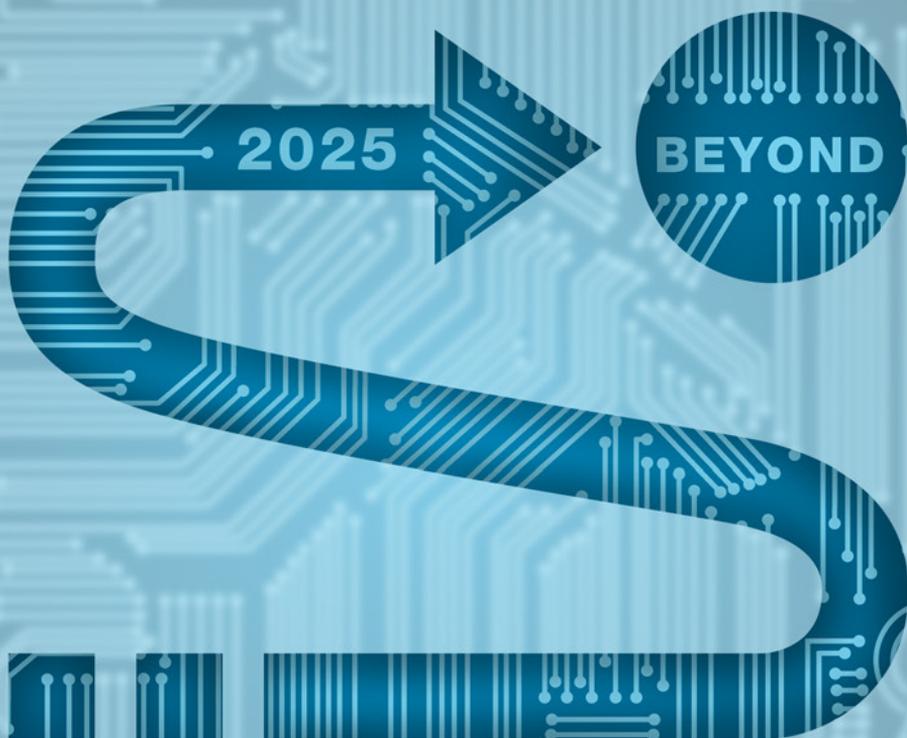


ICT ROADMAP

ON DISASTER MANAGEMENT
FOR 2025 AND BEYOND



ONE ASEAN
ONE RESPONSE



ICT ROADMAP

ON DISASTER MANAGEMENT
FOR 2025 AND BEYOND



2025

BEYOND





THE ICT ROADMAP ON DISASTER MANAGEMENT FOR 2025 AND BEYOND



ONE **ASEAN**
ONE **RESPONSE**

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The development of this ICT Roadmap was supported by Japan-ASEAN Integration Fund (JAIF) under ICT phase IV project.

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A EXECUTIVE SUMMARY

The ICT Roadmap on Disaster Management for 2025 and Beyond is a guideline to ensure the work programme or initiatives of the ICT function are aligned and relevant with the organisation plan and strategic direction. This is a multi-purpose tool that will serve as guidelines for ICT infrastructure and solutions for the AHA Centre and its network with the ASEAN Member States (AMS). This will become an important guideline not only owned by the AHA Centre, but also for all AMS to further enhance the ICT capabilities for the betterment of disaster management of ASEAN region.

The AHA Centre, in close collaboration with the ten representatives from all AMS and ASEAN Secretariat as ICT Task Force conducted the ASEAN Workshop on ICT Roadmap 2025 and Beyond on 17-18 July 2019. The first day of the workshop was designed to broaden views and insights including trends, future, and potential technology that can be implemented on disaster management from several technology experts. The second day of the workshop was intended to collect information from the ten AMS as key inputs to define initiatives and its attached components for the ICT roadmap development.

Each ICT Strategic Pillar has four ICT core values: Connected, Smarter, Influence, and Innovative. The four ICT core values are then translated into well-defined ICT Strategic Pillars and its related initiatives as follows:

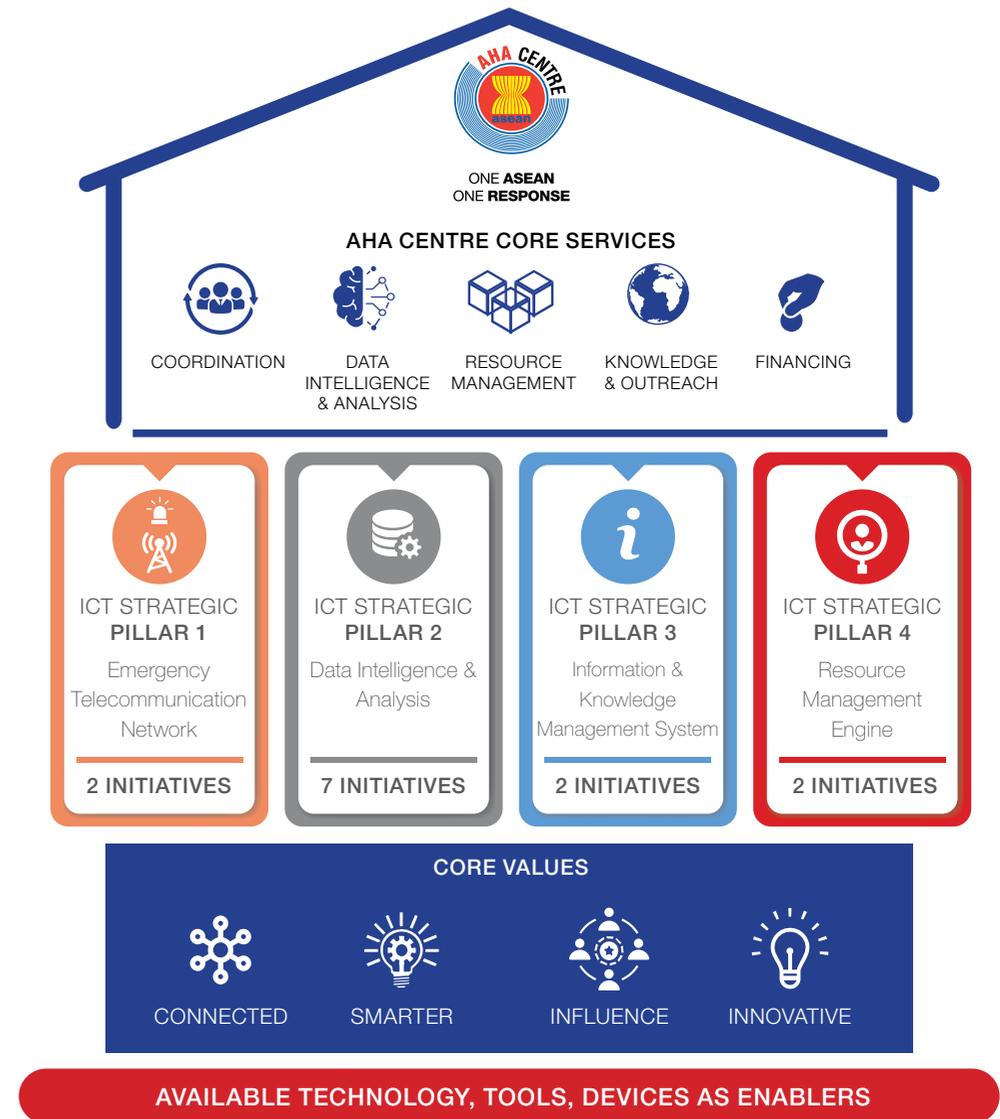


Figure 1. ICT Strategic Pillars and Core Values

Each ICT Strategic Pillar is supported by the following initiatives:

ICT Strategic Pillar 1

EMERGENCY TELECOMMUNICATION NETWORK

- 1 Establishment of Emergency Telecommunications on Disaster Management
- 2 Improvement of Agility & Mobility of Emergency Telecommunications Infrastructure

ICT Strategic Pillar 2

DATA INTELLIGENCE AND ANALYSIS

- 1 Enhancement of Data Collection & Assessment for Emergency
- 2 Integration of the Emergency Information System
- 3 Establishment of Multilingual ASEAN Translation Platform
- 4 Improvement of Integrated Early Warning System through Data Analysis
- 5 Data Sharing & Data Management Agreements
- 6 Climate Modelling & Forecasting
- 7 Public Dissemination Platform

ICT Strategic Pillar 3

INFORMATION AND KNOWLEDGE MANAGEMENT SYSTEM

- 1 Improvement of Human Resource on Disaster Management in the Region through ICT
- 2 Improvement of Knowledge Management through ICT

