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International Atomic Energy Agency  
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**ASSESSMENT AND EVALUATION OF THE IMPACT OF NUCLEAR SECURITY EDUCATION  
AND TRAININGS OFFERED TO SCIENTIST, ENGINEERS AND PROFESSIONALS IN NIGERIA  
BY INTERNATIONAL AND GOVERNMENTAL ORGANIZATIONS**

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# Introduction

- Nuclear materials and radioactive sources are used in the fields of nuclear research, nuclear medicine, nuclear well logging in Nigeria as civilian applications of peaceful nuclear technology
- Protecting these materials and facilities remains a difficult security challenge for many countries worldwide, most especially developing countries like Nigeria
- Proper education, training and manpower development in the field of nuclear security



# Objective

The objective of the study is to assess and evaluate the impact of the nuclear security related training received by individuals, institutions and how effective and useful it has been in protecting nuclear and other radioactive materials in the facilities, regulatory institutions and the academia,

With the aim of addressing the gaps and challenges identified.



## Nuclear Security Education & Training in Nigeria

- Nigeria recognizes the development of a knowledgeable and skilled workforce as an essential element in the implementation of a nuclear power programme and safe operation of all Nuclear facilities
- NNRA, NAEC organized a number of workshops on nuclear education and training and Nuclear Security
- The Center for Energy Studies at the University of Port Harcourt is also offering Postgraduate Certificate Course on Nuclear Security
- Nuclear Security trainings, workshops and seminars, round tables, webinars has been offered to Nigerians with the support and assistance from the IAEA, USDOE/ NNSA ,PNS, WINS and GICNT
- Nigeria professional's accounts for 40% of WINS certified nuclear security professionals globally

# Research Method and Sources of Information



- The research adopted both the quantitative and qualitative research methods.
- Questionnaires were administered and interviews were conducted with some of the personnel that had attended training program on nuclear security, to obtain both quantitative and qualitative data.
- Respondents were asked to rank factors which were presented to them and results were presented in percentages, mean and relative importance index.
- Questionnaire were administered to identified individuals who have attended one or more trainings in areas of , Physical Protection, Transport Security, Cyber Security, Response and Preparedness, Insider Treat , Est.
- The feed backs were also collected in the same manner from staffs of the Nigeria Atomic Energy Commission (NAEC), Nigerian Nuclear Regulatory Authority (NNRA), and Centre for Energy Research and Training (CERT), University of Port Harcourt, Ahmadu Bello University, Response Organizations and Front line Officers

# Sample Size

The sampling size was determined using the formula below considering the fact that the targeted population is unknown:

$$n = (z^2 pq) / d^2 \text{ ----- [6]}$$

Where;  
**n** = the desired sample size  
**z** = the ordinate on the Normal curve corresponding to or the standard normal deviate. For the purpose of this study, a confidence level of 90% was adopted.

Usually a 90% level of confidence has  $\alpha = 0.10$  and critical value of  $z_{\alpha/2} = 1.64$ .

**P** = the proportion in the target population estimated to have particular characteristic (normal between the range of 0.1 - 0.5)

$$q = 1.0 - p$$

**d** = degree of accuracy corresponding to the confidence level and Z selected.

Consequently, the sample size is determined as thus,

$$z = 1.64$$

$$d = 0.1$$

Where  $p = 0.3$

$$q = 0.7$$

Hence,

$$\text{Sample size } n = [(1.64)^2 \times 0.3 \times 0.7] / (0.1)^2 = 56.4$$

**Thus the study administered 56 questionnaires.**



# Structured questionnaire



- Questionnaire were used to source for data and information from all the stakeholder Organizations, the Regulatory Body, Facilities operators, Academia, and Law enforcement
- Most of the questions entailed ranking identified variables on a five (5) point likert scale that assessed either agreement or disagreement and significance of the factor
- For example, 1.Helpful, 2.= Very helpful,3.= Some what helpful, 4.= Not helpful & 5.= Will be helpful in the future
- The questions covered key areas of Nuclear Security that training has been offered and personnel work schedule, such as Physical Protection, Cyber Security, Transport Security and Human Reliability
- the questioner assesses competencies; how much the information's from the training has been disseminated amongst work place colleague's, means of dissemination, how much/ how well were the trainings received were implemented, challenges faced while implementing the knowledge, how much support did trained personnel got from there Management to implement the knowledge on the security arrangement of their facilities, security culture and practices of employees.



# Relative importance index (RII)

Relative importance index was used in the study to assess and evaluate the impact of the training received by individuals, institutions and how effective and useful it has been in protecting nuclear and other radioactive materials in the facilities, regulatory institutions, law enforcement agencies and the academia.

