

Project Concept Template

Project Proposals for the RCA Programme 2024/2025

Part 1: Information Sheet

Project proposals for the RCA Programme 2024/2025 are to be prepared using the attached template and submitted **BEFORE 31ST OF DECEMBER 2021**. Completed templates will be reviewed by the RCA PAC in January 2022.

Resource documents required for developing Project Concepts can be found in the RCA web-site – **(RCA Regional Office (rcaro.org))**, under Projects/Resource Documents. (see below for the list of resource documents).

The Project Concept should be prepared in consultation with the stakeholders of the other participating GPs. Information on RCA stakeholders can be found in the RCA web-site **(RCA Regional Office (rcaro.org))**, under Projects/Project Information.

Please request access to the RCA Members Only web-site from RCARO (email: rcaro@rcaro.org) through your National RCA Representative if you do not already have access.

A proposal will be evaluated against the following criteria:

- Alignment of the objectives with priorities set out the RCA Regional Programme Framework (RPF) for 2024/25.
- Whether the project addresses a regional need.
- Whether nuclear technology is an essential component of the project.
- Whether outcomes and achievements of previous projects in this area of technology are considered.
- 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 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 another GP?

List of Resource Documents on RCA web-site (www.rcaro.org)

1. Timeframe for preparation, review and approval of Project Concepts
2. Brochure on Logical Framework Matrix (Quick Reference Guide on Designing IAEA TC Projects)
3. RCA Regional Programme Framework for 2024-29
4. Details of RCA TC Projects implemented in 2007-2019
5. List of TC Projects being implemented in 2020/21 and projects approved for 2022/24
6. Recommendations on Technical Cooperation among Developing Countries (TCDC)

Please note that your National Representative will be reviewing the concept document to ensure that it has been prepared in compliance with the RCA and IAEA Criteria for TC Projects

Please contact the Chair of the RCA Programme Advisory Committee, Dr. Prinath Dias at prinathd@yahoo.com if you need assistance.

Part 2: Concept Template¹

Title:

Enhancing the Capability of Medical Physicists in Performing Advanced Radiotherapy Dosimetry Audit via Establishment of Inter-Regional Dosimetry Audit Network (RCA)

Analysis of gaps / problems / needs as applied to the RCA region:

Outline the major gaps / problems / specific needs to be addressed by the project (~ max 300 words):

The external dosimetry audit plays an important role in the development and safety of radiotherapy. The programmes to date have demonstrated that they are a good indicator of errors and consistency between radiotherapy centres, as well as having the potential to identify issues that may cause harm to patients. Through this regional cooperation platform, the main quality assurance and auditing bodies in radiotherapy will be discussed, including how these networks can work together to streamline the audit programme. This will achieve through (1) the establishment of the first RCA radiotherapy dosimetry audit network; and (2) strengthening infrastructure and radiotherapy laboratory capabilities in improving standards and accuracy in advanced clinical practice and trials. This network is also expected to support the implementation of complex techniques in radiotherapy, facilitate awareness and understanding of any issues which may exist by benchmarking centres with similar equipment. The structured training modules include the various approaches to dosimetry audit: peer-to-peer or central review, postal or in-site visits, and commercial equipment or in-house tools for medical physicists (MPs) will also be developed. This can be done by utilising the IAEA dosimetry audit programme or other international dosimetry audit bodies. The limited number of trained MPs and premature national practice guideline for radiotherapy audit in the RCA region will impede the credentialing programme will take place in the future. Through the project, the national audit networks will closely cooperate at the consecutive stages of developing the dosimetry audit methodology locally and by carrying out cross-measurements. This interlinking of national audit systems helps ensure that international and national radiotherapy dosimetry audit networks are working to consistent levels.

Review the resource documentation and list any past RCA projects that have addressed similar problems/needs in this area of technology. Consider outcomes and achievements of previous projects, and avoid any overlap or duplication.

There is no project related to radiotherapy dosimetry audit reported in the http://www.rcaro.org/project-search/project_index.