ICT Strategic Pillar 4

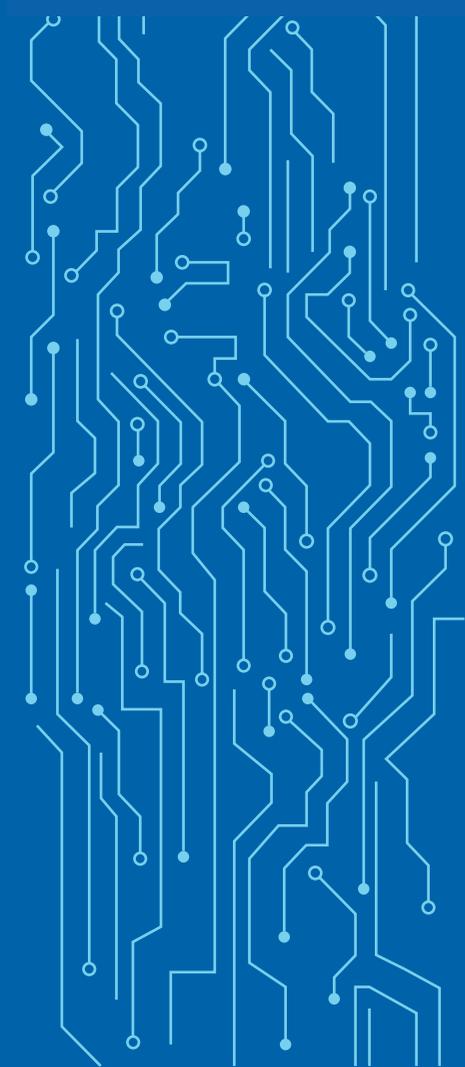
RESOURCE MANAGEMENT ENGINE

- 1 Supply Chain Management
- 2 Partner Engagement & Network Platform

Subsequently, the ICT Strategic Pillars and its initiatives, as well as components, are mapped into a single ICT Roadmap on Disaster Management for 2025 and Beyond. The implementation of the ICT Roadmap of the AHA Centre will be marked by implementing data sharing and data management agreement initiatives and partner engagement & network platform in early 2020. By the end of 2025, the AHA Centre is expected to provide a more integrated information system for the AMS.



B INTRODUCTION



B. 1 BACKGROUND

ASEAN is the most disaster-prone region in the world. More than 50 per cent of global disaster mortalities occurred in the ASEAN region during the period of 2004 to 2014. From the global number of 700,000 fatalities due to disasters that occurred during the period, 354,000 fatalities (or more than half) occurred in Southeast Asia. The United Nations Office for Disaster Risk Reduction reported in 2015 that two ASEAN countries, Indonesia and Myanmar, are among the top 10 countries with the highest disaster mortalities between 1996 to 2015. According to INFORM (which is a global, open-source risk assessment for humanitarian crises and disasters), Indonesia, along with Myanmar and Philippines are among the top five countries in the Asia Pacific that are at the highest risk to host the next large-scale disasters.

Consequently, as a region and as an institution, ASEAN has placed disaster management and response among its highest priorities. As part of its ASEAN Vision 2025 on Disaster Management, it was recognised that “... the region faces a continued evolution of the *humanitarian landscape and nature of disasters. While ASEAN has progressed in terms of cooperation and collaboration, it is evident that the mechanisms to respond to these new challenges need to be further developed.*”. The conclusion being

that ASEAN must recognise and adapt to these changes in innovative ways that also position it as a global reference in the sphere.

Further informing ASEAN’s approach to disaster management, the ASEAN Declaration on One ASEAN, One Response: ASEAN Responding to Disasters as One in the Region and Outside the Region - was endorsed by Heads of Government/State in September 2016. It aims to achieve a faster response, mobilise greater resources and establish stronger coordination to ensure a collective response to disasters. The declaration also provides for ASEAN to eventually respond to disasters outside the region in partnership with other entities.

The ASEAN Committee on Disaster Management (ACDM) initiated the establishment of the Information and Communications Technology (ICT) systems for the ASEAN Coordinating Centre for Humanitarian Assistance on disaster management (AHA Centre) even before the establishment of the AHA Centre in November 2011. When the Agreement on the Establishment of the AHA Centre was signed by the Foreign Ministers of ASEAN and witnessed by the ASEAN Leaders at the 19th ASEAN Summit on 17 November 2011, the initial ICT systems to support the AHA Centre’s operations were already

established through the “Establishment of an Integrated Information and Communication Technology System to Strengthen the Operation of AHA Centre – Phase I”, funded by Japan-ASEAN Integration Fund (JAIF). As the continuation of ICT Phase I project, the AHA Centre has successfully accomplished ICT Phase II project during the period of May 2013 and April 2015. Then, the ICT Phase III project, which was about the establishment of redundant facilities, was accomplished in March 2018.

The Third Meeting of the Project Steering Committee (PSC) of ICT Phase III conducted on 2 March 2017 in Da Lat, Viet Nam and also the Fourth Meeting of PSC of ICT Phase III conducted on 23 February 2018 in Jakarta, Indonesia, mentioned the importance of having a solid long-term ICT Roadmap so that the AHA Centre will have a clearer direction to implement the ICT infrastructure as well as provide solutions to support the work of AMS. During these meetings, the AHA Centre has been tasked to develop an ICT Roadmap for 2025.

Further discussion was continued in the Fourth Meeting of the ACDM Working Group on Knowledge and Innovation Management (KIM WG) conducted on 14-15 May 2018 in Hanoi, Viet Nam. The meeting agreed that the AHA Centre will

form a task force and develop the AHA Centre ICT Roadmap 2025 as part of the ICT Phase IV Project.

The AHA Centre has organised several platforms involving AMS representatives, ASEAN Secretariat, experts, ASEAN Dialogue Partners, ASEAN Development and Sectoral

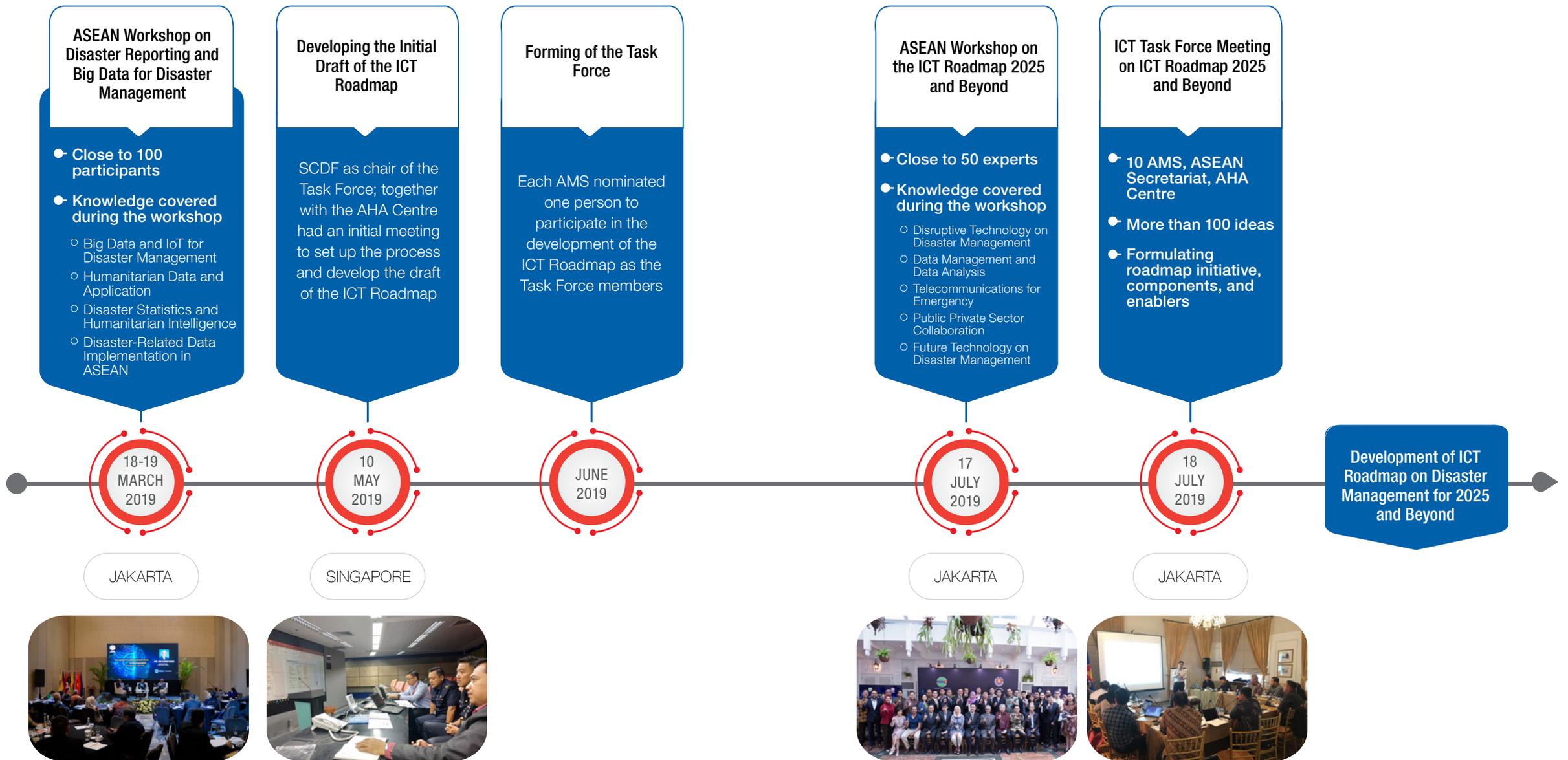


Figure 2. Development Process of ICT Roadmap on Disaster Management for 2025 and Beyond

Dialogue Partners, regional and international organisations, academic institutions, civil societies and the private sector in order to optimise input gathering for the development of a comprehensive ICT Roadmap based on the current state of the ICT system of the AHA Centre and AMS, technology trends and the needs as follows:



ASEAN Workshop on Disaster Reporting and Big Data for Disaster Management

18 - 19 March 2019, Jakarta

The ASEAN Workshop on Disaster Reporting and Big Data for Disaster Management was held on 18- 19 March 2019 in Jakarta, Indonesia. The workshop was attended by close to 100 participants with up to three representatives from each ten AMS, ASEAN Dialogue Partners, ASEAN Development and Sectoral Dialogue Partners, among others from Japan, United States, Australia, Canada, EU, ICT and data experts and professionals from UN, regional and international organisations, academic institutions, civil societies and the private sector.

