

**Social and Economic Impact Assessment of the RCA Programme**

**Non-Destructive Testing Case Study**

Report Information

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# Executive Summary

The Regional Cooperative Agreement (RCA) for Research, Development and Training related to Nuclear Science and Technology for Asia and the Pacific will celebrate its 50th Anniversary in 2022. This report assesses the social and economic impacts of non-destructive testing projects under the RCA, focusing on value added over and above the primary research that has been undertaken by individual countries independently.

Non-destructive testing involves... [xxxxx]

This impact assessment was designed and undertaken by a team of external experts, in consultation with IAEA and RCA stakeholders.[[1]](#footnote-1) It involved gathering evidence through an online questionnaire completed by nn of the NN participating Government Parties (GPs), analysis of IAEA administrative data, gathering information from non-destructive testing experts at the IAEA and GPs, narrative success cases of non-destructive testing projects from four GPs, and economic analysis of costs and benefits of non-destructive testing projects under the RCA.

The impact assessment found that the RCA has supported a significant body of non-destructive testing projects, including [scale and scope]. Key impacts of this research include improved non-destructive testing capacity and capability, increased scope and scale of non-destructive testing demand and use, improved health and safety, and economic value. These impacts include:

* Things
* And
* Stuff.

These impacts may not be solely attributable to the RCA, but the RCA contributed significantly to [what aspects of]. In some cases, the RCA enabled [what aspects] that would not otherwise have happened. The RCA supported [things and stuff]. Feedback from many countries highlighted the importance of the RCA for building their non-destructive testing skills and capacity.

Cost-benefit analysis estimated that the RCA created [more economic value than it consumed], with each 1 EUR of costs incurred between 2000 and 2020 associated with XXX EUR of economic benefits. Sensitivity analysis found that the net benefits attributable to the RCA remained positive under alternative assumptions about benefits and costs, with a likely range of benefits between XXX EUR and XXX EUR per 1 EUR of costs. This suggests it is [very likely/likely/possible/unlikely] that the economic benefits of the RCA exceeded its costs.[[2]](#footnote-2)

Pre-defined performance criteria were agreed with IAEA and GP experts to provide an evaluative framework for the impact assessment (Table 16, Annex G). On the basis of evidence provided by the IAEA and GPs, the RCA’s impacts meet standards for [excellent/good/adequate/poor] performance on improved non-destructive testing capacity and capability, [excellent/good/adequate/poor] performance on increased scope and scale of non-destructive testing demand and use, [excellent/good/adequate/poor] performance on improved health and safety, and [excellent/good/adequate/poor] performance on economic value.

# Introduction

The International Atomic Energy Agency (IAEA) is the world’s central intergovernmental forum for scientific and technical co-operation in the nuclear field. Established in 1957, and headquartered in Vienna, Austria, the IAEA works for the safe, secure and peaceful uses of nuclear science and technology, contributing to international peace and security and the United Nations (UN) Sustainable Development Goals. The IAEA works in close partnership with Member States, UN agencies, research organisations and civil society to maximise the contribution of nuclear science and technology to the achievement of development priorities (“Atoms for Peace”).

The Regional Cooperative Agreement (RCA) for Research, Development and Training Related to Nuclear Science and Technology for Asia and the Pacific was established in 1972 and has enjoyed the benefit of the IAEA Technical Cooperation (TC) programme since. With the RCA due to celebrate its 50th Anniversary in 2022, it is timely to assess the social and economic impacts of the RCA programme supported under the IAEA TC programme.

The RCA has 22 participating Government Parties (GPs): Australia, Bangladesh, Cambodia, China, Fiji, India, Indonesia, Japan, Laos, Malaysia, Mongolia, Myanmar, Nepal, New Zealand, Pakistan, Palau, Philippines, Singapore, South Korea, Sri Lanka, Thailand, and Viet Nam.