There are a few projects under IAEA Technical Cooperation Projects – Radiation and quality assurance that are relevant to this proposed project such as:

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.

- 1) VEN6019 Evaluating and Implementing a Postal Dosimetry Audit System in Radiotherapy Beams - Phase I for TC region of Latin America and the Caribbean;
- 2) RER6036 Improving Radiotherapy Practices for Advanced Radiotherapy Technologies Including Quality Assurance and Quality Control for TC region of Europe;
- 3) SAF6021 Establishing a National Audit Programme for Small Field and Non-Reference Fields in Radiotherapy for TC region of Africa; and
- 4) LIT6006 Improving the National Framework of Radiation Protection of Patients in Radiotherapy and Nuclear Medicine through Standardization of Quality Assurance and Quality Control Procedures and their Implementation in Hospitals for TC region of Europe.

All projects are in active status and has been started since 1 January 2018. We found that there is no duplication between these IAEA TC projects and the proposed project in terms of project's objective and the participating countries i.e none of these projects cater for Asia Pacific region.

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

It is expected that after the successful implementation of the project, the level of regional capabilities in MPs will be enhanced. This can be measured through:

- 1) *Pool of competent MPs in performing Step 1: postal dose audits for photon beams in reference conditions, as recommended by TRS-398*
- 2) *Pool of competent MPs in performing Step 2: postal dose audits for photon beams (step 2a) in non-reference conditions, on the beam axis and electron beams (step 2b) in reference and in non-reference conditions, on the beam axis.*
- 3) *Pool of competent MPs in performing Step 3: postal dose audits for photon beams in reference conditions and in non-reference conditions off-axis.*
- 4) *Pool of competent MPs in performing Step 4: postal dose audits for photon beams shaped with multi-leaf collimators (MLC).*
- 5) *Pool of competent MPs in performing Step 5: postal dose audits for photon beams in the presence of heterogeneities.*
- 6) *Pool of competent personnel from the national dosimetry laboratories who capable in strengthening the radiotherapy audit infrastructure to establish the remote dosimetry audits.*
- 7) *Pool of personnel from dosimetry laboratories, clinical radiotherapy medical physicists, personnel from clinical trial quality assurance groups, oncologist, and personnel from international and national dosimetry audit centres who capable in establishing the national radiotherapy dosimetry audit module.*

The IAEA guidelines such as TRS 398 Absorbed Dose Determination in External Beam Radiotherapy, Safety Reports Series No. 38 Applying Radiation Safety Standards in Radiotherapy and IAEA Human Health Series No. 31 Accuracy Requirements and Uncertainties in Radiotherapy will be the main resources for the trainings.

Overall Objective: (Required for the preparation of the IAEA Regional Programme Note)

State the overall long-term objective to which the project will contribute. This should reflect an impact related to the RCA Regional Programme Framework for 2024/29.

This project aims to establish an inter-regional dosimetry audit network in RCA countries to collaborate in enhancing the capability of Medical Physicists (MPs) to perform basics and advanced remote dosimetry audits in radiotherapy.

Problem and objective analysis using objective and problem trees is recommended. (See pages 9 and 10 of the Quick Reference Guide on Designing IAEA TC Projects in resource documents)