The workshop was organised by the AHA Centre as part of the ICT Phase IV project under the purview of the ACDM, with funding support from Japan-ASEAN Integration Fund (JAIF). It was intended to identify the current state of data analysis and management of disasters and hazards in AMS and in the ASEAN region; deliberate and exchange insights on disaster data collection, storing, reporting and sharing mechanisms, as well as innovations in information management in AMS and in the ASEAN region; explore relevance of Big Data and IOT applications for disaster management in AMS and in the region; and define the role of the AHA Centre as a regional knowledge hub for disaster management in the ASEAN region.

The first day of the workshop covered three panel sessions engaging experts to talk about Introduction of Big Data and Internet of Things, Humanitarian Data and Applications, and the Future of Humanitarian Data Intelligence. The workshop participants then worked in groups to deliberate on the topic of Unboxing Disaster-Related Data Implementation in ASEAN. The discussion focused on what each

AMS currently has, what is next and how to achieve vision for the future, which one of them should be included in the ICT Roadmap on Disaster Management 2025 and Beyond. The participant list of the workshop is attached in **Annex 1**.



Initial Meeting with ICT Task Force Chair

10 May 2019, Singapore

Upon completion of the ASEAN Workshop on Disaster Reporting and Big Data for Disaster Management, the AHA Centre worked closely with Singapore as the Chair of ICT Task Force in order to come up with the Draft ICT Roadmap 2025 and Beyond. The peak of the discussion was the initial meeting on 10 May 2019 at the Singapore Civil Defence Force (SCDF) office in Singapore. The meeting successfully set up the process to be adapted and developed for the initial Draft ICT Roadmap 2025 and Beyond, including the preparation of the ICT Roadmap Workshop and proposed timeframe.



Forming of the ICT Task Force

June 2019

As the follow up of the Fourth Meeting of the KIM WG conducted on 14-15 May 2018 in Hanoi, Viet Nam, the ICT Task Force was then formed. Each AMS through the ACDM Focal Point was requested to nominate one candidate as a member of the ICT Task Force. Upon receiving input from the respective ACDM Focal Point, the ICT Task Force was officially formed. The nominated ICT Task Force members were invited to attend a workshop and the ICT Task Force Meeting in July to discuss and provide input to the ICT Roadmap 2025 and Beyond.

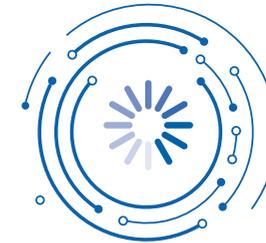


ASEAN Workshop on ICT Roadmap 2025 and Beyond

17 - 18 July 2019, Jakarta

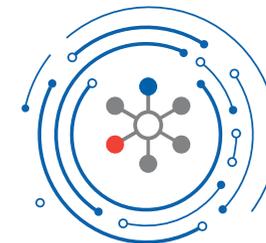
The ASEAN Workshop on the ICT Roadmap 2025 and Beyond, which was conducted on 17-18 July 2019, comprised of two sessions, first session on the first day was presentation sessions by experts, and the second session on the second day was the ICT Task Force Meeting. The workshop aimed to provide meaningful information on the technology trends on disaster management from the experts. Insightful adoption of technology trends on disaster management from five presentation sessions on the day was expected to bring ideas for the AMS in outlining needs as inputs to the ICT Roadmap on Disaster Management for 2025 and Beyond.

The workshop was attended by around 50 participants from the AHA Centre, ASEAN Secretariat, experts from UN, regional and international organisations, private sector, civil society and academic institutions, as well as nine AMS who were involved in outlining inputs as ICT Task Force. They were representatives from the NDMOs of Brunei Darussalam, Cambodia, Indonesia, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Viet Nam. Lao PDR provided input on the identified needs to the AHA Centre separately. The participant list of the workshop is attached in **Annex 1**.



B. 2 OBJECTIVES

The ICT Roadmap on Disaster Management for 2025 and Beyond is a guidance for use by the AHA Centre for the strategic planning cycle of 2025 and beyond. It is a living document that should evolve as implementation proceeds. Consequently, the roadmap aims to enhance ICT development and capabilities to support the AHA Centre and interoperability with the AMS for operationalising One ASEAN One Response. The roadmap is comprehensively suitable as principle to consolidate various activities into implementable outputs and defined goals as well as a tool to monitor the implementation progress for better disaster management.



B. 3 ICT ROADMAP DEVELOPMENT FRAMEWORK

To strengthen the foundation in the development of the ICT Roadmap on Disaster Management for 2025 and Beyond, a strong framework on ICT development which is a globally recognised best practice should be referred to. Hence, the ICT Roadmap development adopts The Open Group Architecture Framework (TOGAF) as a reference. The TOGAF is a proven Enterprise Architecture (EA) methodology and framework used by the world's leading organisations to support and proven to improve the business process. The Architecture Development Method (ADM) is the core of TOGAF that is widely adopted by many organisations and consists of the detailed step-by-step process for developing or enhancing the EA. In total, there are eight phases within the ADM as follows:

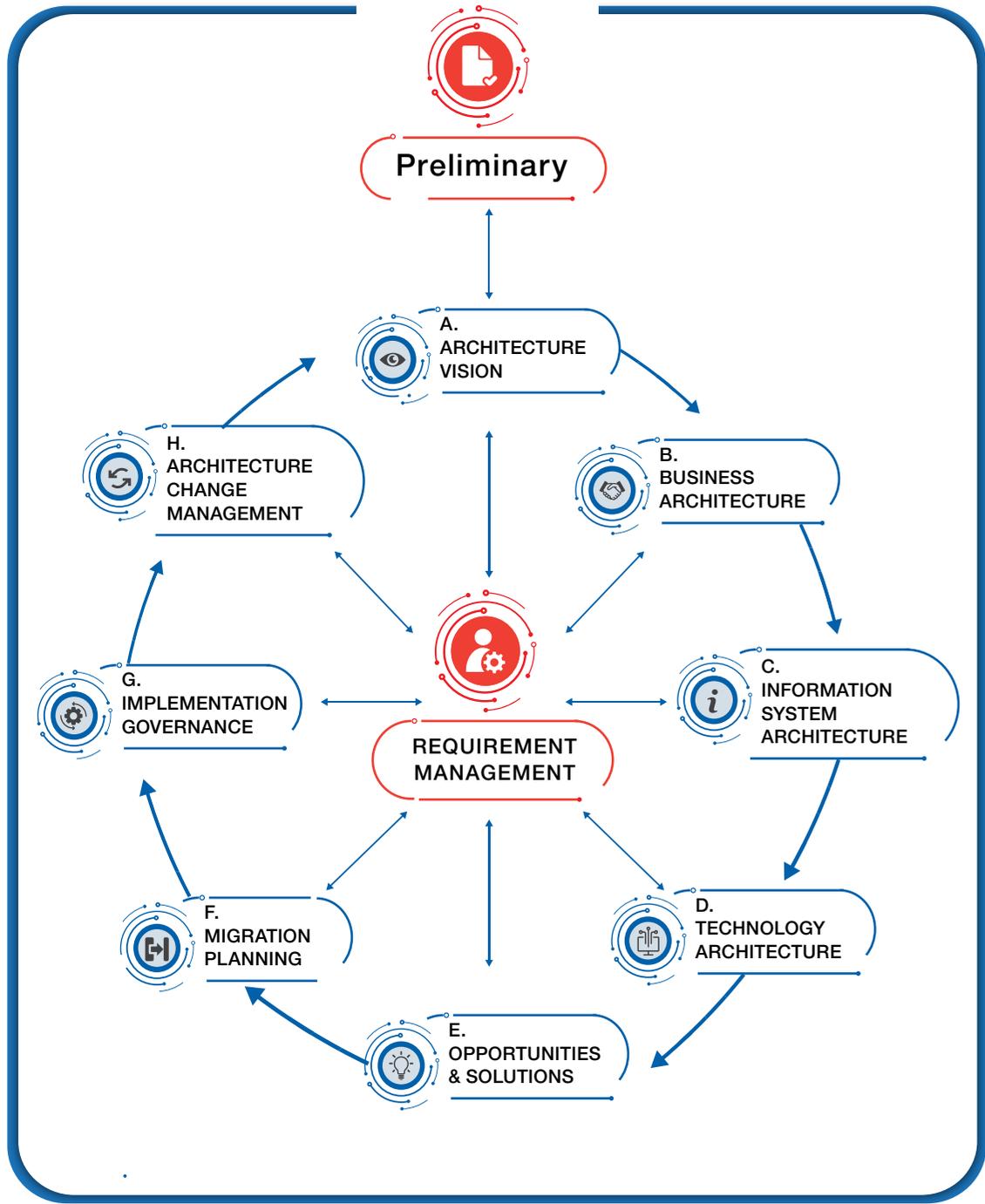


Figure 3. TOGAF Framework

The ADM guided the ICT Roadmap on Disaster Management for 2025 and Beyond development where the eight phases are stratified into two categories:



1. Strategic Planning Cycle

The strategic planning cycle consists of Architecture Vision (phase A), and Business Architecture (phase B). Phase A describes the initial phase of an ICT development cycle. It includes information about the view from all involved stakeholders as well as an understanding of the organisation’s vision in the development of the ICT Roadmap.

