

# TRANSPORT NOTES

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### ***Improving Local Roads and Creating Jobs through Rapid Response Projects: Lessons from Armenia Lifeline Roads Improvement Project***

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*The World Bank's Operational Policy 8.0 'Rapid Response to Crises and Emergencies' is used when there are major adverse economic and/or social impacts resulting from actual or imminent natural or man-made crisis or disaster. This invokes a set of stream-lined procedures which results in projects being prepared very rapidly.*

*In late 2008 the Republic of Armenia requested the Bank's assistance to mitigate the impact of the global financial crisis. This technical note describes how the Lifeline Road Improvement Project (LRIP) was prepared and implemented as a Rapid Response Project, prepared in only six weeks. This project saw over 150 km of roads improved and almost 12,000 person-months of employment generated during an eight month period between May to December 2009. The lessons learned may guide other projects with similar objectives.*

*The findings, interpretations, and conclusions expressed here are those of the author and do not necessarily reflect the views of the Board of Executive Directors of the World Bank or the governments they represent.*

#### **Challenges facing Armenia following the Financial Crisis and the World Bank's response**

The 2008 world financial crisis had a major impact on the Republic of Armenia. The GDP is projected to have fallen by about 15.6 percent in 2009. The construction subsector was particularly hard hit, with output declining by some 38 percent and employment by some 40 percent. Exports declined by about 6.3 percent in 2008 and 37.4 per cent in 2009. Foreign Direct Investment dropped to 3 percent of GDP in 2009, down from 7.9 percent in 2008. Many migrant workers in Russia lost their jobs and returned home, further stressing local labor markets while depriving the rural poor of critical income in the form of remittances.

As a result, a significant portion of the labor force became unemployed. By mid 2009 poverty had increased to 28.4 percent of the population, up from 23.5 percent in 2008. Extreme poverty increased to 6.9 percent of the population, compared to 3.1 percent in 2008. A rapid response was needed to help arrest this sharp rise in poverty levels.

The Government of Armenia acted swiftly and requested support from the World Bank to help weather the economic shocks. In response, the Bank decided to utilize the "IDA Financial Crisis Response Fast-Track Facility" to support "shovel ready" investments which, in addition to

addressing broader development challenges facing the country, would create jobs and mitigate the negative impact of the financial crisis. The Lifeline Road Improvement Project (LRIP) was prepared in this context with the objective to upgrade selected sections of the Lifeline Road Network (LRN) and create temporary employment in road construction. The project was approved by the Board of Directors on February 24, 2009, with Additional Finance to expand the project scope approved on August 27, 2009. Table 1 summarizes the financing for the project.

**Table 1: LRIP Project Financing**

Phase	Financing (US\$ million)		
	IBRD	Gov't of Armenia	Total
Original Project	25.0	5.4	30.4
Additional Finance	36.6	9.1	45.7
<b>Total</b>	<b>61.6</b>	<b>14.5</b>	<b>76.1</b>

#### **Project Milestones**

- Identification Mission – 1/10/2009
- Concept Review – 1/13/2009
- Appraisal – 1/14/2009
- Negotiations – 1/26/2009
- Bank Approval – 2/24/2009
- Signing – 2/26/2009
- Effectiveness – 4/10/2009
- All civil works contracts started – 6/15/2009
- Additional Finance Approval – 8/27/2009
- Civil works (153 km); substantially completed – 12/31/2009
- All Civil works (264 km); completion expected before 12/31/2010

**The Lifeline Road Improvement Project**

The LRIP aimed to rehabilitate 100 km of the Lifeline Road Network, which connects rural communities to the main road network, and to create 7,600 person-months of temporary jobs. The Additional Financing in the amount of \$36.6 million was designed to rehabilitate an additional 145.9 km of LRN and create some 10,000 person-months of new employment. Table 2 summarizes the investments supported under the LRIP. Due to lower bids than expected under the original project, cost savings allowed for an additional 18.5 km of improvements.

**Table 2: LRIP Investments**

Stage	Construction		
	Season	Number of Contracts	Km Improved
Original	2009	25	99.9
Original Cost Savings	2009	5	18.5
Additional Finance	2009	11	35.0
Additional Finance (Estimated)	2010	32	110.9
Total		73	264.3



*Typical unimproved road*

All project roads were in poor or very poor condition, and many suffered from severe pavement failure. Drainage was inadequate or missing in most locations, exacerbating pavement deterioration which was caused primarily by environmental factors and lack of timely maintenance. The project primarily repaired road pavements, drainage facilities and small bridges/culverts where necessary, in addition to installing safety measures such as guardrails, pavement markings and sidewalks in urbanized road sections, especially near schools and other public facilities. The addition of safety improvements and pedestrian facilities was a major contribution of the project to rural road design and construction in Armenia. The existing alignments were maintained to avoid land acquisition and resettlement. To ensure that there was no resettlement, the project team visited each road prior to it being included in the work program.

