Project Proposals for the RCA Programme 2022/2023
2nd Round Project Concept Template

Part 1: Information Sheet

Project proposals for the RCA Programme 2022/2023 are to be prepared using the attached template. Completed templates will be reviewed by the RCA PAC in November 2019.

- **PLEASE NOTE THAT ALL PROSPECTIVE CONCEPTS REQUIRE INFORMATION THAT IS LODGED ON THE RCARO WEBSITE (access is only required to the RCA information not the whole Members Only site).**
- **YOU WILL HAVE TO APPLY FOR A PASSWORD AND ACCESS CODE TO ENABLE ACCESS TO THIS INFORMATION.**
- **PLEASE GET ENDORSEMENT FROM YOUR NATIONAL REPRESENTATIVE FOR THIS ACCESS.**

The important documentation for the concept designs is available on RCARO Website.

A proposal will be evaluated against the following criteria:

- **Is its aims and objectives in line with priorities set out the RCA Medium Term Strategy for 2018/2023?**
- **Identify which elements of the MTS are being complied with.**
- **Why it should be a regional project.**
- **The essential role of the nuclear technology in the project.**
- **Does the proposal identify links to previous projects in this area of technology?**
- **Does the proposal overlap or duplicate current or previous RCA projects?**
- **Is a convincing case made to justify further projects in this area?**
- **Is there a strong TCDC component?**
- **If so, does it exploit the benefits from the earlier RCA projects?**
- **Is there a readily available baseline against which to measure the effectiveness of the project?**
- **If the proposal is essentially an extension of previous projects in this area that have been implemented for more than 2 TC Cycles, does the proposal include arrangements for the transfer of project leadership to others?**

Please note that your National Representative will be reviewing the concept document to ensure that it has been prepared in compliance with the RCA special requirements.

Please be aware that, if your concept design does not take account of the special requirements for the RCA programme, it will be rejected.

Part 2: Concept Template[1]

Title:
The title should be as concise as possible and should summarize the objective of the project.
Enhancing the Regional Collaboration in Water and Environmental Isotope Analyses for improvement of water management practices, an effort to alleviate climate change impacts in Asia Pacific Region.

Compliance with the RCA Medium Term Strategy for 2018/2023:
All RCA projects have to comply with the RCA MTS for 2018/2023 - please refer to the MTS document.

i) *Briefly indicate to which specific MTS priorities this project proposal contributes.*

The project proposal falls under MTS C.2.4 Priorities in Environment (Water Resources and partly Coastal and Marine Resources). The project will address all the elements mentioned in the MTS reproduced below:

1. Strengthen the capacity and capability of water administrations to effectively manage water resources
2. Assess the effect of human activities and climate change on the water cycle
3. Promote the application of nuclear techniques in environmental forensics to identify sources of pollutants and to understand anthropogenic and geogenic mechanisms, and support remedial actions
4. Assist the relevant regulatory authorities to adopt nuclear based analytical techniques to improve decision making related to marine pollution

Human capacity and physical infrastructure building in all above-mentioned priority areas (Sector cross-cutting priority need)

ii) *How will these be achieved?*

Isotopes (stable and radioactive) have long been proved as creditable tracers in environment-hydrology. The isotopic data are keys to reveal the sources of pollutants and how the pollutants are proceed, converted, and transferred over the water course. The impact of climate change (sea level rise, salinity intrusion, droughts/floods, evaporation) on water quality and quantity will also be addressed with the use of isotopic data, hydrological data, biogeochemical data, and numerical simulation.