At the 48th RCA General Conference Meeting in Vienna, Austria, 13 September 2019, the RCA endorsed the initiative to conduct social and economic impact assessment. To this end, the TC Division for Asia-Pacific (TCAP) and TC Division of Programme Support and Coordination (TCPC) jointly proposed to undertake case studies. A methodology was developed and was piloted to assess social and economic impacts of RCA projects. This report presents the findings from the social and economic impact assessment of non-destructive testing collaborations under the RCA.

## **Non-destructive testing**

[2-3 paragraphs on what it is]

## Social and economic impact assessment methods

The social and economic impact assessment methodology was developed specifically for the IAEA, in order to conduct impact assessments for case studies of TC projects under the RCA. The methodology follows the *Value for Investment* approach (King, 2017; King, 2019; King & OPM, 2018) and the Kinnect Group approach to evaluation rubrics (King et al., 2013; McKegg et al., 2018) – combining evidence from quantitative, qualitative and economic analysis, through the lens of an agreed performance framework, to evaluate the impact of non-destructive testing projects under the RCA.

Social and economic impacts of the non-destructive testing projects are diverse and include contributing to:

* Things
* From
* Theory of change.

Some of these impacts can be evaluated using cost-benefit analysis. For example, [xxxx, yyyy and zzzz] have a monetary value that is relatively simple to estimate. However, economic benefits are difficult to measure when [zzzzzzz]. Moreover, some impacts, such as [zzzzzzz], can be difficult to translate into monetary values. More complex still, impacts such as [zzzzzzz]may be best understood by examining a range of evidence including ‘hard’ and ‘soft’ measures.

Accordingly, the non-destructive testing case study uses a mix of methods, including:

* An online questionnaire deployed to all countries in the RCA and completed by nn of the NN GPs
* Analysis of administrative data on non-destructive testing activity and costs, provided by IAEA
* Gathering additional information from non-destructive testing experts at the IAEA and GPs
* Narrative case examples, written from details provided by four countries on a selection of ‘success cases’ of non-destructive testing
* Economic analysis of costs and benefits of non-destructive testing projects under the RCA.

To combine the quantitative, qualitative and economic analysis, evaluation rubrics were developed. Rubrics, comprising a matrix of agreed criteria (aspects of performance) and standards (levels of performance) provided a transparent and robust framework for rating the social and economic impact of the non-destructive testing projects under the RCA from the mix of evidence. Refer to Annex G for full details of the methodology.

# Social and economic impacts

[This is the section where **Julian** will summarise key findings, synthesising across the survey, case studies and economic analysis, using the rubrics to guide the reporting structure]

## Improved non-destructive testing capacity and capability

Xxxx

* xxx

Example from case study.

## Increased scope and scale of non-destructive testing demand and use

Xxxx

* xxx

Example from case study.

## Improved health and safety

Xxxx

* xxx

Example from case study.

## Economic impacts

A social cost-benefit analysis was conducted to estimate economic impacts generated by the RCA. The analysis estimated the incremental (additional) costs and benefits that are attributable to RCA collaboration in non-destructive testing – i.e. it did not estimate the benefits and costs of non-destructive testing activities as a whole but rather the benefits and costs associated with collaboration under the RCA, compared to a hypothetical situation with no RCA.

The analysis used data from the survey, together with administrative and cost data provided by the IAEA. It estimated the costs and benefits that occurred between 2000 to 2020. Costs and benefits were analysed as annual time series and adjusted for timing, using discounting to convert values occurring at different points in time into present values.

**Benefits** represent [xxxx] and included:

* Things
* And
* Stuff.

**Costs** represent the opportunity costs arising from committing resources of the IAEA and GPs to RCA-related activities. They include costs of [xxxxx].

