



ARCAL

**REGIONAL CO-OPERATION AGREEMENT FOR THE PROMOTION OF
NUCLEAR SCIENCE AND TECHNOLOGY IN LATIN AMERICA AND THE
CARIBBEAN**

**PROCEDURES MANUAL
FROM ARCAL**

**ANNUAL REPORT
Country: JAMAICA**



1. EXECUTIVE SUMMARY

For the 2023 period, Jamaica had active participation in five (5) ARCAL projects.

Table 1. Jamaican Active Projects

| Project Counterpart(s) | Project # and Title |
|------------------------|--|
| Prof. Charles Grant | RLA0070: Strengthening Regional Cooperation (ARCAL CLXXXVI) |
| Mr. Haile Dennis | RLA1022: Improving the Satisfaction of Regional Demand for Products and Services of Nuclear Research Reactors (ARCAL CLXXX) |
| Mr. Haile Dennis | RLA5089: Evaluating the Impact of Heavy Metals and Other Pollutants on Soils Contaminated by Anthropogenic Activities and Natural Origin (ARCAL CLXXVII) |
| Prof. Minerva Thame | RLA:6089: Using Stable Isotopes to Reduce Nutritional Risks in Pregnant Women and Their Impact on Infants (ARCAL CLXXXIV) |
| Mr Johann Antoine | RLA7023: Assessing Atmospheric Aerosol Components in Urban Areas to Improve Air Pollution and Climate Change Management (ARCAL CLIV) |

One project (RLA 7023) had major malfunctions on two (2) out of three (3) pieces of equipment, unfortunately this was not resolved before the close of the project. On a positive note, the sampling protocols have been incorporated in the intuitions routine work load, as such both air samplers will be repaired and put back in to service. Project RLA6089, is now making good progress with planned procurements for Q4 2023 partially achieved and a 96% recruitment rate for the study population. For project RLA5089, Jamaica participated in all but two of the activities within the project. These two activities were not attended as they were scheduling overlaps with other events. The events that Jamaica participated included project coordination and communication related meetings, working group meetings to develop and review the protocols for the analytical techniques (XRF, NAA, ICP) and sampling procedures that will be used, training courses in x-ray fluorescence spectrometry, neutron activation analysis and sampling. Jamaica hosted the training course on neutron activation analysis that was



held in May 2023. The course was attended by 11 participants including 5 from Jamaica. For project RLA1022, Jamaica participated in all activities within the project. The events that Jamaica participated included project coordination and communication related meetings. Jamaica also developed the draft regional NAA work plan for technology transfer which identified the potential and existing needs of member institutions of the Regional Network of Research Reactors of Latin America and the Caribbean (RIALC) and how the network can contribute to meeting these demands. Project RLA0070 progressed as planned with Jamaica participating in one (1) regional meeting.

2. PARTICIPATION OF THE NATIONAL COORDINATOR IN ARCAL ACTIVITIES

In addition to the approval of meetings and corresponding with project counterparts, I attended the XXIV Meeting of the ARCAL Technical Coordination Board (OCTA), Viña del Mar (Chile) 15-19 May 2023. As the NCR, I also ensured that project calls and adherence forms were distributed to all relevant stakeholders in the country and, when necessary, forwarded to the IAEA for consideration.

3. RESULTS

RLA7023: The project has not had the impact anticipated in terms of the results but there is a clear path for continuation of the activities post-project. The major impact of the project to date is a comprehensive sampling campaign that saw the collection of hundreds of air quality filters that can be analysed by various techniques. The addition of the MABI means that there is a method to measure atmospheric black carbon in the urban environment. The project also provided the two air samplers that formed the basis of the sampling regime.

RLA6089: The information gleaned from this research will be paramount in assisting our Ministry of Health and Wellness in fighting the battle of obesity and malnutrition which plague our population and burden our health care facilities. Data



will be disseminated at conferences both local and international, journal publication and departmental seminars.

RLA5089: The activities carried out so far under the project have been primarily foundational to equip the project team with the necessary skills and competencies to perform the sampling and analyses. These skills will undoubtedly enable us to continue with the execution of the project and achieve the established objectives.

