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# REAAA Newsletter

Road Engineering Association of Asia and Australasia

# REAAA Newsletter

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# Message from the President

***Dr. Sung-Hwan Kim***
***President of REAAA***

Dear Colleagues,

I wish you all a happy New Year full of happiness and success in your personal and professional lives.

Sixteen months ago, I took up the Presidency of REAAA after the successful 16th General Meeting in Manila, in hybrid.

At the start of the 17th term, we had the opportunity to review the performance and achievements of REAAA. Setting new priorities and strategies, and as a result of our commitment to achieving them, a set of Working Committees were established. I am very grateful to all Council members who have been devoting their precious time to REAAA and its activities and I will of course continue to support the Working Committees to spread their work for our members.

I shall continue the work of my predecessors to strengthen the membership network, in particular bringing new associations and partners to REAAA. I deliver a message to neighbouring countries that have small engineering associations or do not have one yet that REAAA is looking forward to assisting them and to having them on board in the framework of a special initiative.

The year of 2023 is REAAA's 50th anniversary and I will do my utmost to cherish REAAA's wonderful moments with our seniors; and to draw new pictures with the young generation to open a new half century.

Lastly, you will agree with me that our Association is full of extensive and professional expertise. All we need to do is to organise and share them with the world. New ideas and suggestions are always appreciated.

I wish all our members a very happy, peaceful and successful new year full of dynamics.

# Case Study of Road Rehabilitation and Performance Monitoring on National Highway No. 117: Nakhonsawan – Nongtao, Thailand

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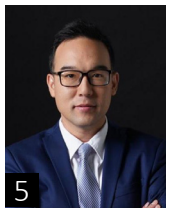



## Background

National Highway No. 117 is the major highway connecting three provinces in Thailand: Nakhonsawan, Phichit, and Phitsanulok. The route also serves as a secondary highway in Phitsanulok and Uttaradit provinces. The average daily traffic and the percentage of heavy vehicles in 2021 were 21,500 vehicles per day and 10% respectively. The existing pavement was a conventional flexible pavement with a four-lane divided carriageway: two lanes northbound (NB) – constructed in 1976 – and two lanes southbound (SB) – constructed in 1997. The highway was subsequently rehabilitated in 2015. After the rehabilitation of the highway had been completed in 2021, the pavement was experiencing severe distress, including longitudinal cracking, block cracking, alligator cracking, and rutting as shown in Figure 1. The highway was also subjected to flooding in the rainy season.

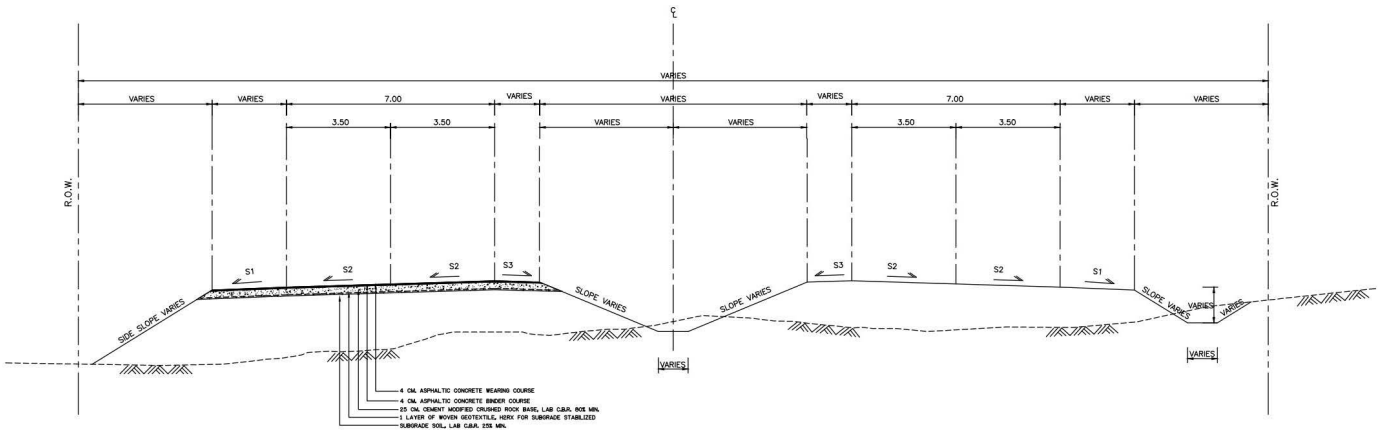
Several routine works and periodic maintenance strategies, e.g. pavement overlay, have been applied but the problem remained unsolved. A site investigation revealed that the possible cause of the problem might be improper quality control management during the construction stage. In addition, it was clear that a traditional solution was not suitable n terms of addressing the current situation.

Figure 1: Common pavement distress types observed on Highway No. 117

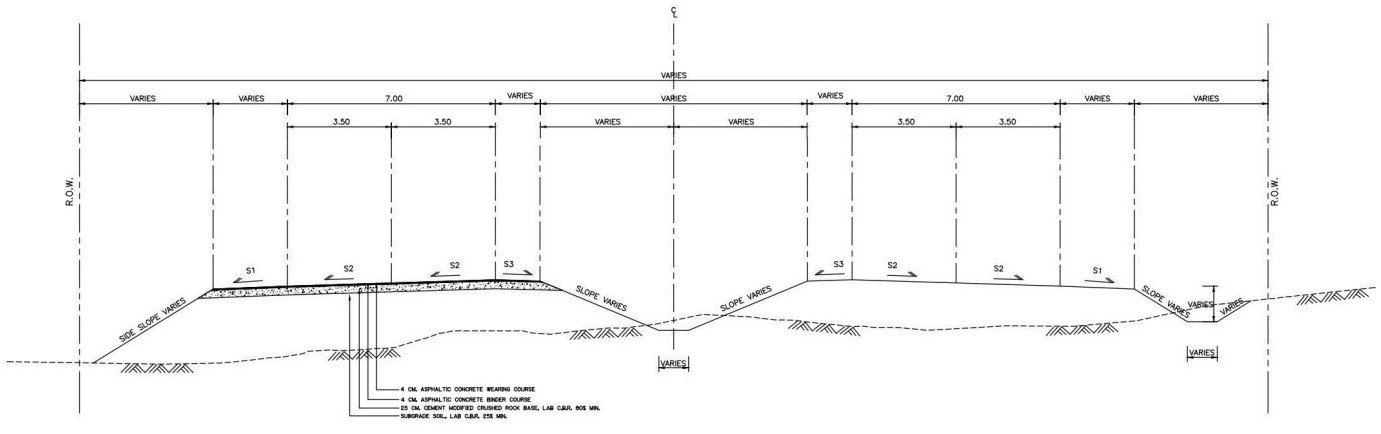
## Rehabilitation Method

Various rehabilitation methods were considered to address all the problems. The aims of the conceptual rehabilitation approach adopted were to: (1) maintain the elevation of the existing road pavement, (2) ensure layer homogeneity and uniformity as well as structural integrity, and (3) provide additional layer reinforcement and a separator between new stabilized layers and the existing problematic underlying materials. This proposed solution would eliminate the existing problems, minimize the impact of moisture damage due to flooding, prevent pumping of underlying fine-grained material, improve load-carrying capacity for heavy vehicles and increase traffic volume in the future.

Based on the traffic information, the expected traffic ESALs for a 15-year design period was 10 million. According to the AASHTO (1993) design procedure, the required minimum structural number (SN) was 6.4. Therefore, a proposed pavement structure consisting of an 80 mm thick asphalt surface, 250 mm of cement-modified crushed rock, 300 mm of soil aggregate subbase, and 200 mm of selected material was considered acceptable (see Figure 2). In addition to this proposed semi-rigid pavement (SN ~ 6.6), the use of a woven geotextile (TenCate Mirafi® H2Rx) was also considered to provide additional reinforcement, lateral drainage, and separate the new stabilized layers and the existing problematic underlying layer materials.




(a) Typical cross-section with woven geotextile




(b) Typical section without woven geotextile

Figure 2: Proposed cross-section of four-lane divided roadway

The Department of Highways, Nakhonsawan 1 Highway District, was responsible for the rehabilitation project of National Highway No. 117 (Nakornsawan-Nongtao). A field trial, 1 km long, between Sta.14+000 and Sta.15+000 (LT) was constructed for the R&D initiative. This trial was divided into two sections, with and without geosynthetic reinforcement, each 500 m long. The project's duration was 30 days, from 24 September to 23 October 2022. The field instrumentation, e.g. horizontal inclinometer, moisture sensor, suction sensor, rain gauge, data logger, etc., were also installed in order to monitor and compare the in-service performance under the actual traffic loading and climatic conditions in Thailand. Figure 3 illustrates the layout of the field monitoring instrumentation used in the project.

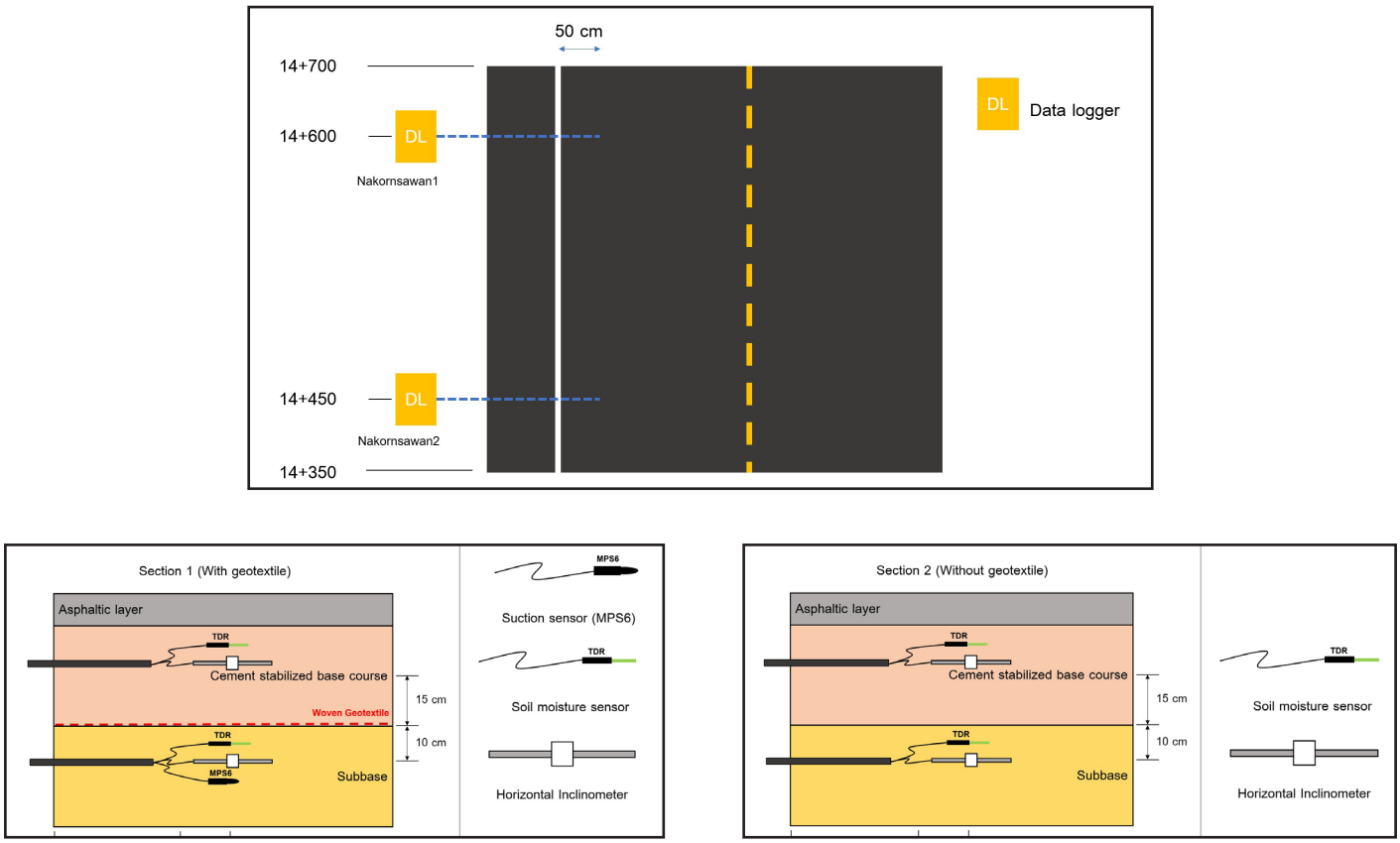



Figure 3: Layout of field monitoring instrument

The existing asphalt surface and 400 mm thick basecourse depth were removed using a milling machine. This was followed by the placement and compaction of the soil-aggregate subbase to meet the designed elevation. Field instrumentation for monitoring the performance of the pavement and woven geotextile for mechanical stabilization, moisture management, and layer material separation were then installed as shown in Figures 4 and 5, respectively. After the installation of the field monitoring instrument and the woven geotextile, a crushed rock layer 50 mm thick was placed for the purpose of base leveling and mixture modification.

Figure 4: Installation of field monitoring instrument

Figure 5: Installation of woven geotextile TenCate Mirafi® H2Rx

The new crushed rock and cement powder were then placed and mixed using a recycling machine to form the cement-modified crushed rock or cement-stabilized base. The cement-stabilized material was required to meet the target unconfined compressive strength (UCS) of 2.4 MPa (24.5 ksc) – DH-S 213/2000. To avoid any damage to the woven geotextile, the mixing process using the recycling machine was performed at a section where there was no geosynthetic reinforcement. It was then hauled to another section having geosynthetic reinforcement. The mixture was uniformly compacted to achieve the designed thickness of 250 mm and the target compaction level of at least 95% of Modified Proctor density. Samples of the mix were also taken for

subsequent UCS testing in the laboratory – DH-T 105/1972. After the final elevation and compaction level of both the cement-modified crushed rock base sections had been met, a prime coat was applied and the asphalt surface was placed. Photos of the construction process are shown in Figure 6.

Figure 6: Construction process

## Performance Evaluation

A 100 mm-diameter cylindrical sample was collected from this site upon completion as shown in Figure 7. The cored sample showed continuity in a solid cylinder and good uniformity throughout the 340 mm thick cement-stabilized base. The results reflected the efficiency of the construction machinery, process, and quality management.


Figure 7: Extraction of 100 mm diameter core

Field monitoring data were collected for in-service performance evaluation as shown in Figure 8. The moisture content of the subbase layer in Section 1 (with woven geotextile, Figure 8a) was relatively constant regardless of the rainfall event, while the moisture content of both the subbase and base layers in Section 2 (without woven geotextile, Figure 8b) changed abruptly approximately one or two days after the rainfall event. The moisture content in the base in Section 1 only slightly increased by 1% following the rain event. The horizontal inclinometer data also indicated a consistent response. With the larger movement observed in Section 2 (without woven geotextile, Figure 8c), and the movement in Section 1 (with woven geotextile, Figure 8d) being much smaller during the rainfall event.

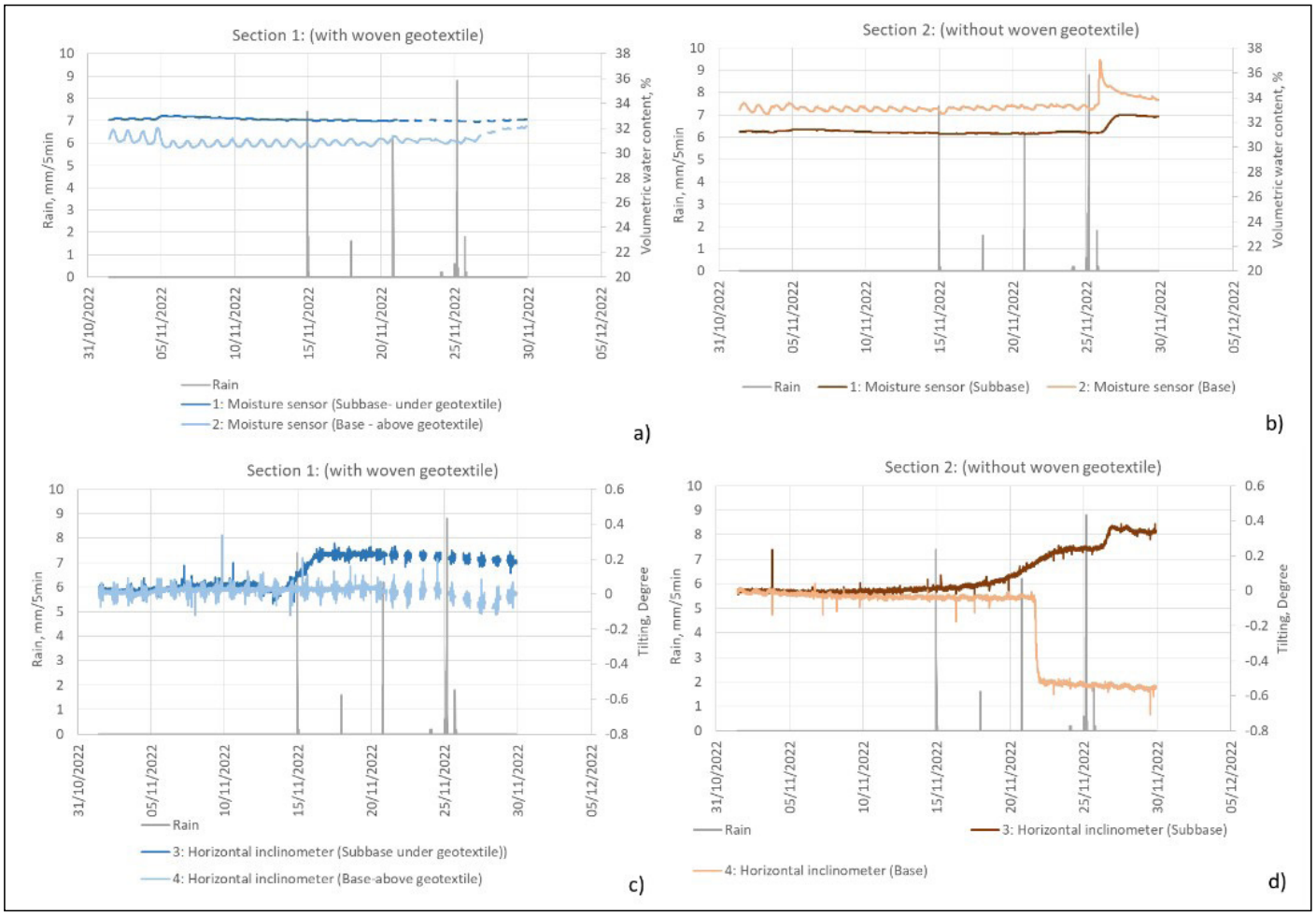



Figure 8: In-service performance evaluation using field monitoring data

Surface deflection testing using the Falling Weight Deflectometer (FWD) was conducted before and after rehabilitation and a comparison of the results is shown in Figure 9. It can be seen that, after the rehabilitation, the deflections reduced by approximately 30%. A pavement evaluation conducted two months after construction suggested that there was no sign of pavement distress. It is clear that the rehabilitation method used resulted in high structural integrity and good in-service performance.