**Results** of the analysis indicate that the RCA delivered [excellent/good/adequate/poor] economic outcomes, with estimated benefits [exceeding] estimated costs. In the baseline scenario, the RCA generated **EUR xxx of net economic benefits** (valued in 2020 EUR, including xxx costs and xxx benefits). As is often the case in cost-benefit analysis, some important parameters required modelling assumptions to be developed, in consultation with non-destructive testing experts. To understand the implications of uncertainty in these modelling assumptions, sensitivity analysis was conducted that involved testing how the estimates of benefits and costs varied under alternative assumptions. Sensitivity analysis revealed that under a range of alternative assumptions, **net benefits could be between EUR xxx and EUR xxx**. In our view, it is likely that the net benefits of the RCA remain positive under [almost all or whatever] plausible assumptions about benefits and costs.

This implies that, historically, **each 1 EUR of costs was associated with xxxx EUR of economic benefits on average with a range from 5 xxx EUR under the most pessimistic scenario that we considered to xxx EUR under the most optimistic scenario that we considered**.

Our estimates of costs and benefits are largely retrospective and are based on actual outcomes under the RCA between 2000 and 2020. These results should not be used to make decisions about the future of the RCA, or to decide whether the scale of the RCA should be increased or decreased. Full details of the cost-benefit analysis are provided in Annex F.

## Conclusion

The RCA has supported a significant body of non-destructive testing projects, contributing to [xxx] including [xxx] that would not otherwise have occurred. This research has brought positive impacts including [xxxxx].

Cost-benefit analysis estimated that the RCA created [more] economic value than it consumed between 2000 and 2020, with each 1 EUR of costs incurred between 2000 and 2019 associated with [xxx] EUR of economic benefits on average.

Pre-defined performance criteria were agreed with IAEA and GP experts to provide an evaluative framework for the impact assessment (Table 16, Annex G). Evidence of RCA impacts provided by the IAEA and GPs suggests that the RCA meets standards of:

* **[Excellent/good/adequate/poor]** performance for **improved non-destructive testing capacity and capability**, with [xxxxx]
* **[Excellent/good/adequate/poor]** performance for **increased scope and scale of non-destructive testing demand and use**, with [xxxxx]
* **[Excellent/good/adequate/poor]** performance for **improved health and safety** with [xxxxx]
* **[Excellent/good/adequate/poor]** performance for **economic value**, with cost-benefit analysis suggesting with a [high level of certainty] that the net benefits of the RCA were positive under [almost all] plausible assumptions about benefits and costs.

Overall, when assessed against the agreed performance framework, the RCA’s contribution to non-destructive testing projects demonstrates an **[excellent/good/adequate/poor]** level of social and economic impact.

# Annex A: [project and country] – case example

### Marti

Marti

# Annex B: [project and country] – case example

### Marti

Marti

# Annex C: [project and country] – case example

### Marti

Marti

# Annex D: [project and country] – case example

### Marti

Marti

# Annex E: Survey Analysis

## Andres

Andres

# Annex F: Economic Analysis

## Aaron

Aaron

# Annex G: Methodology

The social and economic impact assessment methodology was developed specifically for IAEA, for case studies of Technical Cooperation (TC) projects under the Regional Cooperative Agreement (RCA) for Research, Development and Training Related to Nuclear Science and Technology for Asia and the Pacific. The methodology follows the *Value for Investment* approach developed by Dr Julian King (King, 2017; King, 2019; King & OPM, 2018) and the Kinnect Group approach to evaluation rubrics (King et al., 2013; McKegg et al., 2018).

### Evaluating impact in complex environments

From the outset it was acknowledged that these case studies would be challenging to conduct. The RCA is a complex environment for evaluation. There are diverse countries and stakeholder groups, long-term investments of decades, with contexts that are continuing to evolve, and multiple outcomes sought across a range of thematic areas. Impact evidence has not been routinely collected; TC outcome monitoring systems have generally focused on immediate outcomes and have not included longer-term social and economic impacts.