There are 4 main work packages:

Monitoring program design: it is necessary to design and validate/test a national/regional monitoring program for surface and groundwaters that adapt to local and regional need and capability (including identify the main water problems such as water shoratge during dry season, salinity intrution, floods/droughts, eutrophication, microplastics contamination, wetland and mangrove change, accessibility to the critical points, junctions of surface water and the deep aquifers in groundwater monitoring)

Isotopic analysis: There will be different forms of capacity building and cross-laboratory standard tests in the field of stable isotope analysis. Three different groups of stable isotope analysis are water isotopes (^{2}H and ^{18}O), carbon isotopes (^{13}C and ^{18}O), and nutrients isotopes (^{15}N, ^{34}S, and ^{18}O). The stable

[1] If you have not been involved in drafting a concept before and if you are not fully acquainted with the RCA and its Programme you are encouraged to support advice and assistance from your RCA National Representative.

isotopes of water ^{2}H and ^{18}O will enable to identify the recharge sources and recharge areas of groundwater system as well as partition water flow in streams/rivers into different inflow patterns (surface, ground, direct, snow,..). Carbon isotopes will be used to assess GHG exchange between water and atmosphere and biogeochemistry of water bodies. Environmental isotopes (^{15}N, ^{13}C and ^{34}S) along with geochemical parameters, trace elements, major cations & anions may characterize the contaminants in surface and ground water. They also show the sources of contamination (agriculture, deforestration, industry, …).

Mapping of isotopes in surface and groundwater (spatial and seasonal). Analytical results of water isotopes will be treated to create thematic maps of isotopes in surface and groundwater. Carbon isotope data will be fitted with the land/vegetation coverage of the region. Nutrient isotopes will be pinned with the landuse change/activities to show both anthropogenic and geogenic impacts. All maps of isotopes will be fitted to project how water and land scape change over space and time. Interpretation of climate change impact could be seen based on these created isotopic maps.

Numerical simulation using water isotopes as calibration and validation tool to project hydrological and water quality changes as function of climate variability (e.g. IWBMIso for water flow simulation, FLEXPART for precipitation simulation)

The results of the project will be shared for the purpose of national and inter-boundary water management and administration to effectively protect water quality and manage the water resources in Asian Pacific region.

Overall Objective:

State the objective to which the project will contribute. Note this has to be in line with the RCA MTS for 2018/2023. It should be a short description expressed as: To do ……

To enhance the regional capability in water quality and water resource monitoring for effective development and management of water (surface and ground water)

RCA Projects are to be designed to have a Socioeconomic Benefit:

What is the potential socioeconomic benefit that might be realised from the project concept over a 5 to 7-year horizon?

It is expected that the monitoring networks, isotope database, and human resource are integral part of climate change research effort to help regional countries to meet their sustainable development goals (SDGs).

Our project will provide both short term and long term benefits:

Short term benefit: Capacity building in water quality monitoring, laboratory and data analysis co-produced with water management agencies. Enhanced and augmented data collection and analysis will evidence environmental assessment, encourage learning and inform national strategic water resource management among regional countries.

Intermediate benefit: To expand utility and value of 'citizen science', we will co-produce with national agencies simple monitoring programmes involving local communities to encourage participation and understanding of change in water quality and resources. Our work will improve both regional and national monitoring capacity, especially at institutional level.

Longer-term benefit: Our activities are in line with the regional Government's efforts at attaining the UN SDGs (SDGs 6 and 14).

The beneficial receivers are:

Whom within the GPs will improve related scientific skills (e.g. analytical and modelling skills) of local scientists and researchers (staffs and students at different levels) and to equip monitoring agencies with skills in collecting, analysing and communicating complex environmental processes in accessible ways:

External stakeholders with which the GPs will work (National level MoNRE and province-level DoNRE and Departments of Science and Technology: to equip local staff's ability to collect, analyse and communicate the environmental issues; Other ministries and institutes - including Hydro-meteorological agencies, Hydropower and water abstraction companies; dwellers who require accessible information about potential scenarios resulting from future climate change; farmers who use water for their agricultural practices; and next-generation and early career scientists; Province-level Department of Natural Resources and Environment will fill the water quality monitoring gaps and find out what are needs in the face of climate change, saline intrusion loss of coastal buffering.)