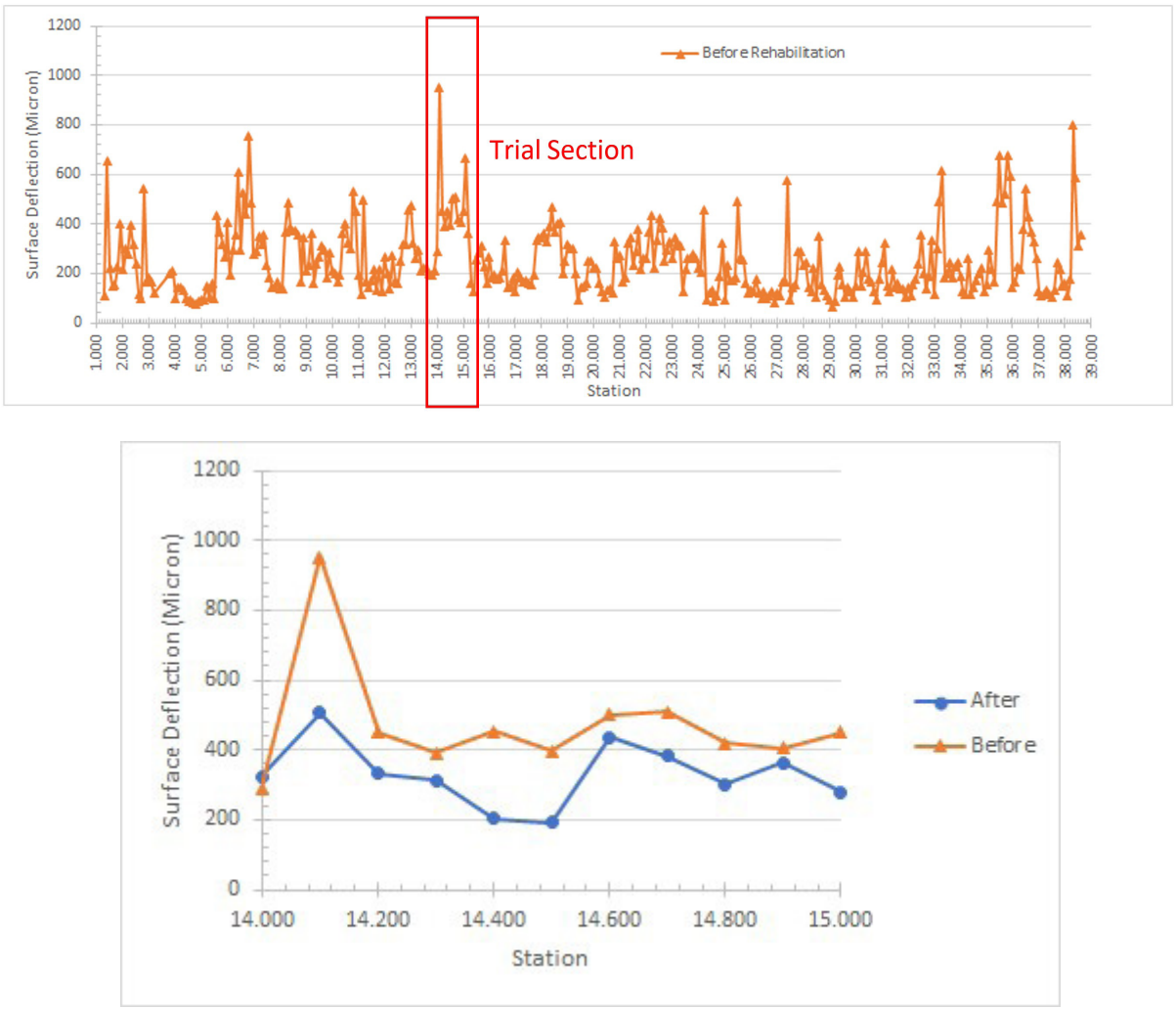



Figure 9: Comparison of FWD surface deflection data before and after rehabilitation

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# Construction Features and Challenges of Kinmen Bridge, Taiwan

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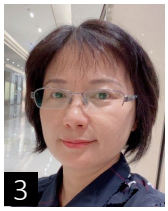


## Introduction

Kinmen County is located in Xiamen Bay, near the Jiulong River. It consists of 12 islands, of which Kinmen, the main island (Great Kinmen) and Lieyu (Little Kinmen) are where the residents live. As the Kinmen-Lieyu waterway lies between the big and small Kinmen (Figure 1), transport between the two islands is completely dependent on ferries and boats. This affects the economic development of little Kinmen and is inconvenient to the local population's livelihood. The completion of the Kinmen Bridge will greatly improve the lifestyle and economy of little Kinmen.


Figure 1: Construction Location

## Kinmen's Geographical Environment

Due to the continental climate and the surrounding sea, Kinmen has a strong northeast monsoon season from December to February of the following year. From February to June, the islands are densely covered with fog. The geology is dominated by granite gneiss, and the maximum tidal range change is 6.3 meters.

## Bridge Design

The Kinmen Bridge is divided into three sections: the main bridge, the side bridge and the approach bridge as shown in Figure 2. The main bridge section is a long extradosed bridge with five pylons and six consecutive spans. An extradosed bridge is a structure that combines the main elements of both a prestressed box-girder bridge and a cable-stayed bridge.

The main bridge was designed to be 1,050 meters long with maximum span of 200 meters. Both sides of the main bridge are the side bridge sections designed to be 360 meters long with maximum span of 150 meters each. The cantilever box girder design and the large span were adopted to reduce the number of piers in the deep groove area. Both sides of the side bridge are connected to approach roads, with a span of 50 meters and a total length of 3,000 meters. After considering the economy and constructability of the project, an equal girder deep pre-stressed concrete box girder bridge was designed.

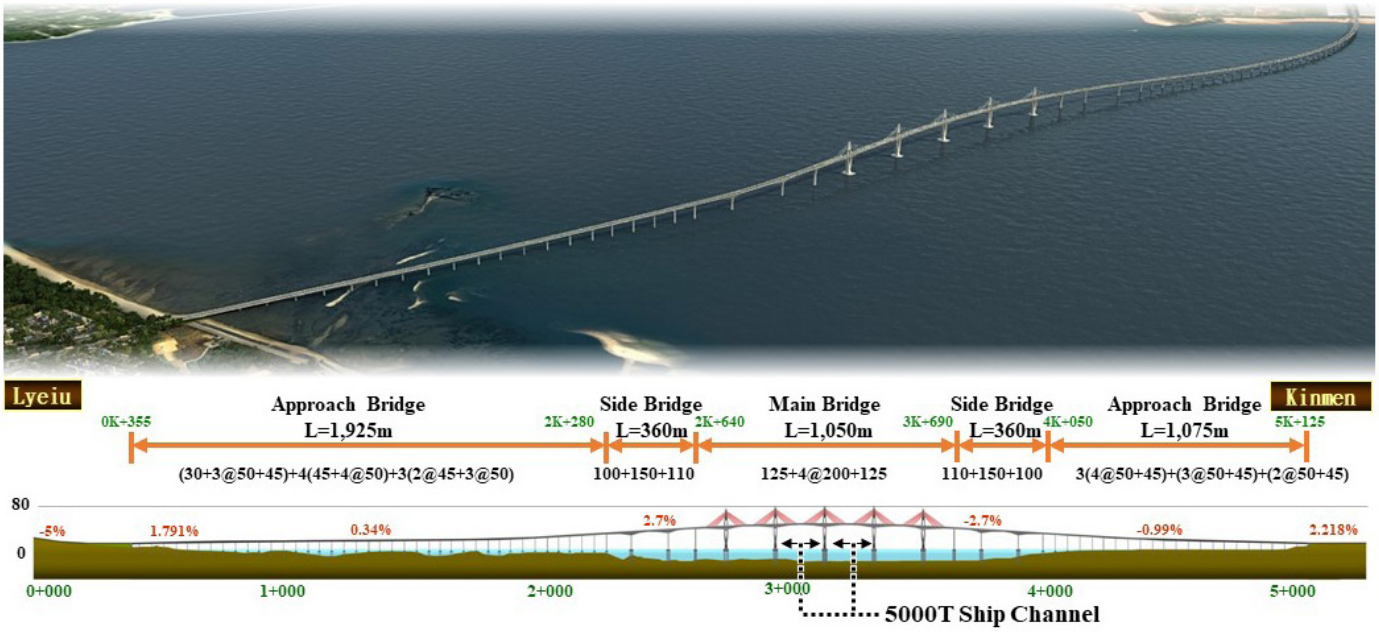


Figure 2: Bridge Layout Drawing

## Construction Features and Challenges

There were problems associated with the construction of the Kinmen Bridge due to the hard ground, unpredictable tides and its location on an outlying island. This made it difficult to obtain resources such as construction ships, machinery and materials, and this led to difficulties during the early stages of construction. These issues are now discussed.

**Drilling of Foundation Piles in Granite Bedrock**

The foundation where the bridge site was located is granite, with a single pressure core strength of 33.37~154.16 MPa. The upper layer was alluvium. Due to the large changes in the depth and weathering of the bedrock at the construction site, a full set of pipe-yard cast RC piles were designed for inclusion in the construction. There are 75 foundations for the whole bridge with a total of 532 piles installed. The foundation pile drilling depth can be divided into three parts: the seawater section, the overburden, and the bedrock. During the construction process, the jacket steel pipe was drilled first to prevent the overburden from collapsing. The foundation pile in the mid-sea section was then grouted, followed by drilling of the main body of the foundation. A schematic showing the construction of the deep water foundation pile is shown in Figure 3.

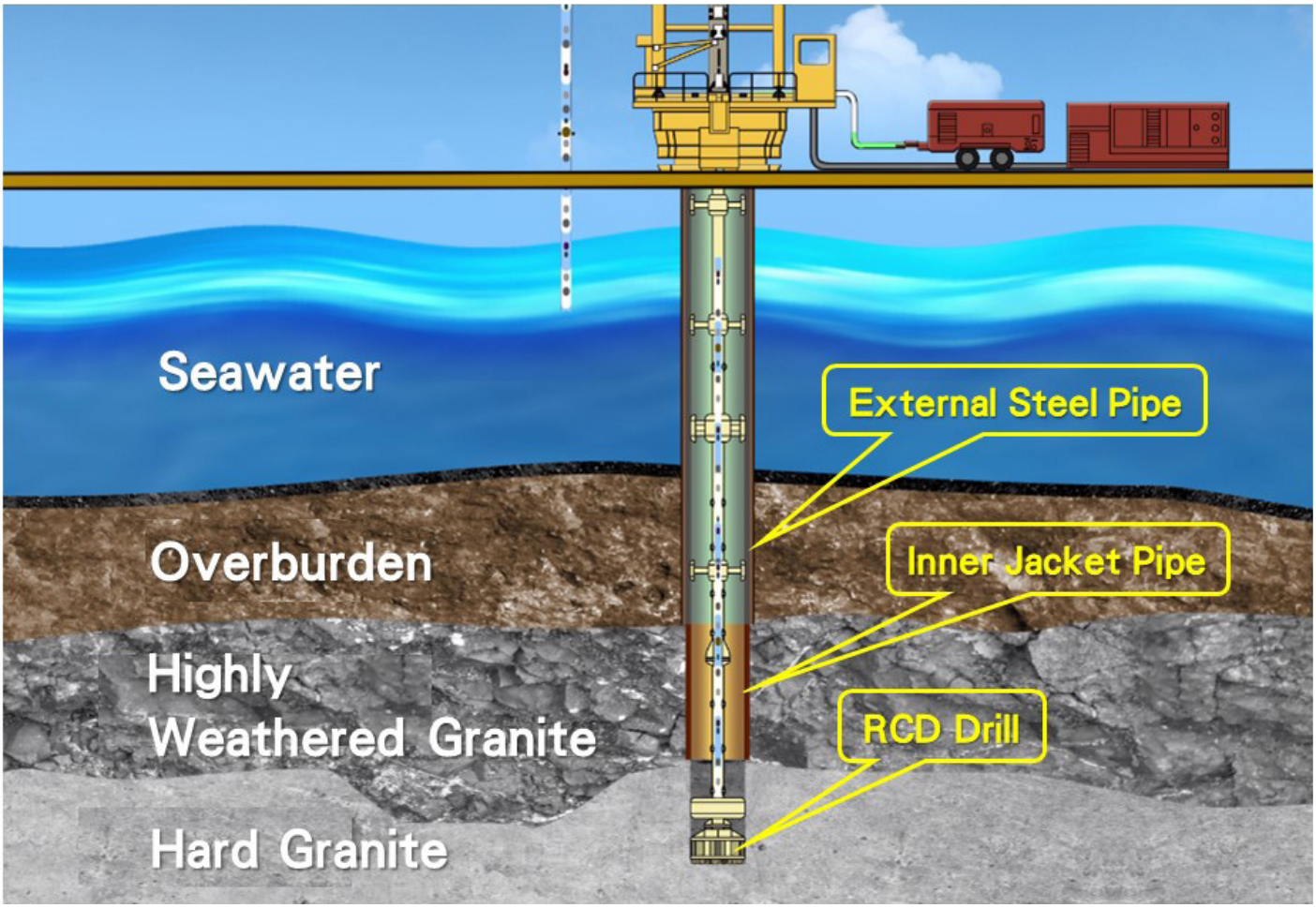


Figure 3: Diagram of Deep Water Foundation Pile Construction

There are two ways to set up the foundation pile drilling construction platform in the sea: (1) erect the construction platform adjacent to the completed foundation pile jacket steel pipe (Figure 4), or (2) use the jack-up platform ships as the gantry (Figure 5). The type of drilling equipment was mainly reverse circulation drills (RCD) and a casing pile oscillator combined with compound drilling for soil extraction.

Figure 4: CASE 1 Build the Construction Platform with the Jacket Steel Pipe

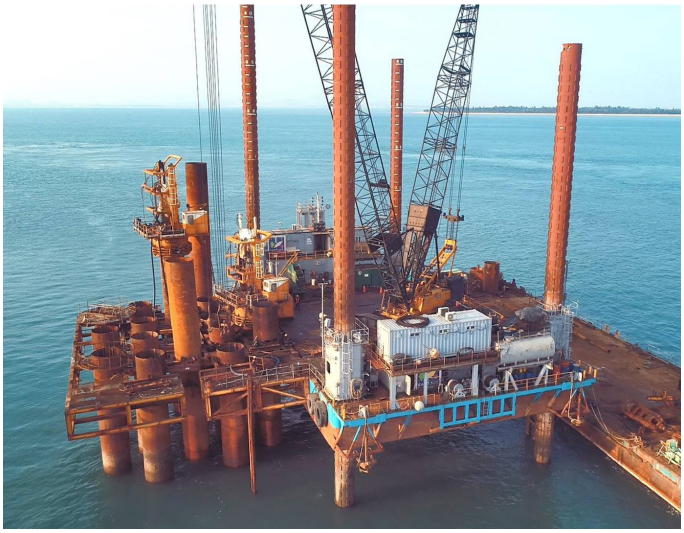

Figure 5: CASE 2 Use Jack-up Platform Ships as Gantry

Due to the hard texture of the granite, the drilling speed could only reach 26~28 cm/h and it was easy to wear the tungsten steel drill bit (Figure 6). Due to the turbid water quality in the sea around Kinmen, workers or photography could not be used to monitor the underwater operation conditions. The construction workers used the lithology of the slag material and the turbidity of the effluent to identify the geological conditions and to adjust the pressure drop speed of the drill pipe.


Figure 6: RCD Drill Bit Wear

The highly-weathered rock mass has the characteristics of becoming soft and disintegrated when exposed to water. A total of 73 collapse holes occurred during the construction of 193 foundation piles in deep water. The collapse holes were repaired by filling sand bags on the seabed surface outside the casing to stop the collapse and by pouring concrete into the pipes so it could solidify before re-drilling (Figure 7). A total of 89 days was spent repairing the collapse holes.

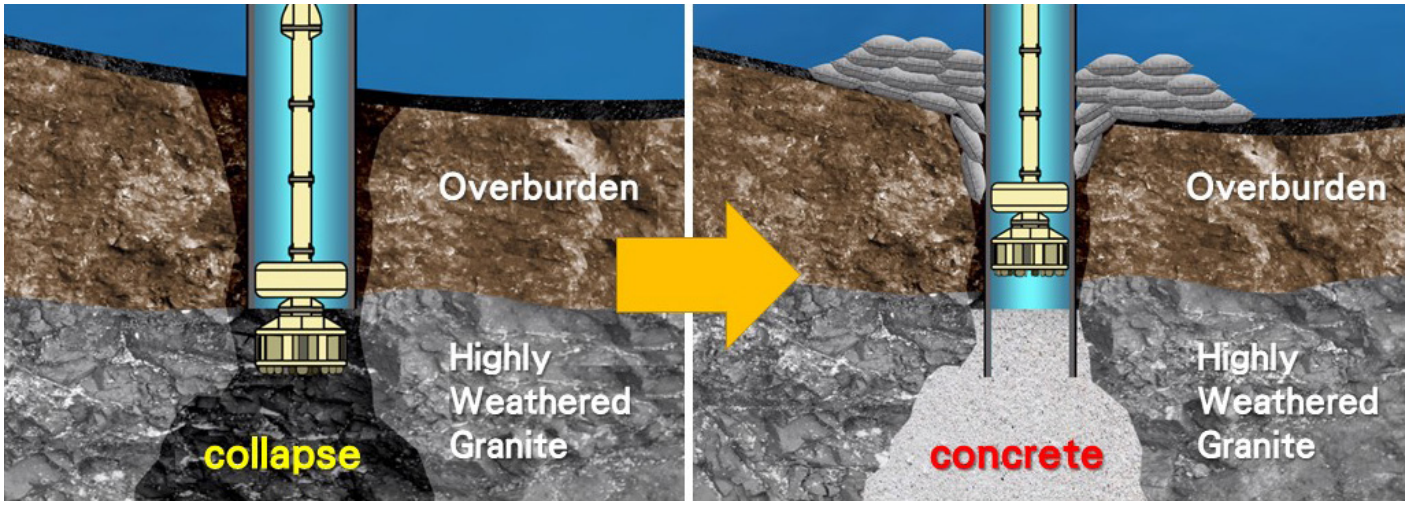


Figure 7: Diagram of the Foundation Pile Collapse Hole Overcoming Method

Due to the inclined rock surface having drastic changes in elevation, the seabed rock position causes uneven stress on the drilling surface, resulting in deformation of the drill pipe and severe wear of the rock drill bit. In order to avoid damage to the drilling and excavation equipment from affecting the construction rate, concrete was poured into the water to build a flat drilling and excavation surface (Figure 8). The pressure drop speed of the drill pipe needed to be adjusted.

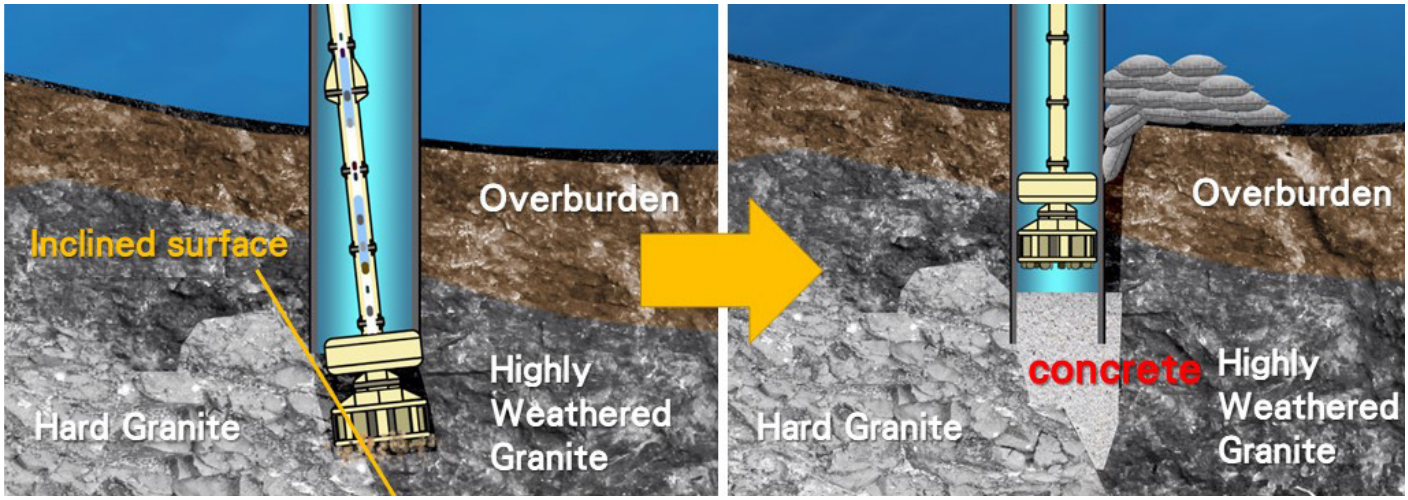


Figure 8: Diagram of Inclined Rock Surface Overcome Method

**Deep Water Pile Cap Steel Box Cofferdam**

In order to create a dry and safe construction environment under the sea, for the first time in Taiwan, a large-scale suspended steel box cofferdam was used for the construction of pile caps in the sea. The maximum size of the steel box was 23 x 29 x 10.8 meters, and it needed to withstand nearly 5,000 tons of buoyancy and the impact of waves when it was sunk below the sea surface. In order to ensure the safety requirements of the steel box structure and to withstand external forces such as buoyancy, hydrostatic pressure, water flow force, wind force, and wave transverse force, a three-dimensional finite element analysis of the steel box structure

was conducted to ensure structural safety. The analysis, design, manufacturing and construction of the steel box structure were all undertaken by the construction team. Details of the deep water foundation pile cap cofferdam are shown in Figure 9.

