KNOWLEDGE DOCUMENT SERIES

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RADIONUCLIDE MONITORING STATION (RN42), TANAH RATA, CAMERON HIGHLANDS AS PART OF CTBT GIZMO

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NUKLEAR MALAYSIA

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CHAPTER 1
THE COMPREHENSIVE NUCLEAR –TEST-BAN TREATY

1.1 Introduction

Comprehensive Nuclear-Test-Ban Treaty (CTBT) is an agreement between States to bans nuclear explosions on the Earth's surface, in the atmosphere, underwater and underground. This treaty is a cornerstone of the international regime on non-proliferation of nuclear weapons and is an essential foundation for the pursuit of nuclear non-proliferation and disarmament. However, this treaty is not yet enter into force because under the provision of the Treaty, all Annex 2 states have to ratify it for the Treaty to enter into force. To date, eight Annex 2 states namely China, Egypt, Iran, Israel, United States, India, North Korea and Pakistan have not ratified the treaty yet. Annex 2 states are states that participated in the CTBT negotiations between 1994 and 1996 and possessed nuclear power reactors or research reactors at that time. Malaysia is not an Annex 2 states. In the interim, Vienna Convention on the law of treaties requires that all States which have signed it must not “defeat its object and purpose”.

The CTBTO consists three main organs:

- Conference of the States Parties (representatives of all States Parties)
- Executive Council (51 members – 6 regions)
- Technical Secretariat (Director-General and staff)

However, subsequently the treaty is not yet enter into force, an interim organisation was set up known as the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization, or CTBTO Preparatory Commission (CTBTO Prep Com). It was established on 19 November 1996 by a Resolution adopted by the Meeting of States Signatories at the United Nations in New York, and based in Vienna, Austria. The CTBTO Prep Com is responsible for building up the verification regime of the Comprehensive Nuclear-Test-Ban Treaty (CTBT) in preparation for the Treaty's entry into force as well as promoting the Treaty's universality.

The CTBTO Preparatory Commission consists three main organs:

- Preparatory Commission (plenary body, meets twice yearly) - which is assisted by three groups: a working group on administrative and financial issues, another on verification-related issues, and an advisory group.
- Working Groups A & B – an Advisory Group in regard to financial, technical etc.
- Provisional Technical Secretariat (PTS) - assists the plenary body carry out its activities. The PTS has three technical divisions: the International Monitoring

System Division (IMS), the International Data Centre Division (IDC) and the On-Site Inspection Division (OSI). These divisions are supported by a Legal and External Relations Division and a Division of Administration.

Verification regime

1.2 International Monitoring System Station (IMS Station)

The implementation of CTBT relies on the verification regime of the CTBT that is designed to detect any nuclear explosion conducted on Earth in all environment namely underground, underwater or in the atmosphere. The verification regime comprises a network of monitoring stations, a global communication infrastructure & a data processing and analysis centre. Hence, the verification regime consists of the following elements:

- The International Monitoring System (IMS)
- International Data Centre (IDC)
- Global Communications Infrastructure (GCI)
- Consultation and clarification
- On-Site Inspection (OSI)
- Confidence-building measures

As September 2019, the International Monitoring System (IMS) comprises of 321 monitoring stations and 16 laboratories built worldwide. These monitoring stations consists of 170 seismic stations, 11 hydroacoustic stations, 60 infrasound stations, and 80 radionuclide stations.