Phase B describes the identification of stakeholders’ need in the ICT Roadmap and also the AHA Centre Core Services.



2. The Technical Implementation Planning Cycle

In general, this planning cycle is a concern in detailing the implementation plan according to the identified stakeholders needs in terms of ICT from Phase B.

From the above categories, the AHA Centre ICT Roadmap development is currently in the strategic planning cycle. To be more precise, the TOGAF ADM is translated into the following official framework of the AHA Centre ICT Roadmap development:

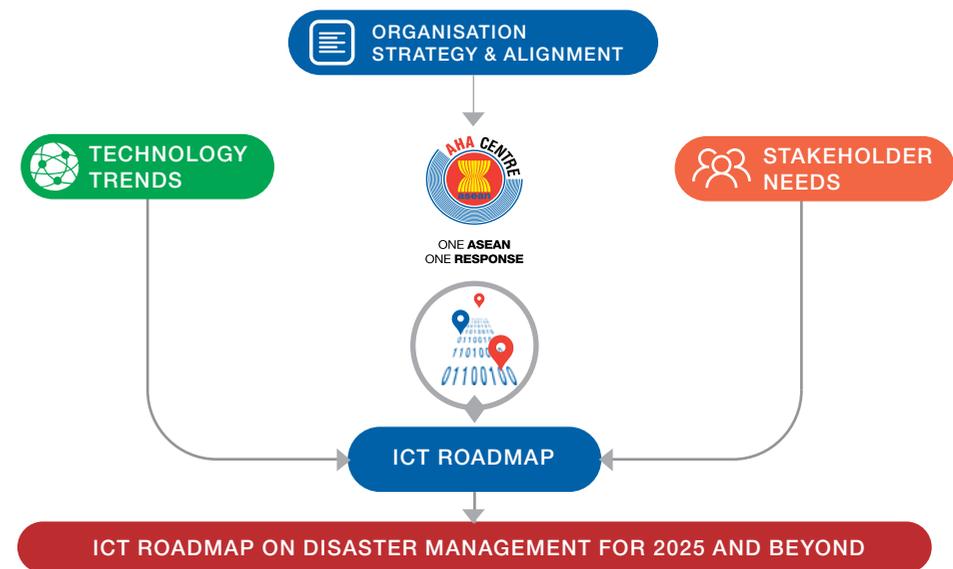


Figure 4. The ICT Roadmap Development Framework



TECHNOLOGY TRENDS

In this modern world, technology is changing rapidly. The advancement and innovation have created new opportunities for enhancing lives in various sectors including disaster management. During the first day of the ASEAN Workshop on ICT Roadmap 2025 and Beyond, speakers and experts from various sectors were invited to give insights including trends, future and potential collaboration in each area and broaden the perspectives of the ICT Task Force members.



ORGANISATION STRATEGY AND ALIGNMENT

It was emphasised that the development of the ICT Roadmap on Disaster Management for 2025 and Beyond should consider the following factors as its main strategic sources:

- A** ASEAN Declaration on One ASEAN One Response: ASEAN Responding to Disasters as One in the Region and Outside the Region;
- B** ASEAN Vision 2025 on Disaster Management;
- C** AADMER Work Programme 2016-2020.



STAKEHOLDER NEEDS

On the second day of the workshop, the ICT Task Force discussed deeper to elaborate and formulate the needs on which technology trends that will significantly beneficial on disaster management in ASEAN region. Adopting the spirit of ASEAN, each AMS representative has equal rights to contribute as each contribution is very important to define initiatives and its attached components.



ICT ROADMAP ON DISASTER MANAGEMENT FOR 2025 AND BEYOND

As the needs have been identified, the AMS representatives were requested to systematically prioritise each initiative using the following variables:

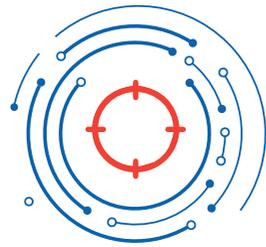
URGENCY

DEPENDENCY

It was agreed by the ICT Task Force that the third variable, i.e. Effort, will be decided by the AHA Centre as the AHA Centre would be in a better position to know the availability of the resources required to set the relevant priority. The final priority including timeline will be set by considering those all three variables.

C ICT PRINCIPLES

To ensure the ICT Roadmap delivers both the valuable and implementable outcomes, the following principles have been defined:



C.1 FOCUS ON THE ASEAN VISION 2025 ON DISASTER MANAGEMENT

Within the 2020-2025 and beyond, the Roadmap aims to advance ASEAN's longer-term vision in the following ways:

- Faster response, more resources, and stronger coordination for collective response – Working through the AADMER platform for the implementation of One ASEAN, One Response, and with the AHA Centre as the primary regional coordinating agency for disaster management and emergency response, the Roadmap will help ASEAN build upon, and accelerate, its efforts to ensure emergency situation and disaster are effectively managed through the effective and innovative Information and Communication Technology.

- ASEAN as a global reference in disaster management – Building on the enhancements to ICT infrastructure and system, the Roadmap will help introduce innovations in monitoring, assessment, response, recovery and knowledge management, which will distinguish ASEAN as the global leader in disaster management.
- Capacity to respond both within and outside regional borders – As ASEAN emerges as a global reference in disaster management, the Roadmap will help ensure that the advances made in ICT position the organisation to expand its capabilities, not only within the region but also outside the region.



C.2 COHERENCE IN REQUIREMENT

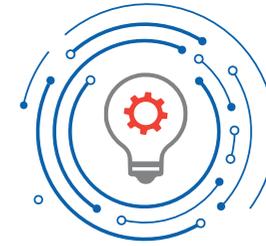
The Roadmap is developed by considering the ICT requirements of the five ACDM Working Groups and the AHA Centre together to ensure that the redundancy, overlapping and duplication are eliminated. Collaboration with the AMS' National Disaster Management Organisations (NDMOs) is required to ensure there is coherence on the requirement across all five ACDM Working Groups.



C.3 ICT INTEROPERABILITY PRINCIPLE

When the ICT seemingly becomes devoted to the business process, ICT needs to provide, maintain, and enhance its interoperability within systems. Therefore, the ICT development of the AHA Centre should consider the following substances to conform with the interoperability principle:

- 1 Interoperability standards and industry standards will be followed unless there is a compelling business reason to implement a non-standard solution;
- 2 A process for setting standards, reviewing and revising them periodically, and granting exceptions must be established;
- 3 The existing IT platforms must be identified and documented;
- 4 Data object and its following flow should be defined and analysed to attain interoperability and data destination transparency.



C.4 ICT SOLUTION PREFERENCE/ TECHNOLOGY ENABLER

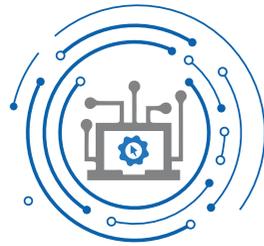
Where possible, the Roadmap will define the preferred technology/solutions to support the requirements of the five ACDM Working Groups and the AHA Centre. The selected solutions are considered based on the consolidated requirement, IT global best practice, technology trend, principles for digital development, financial sustainability as well as the integration of the current ICT system of the AHA Centre and the AMS.



C.5 RESOURCING EXPECTATIONS

The ICT Roadmap document is also intended to be as a guideline for the following AHA Centre's potential and existing resources/donors/partners, amongst others, in considering their future assistance/support/collaboration:

- 1 ASEAN Member States, including the NDMOs through ACDM, and information and telecommunications senior officials through TELSOM;
- 2 ASEAN Dialogue Partners;
- 3 ASEAN Sectoral Dialogue Partners;
- 4 ASEAN Development Partners;
- 5 Regional & international organisations, UN, Red Cross & Red Crescent Movement, civil societies, academic institutions;
- 6 Private sector.



C.6 PRINCIPLES FOR DIGITAL DEVELOPMENT

The principles for digital development are nine living guidelines that are designed to help integrate best practices into technology-enabled programmes and are intended to be updated and refined over time. They include guidance for every phase of the project life cycle, and they are part of an ongoing effort among development practitioners to share knowledge and support continuous learning.

They were first created in consultation with organisations such as the Bill and Melinda Gates Foundation, the Swedish International Development Agency (SIDA), the UN Children's Fund (UNICEF), UN Development Programme (UNDP), the World Bank, the U.S. Agency

for International Development (USAID), and the World Health Organization (WHO). Now it is widely endorsed by, among others, UN World Food Programme, World Vision, World Bank Group, WHO, USAID, UN University (UNU), UN Industrial Development Organization (UNIDO), UK Aid, Save the Children, Plan International, and Oxfam.