A methodology was needed that could:

* Evaluate impacts retrospectively, looking back many years
* Evaluate long-term effects, because there is often a long lag between project completion and the realisation of social and economic impacts
* Capture unexpected outcomes, instead of just looking for the expected outcomes, because these can be as impactful as the project’s originally stated target outcomes
* Measure the intangible value of the RCA’s contributions, such as networking, in addition to outcomes that are more amenable to numeric and/or monetary metrics
* Deal with the complexity of attribution (or at least contribution), recognising that one outcome can arise from many contributions (of which the RCA project may be only one) and conversely one project may contribute to many different outcomes or impacts.

### Developing the methodology

A meeting was held in Vienna, Austria from 1-4 July 2019 to establish a methodology and work plan for performing the case studies. The meeting had eight participants including representatives from TCAP, TCPC, and invited experts from China and New Zealand. Invited experts Dr Julian King and Kate McKegg summarised and compared approaches and tools for social and economic impact assessment. A methodology was proposed – *Value for Investment* – that combines strengths from the disciplines of economics and evaluation.

Evaluation is the systematic determination of the merit, worth or significance of something. Evaluation of social and economic impacts requires not only *evidence* of those impacts, but also *valuing* – interpreting the evidence through the lens of what matters to people (King, 2019). Economics and evaluation bring different approaches to valuing. For example, cost-benefit analysis uses money as the metric for understanding value (Drummond et al., 2005), while other approaches include numerical or qualitative synthesis (Davidson, 2005), or citizen deliberation (Schwandt, 2015).

The Value for Investment approach combines approaches to valuing from evaluation and economics. It accommodates multiple values (e.g., social, cultural, environmental and economic) and multiple sources of evidence (qualitative and quantitative) to enable robust and transparent ratings of the RCA’s impacts. The approach involves eight steps:

1. Understand the programme or project, including its context, stakeholders and theory of change.
2. Develop performance criteria – the aspects of social and economic impacts that will be the focus of the evaluation – e.g., increased food production, reduced use of agricultural inputs, etc.
3. Develop performance standards for each criterion – narratives that describe levels of performance such as ‘excellent’, ‘good’, ‘adequate’ and ‘inadequate’.
4. From the criteria and standards, select and identify the evidence needed and the methods that should be used to gather the evidence – e.g., surveys, case examples, administrative data, etc.
5. Gather evidence. Note that the evidence needed and means of gathering it need to be tailored to the circumstances of the project.
6. Analyse the evidence. At this stage, each evidence source is analysed separately, using methods suited to each source – e.g., quantitative analysis of survey data, qualitative analysis of case examples, economic analysis of costs and benefits.
7. Synthesise the evidence. At this stage, the streams of analysis are brought together to make evaluative judgements – ratings of performance according to the agreed criteria and standards.
8. Reporting, based on the criteria agreed in advance.

Following this sequence of steps helps ensure the evaluation is aligned with the RCA context, gathers and analyses the right evidence, interprets the evidence on an agreed basis, and provides clear conclusions about the RCA’s social and economic impact. Involving stakeholders in the design of the evaluation and the interpretation of findings supports understanding, ownership, validity and use (King, 2019).

The methodology was piloted in a case study of mutation breeding projects under the RCA (King, McKegg, Arau, Schiff, & Garcia Aisa, 2020) before being deployed in subsequent case studies.

### Applying the methodology

#### Theory of change

A theory of change is a depiction of the programme to be evaluated, including the needs it is intended to meet and how it is intended to function (King, 2019). A theory of change “explains how activities are understood to produce a series of results that contribute to achieving the final intended impacts” (Rogers, 2014, p. 1).

The theory of change for the non-destructive testing programme (Figure xxx) was developed iteratively by IAEA, selected experts from participating GPs, and the impact assessment team. Developing a theory of change in a participatory manner helps lead to a clear and shared understanding of the programme (Funnell & Rogers, 2011).