- Relative Importance Index (RII) =  $(\sum fx) / (\sum f) \times 1/k$  ----- .2 [7]
- Where,
- $\sum fx$  = is the total weight given to each attributes by the respondents.
- $\sum f$  = is the total number or respondents in the sample.
- K = is the highest weight on the likert scale.
- Ranking of the items under consideration was based on their RII values. The item with the highest RII value is ranked first (1) the next (2) and so on.
- Interpreted RII values as follows:
  - $RII < 0.60$ , item is assessed to have low significance.
  - $0.60 \leq RII < 0.80$ , item assessed to have high significance.
  - $RII \geq 0.80$ , items assessed to have very high significance.

## Data Presentation and Analysis

- (30) questionnaires were administered to the Nigerian Nuclear Regulatory Authority and Twenty Two (28) were properly completed and returned representing a Eighty-three percent (93.3%) return rate
- (40) questionnaires were administered to the Nigerian Atomic Energy Commission, Centre for Energy Research and Training (CERT), Centre for Nuclear Energy Studies (CNES), Centre for Energy Research and Development (CERD) and the Nuclear Technology Centre (NTC) and Twenty Two (32) were properly completed and returned representing a Eight percent (80%) return rate
- (30) questionnaires were administered to the Nigerian Police Explosives and Ordnance (EOD), Nigerian Customs Service (NCS), Nigeria Security and Civil Defence Corps (NSCD), Office of the National Security Adviser and Nigerian Military and Twenty Eight (28) were properly completed and returned representing Ninety-three percent (93%) return rate.
- These assessment will show how effective these trainings and education have impacted on the personnel's and impact on their job duties

# Discussions and Interpretation of Result

- The study Grouped the Institution into three categories , namely the Regulatory Body , Facility, and Response Organization.
- The Nigerian Nuclear Regulatory Authority had (RII =0.7) is assessed to have high significance with first position for sharing the information received from trainings regarding nuclear safety and security amongst fifty or more people.
- Management support for implementation of the knowledge on security arrangement and security culture practices by employees had (RII =0.6)
- NNRA Implementation on what was learnt from the trainings and workshop effectively had (RII = 0.5) i.e.  $RII < 0.60$ , item is assessed to have low significance
- The Nigerian Atomic Energy Commission and its centers had (RII = 0.8) as first position for high number of trained personnel to have shared information's regarding nuclear safety and security through presentations of lectures and seminars, is assessed to have high significance
- Management support for the implementation of the knowledge on security arrangement and security culture practices by employees also had (RII =0.6) is asessed to have high significance

# Discussions and Interpretation of Result

- it was also discovered that the trained personnel were unable to implement what they learnt from the trainings and workshop effectively with (RII = 0.5) i.e.  $RII < 0.60$ , item is assessed to have low significance
- how helpful were the trainings attended to your job duties” to have high significance of (RII = 0.6), with mean score of 3.0 out of 5.0.
- The Response Organizations had (RII = 0.6) for high number of trained personnel to have shared information’s from the training with their colleagues on nuclear security
- The trained personnel were also able to develop and improve their work processes and protocols regarding nuclear security with a mean score of 3.0 out of 5.0 and (RII= 0.6) which is assessed to have high significance in second position
- Management support from all the Response Organization for implementation of the knowledge on security arrangement and security culture practices by employees also had (RII = 0.6) is assessed to have high significance with third position

# Discussions and Interpretation of Result

- Numbers of nuclear security training personnel from the response organizations had attended” had (RII = 0.4) with a mean score of 2.1 out of 5.0 with eight position shows there are more training needed for the Response Organizations, fewer personnel had the opportunity to attend trainings and workshop on nuclear security

# Conclusion



The research assessed and evaluated the impact of nuclear security education and training on personnel trained on nuclear security from the Regulatory Body, facilities/ academia , frontline officers and response organizations.

The study found that the training received by Nigerian Professionals were very effective and helpful with an assessment score of 3.0 out of 5 as average for the three categories . The level of shared information received from the training is said to be high amongst the organizations. Management support for implementation of the knowledge on security arrangement and security culture practices by employees also had (RII=0.6); trained personnel were unable to implement what they learnt from the trainings and workshop effectively with (RII = 0.5).

# Conclusion



From the findings it was discovered that;

- information received from the training were well shared amongst staffs of the organization and the training were effective to an extent but more is required to be done,
- that the reason for low implementation were that some of the trainings were generic, not specific to the job schedule and lack of opportunities to implement some of what was learnt
- that management support for the effective implementation was also low due to budgetary provisions and lack of adequate funding for equipment's
- Personnel from the response organizations attended few trainings with (RII =0.4) with a mean score of 2.1 out of 5.0 shows there are more training needed for the Response Organization and Front line Officers to meet up with the challenges



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