Within eight months after the project became effective (April 2009), LRIP had rehabilitated about 150 km of LRN under 42 civil works contracts. Indeed, the original LRIP outperformed the project target by using cost savings to rehabilitate an additional 18 km of LRN. It created almost 12,000 person-months of employment in the form of new jobs, or people keeping existing jobs. In addition, local designers and contractors successfully applied new technologies and appropriate and cost-effective design standards based on international practice, strengthening the sustainability of investments and improving safety for pedestrians.

**Key success factors**

There are six key factors that led to the success of the project, as summarized below.

Key Success Factors
<ul style="list-style-type: none"> <li>• Full support of the Government</li> <li>• Critical rural road links called “Lifeline Roads” had been pre-identified</li> <li>• Basic data and designs were available, and only needed to be updated</li> <li>• Local capacity and willingness to try new designs and technologies to improve efficiency and maximize the impact</li> <li>• Using technical supervision as a means of technology transfer</li> <li>• Competent and experienced Project Implementation Unit (PIU)</li> </ul>

**The Government pre-identified the Lifeline Road Network as priority rural road links**

In 2004 the World Bank published a report which identified outstanding issues with regard to rural infrastructure in Armenia.<sup>1</sup> This report provided public policy makers with the information necessary to develop a rural infrastructure strategy.

The Government adopted the Rural Infrastructure Strategy and Action Plan, and started its implementation as conditions of adjustment credits. One of the actions was the amendment in the Law on Automobile Roads



*Typical unimproved road*

<sup>1</sup> *Rural Infrastructure in Armenia: Addressing Gaps in Service Delivery*. The World Bank, 2004. Available for download from: <http://tinyurl.com/s5mmu>.

stipulating that each rural community should have a winter accessible road connecting the community to the national road network.

About 3,000 km of such road links<sup>2</sup> were identified as the LRN. With road lengths ranging from one to 59 km, and traffic volumes from 50 to 2,500 vehicles a day, the LRN provides rural residents with critical basic access to markets and social services. More than 60 percent of LRN was in poor or very poor conditions, imposing considerable challenges for the rural population. Farmers lose over 40 percent of produce due to difficulties in getting crops to market on time, with losses as high as 80 percent for the worst served communities.<sup>3</sup> The poor road conditions limited access to basic education and medical services for many communities.

The Government pre-identified priority rural road links of the LRN thereby ensuring that any new project road selected from the LRN would improve basic access to rural populations and contribute to improving their livelihood. The LRIP project only needed to conduct a cost-benefit analysis to verify that all project roads would have sufficient economic rates of return, including consideration of basic access needs, to warrant investment. Project preparation would have taken longer and impact would have been smaller if the strategic rural road links had not been pre-identified.

### **Basic data and designs were available, and only needed to be updated**

Basic data and detailed designs for the priority road links to support the decisions on which roads to select for investment were available by the time project preparation started. Road condition and traffic volume had been surveyed, and cost benefit analysis conducted, for a sample of LRN<sup>4</sup> under a study funded by the US Millennium Challenge Account for Armenia (MCA)<sup>5</sup> in 2007.

While the availability of basic data and designs was helpful to prepare the project in a very short time, the designs needed to be updated to reflect current pavement conditions. Some data were collected before the winter season, which allowed updating of designs, but they were deemed insufficient to address varying degrees of deterioration that occurred in different sections of

project roads. Also, further deterioration was expected during the spring thaw.

It was therefore decided that designs would be updated as best as possible with the available information, and then updated immediately after contracts were signed through “walk over” surveys (see below), which were jointly conducted by the Armenian Roads Directorate (ARD), the supervision consultant, the contractor and the designer. This aimed to identify all variations from the design and reaching agreement upon the activities to be performed. The designer then updated the design to reflect the situation at the start of work.<sup>6</sup>

### **Local capacity and willingness to try new designs**

Under the LRIP, the detailed designs were not only updated but also significantly improved and amended to achieve the following:

- Where appropriate, more labor intensive designs and specifications were adopted. For instance, concrete was used for pedestrian sidewalks rather than asphalt which was commonly used in Armenia. Masonry parapets were used instead of imported steel guard rails, since they are more labor intensive and can be locally produced.
- Wherever possible, international standards for low volume roads were used rather than the Armenian standards which called for the same minimum pavement design for all roads carrying below 1,000 vehicle/day.<sup>7</sup> More cost-effective pavement designs were adopted for paved roads e.g. use of thicker, well-compacted crushed



*Road construction work*

<sup>2</sup> Armenia has about 7,700 km of non-urban roads.