During the sinking of the suspended steel box cofferdam, and due to the huge buoyancy generated by the pumping of the cofferdam, the construction team used an anti-pressure bracket on the bottom plate of the steel box to connect with the foundation pile jacket steel pipe to provide anti-buoyancy and bearing capacity of the steel box.

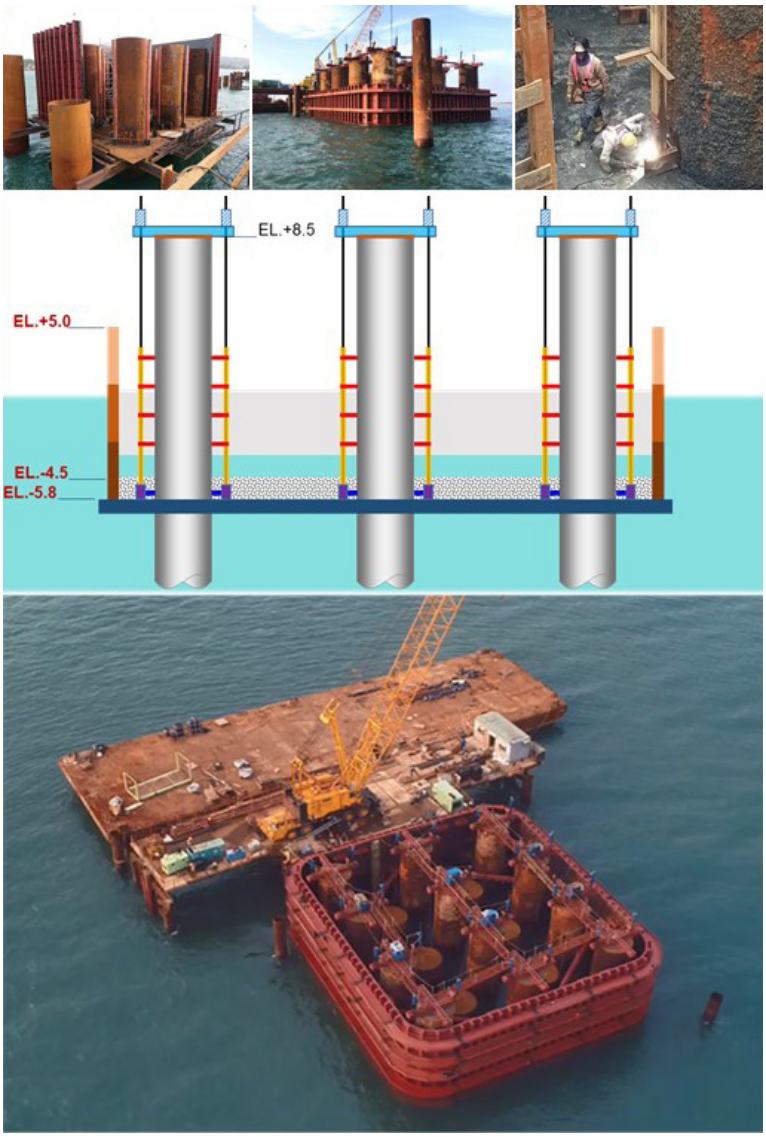


Figure 9: Deep Water Foundation Pile Cap Cofferdam

**Strong Northeast Monsoon Affects High-Altitude Operations**

There are an average of 112 days per year in the Kinmen area where wind speeds are greater than 10.8 m/s (about 40 km/h). These are accompanied by 2.5-3.0 m high waves. The strong northeast monsoon causes construction ships to shudder, and greatly affects offshore operations, especially in winter (December to

February). When construction workers encountered strong gusts, all they could do was suspend high-altitude hoisting operations; this increased the construction time.

**Sorghum (Kaoliang) Spikes Shaped Pylons**

Sorghum (Kaoliang) is the main agricultural product of Kinmen, and it is also its most important economic product. The pylons of the main bridge of the Kinmen Bridge were designed in the image of sorghum spikes, which are fully integrated with local characteristics.

Figure 10: The Bridge Towers Adopt the Shape of Sorghum (Kaoliang) Spikes

The pier column elevation is planned to be 16-18 elevation layers. The EFCO's system formwork is used, which can be adjusted according to the shape of the pylon. It is easy to fix the mold. The rise of the pylon is divided into 11 elevation layers, with elevation levels 1-5 using the PERI system formwork, and elevation layers 6-11 using the steel formwork as shown in Figure 11.

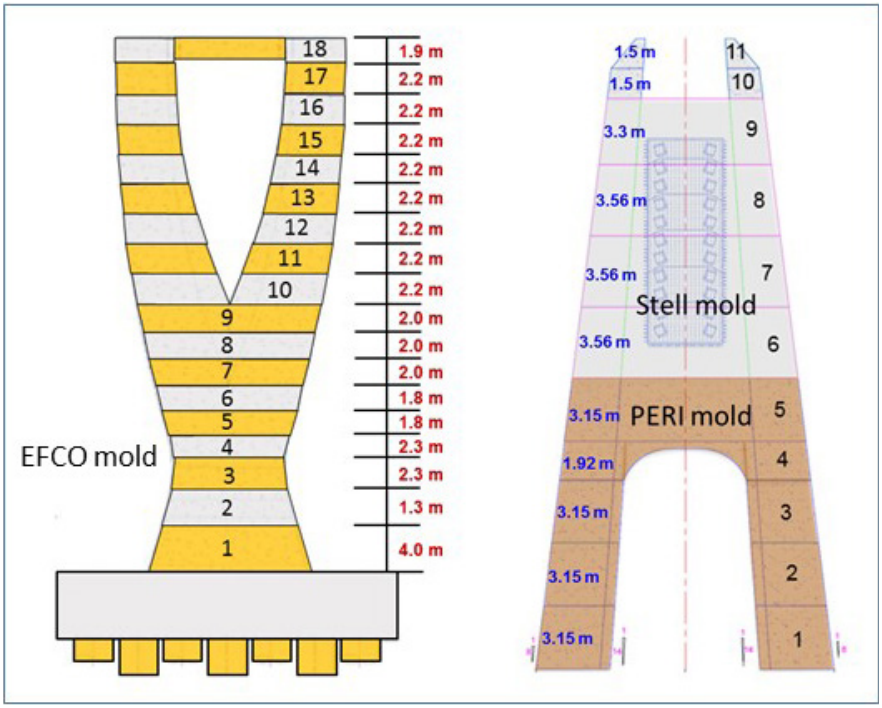


Figure 11: Diagram of Pier Columns and Bridge Tower Layers

Considering the structural strength of the main pier column of the Kinmen Bridge, the main reinforcement is designed in the form of continuous connection. The total number of main reinforcement connection is 6,180. In order to improve the connection rate of the steel bars in the high-altitude environment, and the curvature change of the pier column, the contractor adopted a 3-piece connection device. Due to the limited availability of offshore hoisting machinery, the length of the steel bar connection was adjusted on site to reduce the slow mechanical high-altitude hoisting operation, and the construction time was shortened by increasing manpower.

Figure 12: The main reinforcement has a large amount of connections with various rotation angles

**Offshore Segment Hoisting for Cross-Sea Transportation**

The segmental hoisting construction method is a common bridge construction method used in Taiwan. The segmental hoisting is carried out at sea and the average height is about 50 meters.

There are a total of 376 segmental precast box girder in the main and side bridges of the Kinmen Bridge. The length of each segment varies, including 2.7 m, 3.25 m, 3.5 m, 4.0 m, 4.5 m and 5.0 m, and the weight of the segments ranges from 75–268 t. Modular steel molds and steel bar samples are used to shorten the cycle rate of the segment casting.

Since Kinmen does not have a suitable location for the production of segmental precast box girders, the Kinmen Bridge segmental precast box girders were produced at Xingda Port in Kaohsiung, Taiwan. As the distance between Xingda Port and Kinmen is 260 km, an assessment of the sea path, in terms of safety, had to be carried out before the girders were transported. The average voyage time was about 36-44 hours when transporting under a wind and wave classification below level 8. It took a total of 39 voyages to transport all 376 segments.

After the segments were transported to the work area, a special hoisting vehicle with a lifting capacity of 600 t was used to lift the segments. The process of segment hoisting was: (1) positioning of the working vehicle, (2) hoisting of the segments, (3) pre-tensioning and (4) moving the working vehicle.

The main bridge section was designed as an extradosed bridge, with 11 pairs of external pre-stressed steel cables for each pylon, and a total of 110 external pre-stressed steel cables. During the segments hoisting process, it was necessary to coordinate with the setting of the external pre-stressed steel cables. It took 24 hours to hoist of the main bridge segments. The harsh working conditions required the construction workers to have perseverance and great physical strength.

General details of the production, transportation and hoisting of the segmental precast box girders are shown in Figure 13, whilst a photo showing the joining of the Kinmen Bridge on 22 July 2022 is shown in Figure 14.


Figure 13: Production, Transportation and Hoisting of Segmental Precast Box Girder

Figure 14: Joining of the Kinmen Bridge 2022.07.22

## Summary

Photos of the completed bridge are shown in Figure 15.

The Kinmen Bridge was constructed based on the design conception of 30% of the traffic being local residents and 70% for tourism. It was opened to traffic on 30 October 2022 and provides a convenient transportation option between big and small Kinmen Islands. In addition to improving the quality of life for the people in the Kinmen area, it is also driving the overall economic development of Kinmen, particularly or tourism.

The Kinmen Bridge project was Taiwan's first long-span sea-crossing bridge. The successful implementation of the design and construction work planning, and the use of construction technology required for bridges in sea areas, the completion of the Kinmen Bridge has greatly improved the design and construction capabilities of Taiwan's engineering community in marine engineering.

Figure 15: Views of completed Kinmen Bridge

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1. Kinmen Bridge Engineering Design Report (2012.11), Taiwan Area National Expressway Engineering Bureau, Ministry of Transportation and Communications.

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# Infrastructure Safety Insights Explorer

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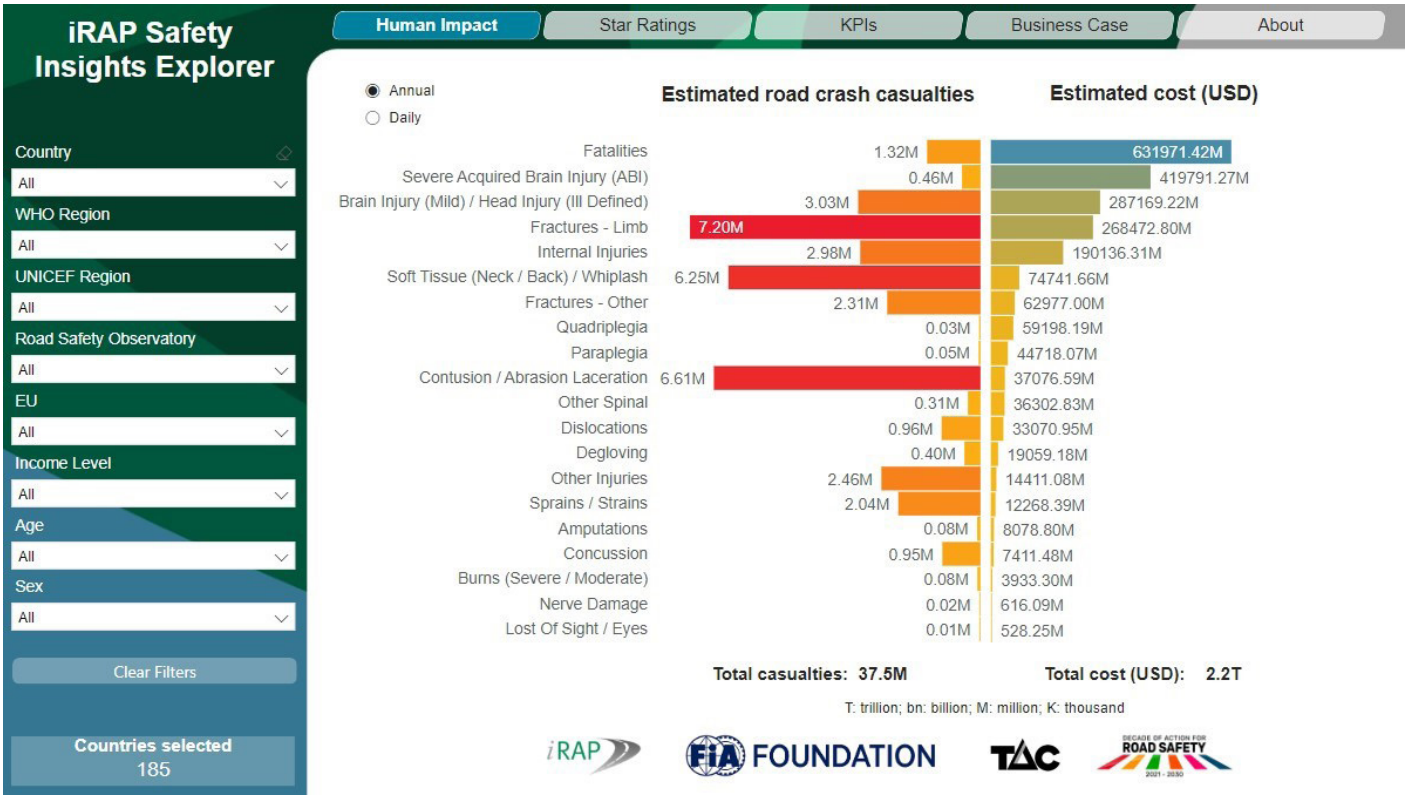
Global Programme Director, International Road Assessment Program (iRAP)




irap.org/safety-insights-explorer

To support the Decade of Action for Road Safety 2021-2030, iRAP has published a new Safety Insights Explorer in February 2023. The Explorer shines a light on the true extent of road trauma, the safety of the world's roads, and the positive impact that can be made with targeted investment.

The iRAP Road Safety Explorer is an update to what was previously known as the 'Vaccines for Roads' tool. It includes new iRAP Star Rating and key performance metrics, new estimates of the types of road crash injuries that occur in each country that can be split according to age group and sex, and new regional filters, including for UNICEF regions and Road Safety Observatory regions.

## Shining a light on road trauma numbers

According to the World Health Organization (WHO), more than 3,600 people are killed in road crashes every day, and it is estimated that more than 100,000 people suffer injuries every day.

Apart from the emotional impact of serious crashes, the cost of emergency response, trauma wards and long-term health care for road crash injury victims is immense. Transport Accident Commission (TAC) insurance claims data in Australia shows that more than half of all the costs occur more than two years after a crash, often buried deep within health and social welfare systems.

However, there is a significant gap in evidence and data about road crash injuries and their costs worldwide. To help support debate about the right scale of response to this enormous level of trauma and cost, iRAP has drawn on data from the WHO, TAC, Institute for Health Metrics and Evaluation, and the International Monetary Fund (IMF) to make simple, high-level estimates of the types of injuries that are occurring in every country around the world, and their costs.

Examples of key estimates of road crash trauma include:

- Each year, 1.32 million people are killed; 3.5 million people are likely to suffer life-changing brain injuries; 80,000 people suffer paralysis; 160,000 lose limbs or are moderately or severely burned; 10,000 lose their vision and 9.5 million people fracture bones.
- Road deaths and injuries are estimated to cost more than USD2 trillion globally each year. Almost two thirds are associated with non-fatal injuries.
- Every day, an estimated 16,300 people aged 19 years or younger are killed or injured, many suffering debilitating injuries such as brain injury, fractures, quadriplegia and internal injuries.
- Deaths and injuries for people aged 19 years or younger cost an estimated USD717 million each day, severe brain injuries alone costing an estimated USD192 million every day.
- More than three-quarters of those killed in road crashes are male. It is estimated that road crashes involving males cost the global economy more than USD1.7 trillion each year, and nearly a third of this cost (28%) is borne by crashes involving young men aged 15-29 years.

*"Road deaths, while tragic, are just the tip of the iceberg. Every day, tens of thousands of people suffer what are often life-changing injuries like severe brain injury, quadriplegia, fractures, internal injuries and burns every day in road crashes. The Safety Insights Explorer shines a light on the enormous level of trauma that women, men, girls and boys suffer every day, and serves as an inspiration to do more and invest more in efforts to improve road safety."*
*Greg Smith, Global Programme Director at iRAP*

## How safe are our roads?

The Safety Insights Explorer also helps to explain why road crashes remain a leading cause of death and injury worldwide. It allows data that has been collected using the iRAP methodology by partners across more than 500,000 km of roads in 84 countries to be explored.

- 17% of pedestrian travel occurs on roads rated 3-stars or better.
- 23% of bicyclist travel occurs on roads rated 3-stars or better.
- 28% of motorcyclist travel occurs on roads rated 3-stars or better.
- 49% of vehicle occupant travel occurs on roads rated 3-stars or better.

iRAP Star Ratings reflect the risk as it relates to an individual road user, with 1-Star roads having the highest risk and 5-Star roads the lowest risk. The data shows that most roads are rated in the higher-risk 1- or 2-star categories. While almost half of the total vehicle travel is on 3-star roads or better, the percentages are much lower for more vulnerable motorcyclists, pedestrians and bicyclists.

The data for infrastructure key performance indicators, which underpin the Star Ratings, reveal that there is significant need for improvement in facilities that reduce the risk of death and injury:

- 7% of roads where pedestrians are present and speeds are 40 km/h or more have formal sidewalks.
- 8% of roads where bicyclists are present and speeds are 40 km/h or more have bicycle facilities.
- Less than 1% of roads where motorcyclists are present and speeds are 60 km/h or more have motorcycle facilities.
- 24% of roads where speeds are 80 km/h or more are divided.
- 29% of intersections where speeds are 60 km/h or more have protected turning facilities.
- 23% of roads where speeds are 80 km/h or more do not have hazardous roadsides.

The data also highlights the large gap that exists between low-income and high-income countries. For example, while more than half (51%) of travel occurs on roads rated 3-stars or better for pedestrians in urban areas in high-income countries, the corresponding number is only 29% in low-income countries.

> *"Road infrastructure safety treatments are like vaccines for roads; when applied consistently they can eradicate death and injury. Proven treatments such as traffic calming, safety barriers, bicycle paths, pedestrian sidewalks and crossings can have a profound effect on the safety of a road environment. The data in the Safety Insights Explorer points clearly to the enormous opportunity we have to save lives and prevent injuries with proven and effective speed management and infrastructure improvements."*
> *Greg Smith, Global Programme Director at iRAP*

## Investing for impact

The Global Plan for the Decade of Action aims to halve road deaths and injuries and Global Road Safety Performance Target 4 is that all road designs and 75% of travel on existing roads are rated 3-stars or better for everyone.