A theory of change may be used as a tool when assessing causality or contribution (Funnell & Rogers, 2011). In the case of non-destructive testing under the RCA, the focus was on the value added through regional collaboration. In the absence of a measurable counterfactual (e.g. a control group), the evaluation design theorised that regional collaboration would add value by [strengthening regional capacity, by supporting some research that would not otherwise have been undertaken, and by enabling some research to be successfully completed more quickly than would have been possible without the RCA]. These theories were tested by eliciting feedback from the participating countries.

A theory of change can also be used to help identify a complete and coherent set of evaluation criteria (Davidson, 2005). For the non-destructive testing case study, it was agreed that the focus of the evaluation would be on four impact areas:

* Improved non-destructive testing capacity and capability
* Increased scope and scale of non-destructive testing demand and use
* Improved health and safety
* Economic impacts.

Figure 25: Theory of change for RCA non-destructive testing projects



#### Criteria and standards

Evaluation criteria and standards for the four impact areas were collaboratively developed. Tables xxx-xxx set out the *rubric* (matrix of criteria and standards) used in this impact assessment. The columns of the rubric correspond to impact areas from the theory of change, while the rows describe levels of performance.

Table 15: Rubric for criterion 1: improved NDT capacity and capability

|  |  |
| --- | --- |
| **Standard (to be applied to each GP)** | **Criterion 1: Improved NDT capacity and capability** |
| **Excellent** (exceeding expectations)  GPs with excellent status meet the standard for Good, plus: | GPs have fulfilled the MRA requirements of ICNDT as a result of the support under the RCA programme of IAEA.  . NDT Society is registered with APFNDT and ICNDT  . The society is a signatory to ICNDT MRA  . NCB for NDT accredited to ISO 17024  . NCB accepted for registration under the ICNDT MRA  . Accredited training centres offering ISO 9712 training.  The support in establishing GPs’ NDT infrastructure through the RCA programme has enabled GPs to produce *certified personnel in advanced techniques (RT-D, PAUT, TOFD, PEC, etc)*, in addition to the conventional methods (RT, UT, MT, PT, ET).  GPs have achieved increased self-reliance in NDT, including offering training and inspection activities to local industries as well as abroad. |
| **Good** (meeting expectations)  GPs with good status meet the standard for Adequate, plus: | GPs have established internationally-recognised NDT infrastructure at the national level as a result of the support under the RCA programme of IAEA.  . NDT Society has been established  . National certification body on NDT has been established.  . Local NDT training centres are offering ISO 9712 training  The support in establishing GPs’ NDT infrastructure through the RCA programme has enabled GPs to produce certified personnel in all levels of NDTs’ *five main methods* (RT, UT, MT, PT, ET) through the national NDT certification scheme.[[3]](#footnote-3)  GPs have local NDT training centres and inspection companies offering services to local industry. |
| **Adequate** (meeting bottom-line expectations) | GPs have established basic NDT infrastructure at the national level as a result of the support under the RCA programme of IAEA.  National certification scheme has been established and there are certified personnel produced by the national NDT certification scheme, however, for limited method(s) and not for all 5 main methods.  There are trained personnel at the GP organisation level.  GPs have training centres and inspection companies, owned by foreign entities. |
| **Inadequate** | The level of NDT infrastructure is below the standard for Adequate |

Table 15: Rubric for criterion 2: increased scope and scale of NDT demand and use

|  |  |
| --- | --- |
| **Standard (to be applied to each GP)** | **Criterion 2: Increased scope and scale of NDT demand and use** |
| **Excellent** (exceeding expectations)  GPs with excellent status meet the standard for Good, plus: | From the involvement in the RCA programme, GPs have managed to support the utilisation of the technology by industry and disseminate the knowledge developed through R&D by publishing research articles, organising international and national seminars and conferences.  Participation in the RCA programme results in GPs applying NDT technology in the industrial sectors for the QA and QC of industrial components - achieving better controlled manufacturing, lower production costs, ensuring material quality, and/or greater product integrity. |
| **Good** (meeting expectations)  GPs with good status meet the standard for Adequate, plus: | From the involvement in the RCA programme, GPs have successfully applied the NDT technology to local industry, and established R&D activities.  Participation in the RCA programme results in GPs becoming more concerned and interested, and starting to apply NDT technology in the industrial sectors for the QA and QC of industrial components. |
| **Adequate** (meeting bottom-line expectations) | From the involvement in the RCA programme, GPs have successfully managed to train personnel in the introduced technology.  Participation in the RCA programme of IAEA results in GPs initiating activities to create awareness among industrial organisations about the benefits of NDT technology for QA and QC. |
| **Inadequate** | Any of the standards for Adequate are not met. |