RLA1022: The only major challenge encountered was related to the language barrier especially where a lot of the communication about project activities are via a WhatsApp group that was created for the project participants. The communication within this group is almost exclusively in Spanish so this presented some difficulties to follow conversations.

4. DIFFICULTIES AND PROBLEMS ENCOUNTERED IN IMPLEMENTING PROJECTS AND THE AGREEMENT

Concerns were raised regarding the language barrier and its impact on the Jamaican counterparts to adequately contribute/participate fully which effectively excluded them from the discussions and project planning. For virtual meetings, the use of live translation by Google Translate was helpful but was far from ideal. A possible solution is to make provisions for translation/interpretation.

For project RLA6089, funding of various aspects still remains a challenge including the budgeting for a research assistant which would be quite helpful given the vast amount of data needed to be collected and the coordination of dates for review of each participant. The cost of refreshments and transportation and compensation for travel at the postpartum visit is also a need to be addressed.

Additionally for project RLA7023, there were several challenges faced during the implementation of the project. The initial problem was finding a suitable site for the deployment of the air quality samplers. Several partners were approached who were thought to be suitable partner organizations and whose location was deemed a suitable proxy for the Jamaican urban environment. It was afterward that the environmental regulator the National Environment and Planning Agency (NEPA)



was approached and agreed to site the air samplers at the offices in the heart of the Kingston Metropolitan Area.

The second major challenge was instrumentation related to the analysis of the filters. There was a minor delay in acquiring a new microbalance for measuring the mass of the filters. Several analytical techniques were not available for the analysis of filters during the project period. The inductively coupled plasma mass spectrometer (ICP-MS), delivered in 2021 was initially not commissioned because of travel restrictions due to the COVID-19 pandemic. Since then there have been repeated delays in the installation and to date has not been commissioned. There were also delays in the installation of the acquired X-ray fluorescence (XRF) spectrometer and its calibration. Both these techniques would have been ideal for the analysis of the filters, especially since there are issues with measuring quartz filters with neutron activation analysis (NAA). There was also a malfunction of the high-purity germanium (HPGe) detector and gamma spectrometer that hampered the calibration for NAA and subsequent analysis of filters by NAA.

The most significant difficulty was the malfunctioning of the motors for both the high-volume and low-volume samplers. This resulted in the cessation of the sampling campaign. The motor of the high-volume sampler has to be replaced and the low-volume sampler has to be replaced completely.

VALUATION OF THE CONTRIBUTION OF THE RLA (ALL JAMAICAN) PROJECTS TO THE ARCAL PROGRAM

| ITEM | REFERENCE VALUE | AMOUNT in € |
|---|---|-------------|
| 1. Experts/conference attendees sent abroad by the Agency (IAEA) | €300 per person per day (including travel days) | €2,100 |
| 2. Local cost of the venues of a regional event held in the country (working group/training courses/workshops/seminars) | €5000 per week | €10,000 |



ARCAL

ACUERDO REGIONAL DE COOPERACIÓN PARA LA PROMOCIÓN DE LA CIENCIA Y LA TECNOLOGÍA
NUCLEARES EN AMERICA LATINA Y EL CARIBE

| | | |
|--|---------------------------------------|----------------|
| 3. Local costs of national events included in the activity plan | €3000 per week | 0 |
| 4. Fellowship holder whose local expenses are borne by the country | €3500 per fellowship holder per month | 0 |
| 5. Publications | Up to €3000 | 0 |
| 6. Database establishment and/or updating | Up to €5000 | 0 |
| 7. Shipment of reagents/radiation sources/radioisotopes/other material | Up to €5000 | €5000 |
| 8. Services provided (e.g. irradiation of material) | Up to €5000 | 0 |
| 9. Time worked as DTM | Maximum €700 per month | 0 |
| 10. Time worked as project coordinator | Maximum €500 per month | €18000 |
| 11. Time worked as local specialists collaborating on projects (maximum of 3 specialists per project) | Maximum €300 per month per specialist | €6400 |
| 12. Contributions to the implementation of each project, broken down as: a. internal/external subsistence b. internal/external transport | Maximum €7500/project | €7500 |
| 13. Expenditure by the country on the project (infrastructure, equipment, etc.) | Maximum €10 000 | €30,000 |
| TOTAL | | €79,000 |

This report has been compiled by Charles Grant, ARCAL National coordinator. Individual project counterpart summaries are presented in appendix 1 of the report.