Proposed Participating Government Parties:

List the Government Parties expected to participate in the project:

1. Australia; 2. Bangladesh; 3. Cambodia; 4. China; 5. India; 6. Indonesia; 7. Japan; 8. Korea; 9. Laos; 10. Malaysia; 11. Mongolia; 12. Myanmar; 13. Nepal; 14. New Zealand; 15. Palau; 16. Pakistan; 17. Philippines; 18. Sri Lanka; 19. Thailand; 20.Viet Nam

Technical Cooperation among Developing Countries (TCDC) Project Component:

Review the resource documentation provided on-line – www.rcaro.org/ *???.*

Outline the TCDC strategies to be used in the project to enhance regional cooperation:

• The project activities will involve the sharing of developing GPs' own expertise, technology, resources, facilities and other capacities with one another.

• Most of the GPs have analytical facilities for isotopic and chemical analyses. Those GPs which do not have these facilities may utilize the facilities of the regional research unit (RRU) and IAEA isotope hydrological laboratory, Vienna. VINATOM as RRU provides water, carbon, and nutrients isotope analyses at minimum cost. Other isotope analysis may be provided by the RRU through IAEA collaborating mechanism such as the VINATOM-IAEA Collaborating Center for water and environment (CC).

• For field work and monitoring design and data exploitation for inexperienced GPs, those do not have expertise in the technology, may utilize expert missions from the regional GPs having appropriate expertise, through IAEA's TC mechanism.

• For human resource development, Regional Training Courses (RTCs) routinely organized at the CC will be conducted covering different aspects of the isotopic techniques to be applied in the project.

• The project will include RTCs, expert missions, spares/small equipment and analytical support by RRU.

Will the project design feature partnering arrangements between those advanced and those less advanced in the technology?

Yes

If so, list those expected partnerships.

The project is based on mutual cooperation between the advanced and less advanced government parties. The on-going project and all the projects completed in the past utilized the experience mutually. The National Project Coordinators (NPCs) will work in close cooperation for solution of common problems and may seek guidance from each other through different communication platforms and media. Those government parties with less advanced technology may get benefit from advanced government parties through utilizing isotopic analytical facilities and other technical supports. Further, transfer of scientific knowledge/experience to less advanced countries will be through technical meetings, regional training courses, dissemination of information through NPC meetings, expert missions for technical guidance/on job training and national executive management seminars. This regional approach will provide solution of common regional problems and will also promote partnership among RCA regional government parties.

The RRU has already been defined and provided training to participants from neighbouring GPs. The CC for water and environment set up in VINATOM, Viet Nam, is an excellent platform for promoting the activities of this RCA proposal. In 2019, CC has already provided training course in isotope hydrology to regional partners. Over the 2 years 2020-2021, a series of training, expert missions will be organized to help GPs.

In addition, IAEA is promoting the triangular cooperation among member states. For instance, Viet Nam and IAEA are closely working to set up triangular cooperation between Cambodia, Viet Nam and IAEA and Lao, Viet Nam, and IAEA. Such triangular cooperation will be put in line with this project.

Partnership between nuclear research institutions (e.g. VINATOM in Vietnam) and general research institutions and administration agencies for hydrology and environment (e.g. Vietnam Environment Administration) will also be addressed. Indeed, in several countries like Vietnam, India, or Pakistan, nuclear techniques are assigned to certain specified research institutions and barred from fully development in others. There is therefore a large gap between those specified and those generalized/civil in the field of nuclear technique research and application. This project aims at extending the knowledge acquisition and broadening the application of nuclear techniques among all research institutions as well as administration agencies.