To help support debate about the case for investment in safe speeds and infrastructure, the Safety Insights

Explorer includes 'business cases' for investing to achieve the Global Road Safety Performance Target 4. The business cases show that:

- If every country achieved the Global Plan targets for safer roads, more than 450,000 lives would be saved every year – over 1,200 lives saved a day.
- Investments of just 0.1-0.2% GDP per year through to 2030 will unlock this incredible outcome with $8 of benefits for every $1 invested.
- Benefits would be highest in low- and middle-income countries, where trauma rates are highest.

*"Governments, development banks, donors and the private sector each have a role to play in mobilising the sustainable investment needed to eradicate serious road trauma, unlocking far-reaching economic, financial and social benefits. "There are few better investments than in safer roads and safe speeds. Yet investment does not yet match the scale of this preventable public health crisis. Currently, only $1-3 is invested in road trauma prevention for every $100 of crash-related costs." Greg Smith, Global Programme Director at iRAP*

## About the Safety Insights Explorer

The iRAP Safety Insights Explorer updates what was previously known as the Vaccines for Roads iRAP Big Data Tool. The Explorer enables people to interact with the data and filter by country, region (e.g. WHO, UNICEF, Road Safety Observatory and EU) and country income level, injury victim age and sex, land use type, rural/urban area type, vehicle flow, and carriageway type.

The iRAP Safety Insights Explorer has been produced by the global road safety charity, International Road Assessment Programme (iRAP), with the support of the Australian Transport Accident Commission (TAC) and the FIA Foundation.

The iRAP Safety Insights Explorer will be updated as new data becomes available, such as in updates to the Global Status Report for Road Safety.

To explore the tool, visit https://irap.org/road-safety-insights/

## About iRAP

iRAP is a registered charity with the vision for a world free of high-risk roads. The charity is active in over 100 countries. It works with governments, development banks, mobility clubs, industry, research organisations and road safety NGOs to provide them with the free methodology, tools, systems and training and support to make their roads safer. iRAP's Star Rating Methodology provides a simple and objective measure of the level of safety which is 'built-in' to the road for vehicle occupants, motorcyclists, bicyclists and pedestrians. iRAP and its partners have: influenced the safety of over USD96 billion dollars of infrastructure investment; Star rated over 1.4 million km of roads and designs, plus 1,028 schools; risk mapped over 1.6 million km of roads, and trained nearly 60,000 people globally. iRAP is the umbrella programme for regional road assessment programmes, including EuroRAP, ChinaRAP, AusRAP, usRAP, KiwiRAP, IndiaRAP, BrazilRAP, South Africa RAP, ThaiRAP, TanRAP and MyRAP. It is financially supported by the FIA Foundation, Global Road Safety Facility and FedEx. Further details are on irap.org.

# Supporting Indonesian Nusantara New Captial: Soft Soil Treatment and Immersed Tunnel

1 **Dr. Danis H Sumadilaga**
Head, Indonesia New Capital Nusantara Task Force, Ministry of Public Works and Housing, Indonesia

2 **Dr. Alfa Adib Ash-Shiddiqi**
Senior Road Safety Officer, Indonesian Road Development Association


REAAA hosted a hybrid webinar on Supporting Indonesian Nusantara New Capital: Soft Soil Treatment and Immersed Tunnel on 7th June 2022. The webinar was attended by 24 participants via an offline meeting, about 500 participants using the Zoom platform, and about 140 participants via YouTube streaming.

The topic of the webinar was soft soil treatment issues and immersed tunnels. The speakers were Dr. Sung-Hwan Kim, the President of REAAA, Mr. Il-Koo Kang from June Construction, and Dr. Sang-Kyoon Jeong from Daewoo E&C. The discussion was interesting, especially the immersed tunnel projects: the Busan-Geoje Fixed Link in Korea, and the Khor Al Zubair IMT project in Iraq.

Along with REAAA, the webinar was organized by the Indonesian Road Development Association (IRDA), which was chaired by Mr. Sugiyartanto, and the Indonesian Task Force for the Indonesian Nusantara New Capital (IKN), which was chaired by Dr. Danis Sumadilaga.

The webinar opened with the Indonesian national anthem, followed by a committee report delivered by Mr. Atyanto Busono (Chair of Transportation Committee IKN Task Force and Secretary of the IRDA Jakarta). In his opening remarks, Dr. Danis Sumadilaga reported that the first immersed tunnel in Indonesia will be constructed in the new-capital Nusantara (IKN). He hoped that the webinar could provide insight into the

immersive tunnel project and expand the knowledge of the audience.

The first speaker, Dr. Sung-Hwan Kim, discussed issues with soft soil treatment. Indonesia is composed of a large number of islands, so there are many soft soil areas which require proper treatment in order to avoid failures such as landslides, bridge collapses, etc. Without proper treatment, building located on soft soils will crack, even though they are built using piles. Several processes for determining how the soil should be treated, including geotechnical investigations, creating GIS (Geographic Information System) and BIM (Building Information Modelling) Integration, and the selection of the SSTM (Soft Soil Treatment Method) during the design phase. Most failures over soft soil are associated with a lack of knowledge of a lack of knowledge regarding the behavior of soft soils and a lack of data regarding the properties of soft soils. Several preventive steps that can be taken to try and avoid failures, including hiring geotechnical experts, providing training programs addressing the treatment of soft soils, and building data bases using GIS and BIM.

The second speaker, Mr. Il-Koo Kang from JUNE Construction, discussed the selection of soft soil treatment methods. JUNE Construction was established in 1998 and, since then, it has been involved in numerous projects in Korea and other countries. There are several soft soil treatment methods that the company uses, including prefabricated vertical drains, vacuum consolidation (the use of pumping systems to remove water), the use of a deep cementing plant, and the use of the sand drain method. For example, the use of the sand drain method in the construction of the West Coast Expressway from Seoul to Mokpo reduced the construction time from five years to four years. JUNE Construction analyzed the effectiveness of the soft soil processing and suggested that the construction of the IKN involve consolidation, reinforcement, and compaction methods. This method would shorten the construction period and hence costs. Some photos of the construction of immersed tunnels are shown in Figure 1.

The third speaker was Dr. Sang-Kyoon Jeong, who presented an introduction to immersed tunnels, followed by the application of the immersed tunnel concept on the Busan-Geoje Fixed Link project in Korea and the /Khor Al Zubair IMT project in Iraq.

The first road immersed tunnel, the Posey Tunnel, was constructed in 1928. It connected Oakland and Alameda. The first immersed tunnel linking two countries was the Detroit-Windsor tunnel, which was constructed in 1930. It connected Michigan, USA, and Ontario, Canada. About 140 immersed tunnels have been constructed to date.

There are two basic concepts of immersed tunnels. The first concept is buoyancy, where the tunnel elements are fabricated in a dry dock, floated to the site, sunk in position, and then connected with pre-installed elements on the seabed. The second concept is water pressure, a fundamental principle for connecting the elements. In this concept, the space between


Figure 1 Immersed Tunnel Construction

two elements, after initially touching, is filled with entrapped water with the final connection completed using water pressure when the entrapped water is removed by an internal pump, thus making the tunnel watertight. Immersed tunnels are used in railway, road, and waterway applications.

The advantages of immersed tunnels are:

- The length of the immersed tunnel is usually shorter than the length of the bridge
- an environmentally friendly construction which does not obstruct the view above the waterline
- minimal disruption to the river/channel used for shipping routes
- speed of construction
- resistance to seismic activity
- safety of construction
- flexibility of profile.

Examples of successful construction are the immersed tunnel on the Busan-Geoje Fixed Link in Korea (Figure 2) and the Khor Al Zubair IMT project in Iraq. The Busan-Geoje fixed link is the first underwater tunnel project in Korea. It has a total length of 8.2 km, consisting of a hanging bridge 3.5 km long, a submerged tunnel 3.7 km long, and the portal and ramp 1 km long. It has two one-way lanes and one central service gallery. It took 72 months to complete, has an operating life of 40 years (2010-2050) with a total investment of USD 2.0 billion. The fixed Busan-Geoje link reduced the travel time between Busan City and Geoje Island by 2 hours, with the distance reduced from 140 km to 60 km. Annual savings in total logistics costs are USD 400 million.

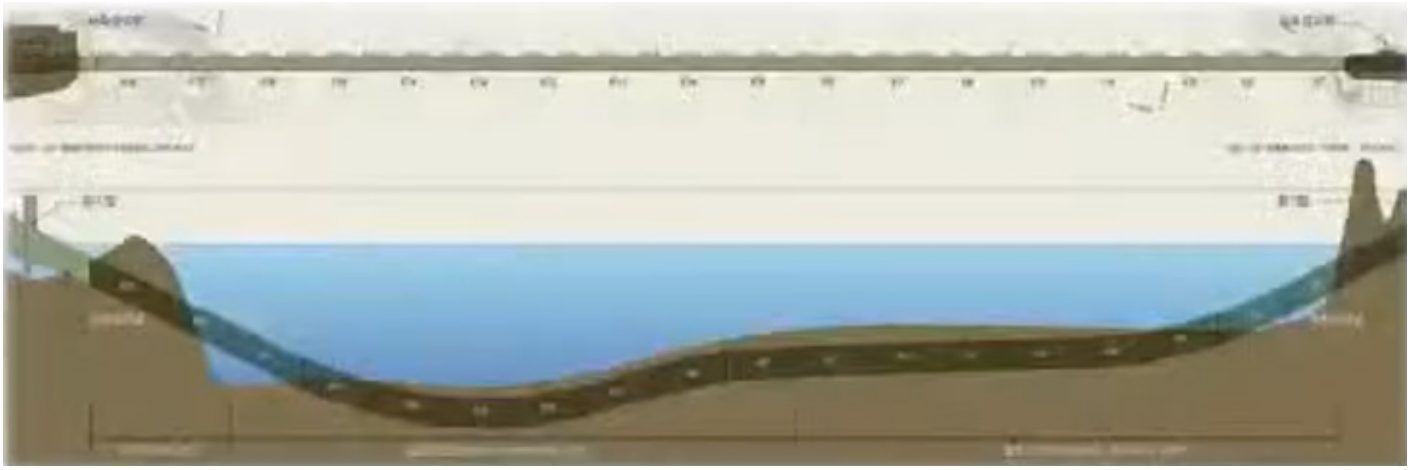


Figure 2 Busan-Geoje Fixed Link

The Al Zubair IMT is 2.8 km long, including 1.26 km of submerged tunnel, a 378 m long section, and a closure distance of 806 m (open section) and 356 m (incline). It has six lanes (three lanes in each direction). The tunnel was constructed to a depth of 20 m below the sea level.

Given the complex infrastructure and transportation developments associated with the construction of the IKN, immersed tunnels provided a logical solution. One of the benefits of underwater tunnels is that they are much more cost-effective than alternative options. However, location of the tunnel must be correct, because

there are many variables that need to be considered when designing an immersed tunnel.

Engineering is key to designing the right tunnel shape and structural system for the water crossing's geological profile, ventilation requirements and the volume of traffic. The successful construction of the Busan-Geoje Fixed Link (Korea) and the Khor Al Zubair IMT (Iraq) is expected to also complement the development of IKN (adib).

Readers can revisit the webinar on the 'Hpji pusat' YouTube channel or the following link:
https://www.youtube.com/watch?v=IGvJ1Nfn7YQ

# 118th REAAA Governing Council Meeting
## 18th October 2022

The 118th Governing Council meeting, which was also the 3rd Council Meeting for the 17th Council Term, was held on 18th October 2022 in Christchurch, New Zealand, in conjunction with the REAAA New Zealand Chapter Roadshow 2022 and the 22nd Young Engineers and Professionals (YEP) meeting. This was the first meeting in New Zealand since the 80th Governing Council meeting, which was held in Auckland in March 2006.

The Roadshow, which was held on 17th October 2022, included a selection of New Zealand presenters who travelled the country and made presentations in Auckland, Taupo, Wellington, and Christchurch. The New Zealand committee selected the presentations for the seminar after a call for papers had been sent out. The committee also extended an invitation to REAAA Council members to attend the seminar while they were in New Zealand for the Governing Council meeting. The seminar was successful, with 60 participants attending including the President, Dr. Sung Hwan Kim, Vice Presidents, Dato' Seri Ir. Haji Mohamad Zulkefly Sulaiman, Mr. Katsugi Hashiba and Dr. Ir. Hedy Rahadian, the Honorary Secretary-General, Ir. Mohd Shahrom Ahmad Saman, and Council members from Indonesia, Korea, Japan, Malaysia, Singapore, Philippines and Taiwan as well as New Zealand. YEPs and members of the Secretariat also attended the seminar.

Council members participated in the seminar

Seminar participants

The 22nd YEP meeting was held on 18th October before the Pre-Council and the Governing Council meetings. The Pre-Council meeting was attended by the President, Dr. Sung-Hwan Kim, Vice Presidents Dato' Seri Ir. Haji Mohamed Zulkefly, Mr. Katsugi Hashiba and Dr. Ir. Hedy Rahadian, the Honorary Secretary-General, Ir. Mohd Shahrom, Ms. IO Song of the Korean Roads Association, and the Executive Secretary, Ms. Zalilahwati Latif (Ila). Several important decisions were made and key proposals were discussed at the Pre-Council meeting.


Members at the 22nd YEP meeting

The REAAA Governing Council meeting was successful, with 29 of the 36 Council members attending in hybrid (physical and online). A total of 52 delegates from eight countries – Australia, Indonesia, Japan, Korea, Malaysia, New Zealand, Philippines, Singapore, and Taiwan – attended the meeting physically. Mr. Geoff Allan, the Chief Executive of Austroads, Australia, represented PIARC at the meeting. In addition, 20 participants joined the meeting on the Zoom platform.

The President, Dr. Sung Hwan Kim, extended his sincere appreciation to all Council members for giving up their time to attend the meeting. The President conveyed apologies on behalf of those Council members who were unable to join the meeting.

Issues addressed at the meeting included preparation for the 119th and 120th Governing Council meetings, the Terms of Reference (TOR) for the Smart Highway Award, the preparation for the REAAA 50th anniversary, the redevelopment of the REAAA website, and collaboration with PIARC, IRF and the UN ESCAP/ADB.

The Finance Committee asked the local Chapters and Council members to help collect current and overdue membership subscriptions. It was agreed that all Council members should promote REAAA and try to recruit a minimum of three institutional members in 2023. The Council members were also asked to provide any suggestions to improve REAAA's finances.

Group photo: Delegates at 118th Governing Council meeting

The 119th Governing Council meeting will be held in Singapore, tentatively from 8th – 10th May 2023. The meeting will be hosted by the Land Transport Authority (LTA) Singapore.

The 120th Governing Council meeting will be held in Indonesia in August 2023, including a celebration of the 50th anniversary of REAAA. The meeting will be jointly hosted by the Ministry of Public Works and Housing, Indonesia, and the Indonesia Road and Development Association(IRDA). Various events will be held, including a technical program, welcome reception, and farewell dinner.

Following the Council meeting, participants enjoyed a tram tour around the city of Christchurch. They also took part in a technical tour of the Canterbury Accelerated Pavement Testing Indoor Facility (CAPTIF). CAPTIF carries out accelerated testing of different types of pavements and surfacings under a revolving, loaded dual-tyred truck wheel that closely replicates actual road conditions. The CAPTIF technology can also test the interaction of various pavement and vehicle properties. Normal road construction equipment is used to build the test pavements and, standard heavy vehicle components are fitted to the loading apparatus.


Group photos during tour of Christchurch

# REAAA Technical Committee Working Committee on Pavement Technology (C4WC1)

**Dr. Keizo Kamiya**
Chair, Working Committee C4WC1: Pavement Technology

Working Committee C4WC1 (Pavement Technology) is currently working on a project 'Sharing experiences and knowledge on pavement maintenance and repair practices in Asia'. The purpose of the project is to investigate the practices or challenges used in member countries to improve the life of damaged pavements, by focusing on factors such as structure, mix design, materials, repair techniques, etc. Case studies of practices that have been used, or tried, to rehabilitate damaged pavements in urban or rural areas are being collated. To date, responses have been received from Australia, Japan, Korea, Singapore and Taiwan. A further update will be provided at the 119th Governing Council meeting in Singapore in May.

The Kuala Lumpur International Pavement Seminar 2023 (KLIPS 2023) will be held from 7th – 9th March 2023 at the Connexion Conference & Event Centre, Bangsar South, Kuala Lumpur. The seminar is being jointly organised by the Ministry of Works Malaysia, the Public Works Department, Malaysia as the lead organiser, and the Road Engineering Association of Malaysia (REAM). It is being supported by the Malaysian Highway Authority (MHA) and Construction Industry Development Board Malaysia (CIDB), in collaboration with the World Road Association (PIARC) in association with the REAAA.

The theme of the seminar is 'Leveraging Innovation Towards Green Technology and Resilient Pavement'. The technical sessions focus exclusively on two topics: pavement recycling, and pavement resilience. Each session will be moderated by prominent PIARC or Malaysian engineers. An REAAA session addressing the topic of recycling is scheduled for 7th March. It will be moderated by Margo Briessinck, the Chair of PIARC TC 4.1. The speakers include:

- 'Hot-in-place recycling patching technology in Taipei City', by Jia-Ruey Chang (Taiwan)
- 'Study of the effects of repeated recycling for asphalt pavements in Japan', by Atsushi Kawakami (Japan)
- 'The use of crumb rubber and steel slag aggregates in Singapore', by Than Than Nyunt (Singapore)
- 'Field performance evaluation of glass fibre grid reinforced asphalt pavements', by Abhijith (Malaysia).

The presentations will be followed by a question and answer session.

Other than presentations at the seminar, the following topics were suggested as case studies for sharing experiences and knowledge for pavement technology.

- ‘Recycling of granular pavement in Australia’, by Dr. Didier Bodin (Australia)
- ‘A hybrid design concept for pavement resilience of National Highway No. 117: Nakhonsawan-Nongtao’, by Dr. Auckpath Sawangsuriya (Thailand)
- ‘Formulating a cold mix standard for pothole patching works in Malaysia’, by Hamzah Hashim (Malaysia).

# REAAA Technical Committee Working Committee on Asset Mangement (C4WC5)

**Mr. Kieran Sharp**
Chair, REAAA Technical Committee

The challenge of climate change should set the framework for asset management over the long-term. A strong emphasis needs to be placed on asset resilience, i.e. its ability to be quickly restored post-incident (climate, overloading, etc.) that can be built into long-term asset performance. This will require minimal, but timely and appropriate, maintenance intervention while also maintaining the desired level of service throughout the service life of a pavement – from construction to either the end of life salvage or a rebuild with improved capacity.

Considerations of sustainability include: the use of recycled materials for surfacing treatments and heavier rehabilitation works when upgrading the asset; and the minimisation of the use of virgin materials to impact less on the carbon footprint and the natural environment. There is a need to understand the impact of recycled materials on performance so that well-informed choices are made regarding the use of recycled and alternative materials. Most of the GHG emissions occur during the service life of a pavement; this can be minimised by maintaining the designated level of service at the lowest possible life-cycle cost.

There is also a concern about equity for the road user community; this could mean improved levels of service on lightly-trafficked roads, while a commensurate decrease in levels of service for heavily-trafficked roads with the consequence of economic and political penalties.

Another issue is the provision for an adaptable infrastructure to potentially cope with heavier vehicles due to the inclusion of batteries when the vehicle fleet becomes electric and parts of the fleet become autonomous. Apart from pavement and bridge impacts, there must be a need for secure and reliable ITS and internet services to maintain safety and level of service. Data collection may become very extensive, allowing more ‘big data’ analytics to be used to build performance models and decision tools for designated regions and road categories. A closed road user charging system will be needed when fossil fuels are eliminated. This system will need hypothecation (i.e. the revenue raised from road user charges is fully re-invested in the road infrastructure), with the revenue raised from road user charging directly connected to investment in road maintenance and upgrading.

Much of this transcends other technical and service issues which can impact on the current institutional arrangements because road agencies could run as self-sustaining businesses.