For the CTBTO world map, please follow the link https://www.ctbto.org/map/

1.3 The Implementation of CTBT in Malaysia

On 24 June 1998, the Cabinet decided for Malaysia to sign the CTBT and has approved Malaysian Nuclear Agency (Nuklear Malaysia) as the National Authority for the implementation of CTBT in Malaysia. Followed this decision, Malaysia signed the CTBT on 23 July 1998 and became the 150th State Party to sign it. Relation to this, on 17 January 2008, Malaysia ratified the Treaty and became the 143th to ratify it. As a State Party to the CTBT, Malaysia is fully committed implementing the Treaty. The implementation of CTBT activities in Malaysia is categorised into two clusters:

i. Management and Legal Aspects. These involves tasks as below:
    - Principle Point of Contact between Malaysia and CTBTO Prep Com;
    - Planning & Strategies;

- Techno-politics [meetings, input and technical advices to Ministry of Foreign Affairs, MESTECC, ASEAN, country statements, etc];
- Administration [utilities, annual contribution, license etc];
- Capacity Building [trainings, regional trainings, expert meetings];
- Awareness/Promotional programmes (awareness seminars);
- CTBT Act, Agreements and Contracts; and
- Promote the use of CTBT IMS data for civil and scientific purposes.

ii. Technological aspect that involves:

- Technical Advice to the relevant entities by the My-NDC;
- Operational & Maintenance of the station: to ensure station is fit to serve its purpose as part of the CTBT IMS; and
- Data Acquisition and Analysis.

The technological aspect tasks or activities are mainly based to the technical component of the CTBT verification system, namely the International Monitoring System (IMS), the International Data Centre (IDC) and On-Site Inspection (OSI). In this regard, Malaysia is hosting a CTBT radionuclide monitoring station coded as RN42, located in Tanah Rata, Cameron Highlands, Pahang Darul Makmur. It has been officially certified by the CTBTO Prep Com on 14 July 2009.

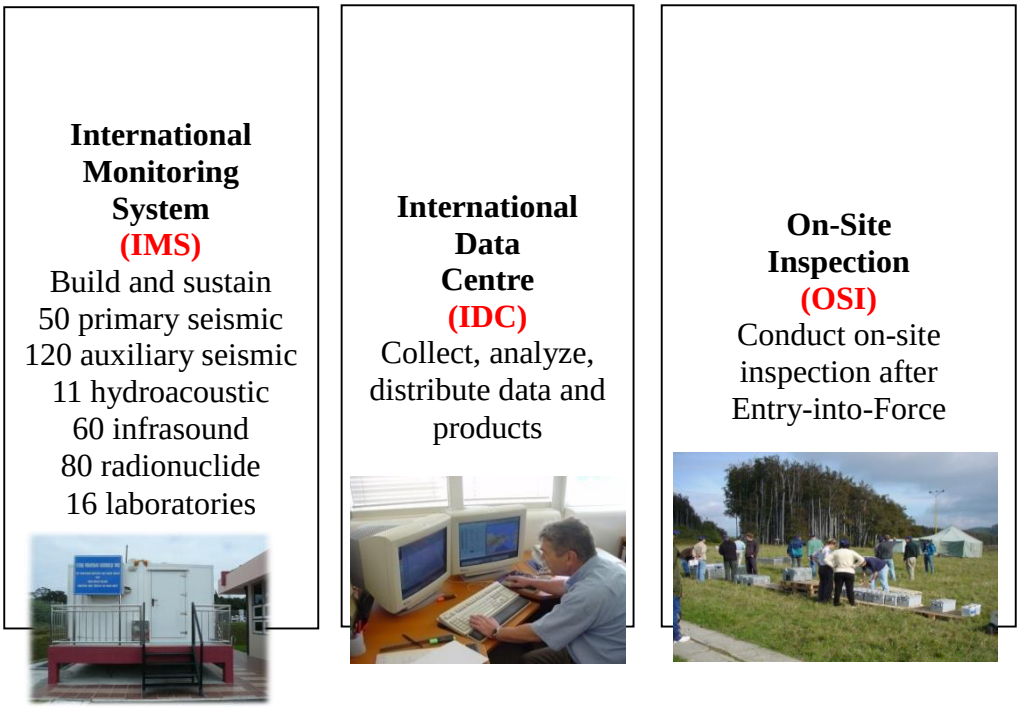

Figure 1 : Technical Components of CTBT Verification System (CTBTO PTS, 2018)