The nine principles, which are intended to help practitioners succeed in applying digital technologies to development programmes, are summarised as follows:



1. Design with the User

Successful digital initiatives are rooted in an understanding of user characteristics, needs and challenges. User-centred design — also referred to as design thinking or human-centred design — starts with getting to know the people you are designing for through conversation, observation and co-creation. Designing together means partnering with users throughout the project lifecycle, co-creating solutions, and continuously gathering and incorporating users' feedback.



2. Understand the Existing Ecosystem

Well-designed initiatives and digital tools consider the particular structures and needs that exist in each country, region and community. Dedicating time and resources to analyse the ecosystem, or context, where you work, helps to ensure that selected technology tools will be relevant and sustainable and will not duplicate existing efforts.



3. Design for Scale

Well-designed initiatives and digital tools consider the particular structures and needs that exist in each country, region and community. Dedicating time and resources to analyse the ecosystem, or context, where you work, helps to ensure that selected technology tools will be relevant and sustainable and will not duplicate existing efforts.



4. Build for Sustainability

Building sustainable programmes, platforms and digital tools are essential to maintain user and stakeholder support, as well as to maximise long term impact. Sustainability ensures that user and stakeholder contributions are not minimised due to interruptions, such as a loss of funding.



5. Be Data-Driven

No amount of data will lead to accelerated impact if it is not used to inform decision making. When an initiative is data-driven, quality information is available to the right people when they need it, and they are using those data to take action. The data produced by a digital initiative should be used for more than just outputs, such as published work or donor reporting. Examples of the types of data that can be collected to inform decision making include surveillance, research, operations, project management and data from secondary source collected outside of the programme.



6. Use Open Standards, Open Data, Open Source, and Open Innovation

An open approach to digital development can help increase collaboration in the digital development community and avoid duplicating work that has already been done. Programmes can maximise their resources - and ultimately their impact - through open standards, open data, open-source technologies and open innovation. By taking advantage of existing investments, finite digital development resources can be applied toward creating global goods.



7. Reuse and Improve

Reuse means assessing what resources are currently available and using them as they are to meet programme goals. Improve means modifying existing tools, products and resources to improve their overall quality, applicability and impact. Reusing and improving is not about designing shiny new objects or limiting technology to internal use; it is about taking the work of the global development community further than any organisation or programme can do alone. Reusing and improving can also dramatically reduce the time needed for development and testing, and reduce your costs.



8. Address Privacy and Security

Addressing privacy and security in digital development involves careful consideration of which data are collected and how data are acquired, used, stored and shared. Organisations must take measures to minimise the collection and to protect confidential information and identities of individuals represented in data sets from unauthorised access and manipulation by third parties.



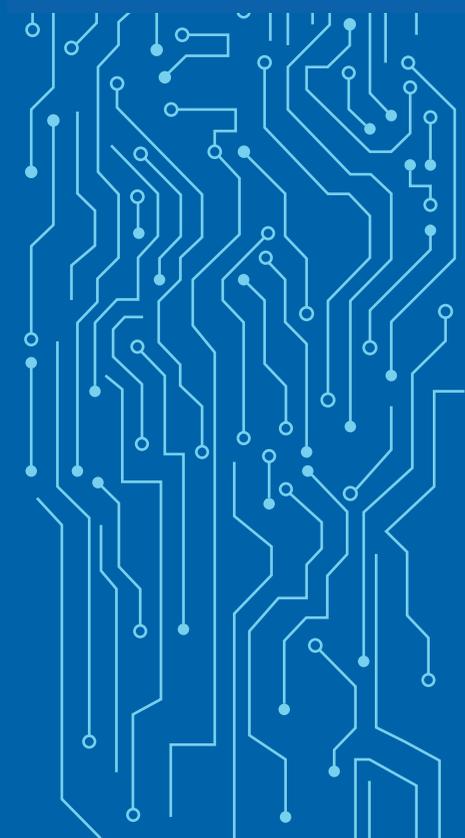
9. Be Collaborative

Being collaborative means sharing information, insights, strategies and resources across projects, organisations and sectors, leading to increased efficiency and impact. This Principle brings all the others together in practice. People working in digital development have a shared vision to create a better world, and collaboration is essential to making this vision a reality.

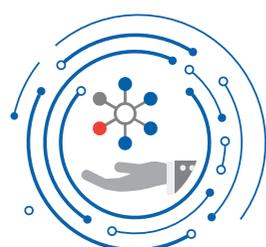
The complete Principles for Digital Development are available on <https://digitalprinciples.org>



D CURRENT ICT SERVICES & TECHNOLOGY TRENDS



In supporting the AHA Centre Core Services, numbers of ICT services are provided to the AMS. In summary, current ICT services are stratified into two categories (i.e.: core ICT services and supporting ICT services). Afterwards, some of the technology trends to be considered as technology enablers are also mentioned.



D. 1 CURRENT ICT SERVICES OF THE AHA CENTRE

To enhance cooperation among the AMS and strengthen coordination for a collective response, the AHA Centre is currently providing numerous ICT services. In total, there are there are several ICT services that are provided to the AMS as the following figure:

THE FIVE CORE SERVICES OF THE AHA CENTRE

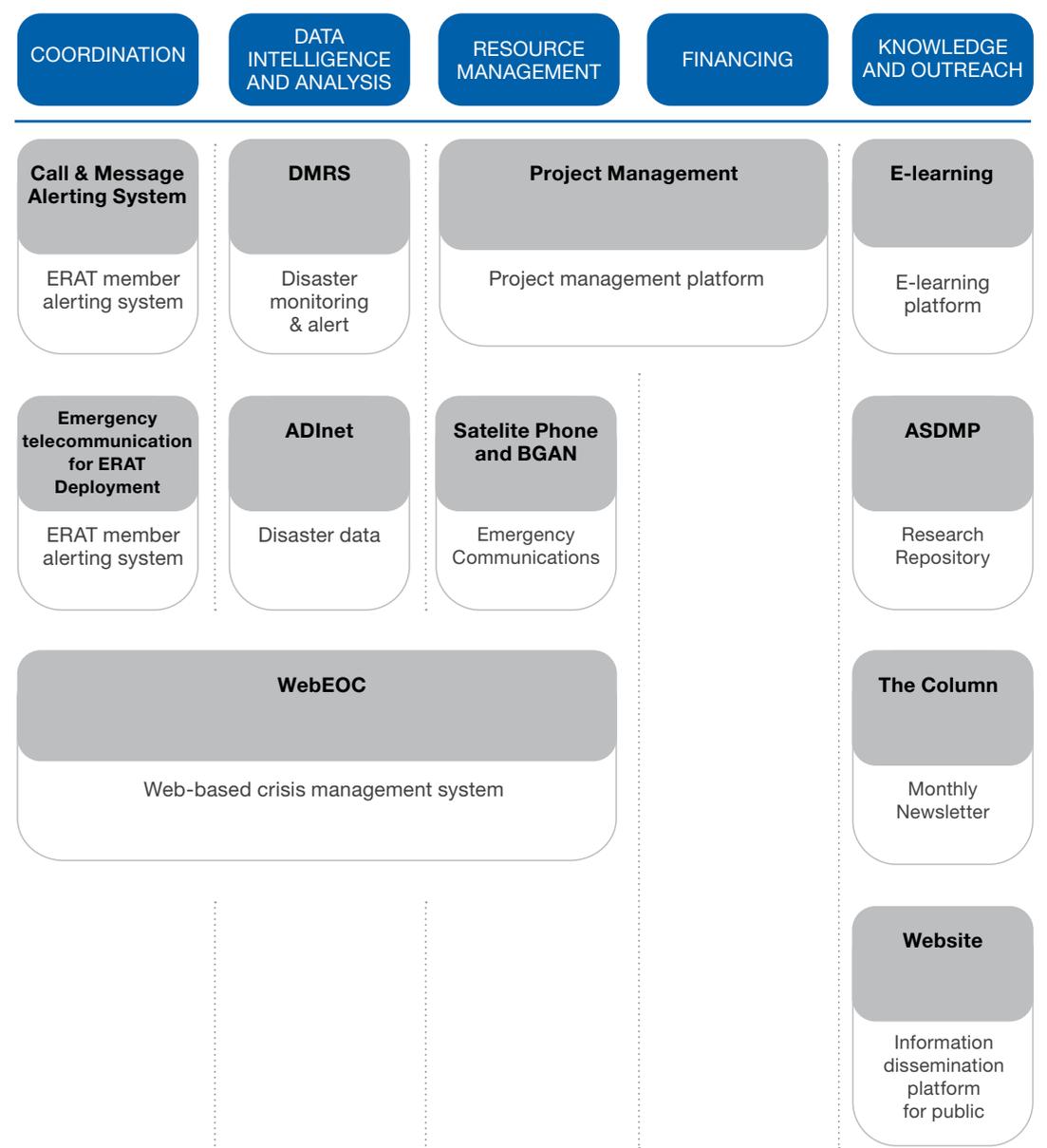
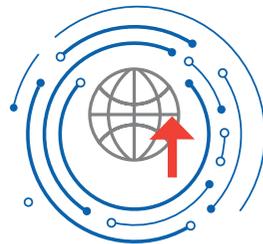


Figure 5. The Current ICT Services of the AHA Centre based on its Five Core Services

The current ICT services have been consolidated in accordance with the AHA Centre Core Services (i.e. Coordination, Data Intelligence & Analysis, Resource Management, Financing, and Knowledge and Outreach). WebEOC as the web-based crisis management system plays a significant role in assisting three core services which cover Coordination, Data Intelligence & Analysis, as well as Resource Management. Project management platform that has been utilised by the AHA Centre also has contribution to two core services, which are Resource Management and Financing.