It was proposed at the last Governing Council meeting in Christchurch in October 2022 that:

- REAAA consider forming and supporting a new Working Committee (C4WC5: Asset Management) which could address these issues
- a small sub-committee be established to draft a Terms of Reference (TOR) for the operation of this Working Committee
- member countries nominate a candidate to serve on this Working Committee; the Committee would then appoint a Chair.

Any work would be closely linked with the activities of C4WC3 (Working Committee on Climate Change, Resilience & Emergency Management) and C4WC1 (Working Committee on Pavement Technology). Links have already been established between these committees and relevant PIARC committees.

The activities of the proposed Working Committee would also have to be linked with the activities of PIARC Committee 3.3 (Asset Management). The aim of PIARC TC 3.3 is to develop, implement, and integrate an asset management framework based on ISO 55001 so that road organizations can manage their performance, risks, and costs more effectively and efficiently.

The main issues being addressed by PIARC TC 3.3 are:

- Innovative approaches for asset management systems.
- Measures for improving the resilience of the road network.
- Renewal and rejuvenation of the aging infrastructure.
- Update of the PIARC Asset Management Manual.

It will be important to identify those members of PIARC TC 3.3 who are based in REAAA member countries, on the basis that they could input into the Terms of Reference and perhaps serve on the REAAA Working Committee.

To date, only one member country (Taiwan) has offered comment on the proposal. The Chair of the Technical Committee will follow up. Depending on the response, the future of the proposed Working Committee will need to be discussed at the 119$^{th}$ Governing Council meeting in May 2023.

# 22nd REAAA Young Engineers & Professionals (YEP) Meeting

**Ir. Hamzah bin Hashim**
Chair, REAAA Young Engineers and Professionals Working Committee

REAAA resumed its normal practice of conducting group meetings, rather than virtual meetings, when it hosted the 118th Governing Council Meeting in Christchurch, New Zealand on 18th October 2022. Associated events included the 22nd REAAA Young Engineers & Professionals (YEP) Meeting, which was held prior to the Governing Council meeting. This was the first 'physical' meeting after two-and-a-half years due to the Covid-19 pandemic. The last physical meeting of REAAA had been held in Abu Dhabi in 2019 during the PIARC World Road Congress. The meeting was hosted by the REAAA New Zealand Chapter.
This was the first YEP meeting to be held in New Zealand since its inception in 2012. Traveling to New Zealand was a great experience for most of the REAAA delegates since it is geographically located at the end of Australasia. It was an exciting journey to the country that is well known for its breathtaking nature and blockbuster movies such as Lord of The Rings and The Hobbit.

During the pandemic, all REAAA meetings were conducted virtually using the Zoom platform. This option was also provided for this meeting to allow members to join the meeting virtually. However, the time difference was challenging, with the meeting set to start at 9.30 am NZ time. There were significant time differences with other member countries, with a 9.30 am local time equivalent to 7.30 am on the east coast of Australia, 6.30 am in Tokyo, Seoul and the west coast of Australia, 4.30 am in Kuala Lumpur, Singapore and Taipei, and 4.00 am in Jakarta. While it was nominally too early in some countries, the fact that members from these countries attended shows the remarkable commitment that members have to the association.

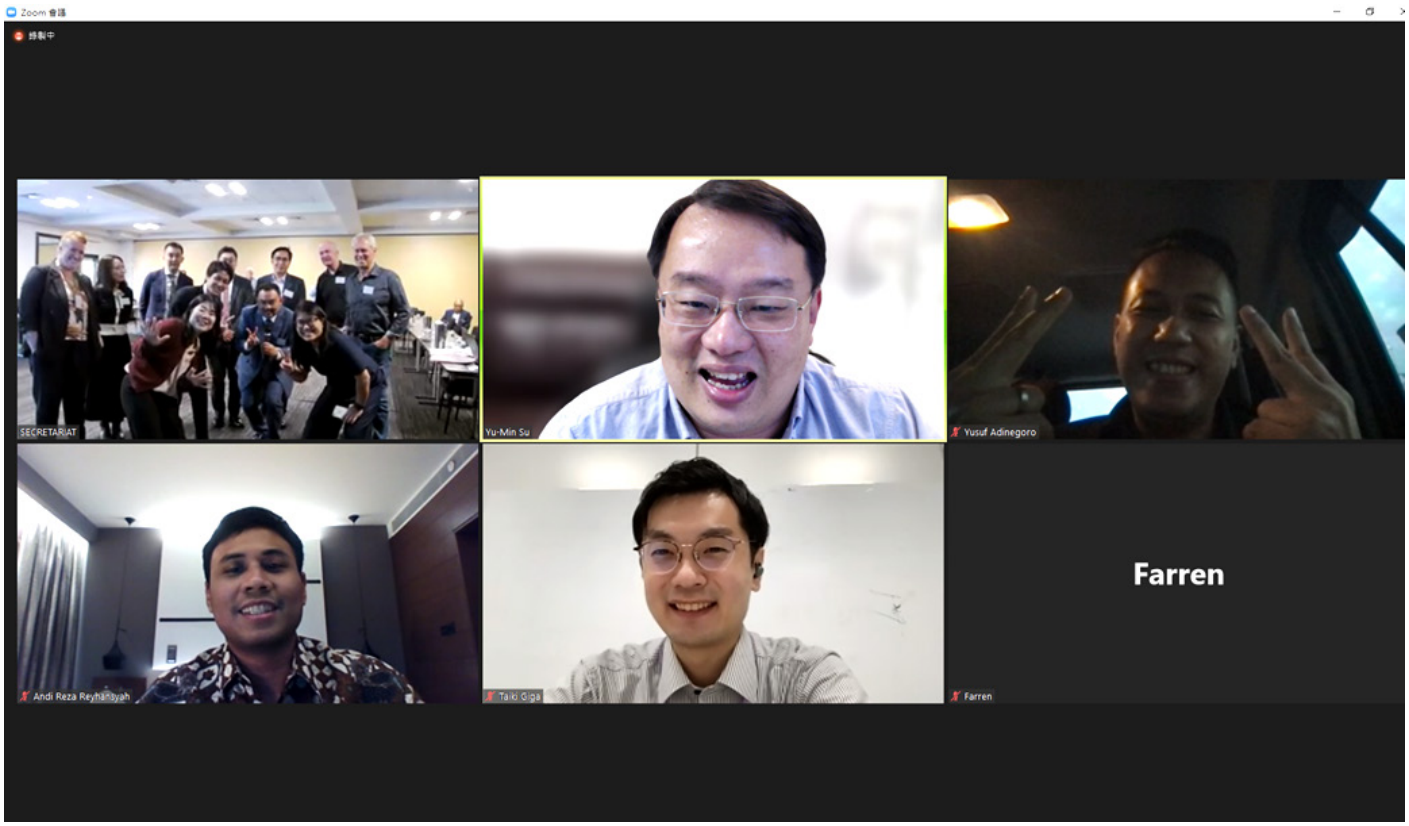
Ten YEP members from Japan, Korea, Malaysia and Singapore attended physically, while members from Australia, Indonesia and Taiwan attended virtually. The President of REAAA also attending the meeting as an observer together with Council members from Japan, Indonesia and New Zealand.

At the commencement of the meeting, there was a 1-minute silence to commemorate the late Dr Hermanto Dardak, Past President of REAAA, who passed away on 20th August 2022. Mike Harrison from the REAAA New Zealand Chapter, who hosted the meeting, welcomed all the YEPs to New Zealand. He stressed that it is important that YEPs continue to develop the agenda as the group grows and develops, by sharing knowledge and learning from mistakes to move forward together.

The meeting included updates from each country. Members had the opportunity to report current activities and receive feedback in terms of what could be implemented back home. The President was pleased with the agenda but suggested a few improvements for future meetings. The meeting also discussed Technical Working Group C4WC4. The main objectives of the Working Group are to encourage members to network with all REAAA countries and to provide YEP with an opportunity to present at international events in the region. The

discussion was fruitful, with agreed actions to be carried out by all members. They were two technical presentations: Andi Reza Reyhansyah from the Directorate General of Highways, Ministry of Public Works and Housing, Indonesia, gave a presentation on 'Nusantara: The new capital of Indonesia' and Dr. Yusof Adinegoro, also from Indonesia, presented 'Bridge design concept of Srandakan 3: Green, sustainable and resilient'.

The meeting ended at noon with group photos of the attendees including those attending via Zoom. It was a very successful meeting and met the objectives that had been agreed upon.




# REAAA-PIARC International Seminar: Climate Change, Resilience, and Disaster Management for Roads

1 **Dr. Nyoman Suaryana**
Director, Road and Bridge Engineering Development, Directorate General of Highways, Indonesia

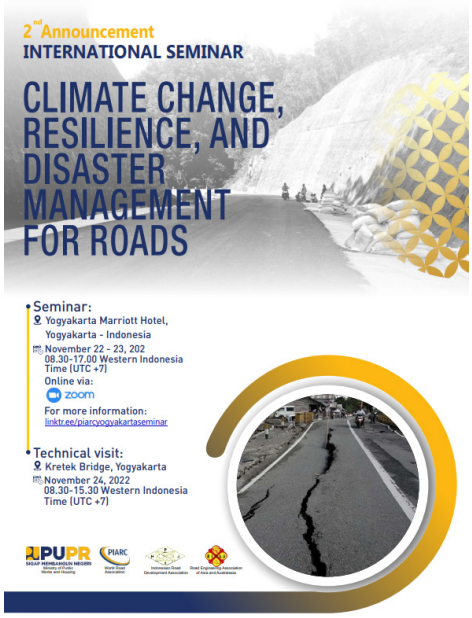
2 **Dr. Alfa Adib Ash-Shiddiqi**
Senior Road Safety Officer, Indonesian Road Development Association

3 **Mr. Kieran Sharp**
Chair, REAAA Technical Committee

4 **Ms. Caroline Evans**
Chair, PIARC TC1.4 Climate Change and Resilience of Road Networks
Co-Chair, REAAA Climate Change, Resilience and Disaster Management Working Committee








The REAAA-PIARC International Seminar: Climate Change, Resilience, and Disaster Management for Roads was held in Yogyakarta, Indonesia, from 22nd – 24th November 2022. The hybrid seminar was divided into three sessions: (1) Adapting to climate change risks and disaster management, (2) Building capacity for adaptation and resilience (economic, social, and environmental), and (3) Best practices on climate change resiliency and disaster management. The seminar was organized by PIARC (World Road Association), REAAA, the Indonesian Road Development Association (HPJI), and the Ministry of Public Works and Housing (PWH). Speakers included members of PIARC and REAAA, leading university lecturers in Indonesia and the PWH. In total there were over 300 participants in-person, and

approximately 100 participants connected online for this hybrid event.

Climate change and other hazards have a wide range of implications on the performance of road infrastructure, and can cause disruptions to road network operations. For example, extreme rainfall influences the intensity beyond the drainage capacity of roadways, resulting in slope collapses and landslides and traffic disruption. The traffic disruption will lead to an increase in traffic accidents and restrictions. Disasters are also associated with significant loss of life each year throughout the world, as well as significant material and intangible damage.

Damage to hundreds of kilometers of road and bridge infrastructure has occurred throughout Indonesia over the last 20 years. The rising prevalence of traffic disruptions, as well as the severely damaged road and bridge infrastructure, stifles economic activity and causes further accidents. The development of uniform and holistic methodologies, and adaptation frameworks, to prevent and address climate change and other hazards plays a significant role in making road transport infrastructure more resilient (explored through PIARC Technical Committee 1.4 Climate, Change and Resilience of Road Networks). Disaster mitigation is needed to lessen the impact that disasters have on people and property, particularly the road infrastructure (the topic of PIARC Technical Committee 1.5 Disaster Management).

The purpose of the Seminar was to share expertise and offer relevant recommendations so that effective solutions and countermeasures may be proposed, taking into consideration the unique characteristics of each city: financial, logistic, existing networks, strategies currently in place, and so on. The Seminar also sought to provide an overview of the challenges associated with managing climatic impacts and road resilience by presenting approaches and case studies from different countries.

The first session addressed how to adapt to climate change risks and disaster management. Most assessments of losses due to natural disasters focus on damage to assets, including buildings, infrastructures, equipment, and production. Recent data indicates that ignorance of risk causes significant losses, socially, economically and financially. Therefore, a comprehensive measure of this risk is required to avoid more societal losses. The session included a presentation that highlighted the implementation of the Build Back Better (BBB) concept. An example case study was the damage caused by the Palu earthquake, which resulted in damage to bridges and roads and the collapse of houses in a surface rupture zone, a phenomena known as balaroa (liquefaction). Planned relocations should provide affected populations with safe and suitable land and/or housing; access to public services such as water, sanitation, electricity, and transportation; and access to social services such as education and health, sources of income, livelihood and/or employment opportunities.

Another presentation addressed Japan's vision to build disaster-resilient highway networks – roads that protect people and their livelihoods from disasters. The target is to enable emergency vehicles to travel on a damaged road within one day of the disaster and general vehicles to pass within about one week of the disaster. Preventative maintenance using new technologies is being used so that symptoms of riverbed degradation and local scour can be detected early. This also emphasized the need for consideration of preventative approaches to decision making processes.

Other strategies to minimize losses include periodically updating the Risk Map, evaluating the infrastructure to check that it meets the latest structural codes, and be aware of relatively new sand deposits where: the groundwater level is shallow, the N-SPT (N value of Standard Penetration Test) is very low < 10, low permeable layers exist which form confined aquifers, and where slopes also exist. The road network could be integrated with dykes to reduce the impact of tsunamis and to manage debris flow. An example is Sabo-works, which consists of a series of check-dams, channel works, and sand-pockets.

The second session addressed adaptation to climate change risks and disaster management. There are challenges in planning and implementation of post-event recovery efforts, where insufficient planning has resulted in a worse impact on affected communities than would have occurred with proper planning, coordination and collaboration, and the timely provision/disbursement of resources (budgets). The process of prioritization requires significant input from both road authorities and communities. Factors to be considered in building a business case include potential loss of life (safety), the availability of alternative routes and accessibility requirements, the cost and consequences of road and bridge closures, environmental/sustainability issues (i.e. pollution, aesthetics, etc.), the costs of repairs, and the availability of funding. In terms of post-event recovery interventions, resources must be immediately available during adverse climatic events for emergency assistance and for post-event recovery interventions. The safety of communities and the protection of their lives and livelihoods should be paramount in recovery efforts. The prioritization of interventions is essential for the optimal use of limited resources to avoid wastage. The monitoring and evaluation of the effectiveness of adaptation measures need to be examined: a robust institutional R&D capacity is essential for continuous refinement and improvement of interventions.

The third session addressed best practices on climate change resiliency and disaster management. Indonesia is one of the ten countries which had the most frequent natural disasters during 2005-2014. Significant damage and loss of life was caused by earthquakes and tsunamis. Network resilience and disaster management practices are needed, including the strengthening of disaster management capacity, improving disaster facilities

and infrastructure, handling emergencies and post-disaster recovery, and strengthening disaster management.

Network resilience involves consideration of both prevention and recovery approaches. The PIARC Climate Change Adaptation Framework for Road Infrastructure (published in 2015, and currently being updated) aims to guide road authorities through the process of increasing the resilience of their networks and assets and is designed to be applicable at any scale such as national, regional, local or asset specific levels. Additionally, network resilience is the ability to withstand and recover from disruption when a disaster occurs. It helps governments to prevent asset loss and minimize damage while enabling people to carry out their daily activities. The PIARC Disaster Management Manual provides advice on effective and efficient strategies and methods for managing disasters (https://disaster-management.piarc.org/en). The Manual presents basic concepts and case studies of lessons learned and experiences gained in applying these basic concepts in practice. These ideas and examples are categorized and provided for in each stage of the disaster management cycle. The use of IT for disaster risk reduction is important because it integrates several existing digital application systems to obtain accurate information for disaster events for mitigation and managing strategies. This requires cooperation with the National Geospatial Agency and other agencies. Risk-based digital maps that overlay infrastructure locations with seismic and geological parameters should be developed to determine disaster risk mitigation measures that need to be carried out. For example, the use of landslide-prone maps, flood-prone maps, the location of active volcanoes, etc. and the collection of data on the condition of the infrastructure in real time to monitor their behavior, helps efficient operations and maintenance activities to be carried out (and sufficient budget allocated). The data can also be used for repairs/retrofitting/rehabilitation as needed.

Following the Seminar, a technical visit to Kretek Bridge, Yogyakarta, took place. As the world's largest archipelago country, Indonesia has an abundance of mesmerizing natural scenery and cultures such as Javanese, Sundanese, Bataknese, etc. As the only royal city in Indonesia still ruled by a monarchy, Yogyakarta is well-known as the heart of the classical Javanese culture of Indonesia, including batik textiles, wayang puppetry, drama, literature, music, poetry, and silversmithing. It is also known as the city of tolerance and the city of students. It serves as a melting pot where people from various backgrounds meet and interact in harmony. Recent developments of the road and bridge infrastructure in Yogyakarta include the Surakarta Toll Road, the Kretek bridge, the Yogyakarta – Bawen Toll Road, and the Yogyakarta – Cilacap Toll Road.

The Seminar provided an opportunity for the exchange of methodologies, approaches and practical applications within Indonesia and internationally, and to enhance collaboration opportunities between PIARC, REAAA, the HPJI, and the PWH. Further information about the Seminar, including the speakers, is available on the following link: https://drive.google.com/file/d/1GU5UCpV-aps_xj_LXnKqY2DpQJ2jkkfx/view.

# In Memory of Past President

## Valediction for Dr. Achmad Hermanto Dardak

Former President of REAAA from 2013-2017, Hermanto Dardak passed away at the age of 65 following a traffic accident on the Pemalang-Batang Toll Road KM 341+400 B on Saturday 20th August 2022. All delegates and members of REAAA express their deep condolences for the passing of one of the best engineers in Indonesia who made a great contribution to infrastructure development in Asia and the Australasian region.

Hermanto Dardak was born in Trenggalek on 9th January 1957. He graduated with a bachelor's degree in Civil Engineering from the Bandung Institute of Technology in 1980. He then completed a Master of Engineering at the University of New South Wales in 1985 and a PhD from the same university in 1990.

After completing his undergraduate education, Hermanto Dardak joined the Directorate General of Highways at the Department of Public Works in 1982. He was entrusted with holding a number of positions, including Head of the Bureau of Foreign Cooperation (1995-1998), Head of the Planning Bureau Secretary-General (1998-1999), Head of the Center for Policy Studies (2002-2003), Director-General of Spatial Planning, Ministry of Public Works (2005-2007), Director-General of Highways (2007-2009), Vice Minister of Public Works (2009-2014) and Head of the Regional Infrastructure Development Agency (2015-2016). He also actively served as a Senior Lecturer at the Ministry, at the same time becoming Head of the Advisory Board for the Nusantara National Capital Task Force.

Hermanto was also active in other organizations, including the Association of Indonesian Engineers (PII), serving as Chairman from 2015-2018. He was also Chairman of the Indonesia Road Development Association (IRDA) from 2007-2011. He was Vice President of REAAA from 2009-2013 and President from 2013-2017. He was the President of the Eastern Regional Organization for Planning and Human Settlements from 2014-2016. He also played an active role in the world of education, serving as Head of the Infrastructure and Environmental Engineering Masters Program, Faculty of Engineering, Pancasila University.

In recognition of his contributions to infrastructure development in Indonesia, Hermanto Dardak received the Mahaputera Utama Star Medal of Honor, presented by Indonesia's 6th President, Susilo Bambang Yudhoyono, in 2014. His legacy includes the former Road Law and Spatial Planning Law of Indonesia. He was also the implementor of the Suramadu Bridge and Trans-Java Toll Road projects, and the initiator of the Selat Sunda Bridge project. He was the first Indonesian to receive the International Road Federation (IRF) Professional of

the Year award in 2014. This award is given to prominent professionals in the private and education sectors who have an outstanding track record, based on their leadership and commitment to the road transport industry. He was Honorary Fellow of the Institution of Engineers Asia, and the recipient of the Legacy Award from the Indonesian Association of Planners (IAP).