<sup>3</sup> *Rural Infrastructure in Armenia: Addressing Gaps in Service Delivery*.

<sup>4</sup> *SWECO Feasibility Study for Lifeline Roads*. SWECO Consultants in Association with Dorproject. 2008.

<sup>5</sup> Funding from MCA was sufficient to rehabilitate less than half the LRN studied.

<sup>6</sup> The Project allocated funds for designers to update designs during construction. Armenian law also requires that original designers would be paid up to 0.6 percent of costs of construction to ensure compliance with designs and cover design updates to accommodate unexpected design issues found during construction.

<sup>7</sup> The *Republic of Armenia Construction Norms IV-11.05.02-99* for reconstruction calls for two asphalt concrete surface layers of 3 cm and 6 cm, on top of a 4 cm bituminous base, which is on top of additional subbase layers from 8 cm upwards. This was applied using a 20 year design life, with a single maintenance activity.

stone base instead of bituminous stabilized base. For gravel roads, the Swedish design standard was adopted.

- Special attention was paid to road safety. All roads passing through urban areas were provided with sidewalks, and designs sought to allow the use of facilities by the handicapped where possible. A formal road safety audit, which could not be done for the original project due to limited time, was planned for the second year program of the Additional Financing. The supervision consultant and the Bank team provided advice on ensuring adequate road safety provisions in project design.
- Traffic safety management at work sites was emphasized, with an Armenian manual and checklist based on best overseas practice prepared, and training courses held.
- An Environmental Management Plan (EMP) with a summary table describing the location of each environmental issue and the specific activities to be carried out by the contractor was prepared for each site and made an integral part of the civil works contract. An environmental checklist was attached to the EMP, to be completed by resident supervisors. Training was organized so that contractors and resident supervisors understood the requirements under EMP.

The local designer and contractors quickly adopted the new designs and technologies, although the level of absorption varied across contractors. Also, a significant variation was observed for the quality of concrete sidewalks and compliance with EMP, indicating that some contractors failed to learn as quickly as others. For instance, some contractors were observed to dump waste materials on embankments, while stabilization of slopes, provision of drainage and spacing and sawing of joints on concrete sidewalks were not adequate on some roads. However, others rigorously followed the requirements in the EMPs.

Nonetheless, many contractors as well as the design consultant acquired considerable knowledge and experience as they implemented the original project. Indeed, while the cost of original projects increased by about 15 percent to incorporate new designs and technologies as well as to address findings of



*Road Construction Work*

the “walkover surveys,” the amount of variation orders under the Additional Financing was less than 1 percent. Also, all minor environmental issues initially observed were addressed in the later stage.

This clearly indicates that the design consultant and contractors quickly learnt the new technologies and standards adopted under the project.

### Technical supervision as technology transfer

One reason behind the quick absorption of new technologies is the approach employed under the project. It emphasized the role of technical supervision as a mode of technology and knowledge transfer.



*Road after improvement*

For construction supervision the project employed an international consultant who had a local sub-consultant. In addition, well-staffed Bank supervision missions and an independent technical auditor were used to provide advice to the client on all aspects of the project. This proved to be particularly valuable in improving the overall quality and effectiveness of the supervision and the project in general.

Throughout project implementation, the designer, supervision consultant, technical auditor and contractors were all encouraged to collaborate under the leadership of ARD. It was stressed that supervisors and technical auditor should not just be concerned about checking the quality of works and ensuring contractors' compliance. Their role was also to include advice on how to improve quality by providing hands-on guidance and showing practical examples, and thus transferring technology and knowledge to contractors, designers and ARD. The Supervision Manual prepared by the international supervision consultants under the LRIP will be a guideline for future LRN construction management.

The international supervision consultants were encouraged to meet resident supervisors on regular basis, and provide training where necessary to ensure that they fully understand the innovations. Workshops were held jointly with the ARD specialists on environmental issues and traffic management. However, as the project progressed it would have been better to vary the staffing schedule of the supervision team

according to the civil works progress and site geographic location.

The technical auditor makes important contributions to the project by providing an independent review of all aspects of the project, from design through implementation.