Analysis of gaps / problems / needs as applied to the RCA region:
Outline the major gaps / problems/specific needs to be addressed by the project (~ 300 words):

In Asia Pacific, the exponential growth of the human population and development of agricultural and industrial sectors in recent decades have caused a sharp increase of nitrogen, sulphates and carbonates loading to surface water bodies and associated groundwater resources in the region. Load of untreated chemical effluents from industry directly into surface water bodies, pesticides, fertilizers and sewage are deteriorating the surface water and subsequently ground water quality. In addition to the direct input of contaminants to water, climate changes are the cause of many water problems. For instance, coastal areas (e.g. Mekong delta) are suffering from salinity intrusion, severe storm surges, or sea level rise related flooding. Combination of droughts and temperature rise has led to ecological and environmental disasters (e.g. wildfire in Australia in late 2019). Snow melting in large scale due to temperature rise has also impacted on the water quality and quantity.

The dual problem in the region now is **shortage of water resource** and **deterioration water quality**. In

most of the GPs, a small fraction of population has access to clean and safe drinking water. Water is unfitted for drinking, aqua-culturing, and/or sustaining natural aquatic life. The cause for deterioration and shortage is anthropogenic, geogenic, or both.

Almost each GP is facing the problem of water and the nature of problem may be little different. Climate change impacts are **regional/inter-boundary problems** and need to be dealt with regionally (e.g. Mekong River, Ganges-Brahmaputra-Meghna river). Unfortunately, there exists no protocol for sharing the information and participating in monitoring networks among neighbouring countries. Also, "isotope techniques" which are widely and highly effectively employed for water management in advanced-level GPs have not yet been possessed in many RCA countries.

There is a need to monitor the variability of water quality and water resources in the region for a better adaptation and protection. Such variability should be interpreted as a reflection of anthropogenic activities and/or climate change impacts. In previous projects, the technique used was the same "isotopic technique" but cause/sources of surface water contamination and interaction between surface water and subsurface water in term of quality and quantity were not fully addressed. To set up a protocol for water quality and water quantity monitoring including the use of isotope techniques to be applicable regionally was not proposed in the precedent projects.

Review the resource documentation and list any past RCA projects that have addressed similar problems/needs in this area of technology.

In the past several RCA projects have been completed addressing different water issues, using isotopic techniques.

- RAS/8/097: Geogenic Contamination of Groundwater
- RAS/8/104 and RAS/8/108: Trends in Freshwater Quality Using Environmental Isotopes and Chemical Techniques for Improved Resource Management
- RAS/7/022: Applying Isotope Techniques to Investigate Groundwater Dynamics and Recharge Rate for Sustainable Groundwater Resource Management
- RAS/7/030: Assessing Deep Groundwater Resources for Sustainable Management through the Utilization of Isotopic Techniques
- RAS/7/031: Assessing the Vulnerability of Coastal Landscapes and Ecosystems to Sea-Level Rise and Climate Change
- RAS/7/035: Enhancing Regional Capability for the Effective Management of Ground Water Resources Using Isotopic Techniques.

In brief, RAS/8/097 addressed the arsenic, fluorides and other metals due to geogenic contamination specifically for groundwater. The project RAS/8/104 and RAS/8/108 addressed the ground water quality trend including the extent of ground water quality. Of course, the sources of ground water recharge are the essential part of an isotope hydrology project. But issues related to the cause/sources and fate of ground water contamination and process of contamination were not addressed. In RAS/7/022 and RAS/7/030, groundwater recharge was focused but surface water was not taken into account. It is all known that pollution in groundwater and surface water is largely different. Therefore, water quality assessment using nuclear and isotope techniques for surface and ground waters should be approached differently. RAS/7/031, on the other hand, addressed the problem of coastal ecosystems impacted by climate changes. Isotopic techniques were extensively used but the impact from terrestrial waters was not clearly focused. RAS/7/035 is seen as an extension of RAS/7/030 to address the cause/sources and fate of ground water contamination

and process of contamination. In general, the precedent RAS projects either focus on groundwater or coastal water. Their design is for development and exchange of technology and knowledge between GPs and took lightly the water problems shared among the GPs.