Farewell, Dr. Hermanto Dardak, we will remember your dedication and make us passionate about serving our country and REAAA. You are truly a renowned engineer and infrastructure figure in the Asia and Australasia region. We hope that we can continue your contributions and legacies.

Contributed by

**Dr. Alfa Adib Ash Shiddiqi**
Senior Road Safety Officer, Indonesian Road Development Association

# In Memory of Former Chair of the Australian Chapter

## Valediction for Mr. GARY LIDDLE

The REAAA Australian Chapter regrets to advise that former Chair of the Australian Chapter and member of the REAAA Governing Council, Mr. Gary Liddle, passed away recently.

Gary was a leader in roads, public transport and infrastructure who made a massive impact on Victoria and Australia, the industry and his community. His legacy includes mentoring and supporting many current industry leaders.

Gary served for nearly four decades at VicRoads, the Victorian State Road Agency, rising to Chief Executive from 2007 to 2013. Gary was an active contributor to Austroads as a program manager, project manager, task force member, working group member, Board member and Chair.

He was chair of iRAP (the International Road Assessment Program) and the Australian Chapter of the Road Engineering Association of Asia and Australasia (REAAA) during its 14th Council term. Gary also served on the Boards of ARRB and Linking Melbourne Authority.

Gary was honoured by being made an Officer of the Order of Australia for distinguished service to public administration in the Victorian transport sector through leadership in policy direction, infrastructure development, road safety and regulatory reform.

The REAAA Australian Chapter and the Governing Council extends its condolences to Gary's family.

Contributed by

**Dr. Richard Yeo**
Chair, REAAA Australian Chapter

**Mr. Kieran Sharp**
Chair, REAAA Technical Committee

# 119th REAAA Governing Council Meeting / 23rd Young Engineer Professionals (YEP) Meeting

## 8 to 10 May 2023, Singapore

## 1. EVENT OVERVIEW

Singapore is pleased to extend a very warm welcome to our guests at the 119th REAAA Governing Council Meeting on 8~10 May 2023. We hope some information enclosed in this mini delegate kit could help facilitate preparation of your pleasant stay in Singapore.

**Programme Summary**[1]

| DATE/DAY | | EVENT | VENUE |
|---|---|---|---|
| 8 May (Mon) | Afternoon | 23rd YEP Meeting | LTA D-Lab [2] |
| | Evening | Welcome Reception | LTA Club 7 [2] |
| 9 May (Tue) | Morning | 119th REAAA Council Meeting | Carlton Hotel Singapore<br>76 Bras Basah Road |
| | Afternoon | Dialogue Session<br>**Roads Less Travelled**<br>*"Navigating Challenges and Opportunities of Sustainable Road Development"* | |
| | Evening | Closing Dinner | Mount Faber *The Ballroom* |
| 10 May (Wed) | Morning | Technical Visit | LTA Intelligent Transport System Centre (ITSC) |
| | Afternoon | Golf Session (optional) | Sentosa Golf Club |

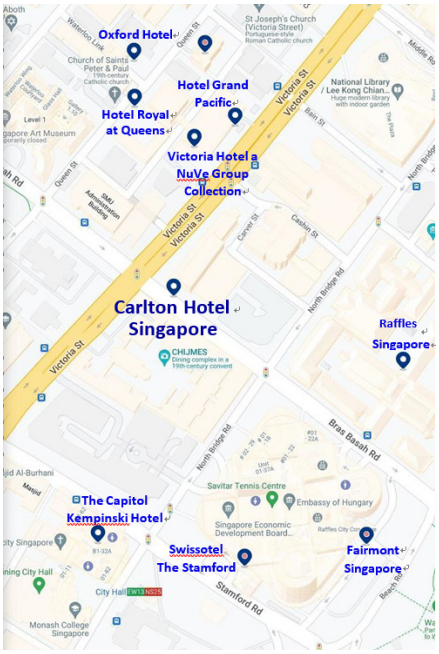
[1] *More detail on the programme would be made available closer to the event*
[2] *Venue at LTA main office at No. 1 Hampshire Road – Transport arrangement will be made available closer to the event*


*LTA @Hampshire Road*

*Welcome reception @LTA Club 7*

## 1.1 MEETING VENUE

**Carlton Hotel Singapore**
76 Bras Basah Road, Singapore 189558
**T:** +65 6338 8333 | **F:** +65 6339 6866
**E:** mail@carltonhotel.sg




*Some hotels in vicinity*


*Carlton Hotel Singapore*

Carlton Hotel Singapore is within short walking distance of **CC2 Bras Basah (Exit A), CC3 Esplanade (Exit F) and EW13 City Hall (Exit A) Stations** of Singapore's Mass Rapid Transit (MRT) train system. There are buses calling at the various bus stops in the hotel's vicinity, and a taxi point is conveniently located at its lobby. Advance bookings for taxis may be made with taxi companies with a booking charge. As the Electronic Road Pricing (ERP) system would be in operation on major expressways and within the Central Business District (CBD) area duringpeak hours, surcharge applies.


*MRT stations and bus stops in vicinity*

## 1.2 CLOSING DINNER

Dinner is served at ***Mount Faber – The Ballroom*** which features floor-to-ceiling glass windows treating guests to close-up with the cable car line, surrounded by memorable views of the city and harbour vista.

*The Ballroom @Mount Faber*

## 1.3 TECHNICAL VISIT

Guests will be hosted to a technical visit at the ***Intelligent Transport Systems Centre*** (ITSC) where hundreds of gadgets, sensors and cameras gather data on traffic flow, travelling times and road demand in the island's over 160km network of expressways and road tunnels. Called the Intelligent Transport Systems (ITS), this web of data collection technologies forms a dynamic, real-time picture of the ebb and flow of a population moving through their daily lives; using sensors, traffic & control systems and data analytics, to maximise road network efficiency and manage traffic flow.


*Intelligent Transport Systems Centre (ITSC)*

### 1.4. GOLF (Optional)

***Don't forget your clubs.*** Golf enthusiasts can look forward to a session of golf at ***Sentosa Golf Club*** after the technical visit. Sentosa Golf Club prides itself as the world's first carbon neutral golf club as part of its sustainability commitment.

*Sentosa Golf Club*

## 2. GENERAL INFORMATION

Singapore is made up of one main island with 63 surrounding islets. The main island has a total land area of 714 square kilometres. However, its compact size belies its economic growth. In just 150 years, Singapore has grown into a thriving centre of commerce and industry.

Singapore is located at one of the crossroads of the world. Its strategic position has helped it grow into a major centre for trade, communications, and tourism. Singapore has the world's busiest container port and has an airport served by over 80 airlines, linking to more than 180 cities in over 50 countries.

One of the world's major oil refining and distribution centres, Singapore is also a major supplier of electronic components and a leader in shipbuilding and repairing. It has also become one of the most important financial centres of Asia, with more than 130 banks. Business dealings are facilitated by Singapore's superb communications network which links the nation to the rest of the world via satellite, 24-hour telegraph and telephone systems.

Singapore's strategic location, excellent facilities, fascinating cultural contrasts and tourist attractions contribute to its success as a leading destination for both business and leisure.

## 3. CUSTOMS

Entry requirements are available from the Singapore Immigration and Checkpoints Authority website (https://www.ica.gov.sg/). Information on aviation security in Singapore, restricted baggage items can be found at https://www.changiairport.com/en/passenger-guide/departing.html.

## 4. CLIMATE/CLOTHING

Singapore is a tropical country. Generally, temperatures reach around 31°C (88°F) during the day and 24°C (75°F) at night with relatively high humidity.

For those who do not particularly enjoy the tropical climate, you may be pleased to know that most of the shops, hotels, office buildings, and restaurants are air-conditioned.

Loose and light summer clothing is highly recommended unless otherwise specified. Casual attire is acceptable for most situations.

## 5. BANKING AND CURRENCY

The local currency is Singapore dollars and cents. Notes come in denominations of SGD2, SGD5, SGD10, SGD50, SGD100, SGD500 and SGD1,000. Coins come in denominations of 1, 5, 10, 20 and 50 cents and SGD1 dollar.

Passports are required when cashing travellers' cheques. You will also find money changers in shopping centres. Normal banking hours are Mondays to Fridays: 10.00am – 3.00pm, and Saturdays: 9.30am – 1.00pm.

## 6. TIME

Standard time zone: UTC/GMT +8

## 7. LANGUAGE

There are four official languages in Singapore: English, Malay, Mandarin, and Tamil. English is the language of business and study, and is widely spoken and understood.

## 8. ELECTRICITY AND DRINKING WATER

The voltage in Singapore is 220- 240 volts AC, 50 cycles per second. Most hotels provide transformers and adapters on request.

Tap water is safe and completely potable. Bottled mineral water is available at any local supermarket or convenience store.

## 9. USEFUL PHONE NUMBERS

Police: 999 (toll-free)
Emergencies/Ambulance/Fire Brigade: 995 (toll-free)

Advance booking numbers for taxis:
Comfort Citycab Dial-A-Cab +65 6552 1111
Comfort Limousine Taxi +65 6552 2828
Premier Taxis +65 6363 6888
SMRT Taxis +65 6555 8888

Flight Enquiry Hotline +65 1800 5424422

**Surcharges on advance taxi bookings apply.*

## 10. HOTEL PHONE SERVICE

Most hotels offer in-room international direct dial (IDD) telephone services. However, some hotels may impose a surcharge for each successful call transaction. As there are different IDD service providers in Singapore, rates and access codes are dependent on the service provider used by the hotel. Generally, local calls are charged at SGD0.10 for every three minutes.

## 11. MOBILE PHONES

If you wish to continue making calls and sending messages on your mobile phone, a good option will be to purchase a Singapore prepaid SIM card. All three local telcos-M1, Singtel and Starhub- offer a wide variety of packages, so take a little time to decide which plan best suits your needs. You can choose from bundles for local and international calls and SMSes and select varying amounts of local mobile data. Durations typically range from five to thirty or more days.

Prepaid SIM cards are easily purchased at the telcos' retail counters and convenience stores like 7- Eleven and Cheers through the island, as well as at Singapore Changi Airport at Changi Recommends, currency exchange and telcos' retail counters. You will have to produce your passport for registration when purchasing a prepaid SIM card.

## 12. TAXES

There is a 8% sales tax, called the Goods and Services Tax (GST). Tax refunds may be obtained at the Global Refund Singapore counters at Changi Airport. In order to qualify for a refund, there should be a minimum expenditure of S$100.00 on purchases made from the same retailer in the same day. Up to a maximum of 3 same-day receipts or invoices from the same retailer can be accumulated to meet this minimum purchase amount. Tax refund is not available for GST incurred on accommodation in a hotel, hostel, boarding house or similar establishments; and any services like entertainment, dry cleaning, car rental etc. as these services are consumed in Singapore.

## 13. SMOKING

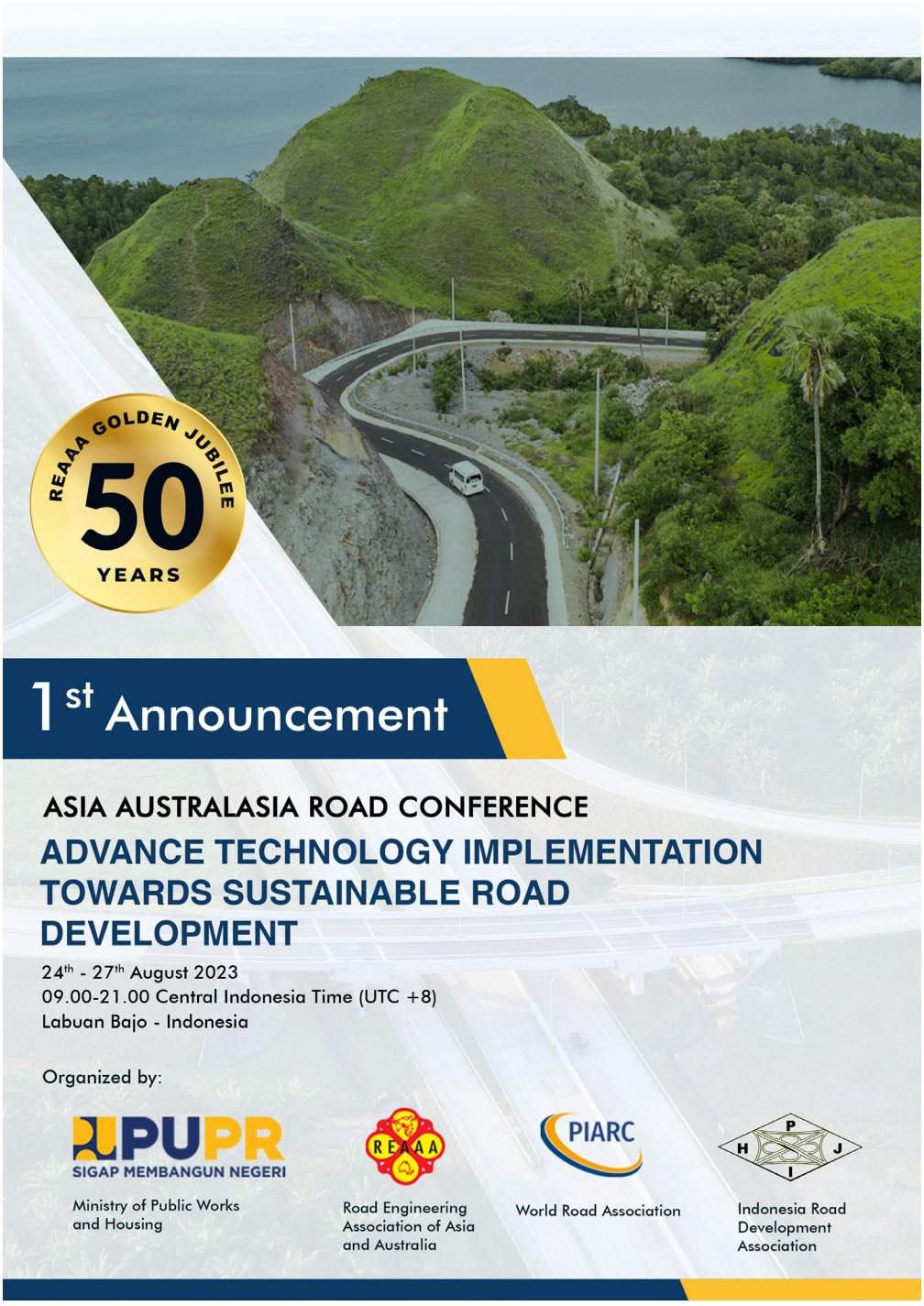
Smoking is not permitted in enclosed spaces such as vehicles, museums, libraries, lifts (elevators), theatres, cinemas, air-conditioned restaurants, supermarkets, departmental stores and government offices as well as in air-conditioned pubs, discos, karaoke bars, night-spots and most non-air- conditioned eating places. Other than that, common areas and public spaces such as corridors, staircases, covered walkways and linkways, all pedestrian bridges, within 5 metres from the edge of bus stops and hospital outdoor compounds are also smoke free areas.

Smoking is also prohibited at indoor public places (eg. shops, shopping/neighbourhood centres, factories, offices) regardless of whether they are air-conditioned; lift and hotel lobbies; within 5 metres of entrances and exits to the indoor area of buildings and facilities where smoking is prohibited; playgrounds and exercise areas; swimming pools; sports stadia; markets; multi-storey and basement car parks; bus interchanges and shelters; and ferry terminals.

For further guest enquiries, please do not hesitate to contact:
-Ms Lin Rongrong (LIN_Rongrong@lta.gov.sg)
-Ms Grace Teoh (Grace_TEOH@lta.gov.sg)

**We wish you a pleasant stay in Singapore**

# REAAA 50 Years 1st Announcement



## Message from Director General of Highways, the Ministry of Public Works and Housing, the Republic of Indonesia and the Head of IRDA

**Hedy Rahadian**

Greetings to all the officers and members in this conference in commemoration of Road Engineering Association of Asia and Australasia (REAAA) 50th anniversary in conjuction with PIARC seminar and IRDA seminar.

It is a great honor for us along with Indonesian Road Development Association (IRDA) to be hosting this prominent conference that not only promotes innovative ways in road-related engineering, but also practices cutting-edge services that create productive technological shares within the industry. This conference marks revolutionary breakthroughs in the fields of road engineering by ushering in innovative development through digitization.

This is a challenge for all of us as we continue to develop and improve our skills, practices and ways that reflect our industry and impacts on our communities by allowing the adaptation of technological movements in the completion of various tasks and projects.

Our chosen theme, “Advanced Technology Implementation towards Sustainable Road Development,” emphasize the necessity to continue embracing latest technologies and seek innovation that can make infrastructure operations more efficient and sustainable in line with our collective quest to provide quality roads for all. The indispensable role that technology plays has long been proven by its significant contributions in numerous industries, including the growth of the construction industry. Breakthrough technologies are now revolutionizing the way the sector functions, bringing in major developments in planning, design, and construction roadways towards green infrastructure.

Simultaneously it also helps us to achieve our organizational vision on the realisation of a reliable, integrated, and sustainable road network system with adequate mobility, accessibility, and safety in all the national regions to support economic growth and social welfare.

I would like to thank all the member countries for your participation in this conference to promote technology advance in the field of road engineering. It is an honor for our country, the Republic of Indonesia, to be the venue for this conference.

Indeed, fostering a culture of knowledge-sharing is a vital step to further equip member countries with the appropriate skills needed to be better nation-builders in the years to come.

# Message from President of REAAA

Sung – Hwan Kim

Greetings to all the committee and members of Road Engineering Association of Asia and Australasia (REAAA) 50th anniversary in conjuction with PIARC seminar and IRDA seminar. As a president of REAAA, it is such an honour to be in this organization that encourage all the members, developing professional, and commercial links within between countries in the region in the Asia Pacific region to promotes the science and practice of road engineering in this era.

**Congratulations for 50th REAAA Anniversary.** The continuity of our organization through 50 years, nowadays we faced this new transformation of digital era, bringing new revolutionizing in digital and technology.

Our chosen theme, **"Advanced Technology Implementation towards Sustainable Road Development"** will be reviewed further in the session of this event. Technology is always experiencing the development breaktrough. Implementation technology of sustainable road is also designed or their entire lifecycle, from planning through construction, maintenance, and eventual decommissioning. Construction and maintenance of roads nowadays also are performed considering only technical conditions without giving a main role to the environmental impact.

As our vision to be the most effective regional organization providing members with technology interchange, transfer and services to promote a better future in road-related engineering, let us continue to raise the bar of our professional development to ensure that our members are knowledgeable about advanced technology is on a par with the best in the world.

# Message from President of PIARC

Nazir Alli

Greetings to the officers and members in this conference being held in commemoration of Road Engineering Association of Asia and Australasia (REAAA) 50th anniversary in conjuction with PIARC seminar and IRDA seminar.

Sustainable road construction involves planning designing and building and maintaining roads in order to limit their impact on the environment to the most minimum through different sustainable practices. The goal itself to maximize the lifetime of a highway or a roadway while restricting the energy and environmental

Through the years we have witnessed the development of technology in improving the sustainable development of roads.

The 50th REAAA Anniversary Asia Australasia Road Conference is an event that represents the aspiration of all the organizations to continue and develop sustainable road development and to share professional knowledge across international boundaries, which is PIARC's mission.

The theme of this conference is "Advance Technology Implementation towards Sustainable Road Development". This notes the need to consider implementation throughout the roads' lifecycle including the technology, from conception, construction, operations and maintenance too. Sustainable road development aims at offering people with safe and comfortable transportation choices in all occasions.
May this conference renew your sense of purpose to develop the role and contribution of sustainable road development and to further advance the knowledge itself. Congratulations and best of luck for REAAA 50th Anniversary.

