2016-PUI-NA-TC

Project Title
Supporting the Preparation and Recovery of Civil Infrastructures in Case of Natural Disasters in Asia and the Pacific.

This activity will be implemented under the on-going TC project RAS0073 "Supporting Human resource Development and Nuclear Technology"

Targeted Member States:
Potential resource Member States: China, India, Indonesia, Japan, Malaysia, Pakistan, Philippines, Sri Lanka, Thailand and Viet Nam. Australia, Korea and New Zealand may also participate as resource Member States.

Receiving Member States: Bangladesh, Cambodia, Lao P.D.R., Myanmar, Nepal and the Pacific Islands Member States.

The list of targeted Member States is not exclusive and could be extended to include other Member States in Asia and the Pacific region as well as to Member states outside the region.

Rationale:
The Asia-Pacific region is exposed to natural disasters of many types which each year kill thousands of people and wreak vast economic destruction, often striking a number of countries simultaneously. Over the period 2005-2014, the greatest loss of life, 200,000, was the result of earthquakes and tsunamis[1]. In addition, many cultural heritage sites and important public buildings such as hospitals and schools were severely damaged by earthquakes.

Many countries in this region are, however, not sufficiently prepared for large-scale seismic events and need to increase their national capacity to provide a prompt response proportionate to the impact of the disaster. Enhanced regional cooperation is also required to address cross-border disasters and support the repair, rehabilitation and rebuilding of affected critical infrastructure.

A devastating earthquake in April 2015 left over 50000 destroyed homes and buildings in Nepal, in addition to severe human casualties. Among the loss and rubble, many historical buildings, hospitals and schools, as well as utility pipe distribution networks were affected. Apart from obvious damage and destruction, hidden structural weaknesses were developed which could expand into a bigger problem or collapse, if not discovered and handled properly.

At the request of the Government of Nepal, the IAEA provided support in complementing national efforts to verify the integrity of key infrastructure and cultural heritage sites, through the use of non-destructive testing (NDT) method. The NDT method, including radiography and other complementary modalities to test the integrity of critical buildings and structures, is an efficient way to verify and determine the integrity of infrastructures, hence preventing the collapse of and restoring confidence in affected infrastructure. These techniques are able to identify structural defects that may be imperceptible to traditional testing methods.

Another nuclear technique, referred to as radiotracers, can also be utilized to assess the structural integrity of buried water distributions networks for underground leakages when they are broken or damaged. Radiotracers are the ideal tool to detect and localize leaks and thus help in the recovery of

[1] Asia-Pacific Disaster Report 2015, United Nations Economic and Social Commission for Asia and the Pacific, 27 October 2015.

various networks, as they identify in a reliable and efficient manner any existing structural irregularities. As a result, the structural integrity of water, natural gas and oil pipelines can be detected and appropriate measures taken. Radiotracers and nucleonic measurement systems are ideal tools to understand sediment transport phenomena in coastal areas and to address and design necessary infrastructure, thereby leading to enhanced disaster management policies.

The IAEA's support to Nepal in this area demonstrated the need of Member States for strong IAEA support and assistance in building both national and regional capacity for the application of radiation technologies in disaster risk mitigation and remediation. A number of Member States in the region have benefitted from previous IAEA support which included practical applications of radiation technologies, training and education programmes implemented through experimental and hands-on activities, as well as through the certification of qualified personnel. However, this did not cover the detection of defects in civil structures.

Against this background, a project was developed for Member States in Asia and the Pacific region with an aim to improve national and regional capabilities for the use of NDT method to verify the integrity of civil infrastructure in case of natural disasters.

Project description:

This project aims to improve national and regional capabilities for the use of NDT methodologies to verify the integrity of civil infrastructure in case of natural disasters through:

- supporting Member States to establish national teams for the application of radiation technologies ;
- supporting Member States with established national teams to perform high quality diagnosis and assessment of civil infrastructure; and
- assisting Member States to strengthen regional cooperation through enhanced professional capacity and to set up a mechanism, through a regional task force, which could be called to provide assistance upon request from Member States affected by natural disasters in the region.