Table 15: Rubric for criterion 3: improved health and safety

|  |  |
| --- | --- |
| **Standard (to be applied to each GP)** | **Criterion 3: Improved health and safety** |
| **Excellent** (exceeding expectations)  GPs with excellent status meet the standard for Good, plus: | As a result of participation in the RCA program of IAEA, GPs have been applying NDT technology in the industrial sectors as set by countries’ industrial laws for the QA and QC of industrial components - resulting in improved health and safety outcomes (i.e. fewer deaths and injuries) and/or reduced environmental pollution. |
| **Good** (meeting expectations)  GPs with good status meet the standard for Adequate, plus: | Participation in the RCA program of IAEA results in GPs applying NDT technology for safer operation of nuclear and other industrial installations. |
| **Adequate** (meeting bottom-line expectations) | Participation in the RCA program of IAEA results in GPs becoming more aware of the benefits of NDT technology for safer operation of nuclear and other industrial installations. |
| **Inadequate** | Standard for Adequate not met |

Table 15: Rubric for criterion 4: economic value

|  |  |
| --- | --- |
| **Standard (apply to GPs collectively)** | **Criterion 4: Economic value** |
| **Excellent** (exceeding expectations)  Meets the standard for Good, plus: | Economic analysis suggests with a high level of certainty that the investment created more value than it consumed.  Break-even is likely in nearly all scenarios (even under conservative assumptions). |
| **Good** (meeting expectations)  Meets the standard for Adequate, plus: | Economic analysis suggests more likely than not, the investment created more value than it consumed.  Break-even is likely in over half the range of scenarios (and under realistic mid-range assumptions) |
| **Adequate** (meeting bottom-line expectations) | Economic analysis suggests that under some scenarios, the investment created more value than it consumed.  Break-even is possible (under plausible assumptions) |
| **Inadequate** | Break-even is unlikely (or only possible under optimistic assumptions) |

#### Evidence for the assessment

The theory of change, criteria and standards provided important points of reference to identify what evidence is needed for the impact assessment. For this reason, selection of methods was undertaken after clarifying the theory of change, criteria and standards. This sequence of steps helps to ensure that the evidence is relevant and focuses on the right changes (King & OPM, 2018).

Examination of the rubric above revealed that the social and economic impacts of the RCA are diverse, and a mix of quantitative, qualitative and economic evidence was needed for the impact assessment. For example, [xxxx] has a monetary value that is relatively simple to estimate. However, [xxxx]. Inclusion of additional methods and data sources enabled assessment of wider impacts and value such as [xxxx].

Accordingly, the case study used a mix of methods, including:

* An online questionnaire deployed to all countries in the RCA
* Analysis of administrative data on non-destructive testing activity and costs, provided by IAEA
* Gathering additional information from non-destructive testing experts at the IAEA and GPs
* Narrative case examples, written from details provided by selected countries on a selection of ‘success cases’ of non-destructive testing
* Economic analysis of costs and benefits of non-destructive testing projects under the RCA.

#### Online questionnaire

The online questionnaire was developed in [mmyy] and deployed in [mmyy]. The data collection period coincided with the onset of the COVID-19 pandemic. The support and cooperation of country representatives and IAEA staff during these unusual circumstances is gratefully acknowledged.