CHAPTER TWO
THE RADIONUCLIDE STATION RN42

2.1 Introduction

The Radionuclide Monitoring Station RN42 is owned and operated by the Government of Malaysia, though, the station is under the authority of the Comprehensive Nuclear-Test-Ban Treaty Organization Preparatory Commission (CTBTO Prep Com). This is accordance with the Article IV, para. 17 of the Treaty that stated The IMS “shall be placed under the authority of the Technical Secretariat”
All facilities “shall be owned and operated by the States hosting or otherwise taking responsibility for them”. The development of the radionuclide monitoring station, RN42 at Tanah Rata is one of Malaysia’s obligations towards the CTBT. Several Divisions in the Nuklear Malaysia were involved in the planning, coordination, development, operation and maintenance of the Station RN42. The Planning and International Relations Division (BPA) was tasked with the planning, site selection, preparation for enactment of the CTBT Act and coordination of the RN42 project. The Engineering Division (BKJ) was responsible for the development of civil work and installation and maintenance of electrical wirings and power generation set. The Health and Radiation Safety Division (BKS) was responsible for the site selection, operation and management of the station while the Technical Support Division (BST) is responsible for the maintenance of the associated electronic and scientific equipment.

2.2 Development of Station RN42

Station RN42 is located on the highland “spine” of Peninsular Malaysia which is in Cameron Highlands, Pahang Malaysia (latitude: 4.48422, longitude: 101.371237) about 260km far away from Malaysian Nuclear Agency office. The station was certified on 14th July 2009. The operational and maintenance activities of this station received a very good collaboration and supports from the Malaysian Meteorological Department (MET Malaysia). MET Malaysia has agreed for the Station to be located at their weather station which is also a Regional Global Atmospheric Watch station (Regional GAW Station). MET Malaysia also supports Nuklear Malaysia by arrange for her staff to work as a part-timer to carry out day to day operation of the station such as radionuclide sampling. This collaboration project has save operational and maintenance cost of the station by using existing government’s resources.

Figure 2:MET Malaysia Regional Global Atmospheric Watch Station (Regional GAW Station)

Initially, there were several proposed sites for the station:

a). First Phase in 2002: Proposed Station Site
- Tanjung Tuan, Melaka
- Bukit Jugra, Banting Selangor

b). Second Phase in 2004: Proposed Station Site
- Bukit Tinggi, Pahang
- Setiawan, Perak
- Cameron Highland, Pahang

Then, on 14 December 2004, the Government of Malaysia decided for the station to be located at Tanah Rata, Cameron Highlands. This decision based on the availability of resources and facilities, as well the pristine environment of Cameron Highlands.

Infographic of selection and site investigation

The development of Station RN42 involved Malaysia and international contractor that was appointed by the PTS. Thus, with team members consisting those of different disciplines, different nationalities who spoke different language, lived in different parts of the world with different time zones and are used to different work ethics and electrical standards, many challenges were faced during the development of the Station RN42 project. The different time zones meant that the communication by emails would only get replied in a 12 to 24 hours lapse and the different electrical caused a fire mishap at the station. To add to this, the remote location of the site, which is on top of a hill with an access road nearly 45^{o} slope, made the transport of heavy equipment to the site even more challenging.

Many lessons were learnt in the course of planning and development of the project. Once the project was underway, careful planning was crucial to ensure the project

stays on track. Good planning important so that time was not wasted correcting mistakes.

For a collaborative project such as this, the coordination was ultimately all about communication and teamwork. Positive relationships and teamwork between team members were the starting point for a happy team which key to a successful project. Meanwhile, project coordination is all about communication to ensure understanding among team members. Keeping in touch regularly and responding to requests promptly because frequent communication helps to keep the project on its trajectory.

