Project Summary

Located in Southern Taiwan's rugged mountainous areas rich in natural beauty, indigenous cultures and rare wildlife, the "Anshuo – Caopu Section of Highway No. 9" is the main arterial in the area critical to the regional economy and livelihoods of nearby communities.

The original route is a narrow, winding road with a poor alignment and steep longitudinal slope constrained by high embankments and side slopes, prone to frequent landslides and traffic disruptions. As widening it would cause catastrophic damage to the surrounding environment, in 2009 plans were launched to build a safer, more environmentally friendly and carbon-footprint-managed route, shortening its length from 16.2km to 11.0km and eliminating the road's dangerous bends by using a long tunnel and viaduct structures. From the outset, the project team committed to a number of environmental mitigation strategies, such as:

- *Accommodating eco-friendly design principles and optimizing the alignment to avoid ecologically sensitive areas*

  From the design stage, 24-hour active infrared detection and other technologies were deployed to conduct extensive ecological surveying, identify animal foraging paths, and map out local wildlife habitats. Other design principles included minimizing construction surface, restoring the area after completion, reducing sound and light pollution, preventing animal intrusions, and protecting large trees.

- *Adopting eco-friendly technologies prior and during construction to mitigate impacts on the surrounding environment and the wildlife*

  A high degree of automation during construction was used, and long-span pre-assembled structures were chosen to be built by the more environmentally-friendly cantilever and advanced shoring construction methods. The "bamboo cut" method was selected for bridge pier foundations to minimize the construction area, and trestle bridges were utilized to prevent intrusion into the forest environment. Additionally, an advanced fire emergency response and rescue system is employed in the tunnel to minimize the danger of fire spread, and the buildings are built following the LEED Green Building design standards. Finally, the remaining earthwork from tunnel construction was re-used for beach regeneration on Taiwan's east coast.

- *Deploying carbon-emissions management and reduction measures and adjusting the tunnel profile from 3% to 2% to reduce emissions during operation*

  An innovative carbon emissions monitoring and management system and database were used throughout the project to implement carbon footprint inventory and verification measures during construction, as well as to allow a more efficient control

of emissions in future projects. Notably, to reduce emissions during operation, the tunnel profile was adjusted from 3% to 2%.

Upon opening to traffic in 2019, over 95% of the traffic volume was diverted to the new route with its reduced travel distance and times, increased velocity, and lower accident rates due to the new safety-oriented traffic information and traffic management system. The old route is still preserved and used primarily as a recreational scenic road made particularly suitable for cycling enthusiasts. Better transportation efficiency and a renewed initiative stimulating local tourism are benefitting the local economy and communities. Very importantly, the project slashes carbon emissions, allows for restoration of the native flora and fauna, and demonstrates a fine balance in project development and environmental protection.