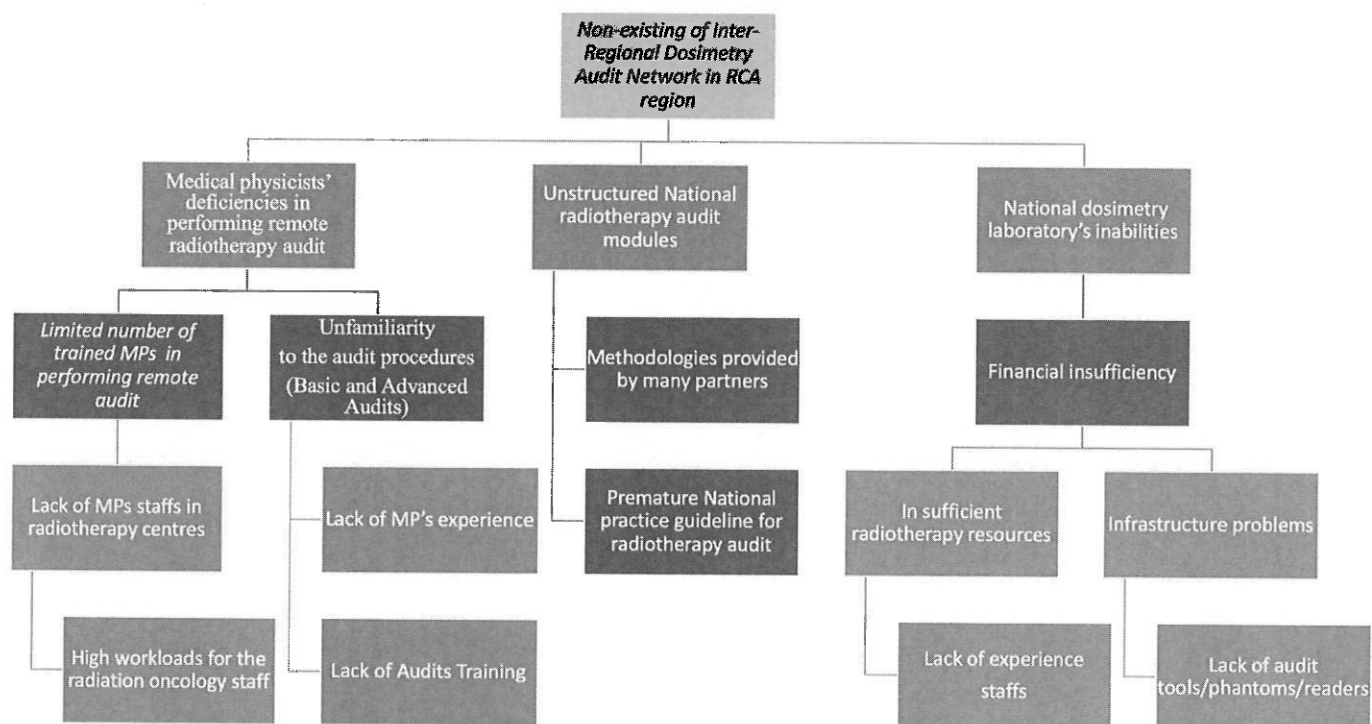


Figure 1: Problem tree.