Infographic on development of station

Chronology of the Development of Station RN42

2.3 Organization Chart

Chart for the Implementation of CTBT in Malaysia:

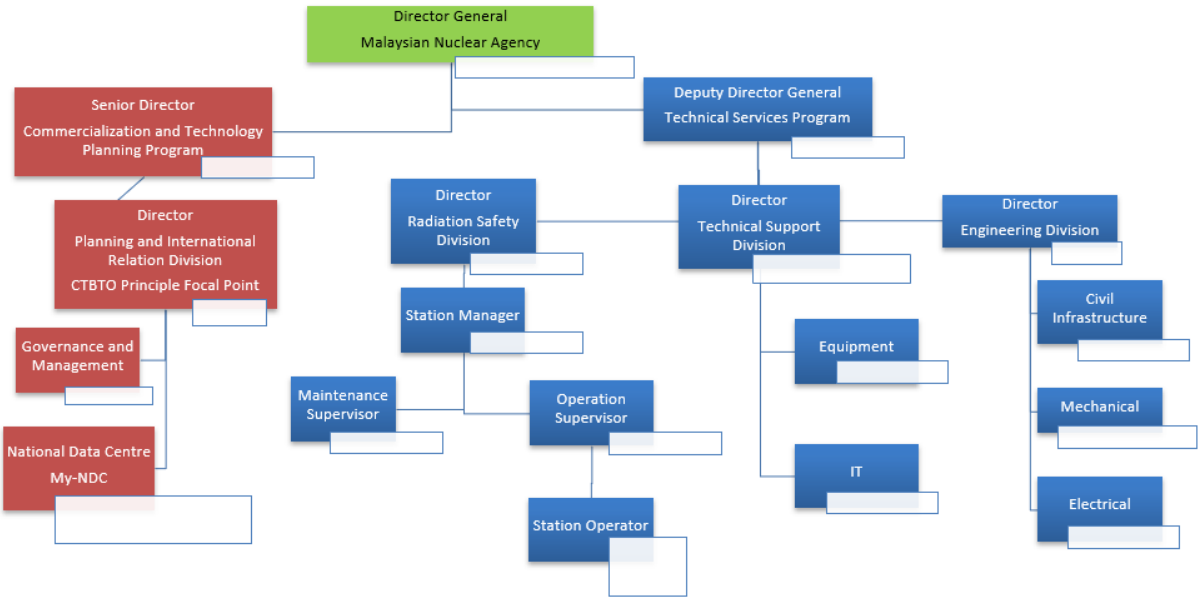

Figure 3: The Chart of Malaysian Nuclear Agency as the National Authority

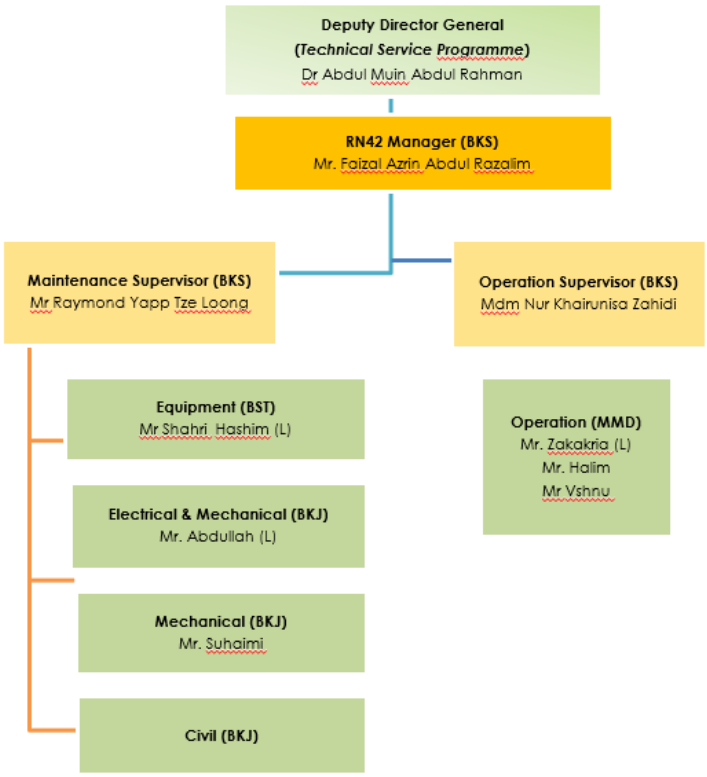

Figure 4: The Chart for the Operational od Station RN42

Inter-agency Collaboration:

1. Malaysian Nuclear Agency (as the National Authority)
2. Ministry of Energy, Science, Technology, Environment and Climate Change (MESTECC)
3. Attorney General's Chamber (AGC)
4. Ministry of Defence (MINDEF)
5. Ministry of Foreign Affairs (MOFA)
6. Ministry of Home Affairs (KDN)
7. Ministry of Finance (MOF)
8. Ministry of Health (MOH)
9. Ministry of Communication and Multimedia (MCMC)
10. National Disaster Management Agency (NADMA)
11. Science Technology Research Institute for Defence (STRIDE)
12. Royal Malaysian Customs Department
13. Polis Diraja Malaysia (PDRM)
14. Malaysia Meteorology Department (MMD)
15. Atomic Energy Licensing Board (AELB)
16. National Security Council (MKN)

2.4 The Operational of RN42 Station

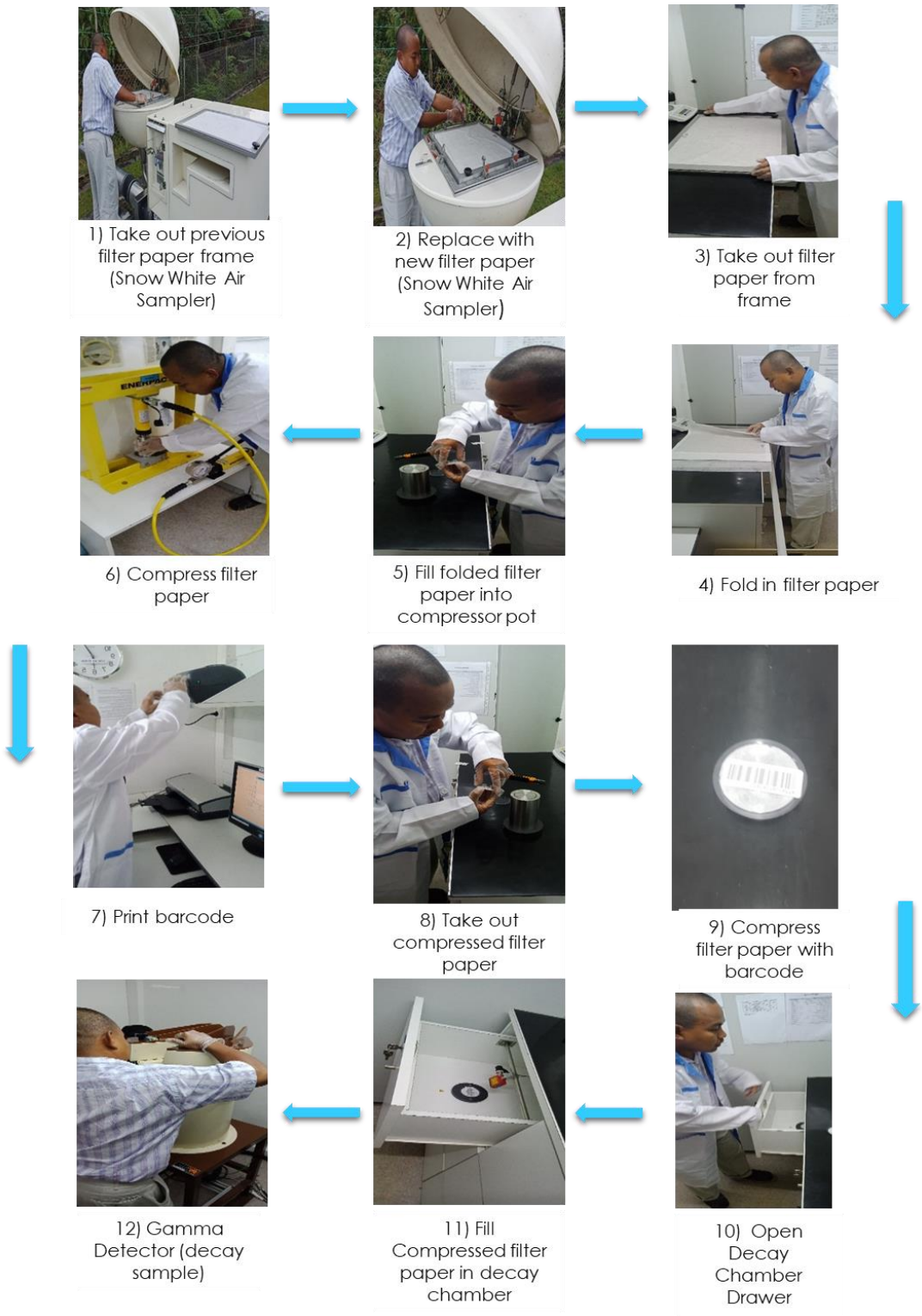

Figure 5 : Daily operation of RN42 Station

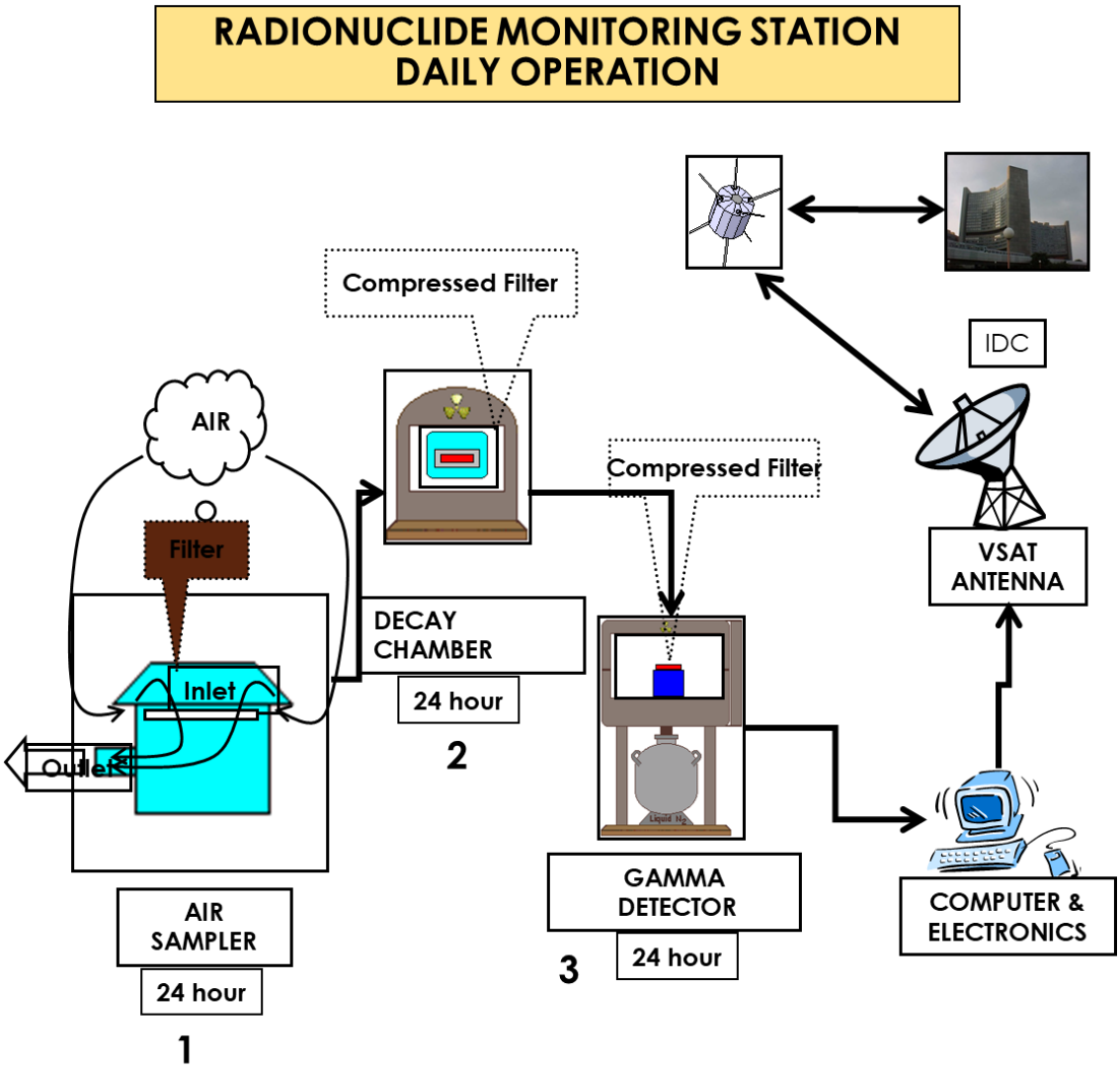

Figure 6 : Schematic RN 42 Operation

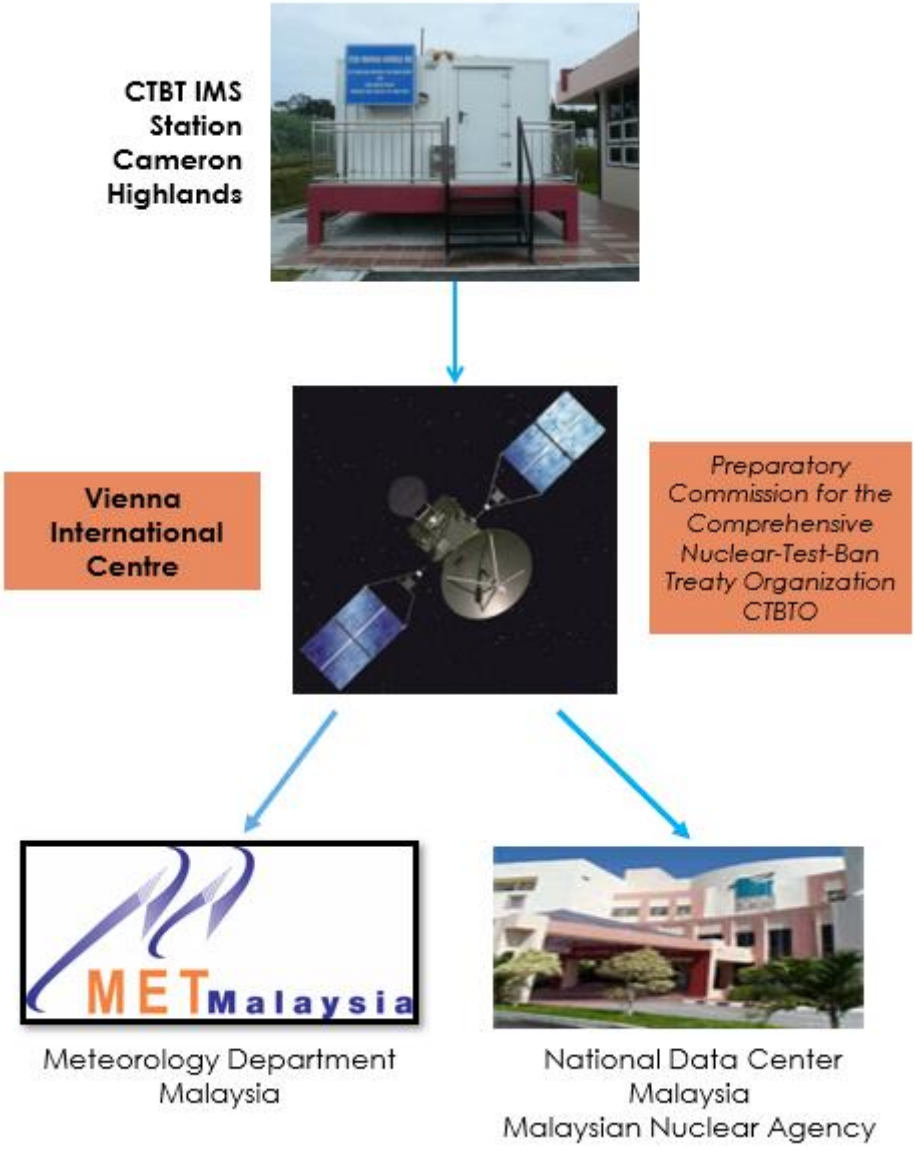

Figure 7 : Data Transfer Process

CHAPTER THREE
THE STATION RN42 OPERATIONAL AND MAINTENANCE

