference only

Breakdown of Beneficiary Organizations surveyed

Blood Transfusion Service (BTS)			Hospital-based Blood Bank (HBB)		
South Sulawesi	Southeast Sulawesi	North Sulawesi	South Sulawesi	Southeast Sulawesi	North Sulawesi
5 sites	1 sites	3 sites	10 sites	2 sites	5 sites
P-BTS (1) D-BTS (4)	P-BTS (1)	P-BTS (1) D-BTS (1) H-BTS (1)	A-class (1) C-class (9)	B-class (1) C-class (1)	B-class (1) C-class (4)