### Competent and experienced clients

Another reason for the quick absorption of new technologies and knowledge, and indeed for the success of the project, is the strong implementation team. ARD project managers regularly visited



Road after improvement

contractors to oversee works, although the ARD environmental supervision was under-resourced. The ARD staff was very supportive of the adoption of new designs and technologies and, working closely with the supervision consultant,

helped ensure the quality of designs and works.

The PIU was very efficient in processing more than forty civil works contracts over a very short period. With so many small contracts spread across the country with many small contractors, procurement processes were extremely time consuming.

Due to the rapid nature of the project, it was agreed to provide shorter times than usual for bid preparation and submission: 30 days for International Competitive Bidding and 21 days for National Competitive Bidding. To increase competition and attract more construction companies, the large contracts were divided so as to have lots estimated to cost in the range \$2.0-2.5 million. To publicize the project, there was broad advertisement through the Government's official procurement web site and the Union of Builders was requested to inform its members about upcoming contract opportunities. Training was also organized for representatives of the construction companies on bid preparation.

### Project impact

About 150 km of the LRN, including 40 km under the Additional Financing, were rehabilitated within eight months after the project became effective. Travel time was reduced on average by about 40 percent. More importantly, the project enabled rural populations to travel to urban centers where markets and social services are available.

*"Renewed [LRIP] roads will allow us to take our produce to the market quickly and in a better state."*  
Spartak Mkrtchyan from the Village of Haykavan

Other positive project impacts include improved road safety with concrete sidewalks in urbanized areas and through villages; this is highly appreciated by village residents. The project also successfully developed the capacity of many contractors who gained knowledge and experience in the use of cost effective pavement solutions and environmental and traffic management too.

### Impact on employment

Job creation was a key objective of the project. New jobs were created, and workers retained in positions which otherwise would have been terminated. In the period June-December 2009, more than 7,000 person-months of workers were directly hired for road construction, and almost 3,000 person-months for workers to produce and supply materials.<sup>8</sup> Taking into account workers retained, almost 12,000 person-months of employment was created.



Road after improvement

The job creation impact of the project is in fact greater than suggested by the number of jobs created. The project rehabilitated roads near factories and mines which had been closed following the economic crisis. Contractors in Armenia typically hire local villagers near construction sites for manual labor due to their lower cost than importing laborers from elsewhere.<sup>9</sup> Some of those people hardest hit by the economic crisis benefited from the project to weather the crisis.

### Lessons learned

- Sound sector strategy with a list of priority investments helps prepare and implement successful projects in a short time.



Urban sidewalks

- Do not shy away from

<sup>8</sup> *Job Creation on the LRIP Project*. Consultant's Report, January, 2010.

<sup>9</sup> On average, about US\$500 is paid per month to each worker. Also, contractors usually provide cash incentives to highly performing workers on top of regular wages.

using new approaches, but make sure the client recognizes it as a learning opportunity and requires supervisors to actively engage in knowledge transfer.

- Detailed design drawings and technical specifications should be provided for any new technologies or standards introduced.
- Where possible, provide sidewalks within urbanized areas and settlements to ensure safety of pedestrians.
- Ensure that local resident supervisors fully understand the applicable technical specifications and the full scope of civil works contract.
- Walk over surveys help detect and address design oversights, and are especially useful when projects need to be prepared quickly. The design and supervision consultant's TORs should clearly spell out any follow-up actions that must be taken based on the result of the walkover surveys.
- Mid-way through the project, undertake a comprehensive design review, including site inspection.
- Ensure the technical specifications call for the contractors to construct pavement trial sections.
- Pay particular attention to drainage, especially in urban areas.
- Include the test requirements as part of the technical specification in the bill of quantities at the time of bidding. Require the contractor to carry out tests at a frequency identified in the technical specification or as deemed necessary by the supervision consultant.
- Road safety audits, even in the simplest manner, improve road safety and should be pursued even if preparation time is limited.
- The EMP should be an integral part of the contractor contract. The Bill of Quantity should specify provisional sum of EMP works and there should be clear penalties for non-compliance.
- In-house capacity of the road administration should be developed so designers and contractors can be properly supervised.
- If the project needs to be implemented in a very short period, the procurement and construction schedule should be carefully planned to ensure that they fit with weather, logistical, budgetary and other conditions.

- Engage the services of a good technical auditor—and implement the recommendations.

*"I heard about the project not long ago, and am very glad that I was immediately hired to do work on the project. I am not only building the road that will link our village to the town, but I am also able to stay employed for the coming months, and sustain my family."* Artem Hakobyan, from the village of Meqhrashat.

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