3.1 Introduction

RN42 Station is approx. 260km from the Nuklear Malaysia, thus, all maintenance works need to be systematic to ensure that the operational of the station is smooth and reliable. Nuklear Malaysia implements 2 structures of maintenance program, namely (i) Preventive maintenance (PM) and (ii) Corrective Maintenance (CM).

3.2 Maintenance Programme of RN42 Station

3.2.1 Preventive maintenance (PM)

A periodical maintenance that carry out to minimize unpredictable damages and optimize equipment replacement. It is a regular and routine maintenance to keep equipment up and running, preventing any unpredictable downtime and expensive costs from unanticipated equipment failure.

3.2.2 Corrective Maintenance (CM)

Carry out if there are unpredicted damages to the equipment or system of the station. It will be carry out once requested by station operator or CTBT or suspected failure detected from CCTV monitoring.

Scope of maintenance works for mechanical and electrical system at RN42 Station, but is not limited to, listed as below:

- air conditioner,
- dehumidifier,
- fire protection system,
- CCTV,
- lightning and electrical socket,
- gamma detector
- air sampler
- gamma spectrometer
- meteorology sensors
- electrical supply and
- standby generator

Once every 2 years, the team will produce equipment integrity evaluation report

3.3 Maintenance Schedule of Station RN42

Table 1 : Maintenance Schedule for the Station RN42

No.	Equipment	Spesification	Quantity	Maintenace Schedule
1.	Air Condition	Ceiling Mounted Capacity 4hp 3ph Brand: Acson(2016), York (2018)	2	Periodic (At Least Once In 3 Months-minor Maintenance)
2.	Dehumidifier	Brand: MUNTERS Model MG90 Year Installed: 2018	2	Periodic (At Least Once In 3 Months)
3.	Standby Generator	Brand: Genelec	1	Periodic (At Least Once In 3 Months-test Run)
4.	LED Lamp		4	Anytime (If Broken)
5.	Cabin Portal	Size: 20ft X 10ft X 8ft		Once A Year
6.	Portable Fire Extinguisher	CO2	5	Licensing One Year
7.	CCTV		4	If Broken

Infographic on RN42 maintenance process

3.4 Problem and Challenges

Problem and challenges found in the operational and maintenance works of the RN42 Station.

Infographic on RN42 problem and challenges

CONCLUSION

Station RN42 operating 24/7 regardless during public holiday. Thus, it needs full commitment and responsibility. The operational of Station RN42 is an example of blue ocean strategy which it involves 2 agencies – Malaysian Nuclear Agency and Malaysian Meteorological Department. Besides good cooperation and communication among relevant parties, a good systematic maintenance (preventive and corrective) plan also helps minimize problem and maintenance cost at the station. It has increases lifespan and reliability of equipment. Thus, a good O&M Plan is needed.

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5. Additional info on CTBT

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https://youtu.be/M6c_OtNTRV4 Media 2
https://youtu.be/RyVbjF0_580 Media 3
https://youtu.be/p51bY9bU7zk Media 4