The survey was structured in alignment with the rubrics, to capture evidence needed in the four impact areas. It included a mix of quantitative (numeric or categorical) and qualitative (free-text) fields. The survey was administered electronically. Respondents entered data into a secure online form, with automatic data validation. Responses were automatically compiled into a database for analysis.

Communication with countries about the online survey was led by IAEA and included communication prior to deployment (to forewarn senior country representatives of the purpose and timing of the survey, giving them time to nominate a staff member responsible for completing the survey and set aside time for this task) and during deployment (including reminders, follow-up questions where needed to clarify responses, and thanking country representatives for their close and effective cooperation). This communication and coordination from IAEA was critical to the success of the survey.

#### Case examples

Development of the case examples occurred following survey data collection. The selection of case examples was agreed with TCAP and TCPC. The senior contact person from each of the selected countries was contacted by IAEA to invite their participation.

Templates and instructions were developed for the countries preparing case examples and were sent to the nominated contact people. After receipt of the case study data, follow up contact was made with the contact people as required to clarify details. Narrative summaries were prepared.

# Works cited

Davidson, E.J. (2005). *Evaluation Methodology Basics: The nuts and bolts of sound evaluation*. Sage.

Drummond, M.F., Sculpher, M.J., Torrance, G., O’Brien, B.J., & Stoddard, G.L. (2005). *Methods for the economic evaluation of health care programs.* Oxford University Press.

Funnell, S.C., & Rogers, P.J. (2011). *Purposeful Program Theory: effective use of theories of change and logic models*. Jossey-Bass.

King, J. (2017). [Using Economic Methods Evaluatively](https://journals.sagepub.com/doi/full/10.1177/1098214016641211). *American Journal of Evaluation*, *38*(1), 101–113.

King, J. (2019). *Evaluation and Value for Money: Development of an approach using explicit evaluative reasoning.*([Doctoral dissertation](https://minerva-access.unimelb.edu.au/handle/11343/225766)). University of Melbourne.

King, J., McKegg, K., Oakden, J., Wehipeihana, N. (2013). [Rubrics: A method for surfacing values and improving the credibility of evaluation](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=2ahUKEwjI-4eLjezhAhWQb30KHeHVAPAQFjAAegQIBRAC&url=http%3A%2F%2Fjournals.sfu.ca%2Fjmde%2Findex.php%2Fjmde_1%2Farticle%2Fdownload%2F374%2F373%2F&usg=AOvVaw1XA0s6SoZhzVp7jmk2UQz_). *Journal of MultiDisciplinary Evaluation, 9*(21), 11-20.

King, J. & OPM (2018). [*OPM’s approach to assessing value for money*](https://www.julianking.co.nz/wp-content/uploads/2018/02/OPM-approach-to-assessing-value-for-money.pdf)*– a guide*. Oxford Policy Management Ltd.

McKegg, K., Oakden, J., Wehipeihana, N., King, J. (2018). [*Evaluation Building Blocks: A Guide*](http://kinnect.co.nz/to/wp-content/uploads/EvaluationBuildingBlocks_A-Guide_FINAL_V1.pdf)*.*The Kinnect Group.

Rogers, P. (2014). *Theory of Change*. Methodological Briefs: Impact Evaluation 2. UNICEF Office of Research.

Schwandt, T., (2015). *Evaluation Foundations Revisited: Cultivating a Life of the Mind for Practice.* Stanford University Press.

[check]

1. The project was commissioned by the IAEA Technical Cooperation Division for Asia-Pacific (TCAP) and TC Division of Programme Support and Coordination (TCPC). Invited experts from the RCA programme from China, Indonesia and Viet Nam provided advice and support. [↑](#footnote-ref-1)
2. These results for the period 2000-2019 should not be used to make decisions about the future of the RCA or to decide whether the scale of the RCA should be increased or decreased. [↑](#footnote-ref-2)
3. Since most national certification schemes started late compared to other certification, acceptance is the main challenge. [↑](#footnote-ref-3)