To support Data Intelligence and Analysis core services, there are three available ICT services which are DMRS, ADINet and WebEOC. There are four ICT services which are in line to sustain the Knowledge and Outreach core services, i.e. E-Learning, ASDMP, The Column, and AHA Centre Website.

For better Resource Management on disaster management in the region, the AHA Centre is currently providing the project management platform, satellite phone and Broadband Global Area Network (BGAN) along with the WebEOC. In the future, the AHA Centre intends to provide more ICT-based services which can be accessed and utilised by the AMS



D.2 TECHNOLOGY TRENDS

Technological advancement and innovation have created new opportunities for enhancing lives in various sectors including disaster management. Evolution of wireless connection from 1G to 5G, Internet of Things, Big Data, Artificial Intelligence, Robotics and Drone technology, Cloud Computing, Social Media, all has changed the humanitarian landscape.

Apart from the evolution of broadband technology telecommunication, some other technologies that need to be highlighted in disaster management are:



D.2.1 Unmanned Aerial Vehicle (UAV)

The UAV has been developed over the years with multiple purposes in particular on disaster management. This technology has been developed over the years in which including rotary wing vehicle and fixed wing vehicle. The characteristic of the UAV to the task of providing a good platform to replace the man are to ensure the security and the ability with visual images, allowing users to understand the actual situation. With advances in technology development, the functions of UAV are widely used for different purposes in recent years. These have included surveying the development of city infrastructure, researching agriculture, fishery and farming, monitoring environmental protection, highway driving, forestry management, and disaster management.

When an area is impacted by disaster, the disaster area is frequently located in a remote area and correspondingly in difficult terrain. The disaster assessors are unable to get into the impacted area. On the other hand, the organisation and/or government should assess the impacted area immediately. To overcome this circumstance, satellite can be used, but unfortunately, the operability of satellite may present difficulty to capture the impacted area in the best way which may be caused by the weather (cloud, heavy rain, etc.).

Many organisations have implemented the UAV as an alternative tool for area data collection. Especially in disaster management, the following are some of the applications of the UAV:

1

Monitoring, forecast, and early warning system

The purpose of implementing UAV for monitoring, forecast, and early warning system is to predict the disaster by structural and environmental monitoring, information analysis for forecasting and early warning systems. Predicting and forecasting the natural disaster are executed during the prevention and preparedness phases of the disaster management cycle.

2

Disaster information fusion

The purpose of the disaster information fusion is to combine different sources of information available and/or to make a bridge between different information technologies that can be of use in other applications for disaster management.

3

Situational awareness and logistic

The purpose of UAV application to situational awareness and logistic content is to gather information during the disaster phase especially regarding the movement of the people affected by the disaster, as well as the rescue teams deployed in the disaster area.

4

Damage assessment

The purpose of the UAV application in conducting the damage assessment is to assess the scale of the damage through video inspection. This method could increase efficiency in the damage assessment time.

5

Search and rescue mission

The purpose of the UAV application for search and rescue mission is to search for and rescue the misfortunate people that happen to be lost, trapped by debris or injured during the disaster or immobile by any other means.



D.2.2 Blockchain

When security becomes a solemn topic, blockchain can be adopted as the preference. Blockchain technology has become popular since the introduction of bitcoin as a digital currency. A blockchain is a shared, distributed, tamper-resistance that every and only participants in the network can apply. There is no one participant in the network can control the blockchain mechanism. In addition to the financial industry, blockchain technology is also being adopted for disaster management.

The application of blockchain on disaster management is intended as the catalyst to verify the validity of the information. For example, blockchain can be utilised for supply chain management to verify the overall chain process from the funding source, warehouse management and distribution of the relief item management.



D.2.3 Big Data

As the digitalisation is growing exponentially, many organisations now heavily depend on data. The data and information increasingly become very valuable assets. To manage the collection of data, big data approach is the best option. The general concept of big data is five Vs: volume, variety, velocity, veracity, and value. The main characteristic that makes data big is volume, which means that the amount of data collected should be huge. Variety of data is interesting since it can be structured data and unstructured data. Velocity is the frequency of incoming data that needs to be processed. Veracity refers to the accuracy and trustworthiness of the data. Value is the real objective that determines the worth and usefulness of data.

Big data does not only address the storage technology issues, but also issues related to accessibility, distribution, analysis, and effective visual presentation of data and analysis. In other words, big data can be applied to help organisations in managing their plenty of data from the various data source to support the decision-making process efficiently.

On disaster management, some major data sources that are frequently collected are:

- 1 Satellite imagery;
- 2 UAV (drone);
- 3 Wireless sensor web and internet of things;
- 4 Crowdsourcing;
- 5 Social media;
- 6 Mobile GPS and call data record.

By having the big volume of data itself is not sufficient for the organisation. Those data should be analysed to provide insightful information especially for decision making support. Subsequently, data could not standalone as a system and it requires analytical tools. By having the analytical tool as an integral part of big data implementation, an organisation could potentially obtain the full benefit of the big data implementation for data driven decision making.



D.2.4 Artificial Intelligence

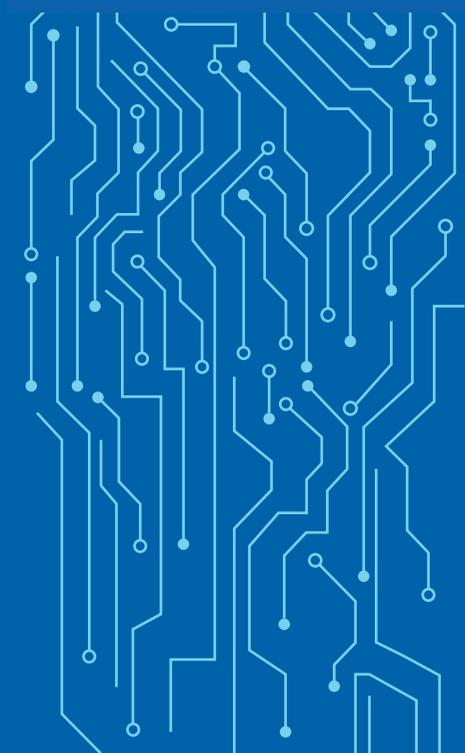
As the data is collected, stored, managed, and visually presented properly to turn into insightful information in a real-time, now information is gradually required to be presented as a future prediction. To predict available information, many organisations applies the algorithm. This algorithm could imitate human intelligence to make a prediction based on a supervised and unsupervised pattern. This algorithm is called Artificial Intelligence (AI).

AI application could have a significant impact on disaster management. The application of AI on disaster management can be beneficial to some aspects as listed below:

- 1 **Processing Information**
AI is usually used for recognition tool specially to recognise imagery in which collected by satellite or drones. Generally, collected imagery will be recognised to identify damaged building, flooding, forest and peatland fires, as well as the blocked road impacted by the disaster event etc.
- 2 **Emergency call centre**
During an emergency call centre might be overloaded. To help the operators, AI can be applied for speech-to-text recognition during an emergency.
- 3 **Social media analysis**
The penetration of social media particularly in ASEAN region is increasingly high. During the disaster, there are many tweets in Twitter which can be mined as real time social sensors providing information about where and what affected people may need and building damage caused by the disaster. Machine learning and AI can be utilised to filter the desired information by defining the keywords or hashtag during the disaster.
- 4 **Predictive analytics**
AI is also used to predict what is likely to happen in the event of a disaster. This could be realised by providing the designated pattern of a disaster event. The data from predictive analytics can support preparedness for disaster response. With good quality of data and analytical skills, predictive analytics can be created.



E ICT STRATEGIC PILLARS, INITIATIVES, COMPONENTS & TECHNOLOGY ENABLERS



Taking into consideration of the ICT Principles (Chapter C) and the Current ICT Services and Technology Trends (Chapter D), the ICT Roadmap on Disaster Management for 2025 and Beyond was developed. The Roadmap used several key terminologies within its frameworks, i.e. ICT Strategic Pillars, initiatives, components, as well as technology enablers. It is critical for the users of the ICT Roadmap on Disaster Management for 2025 and Beyond to understand the differences between these terminologies. The following are the definitions of each level ICT Strategic Pillars, Initiatives, Components and Enablers:

- ICT Strategic Pillars are high-level plans to support five core services of the AHA Centre.
- Initiatives are the highest strategic needs and will be supported by one or more components which aim to attain the ICT Strategic Pillars.
- Components are the detailed activities that are attached to each initiative. They will be prioritised in terms of urgency and dependency.
- Enablers refer to the technology which could be utilised to implement the components and initiatives.



E.1 ICT STRATEGIC PILLARS & INITIATIVES

The identified needs collected from the AMS during the ASEAN Workshop on ICT Roadmap 2025 and Beyond were formulated as keys and input to the ICT Roadmap on Disaster Management for 2025 and Beyond, to serve as guidelines for ICT infrastructure and solutions for the AHA Centre and its network with the AMS.

