Rebuilding Rabaul

SUMMARY

On 19th September 1994, Rabaul in the East New Britain Province of Papua New Guinea was a modern town of 17,000 people. At 6.00am on that morning, it was essentially destroyed by the effects of a twin volcanic eruption triggering earthquakes, ashfalls, pyroclastic flow, mudflows, flash floods and tsunamis.

SMEC International was commissioned by the Gazelle Restoration Authority to undertake the risk assessment, technical feasibility, planning and subsequent design and documentation for the reoccupation and restoration of Rabaul Town.

The challenge was to plan and design infrastructure that will be less susceptible to the effects of another eruption of similar size and nature to the 1994 eruption. This task required a delicate appreciation process addressing the genuine needs and aspirations of the community balanced against:

- *real and apparent hazards and their associated risks,*
- *restoration costs, and*
- *opportunity to use existing and recoverable infrastructure.*

This was achieved by the foresight and professionalism of a team lead by SMEC International with the close cooperation, review and approval of the client, community and relevant authorities.

FEATURES OF EXCELLENCE

Prior to the 1994 eruption, Rabaul had the most extensive infrastructure compared to any other town in Papua New Guinea. Combined with its natural beauty and warm, friendly people, Rabaul was an ideal place to live, work and visit. The eruption of September 1994 and the ensuing aftermath damaged or destroyed most of the town. A similar eruption in 1937 also damaged a large section of the town, therefore the effects of an eruption are clear but the means of dealing with these massive forces of nature are not so obvious.

SMEC International as prime consultant working in association with Beca Gure (PNG) Pty Ltd, Asia Pacific Surveys Pty Ltd and M+E Partnership was commissioned to assess the damage to the infrastructure, identify hazards and risks, assist in re-planning the town and ascertain the best means of restoration. This was achieved during a fourteen-month project with a multi-disciplined team of foreign and local experts involving engineering feasibility, physical planning, and detailed engineering design and documentation.

The aim of this submission is to portray the engineering excellence involved and the appreciation applied to the restoration of a town extensively damaged twice by volcanic eruptions within 55 years. All evidence predicts there will be another eruption of equal magnitude within 40 years. The plan prepared and now implemented takes this fact into account and aims to mitigate the loss of life and infrastructure should such an event occur.

The members of the team found themselves grappling with concepts of '*risk'*, *'compromise'*, and *'mitigation'*. The goal was to plan and design a town to meet the needs and aspirations of the community and government, but also ensure life and property is less susceptible to the various current and future hazards. SMEC and its associates were able to achieve this goal and in the process demonstrate the definable features of engineering excellence required to fulfill the real demands of such a challenging project.

Features of excellence can be summarized as:

Assessment of Hazards and Risks. The impending hazards confronting Rabaul are very real: volcanoes, tsunamis and earthquakes. The Team was able to determine the complex nature of these hazards and ascertain the associated risks. This has not been done before and cast into perspective the *'risk'* component of the analysis.

Classification of Volcanic Effects. Rabaul is nestled in a huge volcanic caldera and there will be another eruption. Therefore, it was essential to understand the effects of the last eruption such that the new infrastructure could be re-planned and re-designed to minimize the effects of a new eruption. The Team assessed the damage to the entire town and classified the volcanic effects.

Formulation of the Town Plan. SMEC convinced the client to re-plan the town taking into account the risk of allowing population to reach it's pre-eruption level, the new anticipated functions of the town, broad-based economics, and the extent of damage in some areas. SMEC was the facilitator for this plan and brought together diverging views of the government and community to agree on a **'compromise'**. This was an intense and extremely difficult process, as it would ultimately require the resumption of land from some 9,000 people.

Development of the Engineering Plan. Designing a town that has been extensively damaged by two volcanic eruptions within 55 years is unique and demanding. SMEC challenged conventional wisdom and developed a restoration plan for all infrastructure that would '*mitigate'* the effects of another eruption

SMEC International achieved these features of excellence was duly recognized by the client as described in a letter (Annex 1) from the Project Manager of the Gazelle Restoration Authority.

> *'SMEC International carried out the work with admirable degree of thoroughness, understanding the complexity of the situation in Rabaul, and facilitating the production of a post eruption zoning plan for the town to guide the future restoration and development of the town.'*

Photo 1 Rabaul Town - early 1980's

Photo 2 Rabaul Town - post eruption 1995

'Tuvurvur' Volcano is at the top of the photo and is still erupting to the present day.
Other dormant volcanoes are evident within the caldera that encompasses the town and harbour.
Ash up to 3m deep covers most of the town.

Photo 3 View of 'Vulcan' Volcano looking north towards Rabaul Town