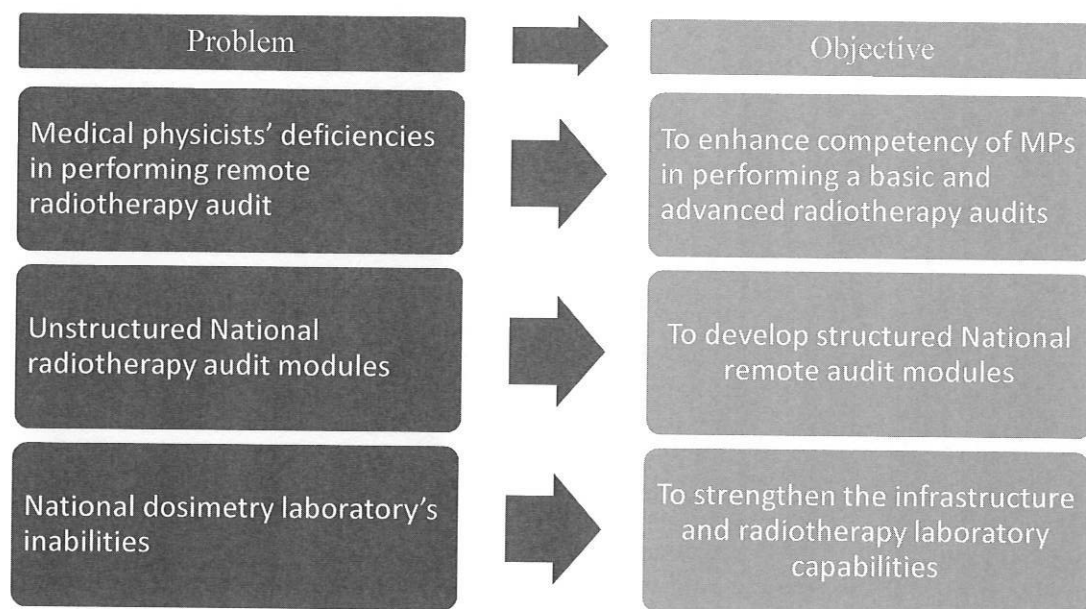


Figure 2: Problem tree to objective tree

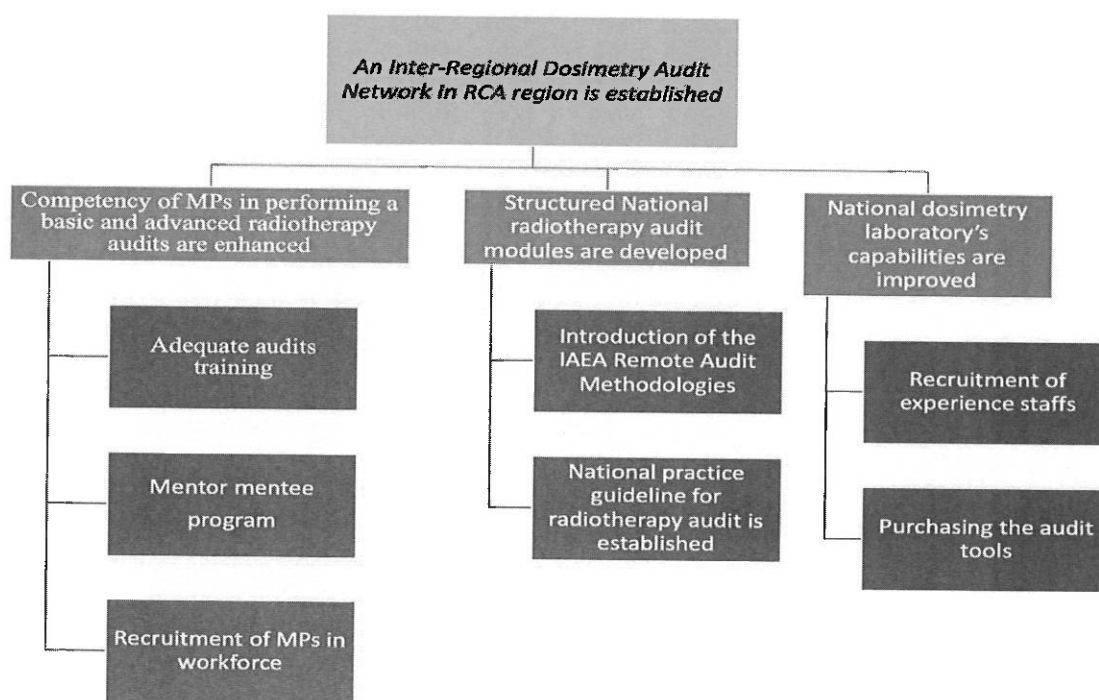


Figure 3: Objective tree

Project Outcome: (Required for the preparation of the IAEA Regional Programme Note)

The outcome is the planned result of a project, achieved through the collective effort of stakeholders and partners. It represents the change or improvement that occurs as a result of the project. Should be worded in past tense. (eg. The capability fordeveloped)

- 1) *The capability of the clinical radiotherapy medical physicists among participating countries in performing remote radiotherapy audit procedures from basic audits (e.g Step 1, 2 and 3 postal dose audits) to advanced audit (e.g Step 4 and 5 postal dose audits) are improved.*
- 2) *The capability of participating countries for strengthening radiotherapy audit infrastructure to establish the remote dosimetry audits. This task involved the dosimetry laboratories, clinical radiotherapy medical physicists, clinical trial quality assurance groups, and international and national dosimetry audit centres.*
- 3) *The capability of participating countries for establishing the national radiotherapy dosimetry audit modules including the uncertainties budget analysis for absorbed dose measurement are developed. This task involved personnel from dosimetry laboratories, clinical radiotherapy medical physicists, personnel from clinical trial quality assurance groups, oncologist, and personnel from international and national dosimetry audit centres.*