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NUCLEARES EN AMERICA LATINA Y EL CARIBE



Appendix 1.

PROJECT COUNTERPART SUMMARIES:

INTRODUCTION

RLA0070: “Strengthening Regional Cooperation” (ARCAL CLXXXVI)”

The objective of this regional programme is to enhance regional cooperation by establishing mechanisms aimed at strengthening technical cooperation among developing countries, and the regional programming for Latin America and the Caribbean (LAC).

1. EXECUTIVE SUMMARY

Jamaica participated in the following project meetings/workshops:

- a. XXIV Meeting of the ARCAL Technical Coordination Board (OCTA), Viña del Mar (Chile) 15-19 May 2023

2. IMPACT OF PROJECT ACTIVITIES IN THE COUNTRY

The country has benefited from the donation of numerous pieces of equipment, as well as training both locally and overseas. Human capacity has been developed in numerous fields of activity that will no doubt be of benefit to the Jamaican people.

3. RESULTS

- a. *XXIV Meeting of the ARCAL Technical Coordination Board (OCTA)*

As a result of this meeting Jamaica as adhered to 5 new projects:

- i. RLA2018-Supporting the Development of Comprehensive Energy Plans Considering the Climate, Land, Energy and Water in Latin America and the Caribbean (ARCAL CXC).



ARCAL

ACUERDO REGIONAL DE COOPERACIÓN PARA LA PROMOCIÓN DE LA CIENCIA Y LA TECNOLOGÍA
NUCLEARES EN AMÉRICA LATINA Y EL CARIBE

- ii. RLA5090-Improving Agriculture Productivity through Better Agricultural Practices and Improved Varieties (ARCAL CXCII).
- iii. RLA5091-Strengthening the Monitoring Programmes of Pesticide Residues and Mycotoxins in Food Through the Establishment of a Proficiency Test Programme in Official Laboratories (ARCAL CXCIV).
- iv. RLA5092-Enhancing Regional Capacity for the Adoption of the Sterile Insect Technique as a Component of Mosquito Control Programmes (ARCAL CLXXXVII).
- v. RLA7029-Enhancing Regional Capacities to Assess Freshwater Availability and Quality Using Isotope Hydrology Techniques (ARCAL CXCIV)

4. DIFFICULTIES AND PROBLEMS PRESENTED DURING THE PROGRESS OF THE PROJECT:

None reported.



PROJECT COUNTERPART SUMMARIES:

INTRODUCTION

RLA1022: “Improving the Satisfaction of Regional Demand for Products and Services of Nuclear Research Reactors” (ARCAL CLXXX)

1. EXECUTIVE SUMMARY

Summary of participation in the project:

- a) participation by the project coordinator (coordination meetings, workshops and working groups);

First Coordination Meeting (virtual) – February 14 – 17, 2022

Virtual Meeting of Counterparts to discuss MOU for the establishment of regional network, October 13, 2022

Project communication meeting, November 8, 2022

- b) resources contributed by the country to the project (include the detailed account as required in the table of financial cash indicators).

N/A

2. IMPACT OF PROJECT ACTIVITIES IN THE COUNTRY

Not many project activities were executed during the year but the establishment of the regional network of research reactors and proposed activities within the network has the potential to be of major impact to the nuclear medicine and environmental research programmes in Jamaica.



3. RESULTS

None reported.

4. DIFFICULTIES AND PROBLEMS ARISING DURING PROJECT IMPLEMENTATION

Many of the meetings were primarily held in Spanish. This made it quite challenging for participants from Jamaica to adequately contribute/participate fully and was effectively excluded (by the language barrier) from the discussions and project planning. For virtual meetings, it was suggested that the subtitle feature be used along with live translation by google translate but this was far from ideal and just isn't a practical solution. A possible solution is to make provisions for translation/interpretation by real people.



