



# Economic evaluation using HDM4 in El Salvador

## Economic evaluation of a road project in El Salvador

In 2007 the Millennium Challenge Corporation (MCC) agreed a compact “to advance economic growth and poverty reduction in the Northern Zone” of El Salvador. This included a ‘Connectivity Project that rehabilitated and improved the Northern Transnational Highway and network of connecting roads, an area hard hit by the civil war from 1979 to 1992

In 2018 MCC engaged a team, including TRL, to carry out an independent economic evaluation of the Connectivity Project. This evaluation was designed to review the project implementation, engineering analysis and economic modelling, road maintenance, road usage and transportation market structure. This included some key questions, such as:

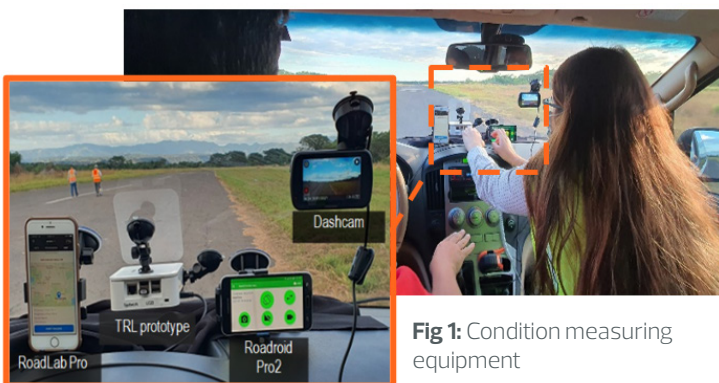
- Was the project implemented according to plan?
- What are the current maintenance practices?
- What is the current condition of the investment?
- Will the investment be adequately maintained?
- What are the travel dynamics and road-user benefits?
- What is the Economic Rate of Return (ERR) post-compact and how does it compare to the original ERR?

### Approach

TRL’s role was to establish the current condition of the road, comment on current maintenance practices and carry out the economic evaluation using HDM4. An evaluation design established the approach and methodology for carrying out the assignment, based on a literature review of the original compact documents. Economic assessment using HDM4 was a key aspect of this evaluation, producing an ERR for the current road status.

### Road Condition Assessment

The original design specified detailed visual inspection of the road, and Class 1 equipment to measure the roughness. Because of the COVID19 pandemic this was impossible to arrange, so TRL proposed an alternative methodology that could be implemented locally and supervised remotely by the TRL team in UK. This involved the use of smartphone



**Fig 1:** Condition measuring equipment

apps, a dashcam and a low-cost data collection tool developed by TRL, as well as visual IRI using the World Bank scale. The TRL data collection tool measures IRI using accelerometers and gyroscopes and takes high resolution still images of the road that can be analysed in an office environment. Together this equipment was able to collect robust data on the current condition of the road.



**Fig 2:** Video and image analysis in the office environment

The data collected included roughness, cracking, ravelling, potholes and rutting for use in HDM4, and the area of patching to gauge the maintenance impact on the road. The condition of drainage and bridges was also noted and investigated further.



**Fig 3:** Rutting measurement and bridge inspections

Training materials were developed for all the data collection methods and delivered remotely with the local team in El Salvador. Data transfer was made on a daily basis and analysis was undertaken in the UK.

### Economic Evaluation using HDM4

This data was used in HDM4 to create a new workspace and evaluate the current ERR for the road. Investigations found that the budget was exceeded substantially, the scope of the project was reduced and the estimated diverted and generated traffic was not realised, especially for heavy vehicles. When compared to the original HDM4 evaluation, the economic benefits were found to be significantly lower than expected. The results were confirmed by sensitivity tests. In conclusion some errors were found in the original HDM4 analysis, but the main cause of the lower ERR is the increase in cost and the lower than expected levels of traffic.

### Contact

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