Three target groups have been identified for assistance through the participation in this project:

- organisations and their technical departments in charge of the maintenance of public infrastructures such as water distribution, roads and bridges, building and civil structures quality control, cultural heritage as well as emergency preparedness and response in the case of natural disasters;
- radiation technology professionals from public institutes; and
- Junior- and mid-career technicians and engineers in the relevant technical field in the public sector.

These identified professionals will be supported through training programmes on the application of radiation technologies. National teams are expected to perform diagnosis and quality control of civil structures and to include an immediate rapid response force capable of providing emergency assistance in case of natural disasters. This project also aims to strengthen national capacities to enhance the response of local authorities to evaluate structural damage in order to implement efficient remediation actions in the case of natural disasters.

Planned activities:

The project proposes to implement the following activities:

1. A coordination meeting to identify the needs, existing capabilities and complementarities in the region (both in terms of skilled personnel and available equipment); discuss the ways to strengthen regional cooperation and a mechanism of delivery of relevant assistance to the Member States affected by a natural disaster; and to build up a regional network in the area of pre and post disaster management.
2. Training of selected NDT professionals already qualified in conventional NDT methods to qualify them for applications in the area of civil engineering.
3. Workshop to share past experiences and knowledge between resource countries related to the application of NDT in civil engineering in the context of natural disasters.
4. Regional workshop to promote the establishment of NDT infrastructure and to introduce the application of NDT and radiotracers methods and techniques to national decision makers and stakeholders.
5. Regional training course for junior- and mid-career professionals for the application of NDT and radiotracers methodology in civil engineering.
6. Expert missions for specific training in NDT methodologies in recipient countries.
7. Procurement of equipment used for assessing the integrity of civil infrastructures in case of natural disasters. The IAEA equipment will be stored in a suitable facility in Fukushima Prefecture of Japan. The utilisation of such equipment will be made available by the IAEA at the request of the relevant IAEA Member States in the Asia Pacific region in case of natural disasters.
8. Participation of selected NDT professionals in the International Society for Structural Health Monitoring of Intelligent Infrastructure (ISHMII), Brisbane, Australia, from 6-8 December 2017 and in the Asia Pacific Conference on NDT, Singapore, from 13-17 November 2017.

Outcome/Outputs:

Outcome:
Improved national and regional capabilities for the use of NDT methodologies to verify the integrity of civil infrastructure in case of natural disasters.

Output 1:
National teams of NDT professionals in the resource Member States trained and qualified for NDT applications in civil engineering.

Output 2:
Recipient Member States prepared for the establishment of national NDT infrastructures and teams.

Output 3:
Regional network for NDT in civil engineering established.

Proposal Period
2017-2018 (2 years)

Estimated budget for the project

Activity n°	Estimated budget in €	Year
1. Coordination meeting	14 participants x 1 week: €80 000	2017
2. Procurement of equipment	€360 000	2017
3. Training of NDT professionals to qualify for civil engineering applications of NDT	24 participants, 2 trainers, 2 weeks: €110 000	2017
4. Workshop for sharing past experience and knowledge	10-12 participants, 1 week: €65 000	2017
5. Expert missions	1 expert, 1-2 weeks in 5-7 countries: €60 000	2017 and 2018
6. Regional workshop for beginners in establishing NDT and radiotracers infrastructures	10-12 participants, 1 week: €65 000	2018
7. Regional training course for beginners and junior- and mid-career professionals in basic NDT and radiotracers methods	24 participants, 2 trainers, 2 weeks: €110 000	2018
8. Participation of selected professionals in NDT conferences on civil engineering	10 participants, 3 days: €50 000	2018

Estimated budget Year 1	€635 000
Estimated budget Year 2	€265 000
Total	€900 000