PROJECT COUNTERPART SUMMARIES:

INTRODUCTION

RLA5089: Evaluating the Impact of Heavy Metals and Other Pollutants on Soils Contaminated by Anthropogenic Activities and Natural Origin (ARCAL CLXXVII)

EXECUTIVE SUMMARY

Jamaica participated in all but two of the activities within the project. These two activities were not attended as they were scheduling overlaps with other events. The events that Jamaica participated included project coordination and communication related meetings, working group meetings to develop and review the protocols for the analytical techniques (XRF, NAA, ICP) and sampling procedures that will be used, training courses in x-ray fluorescence spectrometry, neutron activation analysis and sampling. Jamaica hosted the training course on neutron activation analysis that was held in May 2023. The course was attended by 11 including 5 from Jamaica.

We also participated in the PTNATIAEA-21: analytical techniques and laboratories involved in the project.

1. RESULTS, DIFFICULTIES AND PROBLEMS PRESENTED DURING THE PROJECT'S PROGRESS:

The implementation of the project so far has resulted in additional staff being trained in nuclear analytical techniques and soil sampling. The skills and knowledge gained from these activities have further enhanced our capabilities in the respective areas.

There were very few challenges experienced during the project implementation. The first challenge is related to the language barrier especially where a lot of the



communication about project activities are via a WhatsApp group that was created for the project participants. The communication within this group is almost exclusively in Spanish so this presented some difficulties to follow conversations.

The other issue encountered was the late receipt of the sampling kit. Other Member States began receiving the sampling kits June/July but ours did not arrive until November. This delayed the training of local staff on the use of the equipment and sampling protocol. The training has been scheduled for Q1 2024 and will be shortly by the sampling campaign and commencement of analyses.

2. **PURCHASE OF EQUIPMENT AND SUPPLIES: Report if the project provided equipment and/or supplies.**

3.

The project provided a kit with equipment to be used for sample collection and preparation.

4. **IMPACTS:**

The activities carried out so far under the project have been primarily foundational to equip the project team with the necessary skills and competencies to perform the sampling and analyses. These skills will undoubtedly enable us to continue with the execution of the project and achieve the established objectives.

5. **LESSONS LEARNED:**

The organization of the training course in Jamaica was faced with challenges in the early stages of planning with regard to getting the HGA approved and signed. This process took longer than expected and the final approval came very close to the scheduled start date for the course. One suggestion would be to start this process earlier in advance to ensure that approvals are received well in advance.



INTRODUCTION

RLA6089: “Using Stable Isotopes to Reduce Nutritional Risks in Pregnant Women and Their Impact on Infants” (ARCAL CLXXXIV)

1. EXECUTIVE SUMMARY

As a part of the group of Latin American and Caribbean countries that seek to provide information on the burden of malnutrition and anaemia, the Jamaican contingent has been actively progressing with the working plan to complete the necessary evaluations as outlined in the project RLA 6089.

Our research over the years has already provided valuable preliminary information on nutritional evaluations on maternal body composition and outcomes in pregnancy. This project seeks to highlight the maternal body composition and infant outcomes using more accurate measurement of body composition. Various modes of measurement including :

1. Accurate assessment of total body water, lean mass and fat mass by the isotopic deuterium dilution technique in pregnancy and childhood.
2. Assessment of anthropometry in pregnancy and in the infant at 3 months of birth.
3. To compare body composition using deuterium dilution with that using Bioimpedance measurement

First Project Meeting

Our first project coordination meeting was held as a Virtual Coordination Meeting in March 2022. The Jamaican work team includes : Cathy Maddan (Department of Obstetrics & Gynaecology UWI), Professor Asha Badaloo (Caribbean Institute for Health Research) and Professor Minerva Thame (Department of Child and Adolescent Health UWI).

Here, prior local research on nutritional associations in our maternal population, maternal and infant outcomes were highlighted including prior work with the IAEA. It was clearly outlined that the project was in line with the work of the Ministry of Health and Wellness to improve nutrition and



aim towards reducing non communicable diseases. We made our commitment to participation and completion of this project.

Approval for Importation of Deuterium Oxide

Our first challenge was to obtain permission for the importation of deuterium oxide into the country for the purpose of research. This was successfully done in September 2022 and the Deuterium was received and stored appropriately.

Ethical Approval

A working protocol was provided by the IAEA for the project but ethical approval according to each country's local ethics committee would still need to be achieved.