Different from these RASs, this proposal will start by targeting surface water and acquiring the results of precedent RASs (on groundwater and coastal water) in order to provide a comprehensive surface-ground water exchange picture. There are (1) modeling works for projection of different climate scenario impacting water (ground, surface, fresh, saline) in Asian Pacific large river systems and (2) designing a protocol for water quality and water quantity monitoring including the use of isotope techniques for deltas and coastal areas that could be widely applied to the RCA member states. Capacity building will be focused differently from precedent RASs. Emphatically, our project activities will be aligned with the regional Government's efforts at attaining the UN SDGs.

What are the major additional capabilities/skills in this area of technology that will be provided through this project (~ 200 words).

The major additional capabilities which will be provided through this project are new analytical techniques (e.g. dual stable isotopes for NO_x conducted in laser isotope analyzers that can be widely and easily applicable in less developed GPs), competence in monitoring network design, and modeling skill and computational packs which were not strongly emphasized in previous projects.

The proposed project will address (1) the contamination of water coastal areas, cause and fate of the contaminants and the conversion-transport processes of contaminants and (2) source of water (ground and surface), surface and ground water inter relationship, fraction of young water, and residence time distribution. Climate changes that affect precipitation pattern, cause sea level rise/salinity intrution, and snow melting leading to change in dynamics of surface and ground water flows will also be addressed.

Monitoring nework design: One critical point we realised so far at national/inter-boundary level is to set up a monitoring network that is able catch the spatial and seasonal variation of water quality and water regime, identify the essential factors controlling such variabilty, and be performed/run at a minimum financial and technical cost affordable to most GPs. Thus, one part of this proposal will be devoted to train and provide information to researchers and governmental officers about designing and setting up the water quality and resource monitoring networks. Isotopic sampling and sample preservation will be a part of the network design.

Analytical techniques: The stable isotopes of ^{2}H and ^{18}O will enable to identify the recharge areas of groundwater system and inter-relationship between surface and ground water as well as hydrological pathways (e.g. fraction of young water, proportion of different water sources (snowmelt, direct runoff, groundwater input)). Environmental isotopes of ^{15}N, ^{13}C, and ^{34}S along with hydrogeochemical parameters, trace elements, major cations & anions may characterize the contaminants present in water with respect to source and process of contamination.

Hydrological and climate modelings: Thanks to their traceability uniqueness, numerous numerical packs have been developed/modified to integrate isotopes into simulation, calibration, and validation. Thus, simulation skills, especially for hydrology and climate projection, will be added in this project.

Requirements for participation:
Indicate the minimum requirements that the counterpart institutions in Government Parties would need to meet in order to participate in this project.

1. Well established Isotope analytical facilities for the analysis of light element stable isotopes (^{2}H, ^{18}O, ^{2}H, ^{15}N, ^{34}S).
2. Existing monitoring plan/networks for surface and groundwaters
3. Chemical analysis facilities.
4. Knowledge and computational facilities in hydrological and climate modeling
5. Trained Manpower
6. Transport for field work

Advanced-Level Parties should have knowledge about the application of isotopic techniques on water resource and quality research and basic to moderate level capacity to implement (access to isotope facilities or networks) nuclear techniques in water. Newcomer GPs and PSIDs should have basic fieldwork and sampling capabilities and technical support for some of the capabilities of the Resource Parties (RPs) above, and knowledge of field sites. Basic level RPs should have fieldwork and sampling capabilities and knowledge of field sites. Some GPs which do not have the facilities can use facilities of RRU in the region and the IAEA isotope hydrology and environmental laboratories.

Stakeholder analysis and partnerships:
Briefly describe who are expected to be the principal beneficiaries of this project and any role that will be defined for them in the project.