Upon classification by the AHA Centre, with the help from IT consultants and experts, the AHA Centre ICT Roadmap, which comprises four ICT Strategic Pillars to support the AHA Centre Core Services Elements, was then developed. The four ICT Strategic Pillars have been identified as the main thrust that would drive and support the identified ICT initiatives to be undertaken for 2025 and beyond. The four ICT Strategic Pillars also have been used as the basis of creation of the core values behind the ICT Roadmap on Disaster Management for 2025 and Beyond. It was envisioned by the ICT Task Force that the ICT Strategic Pillars and initiatives would remain relevant at least up to 2030.

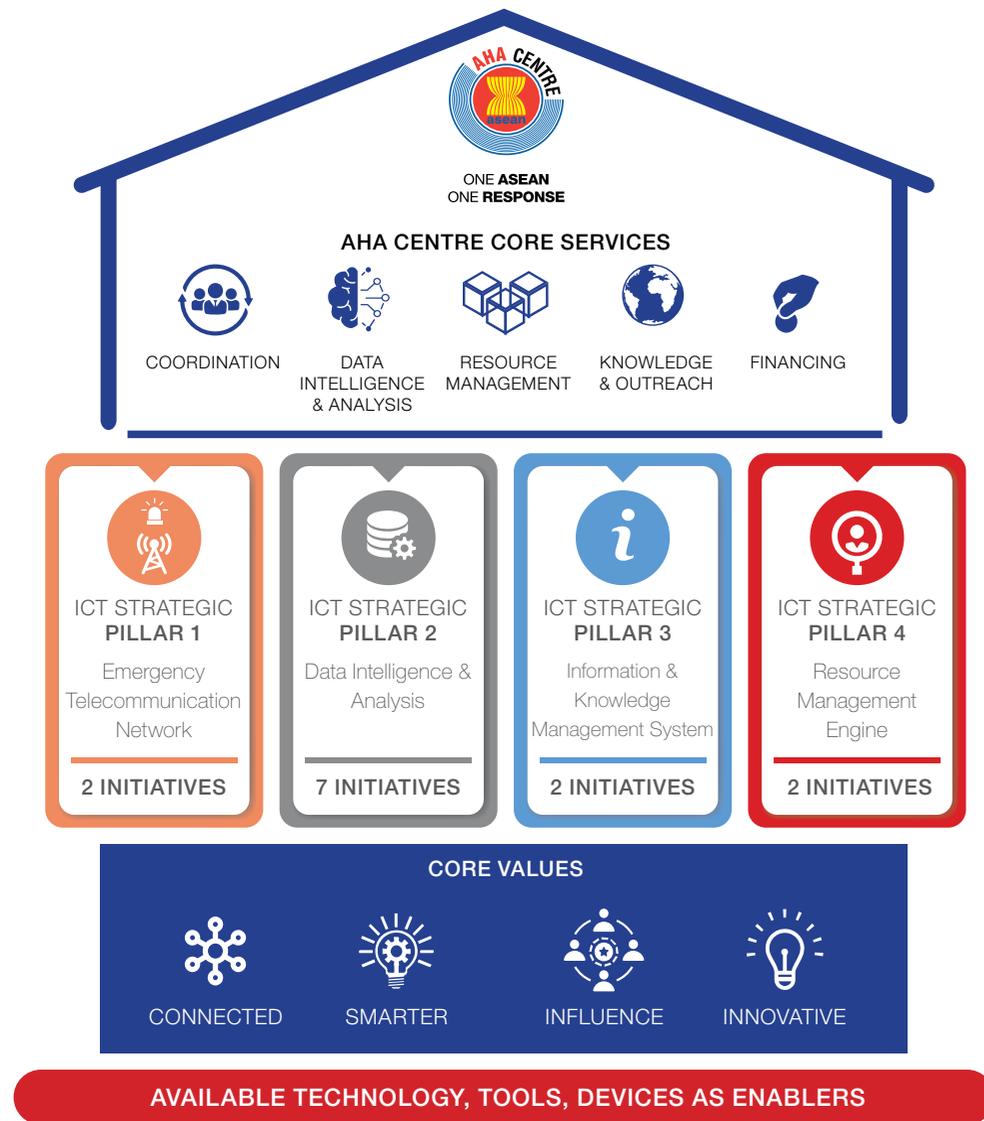


Figure 6. ICT Strategic Pillars and the Respective Initiatives Supported by the ICT Core Values



E.2 COMPONENTS AND TECHNOLOGY ENABLERS

To achieve the desired ICT Strategic Pillars in supporting the five AHA Centre Core Services as well as the ICT Strategic Pillars, the initiatives comprise multiple components. In implementing components, ICT of the AHA Centre can refer to the selected technology enablers as technology reference that can be applied to every component. Those technology enablers are identified during the workshop. It was also agreed by the ICT Task Force that the components and technology enablers should be dynamic in nature and would be subject to a more regular review to ensure its effectiveness and relevancy.

ICT STRATEGIC PILLARS



PILLAR 1
Emergency Telecommunication Network

INITIATIVES



A. Establishment of Emergency Telecommunications Network

B. Improvement of Agility & Mobility of Emergency Telecommunications Infrastructure

PILLAR 2
Data Intelligence & Analysis

A. Enhancement of Data Collection & Assessment for Emergency

B. Integration of the Emergency Information System

C. Establishment of Multilingual ASEAN Translation Platform

D. Improvement of Integrated Early Warning System through Data Analysis

E. Data Sharing & Data Management Agreements

F. Climate Modelling & Forecasting

G. Public Dissemination Platform

PILLAR 3
Information & Knowledge Management

A. Improvement of the Human Resources of Disaster Responders in the Region through ICT

B. Improvement on Knowledge Management through ICT

PILLAR 4
Resource Management

A. Supply Chain Management

B. Partner Engagement & Network Platform

COMPONENTS



Enhancing the agility & mobility to deploy emergency communication equipment

Enhancing the ERAT Telecommunication System

Establishing Regional Emergency Telecommunication Network

Establishing a strong and robust relationship with Telco Provider and Satellite Company

Elevating the proposition capability and mobility of the ICT for emergency equipment including Emergency Operation Centre

Providing reliable information on Regional assessment/mapping on Emergency Telecommunication

Adopting drone technology for disaster management including assessment and data collection

Enhancing Data Collection & Assessment platform

Enhancing the integration of the information system by elevating the interoperability capability of all related systems

Adopting machine learning and artificial intelligence for smart integrated A to Z disaster management platform to support data driven decision making

Providing translation-ready web application

Establishing data sharing and dissemination of information

Establishing ASEAN Chatbot as an enhancement to the dissemination of information

Providing the real-time monitoring tool which covers all over ASEAN region

Establishing data sharing and dissemination of information

Establishing a portal as a single information window of disaster management among AMS

Enhancing data analysis in disaster management

Providing forecast based financing tools

Providing reliable information system to detect, predict, as well as monitor the climate

Establishing a portal as a single information window of disaster management among AMS

Providing single-window public dissemination mobile application

Capacity building on disaster management through ICT

Capacity building on ICT for disaster management

Implementing e-Learning Information System

Scientific researches on ICT for disaster management

Establishing a warehouse control information system

Enhancing and integrating Logistic Management System

Providing the real-time monitoring tool which covers all over ASEAN region

Enhancing the supply chain management for DELSA

Establishing an information system to monitor logistic movement as an enhancement to supply chain management

Providing information system of Disaster Camp Management

Establishing a strong and robust relationship with Telco Provider and Satellite Company

Establishing and developing Partner Engagement & Network Platform

TECHNOLOGY ENABLERS



1. 3D terrain map
2. Application Platform Interface (API) Management
3. Artificial intelligence
4. Big Data
5. Blockchain technology for supply chain
6. Business intelligence tool
7. Chatbot
8. Cloud backup system
9. 3D terrain map
10. Application Platform Interface (API) Management
11. Artificial intelligence
12. Big Data
13. Blockchain technology for supply chain
14. Business intelligence tool
15. Chatbot
16. Cloud backup system
17. Collaborative-based map platform
18. Crowdfunding platform
19. Data analytics tool
20. Data management tool

21. Extract Transform Load (ETL) and Data warehouse platform
22. ICT Training for AMS
23. Internet of Things (IoT)
24. Low earth orbit satellite
25. Machine learning
26. Mobile device platform
27. Natural language processing
28. Open-source data collection
29. Open-source data sharing platform
30. Open-source email platform with official domain address
31. Advanced Cyber Security tool
32. Predictive analysis
33. Sensors
34. Satellite phones
35. Very Small Aperture Terminal (VSAT)

Table 1. The Relationship between ICT Strategic Pillars, Initiatives, Components, and Technology Enablers