Protocol revision was done within the work team to conform to the project objectives but edited to include a few local targets including assessment of associated fetal biometry using ultrasonography. From prior research we had learnt that the participant "drop out" rate was about 10 percent with further loss of data in the infants associated with unavoidable loss of deuterium dose. To account for these losses our sample size was increased from the requested $n=30$ to $n=50$ participants.

This was submitted to the Mona Campus Research Ethics Committee as the project would be completed within the obstetric population at the University Hospital of the West Indies. The submission date was May 2023. Several concerns were outlined by the Ethics Committee including :

- The need for a sample size calculation
- Concerns for the time lapse during which the participants would not be allowed to eat.
- Compensation for travel at the postpartum follow up
- Compensation for time spent

These concerns highlighted caused a delay in our work plan. The concerns were addressed and ethical approval was finally obtained in December 2023.



Training Courses

We were unable to attend the Regional Training Course on Standardization of Techniques for the Evaluation of Body Composition in Pregnancy and Infancy held in November – December 2022.

A similar training course was held in Kingston Jamaica for RLA 6087 “ Training on Body Composition Assessment Using Stable Isotopes” . Cathy was able to attend this and this proved beneficial with her being able to meet the team that would assist in the analysis of saliva samples.

Further local training at the Caribbean Institute for Health Research was held in December 2024 for the work team to include persons who would be locally assisting with data collection and conduction of measurements.

Virtual data entry training for use of REDcap has been completed with Cathy and her team for data collection in December 2023.

Procurement Status

To date we have received : Deuterium oxide, a bioimpedance assay machine.

We have been informed that disposables are enroute.

We already had in possession : skin fold calipers , a stadiometer, digital infant and adult scales .

Study Details

Having completed ethical approval and obtaining the necessary equipment to commence, measurements were started in January 2024.

Thus far, we have recruited 48 of the 50 pregnant women with singleton gestation from the antenatal clinic at UHWI. These individuals ranged between the gestational age of 12- 16 weeks pregnant. They have all completed their questionnaires and first measurements as required by the study protocol.

Our work plan is as shown in the table below.



| Start date | Activities | Achievement |
|------------|--|-------------|
| Q4 2023 | Complete procurement | Partial |
| Q1 2024 | Recruitment (GA 12-16 wks) and measurements | Done |
| Q2 2024 | GA 26 – 27 weeks measurements | -- |
| Q3 2024 | GA 34-36 wks measurements and FTIR | -- |
| Q4 2024 | Postpartum Evaluation. Data analysis & Report | -- |
| Q1 2025 | Dissemination of Results | -- |

Challenges

Funding of various aspects still remains a challenge including the budgeting for a research assistant which would be quite helpful given the vast amount of data needed to be collected and the coordination of dates for review of each participant. The cost of refreshments and transportation and compensation for travel at the postpartum visit is also a need to be addressed.

Impact

The information gleaned from this research will be paramount in assisting our Ministry of Health and Wellness in fighting the battle of obesity and malnutrition which plague our population and burden our health care facilities. Data will be disseminated at conferences both local and international, journal publication and departmental seminars.

Through the process we have had a few learning points to note for future projects.

1. Consideration for time to obtain ethical approval can be extensive and must be taken into account for project deadlines to be established.
2. More local training be included as the language barrier can be prohibitive at the regional meetings,



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ACUERDO REGIONAL DE COOPERACIÓN PARA LA PROMOCIÓN DE LA CIENCIA Y LA TECNOLOGÍA
NUCLEARES EN AMERICA LATINA Y EL CARIBE

3. A direct and established channel be made for shipping and receipt of equipment to reduce delays and confusion between projects.

Our team remains committed to this project as we seek to assist the IAEA and the United Nations in obtaining relevant data for policies and intervention to be implemented in improving the future health of our population.



INTRODUCTION

1. EXECUTIVE SUMMARY:

The project RLA7023 was scheduled to close at the end of 2023. As was the case in 2022, the project effectively went dormant in terms of external activities and communication with the designated team member and programme management officer. Challenges continue to affect project activities including analysis and sampling. While the project did not achieve the analytical results during the period, the basis has been set for the project to benefit the member state in the near future with the project activities set to be institutionalized by the International Centre for Environmental and Nuclear Sciences (ICENS) and to achieve the results that would have been expected eventually.