Stakeholders within the RCA Network to improve related scientific skills (e.g. analytical and modelling skills) of local scientists and researchers (staffs and students at different levels) and to equip monitoring agencies with skills in collecting, analysing and communicating complex environmental processes in accessible ways.
External stakeholders with which the RCA Network will work:

- National/ministerial level and province-level environmental and natural resource administrations;
- Departments of Science and Technology: to equip local staff's ability to collect, analyse and communicate the water-environmental issues;
- Other government ministries and institutes including: Environment Administration, National Water Resources Planning And Investigation, Meteo-Hydrology Administration, etc..
- Hydropower and water abstraction companies;
- The dwellers who require accessible information about potential scenarios resulting from future climate change;
- Farmers who daily use water for agricultural and aqua-cultural production;
- Next-generation and early career scientists.

It should be noted that all external stakeholders are involved in facilitating fieldworks and sampling and counselling/consulted for designing monitoring networks. In return, they are primary beneficiaries of our project outcomes.

Have any extrabudgetary funding possibilities, sponsors and partners been identified?

Yes, Extrabudgetary funding possibilities may come from regular funding of the VINATOM-IAEA collaborating center for water and environment. In addition, water resource research is highly appreciated by

the advanced-level GPs such as Korea and Japan. Some financial contributions are expected to be made from these GPs.

In water and environmental isotope projects, water samples are required for different analyses, from surface bodies, ground water system and precipitation. There will be in-kind contribution by the end users/partners. They will facilitate access to the monitoring and sampling sites, field experiments, and provision of hydrogeological literature/data.

The end users may be requested at some suitable time for some funding.

Have they been involved at this concept stage?

Yes, partly!!!

They are already aware of the isotope hydrological activities to solve different water related problems in the GPs. Ultimately they are the end users of the results obtained from the project.

For instance in Viet Nam, we have held scoping meetings with a range of vice directors of Province-level Department of Natural Resources and Environment (DoNRE), which has helped us to identify water quality monitoring gaps and additional needs in the face of climate change, saline intrusion loss of coastal buffering. This includes analysis of fragmented data that currently exists for the Mekong Delta and Red River Delta. In addition, we have held scoping meetings with MoNRE divisions, including the National Water Resources Planning And Investigation (NAWPAI), Vietnam Environment Administration (VEA) and Vietnam Meteo-Hydrology Administration (VMHA).

We have triangular TC meetings with Lao and Cambodia partners and the consultation from Lao and Cambodia partners also help to shape up our plan.

Role of nuclear technology:

Indicate the essential nuclear technique that would be used and outline why it is suitable for addressing the problems/needs in question.

Because of their unique 'fingerprinting' of sources that are often preserved within the water bodies, water stable isotopes are exccelent tracers for water source identification and quantification. The determination of sources of ground water, recharge mechanism, identification of recharge areas, recharge rates, mixing of surface water and ground water, residence time distribution and sources of contamination are the problems those can only be addressed using nuclear techniques. Radioactive isotopes of ^{3}H, ^{14}C, ^{3}He, nobal gas of SF_6 and CFCs provide information about age/ residence time distribution, different flow paths and recharge rate of ground water.

Isotopic technique is also highly effective for tracing the sources of pollutants in water. The isotopes of ^{18}O, ^{15}N, ^{13}C, and ^{34}S in dissolved contaminants give information of sources of pollutants and combining with the above mentioned isotopes give information about transport and coversion of contaminants.

Is this the only available technique?

Yes, nuclear technique is the only available technique, however integration of nuclear techniques with conventional methods (chemical and hydrogeological techniques) gives excellent results. For instance, water chemistry (e.g. trace elements, major cations & anions, persistent organic contaminants, …) helps to assess source and process of contaminants in water column. Classical hydrology (e.g. hydraulic conductivity, transmissivity, storage coefficient) provides information about variations in water table and storage capacity of aquifer.

Does it have a comparative advantage over non-nuclear techniques?

The domains of investigation of nuclear and non-nuclear techniques are quite different. The information obtained by nuclear techniques can mostly not be obtained by non-nuclear technique. Isotopic techniques always have advantages over non-nuclear techniques. For instance, in groundwater assessment, there is no comparison as the information about the sources of ground water and contamination cannot be obtained by non-nuclear technique. The source of ground water, recharge mechanism, age/residence time distribution, sources of contamination, surface and ground water interaction are the parameters which can only be addressed by nuclear techniques. Another example is the nitrate dual stable isotope technique that helps identify simultaneously the source of nitrogen pollutants and the biogeochemical processes dominating in the aquatic media.