● F PRIORITY AND TIMELINE

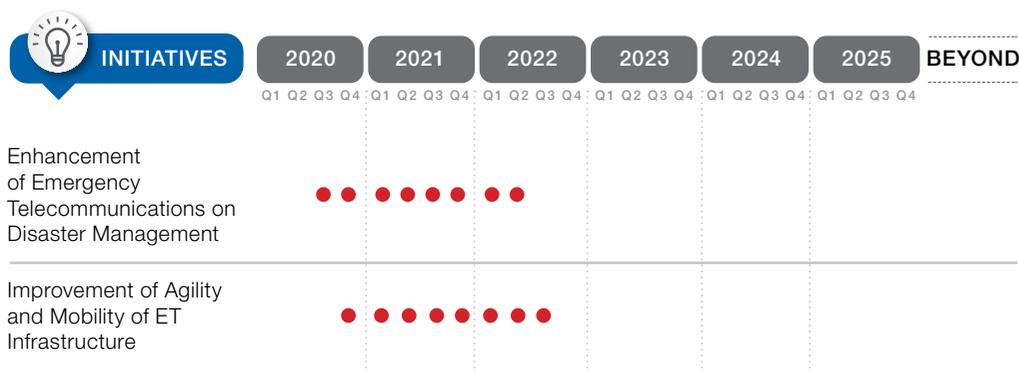
Each AMS contributed inputs to the development of priorities of the ICT Roadmap on Disaster Management for 2025 and Beyond based on their current ICT systems and needs. The AMS needs were then categorised and classified into initiatives and components. Each initiatives and components were ranked based on urgency and dependency level from 1 to 5 scale, with 1 is the lowest priority and 5 is the highest priority. The AHA Centre then formulated the scores and ranks into a strategic document and arranged the priority based on inputs from the AMS as follows:

| INITIATIVES | AVERAGE |
|--|---------|
| Data Sharing and Data Management Agreements | 4.89 |
| Enhancement of Data Collection & Assessment for Emergency | 4.89 |
| Improvement of Agility & Mobility of Emergency Telecommunications Infrastructure | 4.78 |
| Establishment of Emergency Telecommunications on Disaster Management | 4.78 |
| Public Dissemination Platform | 4.56 |
| Partner Engagement & Network Platform | 4.44 |
| Improvement of Human Resource on Disaster Management in the Region through ICT | 4.44 |
| Improvement of Integrated Early Warning System through Data Analysis | 4.00 |
| Climate Modelling & Forecasting | 3.67 |
| Supply Chain Management | 3.67 |
| Integration of the Emergency Information System | 3.60 |
| Establishment of Multilingual ASEAN Translation Platform | 3.56 |
| Improvement of Knowledge Management through ICT | 3.22 |

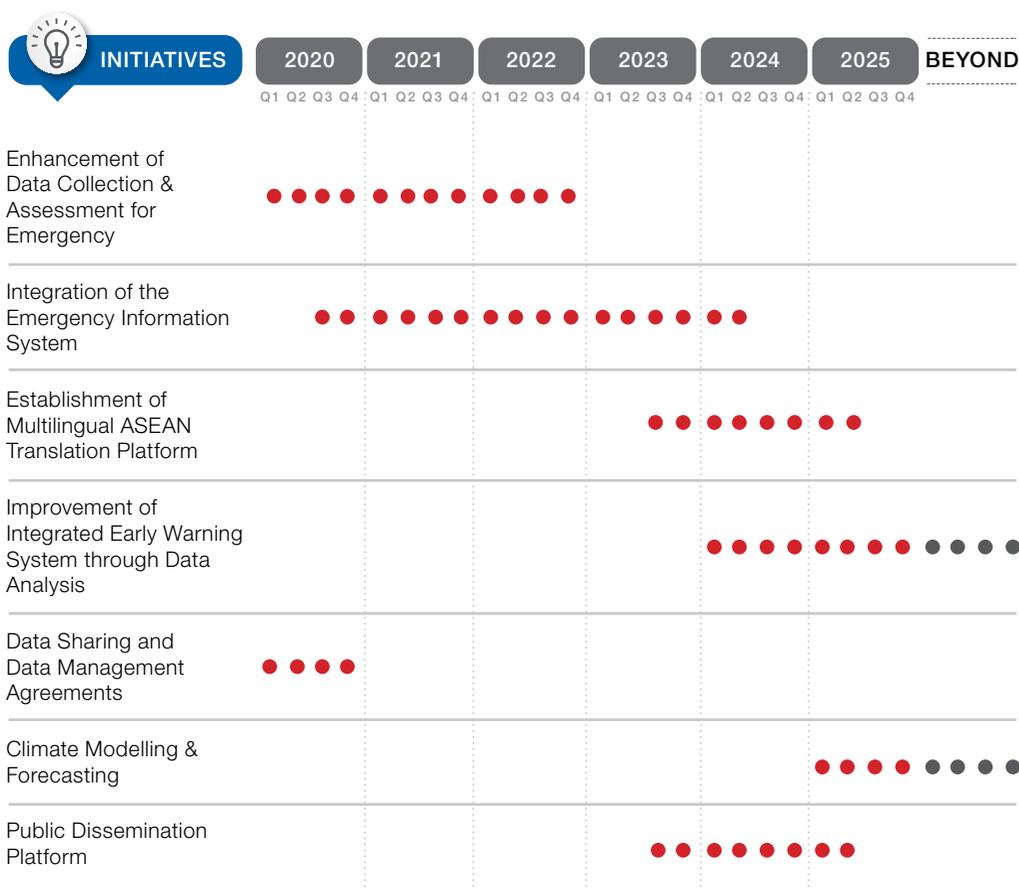
Table 2. Average Score of Initiatives

Those initiatives were arranged into a tentative timeline based on the priority and the effort of its implementation. Some of initiatives are planned to be done in a year and some others are multi-year implementation due to its complexity and number of activities to achieve them. The following figure shows the tentative implementation schedule for each initiative and behind every initiative lies their respective component.

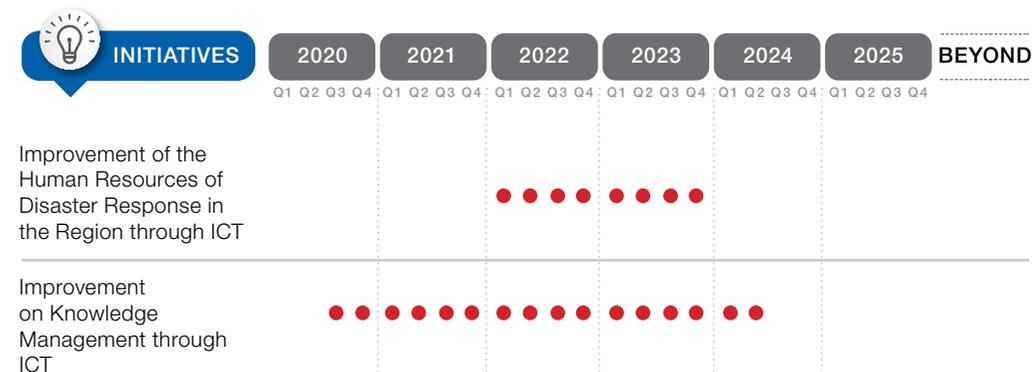
ICT STRATEGIC PILLARS: EMERGENCY TELECOMMUNICATION NETWORK



ICT STRATEGIC PILLARS: DATA INTELLIGENCE AND ANALYSIS



ICT STRATEGIC PILLARS: INFORMATION AND KNOWLEDGE MANAGEMENT SYSTEM



ICT STRATEGIC PILLARS: RESOURCE MANAGEMENT ENGINE

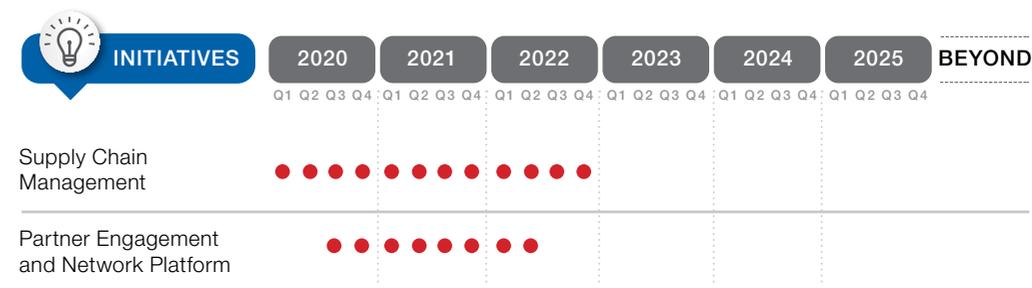


Table 3. Tentative Timeline for the ICT Roadmap 2025 and Beyond



• G CONCLUSION

The ICT Roadmap on Disaster Management for 2025 and Beyond was adopted by the ACDM on 31 October 2019. This multi-purpose tool will serve as guidelines for ICT infrastructure and solutions for the AHA Centre and its network with the AMS. This will become an important guideline not only owned by the AHA Centre, but also for all AMS to further enhance the ICT capabilities for the betterment of disaster management of ASEAN region.

The roadmap is a living document. Even though its strategic pillars and initiatives would be more definite in nature, the components and technology enablers are dynamic. It provides opportunities for evolvement from time to time as implementation proceeds. The implementation time for each component too will be adjusted accordingly based on the availability of budget, technology enablers and other factors. The progress of the roadmap is planned to be presented at KIM WG on a regular basis to ensure its relevancy and effective implementation.

LIST OF PARTICIPANTS ASEAN WORKSHOP ON DISASTER REPORTING AND BIG DATA FOR DISASTER MANAGEMENT

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| 41 | Mr | Wataru Kurihara | Mission of Japan to ASEAN | First Secretary |
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