# ORGANIZATION

## DGH, THE MPWH, THE REPUBLIC OF INDONESIA IN BRIEF

DGH (Directorate General of Highways), is an implementing unit at the Ministry of Public Works and Public Housing of the Republic of Indonesia. It has tasks of carrying out the formulation and implementation of policies in the field of road, bridge, and tunnel management in accordance with applicable legislation, consisting of 1 (one) secretariat and 8 (eight) directorates along with 37 Technical Implementation Units which are spread across Indonesia

## REAAA IN BRIEF

REAAA is the Road Engineering Association of Asia and Australasia, which promotes the science and practice of road engineering and related professions in the Asia Pacific region through developing professional and commercial links within and between countries in the region, was set up in June 1973 with a permanent secretariat in Malaysia, where it has more than 1,400 members in about 24 countries and holds regular events including an annual heads of road authorities (HORA) meeting, a triennial international conference, technical visits and study tours, trade exhibitions, seminars, forums and workshops.

## PIARC IN BRIEF

PIARC is the World Road Association. Founded in 1909, its mission is to organise the exchange of knowledge on all matters related to roads and road transport. PIARC members include 125 governments as well as thousands of universities, companies, and individuals. PIARC produces reference technical reports and organises seminars and events on all topics related to roads, thanks to the work of its network of hundreds of volunteer international experts. PIARC contributes to the stable and sustainable development of roads and road transport in order to serve road users' and society's needs.

## IRDA IN BRIEF

IRDA (Indonesian Road Development Association), as known as HPJI (Himpunan Pengembangan Jalan Indonesia) in Indonesia is a professional organization for practitioners, planners, and development workers for roads and transportation systems. IRDA has grown with the formation of 33 Regional Executive Boards throughout Indonesia, all of which are now independent, with the hope of contributing to local governments. From a quality aspect, IRDA's membership grew rapidly starting from 150 people in 1975, now it has grown to more than 22,000 members spread throughout Indonesia.

# THEME

## ADVANCED TECHNOLOGY IMPLEMENTATION TOWARDS SUSTAINABLE ROAD DEVELOPMENT

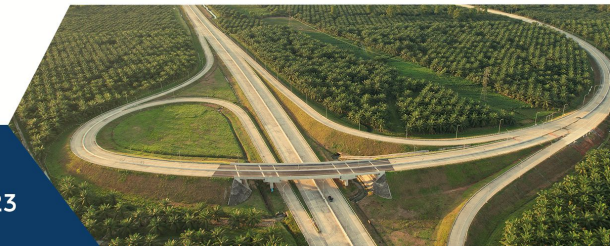
Infrastructure plays an important role in supporting economic growth. Referring to the publication of the World Bank in 2021, access to infrastructure plays an important role in unraveling the barriers created by lack of infrastructure to economic growth. The road, as a part of transportatInfrastructure plays an important role in supporting economic growth. Referring to the publication of the World Bank in 2021, access to infrastructure plays an important role in unraveling the barriers created by lack of infrastructure to economic growth. The road, as a part of transportation infrastructure, provides a multiplier effect. It increases connectivity, improves accessibility, as well as stimulating equitable development and regional economic growth.

For all of its benefits, there are environmental impacts caused by road infrastructure. All phases of road development from construction and use by vehicles to maintenance affect physical and chemical soil conditions, water flow, and air and water quality, as well as plants and animals. Roads and traffic can alter wildlife habitats, cause vehicle-related mortality, impede animal migration, and disperse non-native pest species of plants and animals. Integrating environmental considerations into all phases of transportation is an important, evolving process. Realizing this, sustainability in road development becomes a strategic issue.

A sustainable road development should satisfy the lifecycle functional requirements of societal development and economic growth while striving to enhance the natural environment and reduce the consumption of natural resources. The sustainability characteristics of a highway or roadway project should be assessed and considered for implementation throughout its lifecycle, from conception through construction, operations, and maintenance.

Sustainable road development should be addressed with the understanding that roads are one part of transportation infrastructure, and transportation is one aspect of meeting human needs. In addition to addressing environmental and natural resource needs, the development of a sustainable highway should focus on access (not just mobility), moving people and goods (not just vehicles), and providing people with transportation choices, such as safe and comfortable routes for walking, cycling, and transit.

To improve sustainability in road development, advanced technology has provided more effective ways of planning, designing, constructing, maintaining, and evaluating public infrastructure, particularly road infrastructure. Green road approach, cold mix technology, appropriate soil bioengineering techniques, eco-friendly manufacturing of noise-reducing asphalt, and smart roads are some of the advanced technologies which can be adopted in road development. Ultimately, the advancement of technology and innovation will shape the future in terms of reducing the impacts of the infrastructure on the environment and boosting economic development.



05
ASIA AUSTRALASIA ROAD CONFERENCE 2023

# CALL FOR PAPER

Contributions are invited to participate only on the topics listed below:

- New and Innovative Pavement Design, Maintenance/Repair Material
- Road Safety
- Resilience and Disaster Management for Road and Climate Change
- Geotechnic, Bridge, and Tunnel
- Transport and Highway Planning, Geometric of Road, and Accessibility
- Transport Administration and Strategic Improvisation of Project Management
- Asset Management and Digital technology in Road Network.

Papers shall be submitted in two stages:

## 1 Abstract

Abstracts are submitted online by the Authors at the latest March 31st, 2023, through this link:

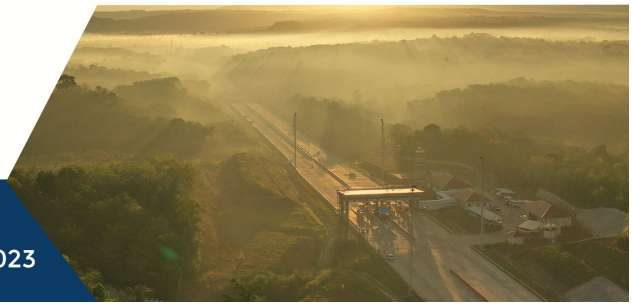
**linktr.ee/AARC2023**

- Abstracts written and submitted in **English are highly recommended**, opportunities for authors who wish to submit their abstract in Bahasa also open up.
- The length of the abstract **should not exceed 400 words**.
- The papers should present case studies, research results, and/or practical experiences related to the topics of this call (attached).

## 2 Full paper

- Full paper can be submitted after the abstract has been accepted.

All the selected papers wil be included in the proceeding.
Registration fee are waived for the selected presentation papers.



06
ASIA AUSTRALASIA ROAD CONFERENCE 2023

## FORMAT AND GUIDELINE ABSTRACTS AND PAPERS

1. Submission in English is highly recommended (opportunities for authors who wish to submit their abstract in Bahasa also open up).
2. The length of abstract should not 250 words in length.
3. The abstract and paper should present case studies, research results, and/or practical experiences related to the topics of this call (attached).
4. The abstract must include the author /co-author /s name /s, date of birth, title /s, position /s, organization /s and contact address/es (including email address/es).
5. The abstract should be typed double spacing on A4 size paper (210 mm x 297 mm) using Microsoft Word.
6. The abstract should be submitted in PDF format.

For the full format and guideline, please access: linktr.ee/AARC2023

## SCHEDULE FOR ABSTRACTS AND PAPERS

| | |
|---|---|
| **MARCH 31st 2023** | Deadline for Submission of Abstracts |
| End of **APRIL 2023** | Notification of Acceptance of Abstracts |
| End of **JUNE 2023** | Deadline for Submission of Full Papers |
| End of **JUNE 2023** | Notification of Acceptance of Full Papers |

07

# PAPER TOPICS

## A New and Innovative Pavement Design & Maintenance/Road Pavement Recycling

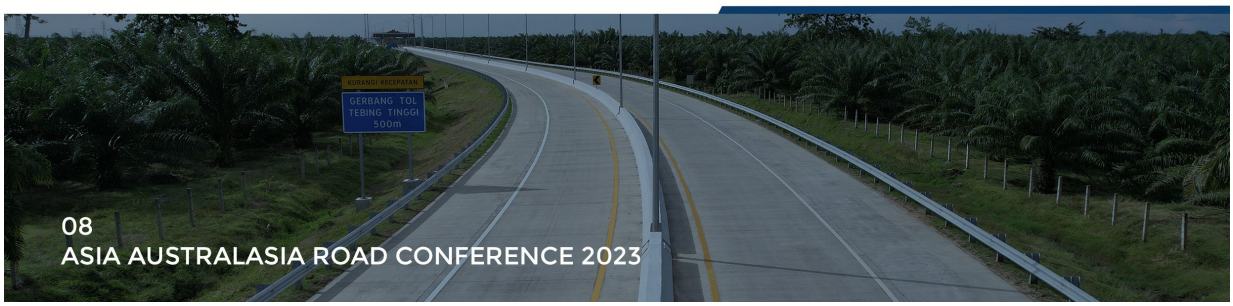
This theme focuses not only on topics relating to innovative methods and procedures for maintenance, including the identification of solutions for maintaining the availability during the execution of maintenance measures as well as the future use of data-driven approaches for the monitoring of pavements but also on aspects of sustainability (recycling and carbon footprint).
This topic also welcomes case studies or research papers related to the development or the use of innovative materials which can be used in pavement structure layers (asphalt, concrete,etc) or base layers.
This covers a broad topic such as alternative or modified binders, the use of alternative aggregates (incl. waste materials such as plastics, rubbers, glasses) or different types of fibers, the development of new pavement mixes, or the use of precast pavement modules of different materials. New design aspects or the effect on the service life of these new materials can also be discussed

## B Road Safety

Traffic safety is a public concern globally, with recorded deaths totaling around 1.35 million annually. It is observed that ninety percent of traffic deaths occur in LMICs (Low Middle-Income Countries), and then assesses and identifies the best practice of road safety activities for LMICs. The theme explores proven countermeasures that are effective in reducing the likelihood and severity of crashes at a given location, safe road design and network for the benefit of all users in particularly for the most vulnerable, and road safety management capacity strategies, plans supported by robust data collection and evidence based.
Furthermore, it forges links with the relevant sectors to assemble knowledge of transportation safety and security issues and their contribution to system resiliency. With the increasing use of cyber-physical systems in monitoring and management, more disciplines involved in the life cycle of road assets need to have an understanding and appreciation of the security issues that arise.

## C Resilience and Disaster Management for Road and Climate Change

It is identified that traffic operations minimize the health impact of vehicle emissions, and improvement of pavement design, construction, and maintenance to reduce traffic noise. Also, understanding the road and road transport impact on wildlife habitats and their interconnections is essential for road construction to be implemented in the area affluent with natural environment. It needs to be carefully considered about environmental sustainability, and diligently presents how road organizations commit to restraining air pollution and traffic noise, and the impact on wildlife habitats.
Road owners and operators are required to manage a very broad spectrum of threats in the future. One of the aim of this theme is to identify hazards and environmental threats within the context of road infrastructure resilience, and to assess several approaches to increase resilience-taking into account the economic, environmental, and social aspects of resilience management.



# PAPER TOPICS

## C Resilience and Disaster Management for Road and Climate Change pt.2

In particular for Indonesia, it must be able to produce infrastructure that is more resilient and disaster-resistant, bearing in mind that in recent years the La Nina phenomenon has resulted in extreme weather in Indonesia, especially during the rainy season. Road and bridge developers are always aware of water-related disasters, especially since the rainy season is now shorter in duration but greater in intensity due to climate change. Topic related to infrastructure development that focuses on 3 (three) things, namely quality, environmental sustainability, and aesthetics as well as hydrology are important.

Developing a reliable information collection and sharing system is the first step of proactive disaster management toward engaging with internal and external stakeholders and understanding their information needs and expectations. The study of disaster management techniques using Big Data and Social Network Data as well as to analyze the financial aspect of disaster management in preparedness, mitigation response, and recovery phase, and to update the Disaster Management Manual are to be expected in this theme.

Furthermore, establishment of an emergency response task force to keep infrastructure including the road network connected and functioning after a disaster can also be related for this topic and the use of meteorological data from the Meteorology, Climatology and Geophysics Agency also forms the basis for responding to disaster risks related to hydrometeorology in road infrastructure.

## D Geotechnic, Bridge, and Tunnel

In addition to questions concerning the improvement of the resilience of earth structures to natural hazards, this theme focuses in particular on the identification of technologies and innovations in their construction and maintenance.

The subject of resilience also plays a major role in the field of Bridges. Here, the focus is on questions of adaptation to the consequences of climate change and on improving the resilience of bridges in the case of seismic events. The development of procedures and methods for bridge inspections and the implementation of these new technologies within bridge management systems can also be included. Lessons learned from forensic engineering of bridge collapses can also be considered. Additionally, the use of innovative construction materials for the repair of aging bridges can also be addressed.

As mentioned above, the subject of resilience can also be dealt with in a separate issue for "Tunnels", where both the construction and maintenance as well as the future use of data-driven approaches for preventive and/or predictive maintenance are addressed. Operating and ensuring the safety of users is a major challenge for owners and operators of road tunnels. Therefore, best practice approaches and successful solutions for the safe operation of heavily-traffic urban tunnels as well as the impact of new propulsion technologies on tunnel operation and safety can be investigated. This theme can address ITS applications for tunnels including the identification of the potential of big data and data analytics applications for the operation of road tunnels as well as the update and improvement of the risk assessment software for the transport of dangerous goods in tunnels.

Strengthening slope stability and applying slope protection to prevent slope collapse in the road network are some things that are much needed to bring up common/latest problems in many regions.

# PAPER TOPICS

## E Transport and Highway Planning, Geometric of Road, and Accessibility

Within the concept of sustainability in transport network planning - also related to accessibility and equity-, one aspect that is analyzed is public health, probably included in the objective of "identifying, investigating and documenting the social value of transport". For this activity, it can be analyzed of impact techniques and identified best practices in ex-post project evaluation. With all this, it will deepen the relationship between transport investments and economic growth.

In view of the importance of guidelines and standards in the field of road infrastructure, this theme focuses on collecting these standards from several countries and analyzing analogies and differences, taking into account the type of road. The current reliability of geometric models addressing the new mobility - new propulsion techniques and autonomous driving - as well as investigating the use of new tools such as Big Data to reconsider design parameters and models based on road user behavior can also be analyzed.

The inhabitants' mobility needs in the commuting areas in order to make sure that all transportation needs in relation to the services delivered by cities will be taken into consideration. It will take into account the complexity of urban areas (integration with land planning, multimodality, public support, and new mobility modes).

Rural areas provide goods, industries, and a workforce for all communities, and roads are the most important way to exchange goods and services. This theme can also be focused on accessibility in rural areas and on mobility needs. Road networks in rural areas are very extensive compared to the low density of the population, and as a result, it is difficult to finance the construction and maintenance of those networks and the safety conditions are generally poor. Therefore, this theme can also be focused on improving technical solutions for paved and unpaved roads in rural areas.

Mobility on the roads is undergoing a rapid evolution in recent years as a result of the application of new technologies both on the roads and in vehicles. Mobility is an issue with a vital impact. It is something that we have corroborated or given greater visibility in this pandemic. Fundamental for the development of our daily life work, leisure and family, and social relationships, and for the industry, and the accessibility to goods.

The rapidity of changes and the appearance of new forms and patterns of mobility make it necessary for authorities and road operators to be aware of the challenges and opportunities that this new reality offers, to manage them appropriately, and to carry out continuous monitoring of evolution.

## F Transport Administration and Strategic Improvisation of Project Management

This theme focuses on identifying best practices for establishing a framework for measuring the efficiency and effectiveness of Transport Administrations, including the establishment of assessment indicators/evaluation indexes (benchmarking) that can be used to recognize opportunities for improving the overall performance of transport administrations, with a particular focus on overall customer experience and communication of performance information. All this, taking into account the impact of the sharing economy and other disruptive technologies on the performance of Transport Administrations

# PAPER TOPICS

## F Transport Administration and Strategic Improvisation of Project Management pt. 2

In addition, it can also be analyzed the effective approaches for defining and promoting diversity in opportunity across the roads and transportation sectors, as well as how to attract new employees into the transport industry/profession, specially, young professionals. Good preparation for infrastructure projects is of utmost importance to secure their proper financing, wide acceptance, and seamless implementation.

Another aims of this theme are to review the literature and existing project preparation software and analyze good practices of project management for improving and optimizing public and private investment, as well as to define strategies to accelerate project delivery and reduce project lifecycle costs. It can also facilitate the identification of how well-prepared projects contribute to a culture of transparency and accountability.

This theme also focuses on identifying best practices for establishing a framework for measuring the efficiency and effectiveness of Transport Administrations, including the establishment of assessment indicators/evaluation indexes (benchmarking) that can be used to recognize opportunities for improving the overall performance of transport administrations, with a particular focus on overall customer experience and communication of performance information. All this, taking into account the impact of the sharing economy and other disruptive technologies on the performance of Transport Administrations.

## G Asset Management and Digital Technology in Road Network

Implements and integrates an asset management framework are developed based on international standards so that road organizations manage their performance, risks, and costs more effectively and efficiently. The results of the theme will bring a guideline for implementing the asset management system. The theme can explore not only asset management but also the resilience of road networks and the renewal and rejuvenation of aging infrastructure. There is another need for decarbonizing road transport all over the world both for freight and passengers. ERS (Electric Road Systems) is one possible solution for diminishing the carbon footprint. ERS plays a leading role in exchanging knowledge and experience in ERS globally, addressing as well road operation, road safety, road maintenance, and cyber security aspects.

This theme will also aim at representing a wide diversity of circumstances, including cases from several countries and continents, and will make references to the work of other organizations, especially car manufacturers, IT companies, equipment manufacturers, service providers, and their representative bodies.

# ABOUT THE EVENT

**In 2023**, REAAA will celebrate its **50th anniversary**. To commemorate its anniversary, REAAA in collaboration with PIARC hosted by IRDA and DGH Ministry of Public work and Housing Indonesia will conduct a series of activities consisting of:

1. Road Engineering Conference (in collaboration with REAAA)
2. Seminar (join organizing with PIARC and IRDA)
3. The 120th REAAA Council Meeting
4. REAAA 24th Young Engineers Professional (YEP) Meeting
5. The 13th Heads of Road Authorities (HORA) Meeting
6. The 10th REAAA Business Forum
7. The 50th REAAA Anniversary
8. Exhibition
9. Site Visit

These activities are intended for local authorities, administrators, the private sector, those responsible for road traffic and safety, design engineers, design consultants, road network administrators, contractors, control and technical assistance consultants, academics, researchers, engineering students, businesses, and professionals. For more information please visit:

**linktr.ee/AARC2023**

# SCHEDULE OF THE EVENT**

The event will be conducted on 24th August- 27th August 2023, with the following agenda:

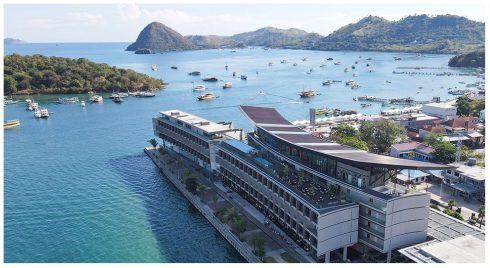
| Date/Day | Activity in Detail * | Venue |
|---|---|---|
| 24th August, 2023 (Thursday) | 24th YEP Meeting "IoT for Road Design and Construction" | Meruorah Hotel |
| | PIARC TC Meeting "Freight and Intelligent Transport System" | |
| | Lunch Break | |
| | Parallel Room:<br>1. 120th REAAA Council Meeting<br>2. HORA Meeting "Standardized Asian Highway and Road Development | |
| | 3. Directorate General of Highways Executive Official Meeting | ITDC |
| | Welcoming Reception | Meruorah Hotel |
| 25th August, 2023 (Friday) | Opening Ceremony (Ballroom) | Meruorah Hotel |
| | Exhibition Opening (Limited Participants) | |
| | Keynote Speaker (Ballroom):<br>1. Investment and Technology Opportunity in Indonesia's New Capital City (Head of Nusantara Capital City Authority)<br>2. Environmental Sustainability in Road Infrastructure (President of REAAA)<br>3. Green Financing for Road Development (President of PIARC) | |
| | Parallel Room:<br>1. Seminar on "Freight and Intelligent Transport System" (TBD)<br>2. Business Forum (Ballroom)<br>Theme: Knowledge Sharing "The Implementation of Technology 4.0"<br>3. Technical Session | |
| | 50th REAAA Anniversary Celebration | Waterfront Marina Labuan Bajo |
| 26th August, 2023 (Saturday) | Parallel Room:<br>1. Seminar on "Road Safety, Database, and Technical Information" (TBD)<br>2. Technical Session | Meruorah Hotel |
| | Parallel Room:<br>1. Seminar on "Climate Change and Resilience" (TBD)<br>2. Technical Session | |
| 27th August, 2023 (Sunday) | Parallel event:<br>1. Technical Visit (Labuan Bajo-Tanamori Road & Widening of Labuan Bajo-Waekelambu Road)<br>2. Culture visit: Komodo Island, Pink Beach, and Padar Island (optional via registration and the fee is exempted from registration fee) | Labuan Bajo-Tanamori Road & Widening of Labuan Bajo-Waekelambu Road |
| | 3. IRDA Senior Official Meeting | Meruorah Hotel |

*There will be held exhibition everyday during the series of event

**The schedule may change due to some adjustments

# LOCATION


**Labuan Bajo** was only a small fishing site, but flourished to become the gateway to many exotic destinations in East Nusa Tenggara. The extraordinary interest among travelers lies in Komodo Dragons or locally called ora. It is a valuable alluring factor, showcased in its superb national park. Labuan Bajo can be that ideal getaway with choices of land and sea to explore for some adventurers. There are three majorities of ethnic groups, namely the Manggarai, Bima, and Bugis. People coming from other parts of Flores, like Ende, Ngada, Maumere, live side by side with them. You can meet some of the locals in their beautiful village of Labuan Bajo.