There was no participation by the project counterpart/coordinator or designates in coordinating meetings, workshops, or working groups in 2023.

2. *RESULTS, DIFFICULTIES AND PROBLEMS PRESENTED DURING THE PROJECT'S PROGRESS:*

There were several challenges faced during the implementation of the project. The initial problem was finding a suitable site for the deployment of the air quality samplers. Several partners were approached who were thought to be suitable partner organizations and whose location was deemed a suitable proxy for the Jamaican urban environment. It was afterward that the environmental regulator the National Environment and Planning Agency (NEPA) was approached and agreed to site the air samplers at the offices in the heart of the Kingston Metropolitan Area.

The second major challenge was instrumentation related to the analysis of the filters. There was a minor delay in acquiring a new microbalance for measuring the mass of the filters. Several analytical techniques were not available for the analysis of filters during the project period. The inductively coupled plasma mass spectrometer (ICP-MS), delivered in 2021 was initially not commissioned because of travel restrictions due to the COVID-19 pandemic. Since then there have been repeated delays in the



installation and to date has not been commissioned. There were also delays in the installation of the acquired X-ray fluorescence (XRF) spectrometer and its calibration. Both these techniques would have been ideal for the analysis of the filters, especially since there are issues with measuring quartz filters with neutron activation analysis (NAA). There was also a malfunction of the high-purity germanium (HPGe) detector and gamma spectrometer that hampered the calibration for NAA and subsequent analysis of filters by NAA.

The most significant difficulty was the malfunctioning of the motors for both the high-volume and low-volume samplers. This resulted in the cessation of the sampling campaign. The motor of the high-volume sampler has to be replaced and the low-volume sampler has to be replaced completely.

3. *PURCHASE OF EQUIPMENT AND SUPPLIES:*

Through the project, the member state received a Tisch Environmental PM_{2.5} high-volume air sampler, a Sven Leckel LVS/LVS6, Low volume sampler, and a multi-wavelength absorption black carbon instrument (MABI) instrument manufactured and sold by the Australian Nuclear Science and Technology Organisation (ANSTO). There was also provision of monitoring instrumentation for weather conditions. This equipment was all purchased and provided through RLA7023 before this year. No equipment or supplies were purchased through the project in 2023.

4. *IMPACTS: Report to what extent the project contributed to the achievement of established objectives to provide a solution to a need/problem identified in the project design.*

5. *LESSONS LEARNED:*

The most positive experience was the training received through the project. This included the Regional Training Course on Method Validation and Quality Assurance



of Airborne Particulate Matter using Nuclear Analytical Techniques (NATs) in San Jose, Costa Rica, the Regional Training Course on Advanced Source Apportionment Techniques in Montevideo, Uruguay, and the Regional Training Course on the Use of Remote Sensing Analysis for Pollution Source Identification, held virtually. These provided the opportunity to institutionalize knowledge and experience that will be useful in nationalising the air quality project. The addition of the multi-wavelength absorption black carbon instrument (MABI) was also a positive experience in adding to the analytical techniques available to the implementing organization (ICENS) and to the nation.

The difficulties experienced during the implementation of the project have provided some insights going forward for the project. The most important lesson learned is to ensure the operation and functionality of the analytical techniques before the start of the sampling campaign. This ensures that there is no prolonged storage of filters before analysis.

Another lesson learned is the significance of ion chromatography (IC) and the analysis of ions particularly in source apportionment. More emphasis should have been placed on upgrading the IC to make it appropriate for air quality analysis.

6. *RESOURCES CONTRIBUTED BY THE COUNTRY TO THE PROJECT*

Apart from human resources including the project counterpart and scientific officers, through the IAEA's national project JAM1001 Upgrading the Research Reactor Infrastructure at the University of the West Indies SLOWPOKE Facility, JM-1. While this is not expressly from the country resources were used from a national project to directly benefit RLA7023 implementation. The cost was approximately €13,400. The country will eventually spend over US\$ 12,300 in total to replace the motor for the Tisch Environmental high-volume sampler and the Sven Leckel low-volume sampler. However these funds were not allocated in the year 2023.