Having trained personnels in the radiotherapy dosimetry audit program through the participation in the planned activities and great cooperation between all stakeholders will ensure sustainability of benefits from this project will continues. The pool of trained personnels created directly by this project will work as the focal resources. They in turn, will generate new pool of trained personnels through regional and national programmes and activities.

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

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

By pooling resources in RCA countries to make this project successful, it hopes that it will contribute to United Nations' Sustainable Development Goal (UN SDG) No. 3 by ensuring healthy lives and promoting well-being for all at all ages and benefit the radiotherapy community by accessing quality essential health-care services as in SDG target 3.4. Apart from that, this project will support the implementation of the national policy in transforming the capability and capacity of ionizing radiation for the benefits of humankind. The potential socioeconomic benefit by having competent MPs to perform basic and advanced radiotherapy audits. This will be materialised through the creation of pool of trained MPs produced directly by this project. They in turn, will generate new pool of trained MPs through their national programme and activities. As a result, the number of trained MPs will be increased, technology will be readily available in the country and finally will benefits the country to support healthcare system, towards promoting a better quality of life.

Proposed Participating Government Parties:

List the Government Parties expected to participate in the project. Indicate target and resource GPs:

Up to now, three GPs has agreed to participate in this project including Indonesia, Singapore and Vietnam. Indonesia and Vietnam may contribute their technical expertise on basic audits as they have experienced

participating in the IAEA/WHO postal radiotherapy audits program. While, Singapore may contribute their expertise to perform an advanced audit based on their experiences in participation in the IROC & ACDS and EQUAL-ESTRO dosimetry audits in radiotherapy. Other countries such as Bangladesh, Thailand and Philippines were also invited in the project.

Technical Cooperation among Developing Countries (TCDC) Project Component:

Please refer to the resource documents (RPF and Recommendations on TCDC)

Will the project design feature partnering arrangements between those advanced and those less advanced in the technology to be transferred through this project?

If so, list those expected partnerships.

Through the regional cooperation platform, apart from acquiring optimum benefits from the advancement of radiotherapy technology, it will also provide support for the sustainability of MPs in radiotherapy in fulfilling current and future requirements. All expected participating RCA have developed sufficient physical facilities (e.g remote dosimetry audit laboratories) and human resources (e.g researchers and laboratory assistants) because of their involvement in their national projects. National institutes with their facilities will provide the necessary drive in the project implementation through a mixture of TCDC and partnership between the advanced RT audit and those at a lower level of audit. These facilities would provide additional boost in terms of physical for the implementation of the project. R&D organisations, academic institutions, regulatory body, and radiotherapy centres will also provide support and extend their resources through involvement as the national project team members. Malaysia with adequate expertise and facilities will contribute their expertise and utilization of their national training programme for the regional activities. Other participating countries will actively provide assistance in the related supporting resources. It is expected that the successful implementation of the project will provide benefit to all participating countries of Asia and the pacific region.

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.

The counterpart institutions should have at least established facilities in remote dosimetry audits in radiotherapy i.e resources such as TLD dosimetry system. They should also establish committed project team member i.e the dosimetry laboratories, clinical radiotherapy medical physicists, personnel from clinical trial quality assurance groups, oncologist, and personnel from national dosimetry audit centres for the implementation of the activities.

Stakeholder analysis and partnerships:

Briefly describe who are expected to be the end-users and principal beneficiaries of this project. Indicate whether the end-users contributed to development of the Concept.

