

# PROJECT PROFILE

## MANAGEMENT PLANNING FOR EARTHQUAKE DEMOLITION DEBRIS

On January 25, 1999, the Coffee Belt of Colombia was affected by a devastating Richter magnitude 6 earthquake. This earthquake affected 28 municipalities and a total population of more than

D'Appolonia developed a master plan for the management and use of the demolition debris from the earthquake itself and that which would subsequently be generated during reconstruction.



Map of earthquake-affected area.

400,000 persons. Approximately 35,000 buildings were totally destroyed and an additional 43,000 seriously damaged by the earthquake. More than 1,000 lives were lost.

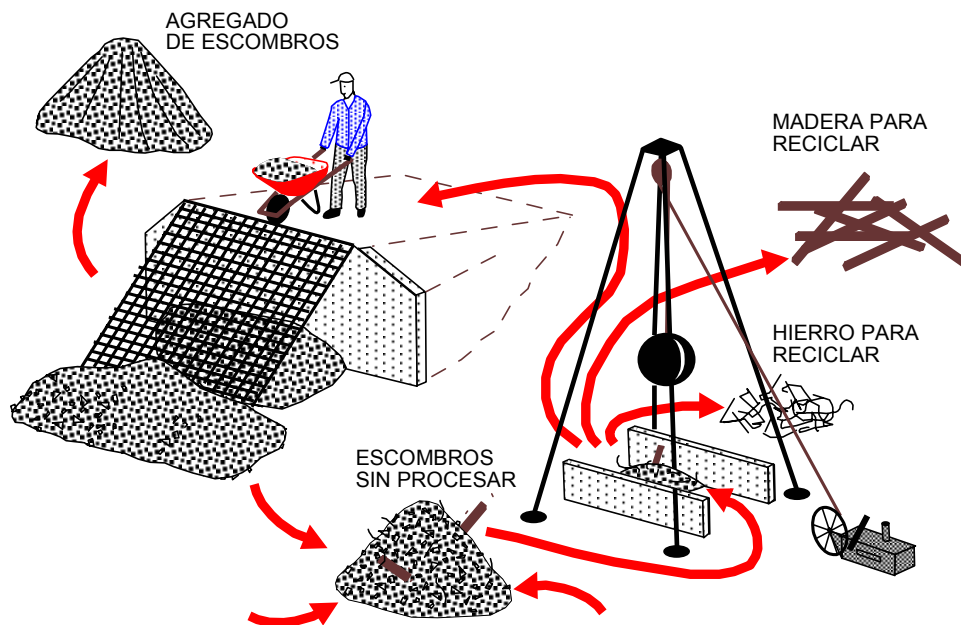
D'Appolonia's involvement in this project included the following tasks:

- Conceptual planning for the removal of demolition debris, including the estimation of volumes of waste, classification of the types of waste, development of operating procedures for managing the waste and siting of temporary waste storage areas.
- Regional studies for locating permanent landfill sites, as well as specifications for landfill design, operation and maintenance.
- Definition of programs for the reuse and recycling of the demolition debris, development of procedures for community participation in the process, preliminary market studies for materials that could be produced from the demolition debris, and technical specifications for the equipment and processes that could convert some of the waste into useful construction aggregate.



Emergency earthquake debris landfill site.

D'Appolonia personnel visited more than 50 emergency landfill sites and developed procedures and costs for remediation of these sites to acceptable standards. In a similar manner, 50 new potential landfill sites were identified and conceptual designs including costs were prepared so that the individual municipalities could develop local plans and begin to manage their demolition waste. The need for a large number of small disposal sites was established on the basis of an economic analysis that accounted for the relatively low disposal costs as compared to the high cost of transportation. Regional landfilling was not an economically viable option because of high transportation costs.



Schematic representation of debris handling and processing at local level.

Recycling of the demolition debris to create construction aggregate was a key component of D'Appolonia's demolition debris management plan. The practice of concrete recycling was found to be not well established in Colombia, but testing of crushed and sorted concrete demonstrated the benefit of using the resulting aggregate for road subgrades and for other situations where high strength concrete was not required, such as for sidewalks or other general applications. Large-scale recycling of concrete (approximately 150 tons/hour) was found to be economical in the large cities of Pereira and Armenia, but manual recycling proved to be more economical in the smaller villages and created about 1,200 needed jobs for local residents.