Environmental stable isotope tracers provide unique 'fingerprinting' of sources that are often preserved within the surface and subsurface waters, For instance, stable nitrogen isotopes can be used for tracking of pollutants derived from urban effluent or other anthropogenic sources that may affect the water quality and aquatic ecosystems. The nitrate dual stable isotope technique is unique in identifying simultaneously the source of nitrogen pollutants and the dominating biogeochemical processes. In surface water, stable isotopes can also be used to determine sediment provenance. Measurements of isotope ratios of carbon, nitrogen and sulphur water are compared to potential sources, both allochthonous and autochthonous, with mixing models used to determine dominant contributing sources. Isotopic technique is the only technique and it is most effective for addressing the issues related to contamination of groundwater resources and the radioactive natural isotopes provide a time scale of subsurface flow. In fact, combining results from both nuclear and non-nuclear techniques is expected to provide excellent interpretation.

Duration of the project:

Indicate the number of years required to complete the project.

Four years.

The isotope hydrological projects are basin wide scale with a specific problems, are selected by the countries. Monitoring network design/planning takes years to be set up and evaluated. Precipitation samples, water samples from surface water bodies and ground water samples are collected periodically for different analyses and should be annual time frame to reflect seasonal variability and to fit it calibration and validation modelling work. Isotope hydrological projects require longer duration even more than 4 years in some cases.

Part 3: National Representative Endorsement for Project Concept

The attached project concept proposal for the RCA Programme 2022/2023 has been prepared using the specified template.

It has been reviewed to ensure that it addresses the following important aspects related to RCA project design priorities:

- ☑ **Are its aims and objectives in line with priorities set out the RCA Medium Term Strategy for 2018/2023?**
- ☑ **Is there a strong TCDC component to exploit existing regional knowledge and capabilities?**
- ☑ **Does the proposal identify which elements of the MTS are being complied with?**
- ☑ **Does the proposal identify why it should be a regional project?**
- ☑ **Does the proposal identify links any to previous regional projects in this area of technology?**
- ☐ **Does the proposal overlap or duplicate current or previous RCA projects?**
- ☐ **If "Yes", has a convincing case made to justify further projects in this area?**

  The proposal does not overlap previous RCA projects. But it is an important extension of the projects RAS 7/031 and RAS/7/035. In fact, it puts more efforts on targeting surface waters of large river systems (e.g. Mekong, GBM) and interaction between surface and groundwater in coastal areas where climate change impacts are substantive. This proposal is therefore considered as supplement to precedent and on-going RAS projects.

- ☑ **If the proposal is essentially an extension of previous projects in this area that have been implemented for more than 2 TC Cycles, does the proposal include arrangements for the transfer of project leadership to others?**
- ☑ **Is the essential role of the nuclear technology in the project identified?**
- ☑ **Is there a readily available baseline against which to measure the effectiveness of the project?**

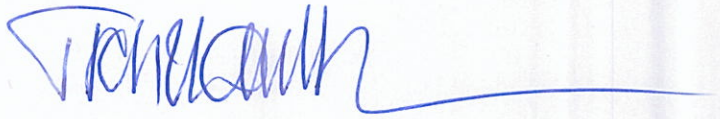
There is no support requested for Fellowships/Scientific Visits or major procurement of materials and equipment.

☑**The concept is not for a research project.**

☑**The concept is not for a national project.**

I have endorsed the proposer to have access to the RCARO web page for the resource documentation necessary to complete the attached concept document.

The concept meets the RCA project requirements and I endorse it as a priority for the RCA Programme 2022/2023.



Signed: TRAN CHI THANH

Date: 14th January 2020