The event will be held in Meruorah, Komodo Labuan Bajo. It is a luxury 5-star hotel that only takes an hour-long flight from Bali. From Meruorah, we can leave all cares behind and relax amidst panoramic beauty.

Following we attach some public facilities around and its descriptions below:

Siloam Hospital
1.9 km

Nurul Falaq Great Mosque
0.11 km

Komodo Airport
2.9 km

Manta Rhei Dive Center
0.55 km

Magnolia Boutique Komodo
0.08 km

Plaza Marina Komodo
0.08 km

Exotic Komodo Souvenir Shop
2.7 km

Cafe Melinjo - France Flavor
0.08 km

Taman Laut Handayani
Seafood Restaurant
0.5 km

# ADDITIONAL INFORMATION

**Location of The Seminar**

**Meruorah**
Komodo Labuan Bajo

Hybrid format:
face to face and virtual format

Expected Participants:
**800** on-site participants

## Registration

- **On-site**
  800 participants
- **Off-site**
  100 participants

Registration Fee*
**USD 300**
*for all kind of attandances

Registration fee are waived for PIARC TC member, Executive REAAA, Executive IRDA, Seminar presenter, and technical session presenter

If you are interested in attending The Event, please fill out the pre-registration form here:

**linktr.ee/AARC2023**

## Site Visit

Site visit will be held in Labuan Bajo-Tanamori Road and Widening of Labuan Bajo-Waekelambu Road

## Business Forum Exhibition

Format:
Round Table

Target Booth: **4** executive booths | **5** international booths | **30** national booths | **10** small, micro, and medium enterprises

## Further Information

For more information regarding entry regulations to Indonesia during the COVID-19 pandemic, please see the following links:

- **VoA**
  https://kemlu.go.id/london/en/news/18631/visa-on-arrival-voa-for-foreign- travellers
- **Visa Application**
  https://www.imigrasi.go.id/en/permohonan-visa-republik-indonesia-wisata- b211a/
- **Restrictions during Covid-19**
  https://kemlu.go.id/losangeles/en/news/11727/update-indonesia-travel- restrictions

## Contact Person

asiaaustralasia2023@gmail.com

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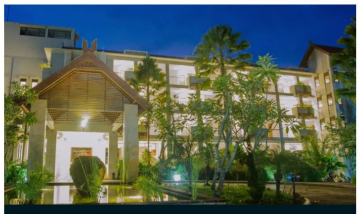
# HOTEL AT LABUAN BAJO

MERUORAH KOMODO LABUAN BAJO
Rp 2,000,000 ★★★★★

AYANA KOMODO WAECICU BEACH
Rp 3,900,000 ★★★★★

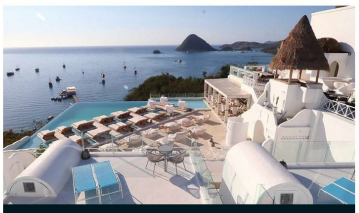
PLATARAN KOMODO RESORT & SPA
Rp 5,980,000 ★★★★★



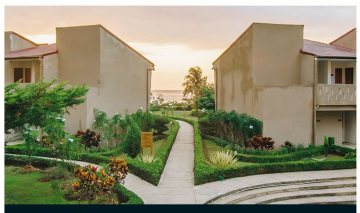
HOTEL BINTANG FLORES
Rp 1,200,000 ★★★★

THE JAYAKARTA SUITES KOMODO FLORES
Rp 1,350,000 ★★★★

LA PRIMA HOTEL
Rp 1,650,000 ★★★★

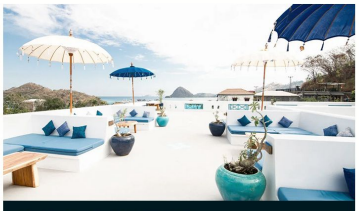


LOCCAL COLLECTION HOTEL
Rp 2,300,000 ★★★★



LUWANSA BEACH RESORT
Rp 700,000 ★★★★

SUDAMALA RESORT
Rp 2,900,000 ★★★★



SEAESTA KOMODO HOSTEL & HOTEL
Rp 900,000 ★★★★

SYLVIA HOTEL & RESORT KOMODO
Rp 1,100,000 ★★★

PURI SARI BEACH HOTEL
Rp 1,050,000 ★★★

*The price above is estimated based on some travel companies

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## AIRCRAFT DIRECT RATE AND DEPARTURE TIME

There are many airlines that can take you to Labuan Bajo, nevertheless during the pandemic, non-stop flights from Malaysia or Singapore are limited. Some of them require passengers to have a stop in Jakarta or Bali. From Jakarta or Bali, seminar attendees can continue their travel to Labuan Bajo by another airplane. City's cab service is very affordable, and online cabservice is also popular. Following are the daily direct flights schedule to and from Labuan Bajo.

| | | | | | |
|---|---|---|---|---|---|
| **JAKARTA — LABUAN BAJO** | | | | | |
| Batik Air | Batik Air | 11:40 | 2 h 25 m | 15:05 | RP 2,260,000 |
| | | 04:30 | 3 h 40 m | 09:10 | RP 2,260,000 |
| Garuda Indonesia | Garuda Indonesia | 11:00 | 2 h 25 m | 14:25 | RP 2,520,000 |
| **DENPASAR — LABUAN BAJO** | | | | | |
| Batik Air | Batik Air | 08:00 | 1 h 10 m | 09:10 | RP 1,260,000 |
| | | 11:40 | 1 h 10 m | 12:50 | RP 1,310,000 |
| AirAsia | Air Asia | 09:10 | 1 h 10 m | 10:20 | RP 1,100,000 |
| | | 15:30 | 1 h 10 m | 16:45 | RP 1,110,000 |
| **LABUAN BAJO — JAKARTA** | | | | | |
| Batik Air | Batik Air | 15:45 | 2 h 30 m | 17:15 | RP 2,160,000 |
| Garuda Indonesia | Garuda Indonesia | 15:20 | 2 h 15 m | 16:35 | RP 2,375,000 |
| **LABUAN BAJO — DENPASAR** | | | | | |
| Batik Air | Batik Air | 09:50 | 1 h 10 m | 11:00 | RP 1,160,000 |
| | | 13:30 | 1 h 10 m | 14:40 | RP 1,160,000 |
| AirAsia | Air Asia | 10:45 | 1 h 10 m | 11:55 | RP 960,000 |
| | | 17.10 | 1 h 10 m | 18.20 | RP 960,000 |

*The rate we attached is estimated based on some travel companies' seasonal rate.

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# TOURISM AROUND LABUAN BAJO 18

## KOMODO NATIONAL PARK

**Komodo National Park** is a national park in Indonesia located in East Nusa Tenggara. This is home to the famous Komodo dragons. To see the Komodo dragons you will have to join a Komodo Island tour with one of the rangers. The best time to visit the island of Komodo is in the early afternoon when the big Komodo dragons are sitting lazily in the shade and the baby dragons are wandering through the wilderness. Aside from dragons, the national park also features outstanding natural landscapes.

## PADAR ISLAND

**Padar Island** is a part of the cluster of Komodo National Park. This small island is as exotic as Labuan Bajo. Speaking of nature, exotism, and satisfaction, this island offers them all. The combination of hills surrounding the sea and the sea itself creates harmony. When you visit in the rainy season, the hills will be covered by grass and they will look green and blue creating a beautiful landscape. It is going to be totally different if you come in the dry season because the hills will be so dry that the green view turns into a sandy one, like a beautiful savana.

## RINCA ISLAND

**Rinca** is one of the 3 biggest islands of the Komodo National Park with Komodo Island and Padar Island. Rinca has a bigger Komodo dragon population with more around 1300 individuals living on the island. Rinca is composed of 3 different types of vegetation with savannah all around the coastline covering 70% of the island, monsoon forest with a dry tropical forest located between sea level and an altitude of 500 meters and the quasi-cloud forest above 500 meters. Being closer from Labuan Bajo than Komodo, Rinca is a better option if you want to see the Komodo dragon.

# TOURISM AROUND LABUAN BAJO 19

## AMELIA SEA VIEW

Amelia Sea View is located in Labuan Bajo. As the name suggests, it is the location to enjoy stunning sea views including the sunrise and sunset. This sightseeing spot is situated on a green hill, on which tourists relax and enjoy the nature passionately.

## MANTA POINT

For those who love nature, Manta Point is a perfect place to explore. It is located near to Komodo National Park. It is also near to Gili Lawa. As the name implies, it is the location to witness a majestic sea creature, Manta Ray. Due to this reason, many tourists come here for either snorkeling or diving.

## PINK BEACH

Pink Beach is one of seven pink beaches on the planet and is just one of the many amazing features of Komodo Island that make it truly a Natural Wonder of Nature. This exceptional beach gets its striking color from microscopic animals called Foraminifera, which produces a red pigment on the coral reefs. When the tiny fragments of red coral combine with the white sands, this produces the soft pink color that is visible along the shoreline.

# TOURISM AROUND LABUAN BAJO

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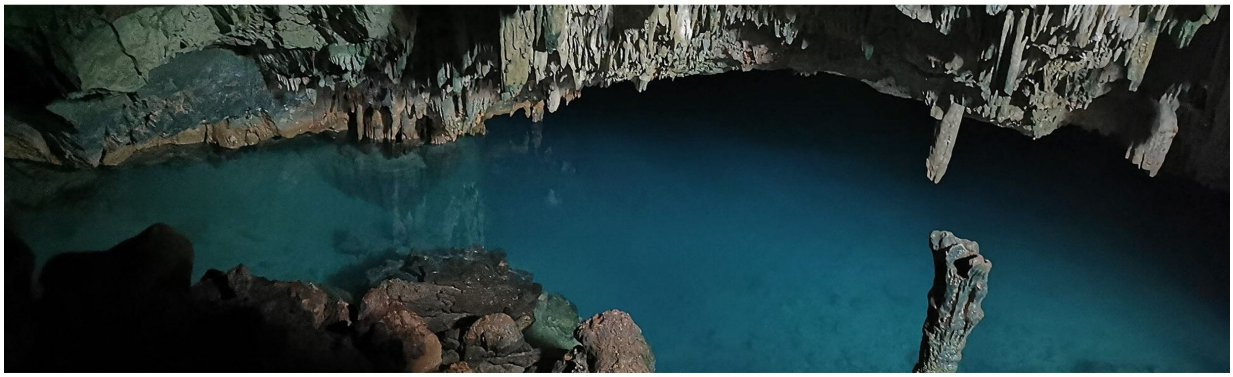

## RANGKO CAVE

**Rangko Cave** is located in Rangko village near Labuan Bajo. Rangko Cave is a limestone cave with a natural blue pool inside. It's a hidden gem in Labuan Bajo. The best lighting comes at 2.30 pm and fades from 3.30 pm onwards. During those 'golden hours', the sun shines through the mouth of the cave, hits the surface of the clear blue seawater inside, and illuminates the whole cave with a greenish-blue glow

## BATU CERMIN CAVE

**Batu Cermin Cave** has an area over 19 hectares and 75 metres high. It is one of the caves under the sea which is then lifted to the surface. The sunlight that broke on the sidelines of the stone then reflected, giving the impression of gloss on the stone (Mirror Cave). The reflection stone that later became the origin name of Batu Cermin Cave. The stone in Batu Cermin Cave contains salt particles causing the stone to sparkle when exposed to light. To watch the gleaming stone tourists need to go to a depth of 20 metres in a narrow area of the cave 200 metres long.

## PUNCAK WARINGIN

Puncak Warigngin is the best place you can visit to see sunset with a view of islands' silhouettes and hundreds of pinisi ships.

# TOURISM AROUND LABUAN BAJO

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## WAE REBO VILLAGE

**Wae Rebo** or Waerebo is a remote and mysterious traditional village in Manggarai Regency, East Nusa Tenggara. Wae Rebo is one of the cultural tourism destinations in Manggarai Regency. In this village there are only 7 main houses or what is known as Mbaru Niang. Wae Rebo was declared by UNESCO as a World Cultural Heritage in August 2012 by setting aside 42 other countries.

## BENA VILLAGE

**Bena Village** is a megalithic village located in Triwuriwu Village, Aimere District, East Nusa Tenggara. It is located on a hilltop and has characteristic of the old community of mountain worshipers as a place for the gods (ancestors). Kampung Bena is estimated to have existed since 1,200 years ago. This village has only one gate for entry and exit. In the middle of the village there are buildings called bhaga and ngadhu. Ngadhu is a representation of male ancestors while Bhaga is a representation of female ancestors

## GILI LAWA DARAT ISLAND

**Gili Lawa Darat** is located in the Northern part of the Komodo National Park. It faces the wide and deep bay of Komodo island and offers amazing views and white sand beaches all year round. In the dry season the island almost looks brown everywhere, with parched golden brown meadows, while in the rainy season, all these changes and the island turns the color into the green with hills covered in lush.

For more information about Labuan Bajo destination, please visit this link:
www.indonesia.travel/gb/en/destinations/bali-nusa-tenggara/labuan-bajo

# WE WIL SEE YOU IN LABUAN BAJO

# Calendar of Events
# Forthcoming Events for 2023 in REAAA Member Countries

| DATE | MEETING/SEMINAR/ CONFERENCE/EVENT | COUNTRY/VENUE | ORGANISER |
|---|---|---|---|
| 7th-9th March 2023 | Kuala Lumpur International Pavement Seminar (KLIPS 2023)<br>"Leveraging Innovation Towards Green Technology and Resilient Pavement"<br>PIARC TC 4.1/REAAA Seminar on Pavement Rehabilitation | Connexion Conference Event Centre, Bangsar South, Kuala Lumpur, Malaysia | • Ministry of Works Malaysia<br>• Public Works Department Malaysia<br>• REAM<br>• PIARC |
| 25th-27th April 2023 | 3rd IRF Africa Regional Congress & Exhibition | Accra, Ghana | IRF |
| 8th-10th May 2023 | • 119th REAAA Council meeting<br>• 23rd YEP Meeting<br>• Technical tour | Singapore | • Land Transport of Authority, Singapore<br>• REAAA |
| 15th-16th May 2023 | "Vision Zero for the Balkans" Regional Road Safety Conference & Technical Showcase | Belgrade, Serbia | IRF |

| DATE | MEETING/SEMINAR/ CONFERENCE/EVENT | COUNTRY/VENUE | ORGANISER |
|---|---|---|---|
| 24th-27th August 2023 | REAAA Golden Jubilee<br>"Advance Technology Implementation Towards Sustainable Road Development"<br>• 120th REAAA Council meeting<br>• 10th REAAA Business Forum<br>• 24th YEP Meeting<br>• 13th HORA Meeting<br>• REAAA's 50th anniversary | Labuan Bajo, Indonesia | • Directorate General of Highways, Indonesia<br>• Ministry of Public Works and Housing, Indonesia<br>• IRDA<br>• REAAA |
| 2nd-6th October 2023 | XXVIIth World Road Congress | Prague, Czech Republic | PIARC |
| 14th-17th November 2023 | IRF Global R2T Conference & Exhibition | Phoenix, AZ, USA | IRF |

# NEW MEMBERS

The membership of REAAA as of 31st August 2022 was 1207. The REAAA Council and Chapters have approved the following 26 new members for the period between 1st March 2022 to 31st August 2022.

| | |
|---|---|
| Institutional | 1 |
| Life | 1 |
| Ordinary | 24 |
| **TOTAL** | **26** |

The list of new members approved at the 118th REAAA Council Meeting in Christchurch, New Zealand on 18th October 2022 is as follows:

## Institutional Members

| | | |
|---|---|---|
| 1. | Magnetic Control Systems Sdn Bhd | I.0271 Malaysia |

## Status Changed from Ordinary to Life Members

| | | |
|---|---|---|
| 1. | Dr. Kyu Young, Hwang | O.3162 to L.0433 Korea |

## Ordinary Members

| | | |
|---|---|---|
| 1. | Ir. Ts. Dr. Muhammad Marizwan Bin Abdul Manan | I.0271 Malaysia |
| 2. | Nik Soh bin Yaacob | O.3857 Malaysia |
| 3. | Ir. Muhamad Uzed bin Mahmud | O.3858 Malaysia |
| 4. | Ag. Muhammad Khairudin bin Ag. Tajudin | O.3859 Malaysia |
| 5. | Nurul Saffreena binti Musa | O.3860 Malaysia |
| 6. | Ir. Md. Azmi bin Abdullah | O.3861 Malaysia |
| 7. | Ir. Ts. Shaharul bin Hamzah | O.3862 Malaysia |
| 8. | Matt Elischer | O.3863 Australia |
| 9. | Eric Friis | O.3864 Australia |
| 10. | Jasmine Vanessa T. Cruzado | O.3865 Philippines |
| 11. | Jervis Rodriguez | O.3866 Philippines |
| 12. | Keyzer Glenn S. Manalac | O.3867 Philippines |
| 13. | Jommel T. Dalapo | O.3868 Philippines |
| 14. | Yancieseth Fodulla | O.3869 Philippines |
| 15. | Jay Atento | O.3870 Philippines |
| 16. | Bryan Sacdalan | O.3871 Philippines |

## Ordinary - Reinstated

| | | |
|---|---|---|
| 17. | Ir. Tan Ai Ping | O.3604 Malaysia |
| 18. | Datuk Zakaria Ahmad Zabidi | O.3559 Malaysia |
| 19. | Sivakumar A/L Jayaraman | O.3258 Malaysia |
| 20. | Jude Ting Mui Heng | O.3467 Malaysia |
| 21. | Ir. Mohd Hefni bin Abdul Aziz | O.3721 Malaysia |
| 22. | Dato' Ng Shin Chie | O.3704 Malaysia |
| 23. | Abdul Razak Abdul Latip | O.3624 Malaysia |
| 24. | Dr. Norfarah Nadia binti Ismail | O.3718 Malaysia |

## Notice of Correction for Newsletter 2022-1

The position of Ms. Caroline Evans on page 29 of Newsletter 2022-1 is Chair of PIARC TC1.4 Climate Change and Resilience of Road Networks and Co-Chair of REAAA Climate Change, Resilience and Disaster Management Working Committee.

# The Governing Council for the 17th Council Term : 2021-2025

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