The end-user and principal beneficiaries of this project are:

1) SSDL

- *Providing a service of the national dosimetry audit and organising the participation of national radiotherapy centres in the international audit programme.*
- *Contributing towards sustainability of human resources, e.g. through coordination of internships and industrial training for medical physicists and scientists who can support the national and regional audit programme.*
- *The end-users contributed to development of the Concept.*

2) *Regulatory body*

- *As the regulatory authority for radiation and nuclear safety in the medical use of ionizing radiation.*
- *Propagating awareness on the radiotherapy audit requirement and advancement.*

3) *Radiotherapy centres*

- *Adapting and utilizing the improved radiotherapy audit technology and practise.*

4) *Academic Institution*

- *Establishing and conducting research activities at BSc, MSc and PhD level in radiotherapy dosimetry audit.*
- *The end-users contributed to development of the Concept.*

Have any extrabudgetary funding possibilities been identified?

Yes, funding from Ministry of Science, Technology, and Innovation (MOSTI) of Malaysia.

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.

The project involves the application of radiation related to radiotherapy from conventional radiotherapy, three-dimensional conformal radiotherapy to advanced radiotherapy using multi-leaf collimator (MLC) and integrated modulated radiotherapy (IMRT) advanced audit. As treatments become more complex, more sophisticated audit programme need to implement include:

- 1) *Step 1: postal dose audits for photon beams in reference conditions, as recommended by IAEA TRS-398. It is necessary for any of the audit systems to successfully implement this step before beginning any subsequent audit steps.*
- 2) *Step 2: postal dose audits for photon beams (step 2a) in non-reference conditions, on the beam axis and electron beams (step 2b) in reference and in non-reference conditions, on the beam axis. This includes checks of dose variation with field size and shape, wedge transmission for photon beams, and checks of electron beam output, as well as dose variation with field size and treatment distance for electron beams.*
- 3) *Step 3: postal dose audits for photon beams in reference conditions and in non-reference conditions off-axis. This includes checks on selected points in beam profiles, with and without wedges, for both symmetric (Part 1) and asymmetric (Part 2) fields in these beams.*
- 4) *Step 4: postal dose audits for photon beams shaped with multi-leaf collimators (MLC). This includes checks on beam axis of dose variation with field size and shape for a range of MLC shaped regular and irregular fields, including wedged fields. It includes audit of the hospital method to calculate these dosimetric parameters, expecting this to be done with the local treatment planning system (TPS).*

5) *Step 5: postal dose audits for photon beams in the presence of heterogeneities. This includes checks in solid phantoms of doses both on and off the beam axis and both inside and beyond heterogeneities, to test TPS and local implementation of approaches for dosimetry modelling and calculation of corrections for the presence of lung and bone in treatment beams.*

Is this the only available technique that could be applied to address the problem/ need?

In this project, the technique of remote dosimetry audits in radiotherapy will be adopted in accordance with the IAEA guidelines (www.dosimetry-audit-networks.iaea.org). Other than IAEA Dosimetry Laboratory, there are another six organisations that also provide international audit services (with different audit approaches/methodologies) including Australian Trans Tasman Radiation Oncology Group (TROG), Brazilian Instituto Nacional De Cancer, France Equal-Estro, USA's Imaging and Radiation Oncology Core (IROC) and USA Radiation Dosimetry Services.

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

There is no comparative over non-nuclear techniques because only nuclear technique could applied in this project.

Duration of the project:

Indicate the number of years required to complete the project.

Two years (2024/25)

Part 3: National Representative Endorsement for Project Concept

As the RCA NR of(RCA GP)....., I have reviewed the Project Concept thoroughly and confirm that it meets the following requirements:

1. The objective of the Project Concept is aligned with priorities set out the RCA Regional Programme Framework (RPF) for 2024/25.
2. The project addresses a regional need.
3. Nuclear technology is an essential component of the project.
4. Outcomes and achievements of previous projects in this area of technology have been taken into consideration
5. There is no overlap or duplication with current or previous RCA projects
6. Further projects in this area can be justified (if relevant)
7. The Project Concept has a strong TCDC component

Signature:



Name:

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Date:

27/12/2021