THE USE OF C4ISR IN SMART CITY FOR DISASTER MITIGATION IN ASYMMETRICAL WARFARE PERSPECTIVE

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ABSTRACT

Natural disasters are one of the threats in asymmetric warfare that occur in the revolution industry 4.0 era. As one of the asymmetric threats that disrupt the stability of the country, a comprehensive strategy and involves all components of the community in mitigating disasters. The purpose of this study is to analyze one of the technologies used in a system that is C4ISR can be applied and needs to be efficient especially for Smart City in Indonesia for disaster mitigation. This research uses the C4ISR concept, the concept of disaster mitigation, the smart city concept and the concept of asymmetric warfare to analyze it. The research method used is the result of this study is a qualitative method that is descriptive analysis that is explaining the phenomenon under study based on data collected and processed, then analyzed using a theory that is relevant, so that a conclusion can be drawn. The results of this study are: By utilizing C4ISR technology, the system can gather information from various sources and locations, including from the point of occurrence, and be able to make effective strategies and decisions based on information from C4ISR (such as using drone integration, seismographs and high performance computing (HPC), and spread information to other devices directly.

Keywords: Mitigation Disaster, C4ISR, Smart City, Asymmetric Warfare

1. INTRODUCTION

The development of a dynamic strategic environment and context always changes the spectrum of complex threats and has implications for national defence. The complexity of threats is classified into patterns and types of threats that are multidimensional in the form of military, non- military, and hybrid threats that can be categorized as real and unreal threats.[1] The real threats that are being and are likely to be experienced by the state include terrorism, radicalism, separatism, natural disasters, cyber-attacks and espionage and drug abuse. Meanwhile, the threat is not yet real, namely open conflict or conventional war.

Natural disasters are one of the threats in asymmetrical warfare that occur in the current era of globalization. This is included in the threat that causes disruption especially in the costs incurred by the state to fight. Organized crime, racial crime, disease, drug trafficking, protest, natural disasters, peaceful civil disobedience or human trafficking as potential asymmetric threats.[2] Natural disasters can cause casualties, environmental damage, loss of property and other impacts that are detrimental to the joints of people's lives that can be utilized by the enemy in war situations.

Indonesia is an archipelagic country prone to various natural disasters. Rising sea levels, increasing prevalence of various climate-related diseases, widespread droughts and floods and declining agricultural production are part of the disaster.[3] Indonesia also includes the Ring of Fire pathway which is an active mountainous route which is vulnerable to tectonic and volcanic earthquakes. In addition, the natural disasters that have occurred so far in Indonesia consist of tsunamis, earthquakes, floods, tornadoes, droughts, landslides, volcanic eruptions, forest and peatland fires which have caused haze disasters.

As one of the asymmetric threats that disrupt the stability of the country, a comprehensive strategy and involves all components of the community in carrying out disaster management. Referring to the National Defence Policy of 2018, for the realization of an ideal national defence, optimization of human resources (HR) and other resources and security support facilities is a matter that must exist and maintain quality.[4] In addition, in the face of non-military threats the government places institutions outside the defence sector as the main element, in accordance with the form and nature of the threats faced. This is prepared early by the government and carried out in a total, integrated, directed and continuing manner to uphold the sovereignty of the country, the integrity of the region, and the safety of all nations from all threats.[5]

Based on this background, the author will discuss how the concepts of technology use for disaster mitigation. One technology used in a system is C4ISR which is a military concept with broad terms that refers to systems, procedures and techniques used to collect, disseminate information and be followed up to decision makers. The use of C4ISR can be applied and needs to be efficient especially for Smart City in Indonesia.

2. METHODOLOGY

This study uses an approach with qualitative methods. Qualitative research is research conducted to understand the meaning of individuals or groups regarding the social problems studied. Qualitative research is descriptive because the data collected is in the form of words, images, so it does not emphasize numbers. The data collected is inductive, namely building information from specific themes to the public.[6] The process of qualitative research includes gathering data obtained, reducing and making research reports. While secondary data sources are writing in the form of reports from other people's research, namely, through literature studies such as books, theses, journals, official documents, newspapers, official websites.[7]

This research is descriptive analysis, which explains the phenomenon under study based on the data collected and processed, then analysed using a theory that is relevant, so that a conclusion can be drawn. So, in conducting this research, researchers collected data, then grouped it based on the material of the discussion. After that, the relationship between one data and another will be searched and analysed using theory to find answers to the research questions. The results of the research answers are drawn into a conclusion.

3. THEORITICAL REVIEW
3.1 C4ISR Concept

C4ISR is a military concept with broad terms that refers to systems, procedures and techniques used to collect, disseminate information and be followed up to decision makers. C4ISR supports various levels of the military and government and the C4ISR function cannot stand alone. C4ISR operates in a kind of IT or management framework that can support strategic decisions, operational planning, and tactical execution. C4ISR support can range from spies on the ground, national surveillance satellite assets, to miniature-sized drones. In C4ISR military assets and the collection of information and data they provide must operate within certain strategic, operational

and tactical frameworks to provide efficient processes and high data and information integrity that are processed in relation to the supported missions. C4ISR operates in the same context when supporting national intelligence and national policy objectives. The main objective in each C4ISR process is the "mission" supported by C4ISR. [8]

Systems, procedures and techniques used to collect and disseminate information. This includes intelligence gathering and deployment networks, command and control networks, and systems that provide the same operational or tactical picture. C4ISR also includes information assurance products and services, as well as communication standards that support the safe exchange of information with the C4ISR system (digital data, voice and video to the appropriate command level). Examples of technologies include hardware, such as radio, receivers, satellites, relays, routers, computers, and other information technology infrastructure. For Intelligence, Supervision and Surveillance ("ISR"), examples include the use of remote sensors (infrared, optical, radio frequency sensors) that are placed on platforms such as satellites and unmanned vehicles. For Command and Control, technology requires computing power and computer algorithms to combine several sensor inputs and data streams into decision support software to provide situational awareness.

Other algorithms and software programs applied to C4ISR include those that ensure interoperability between different communication systems, encryption algorithms to ensure secure communication, signal detection and methods of image processing, antijamming and low signal interception technique capabilities, communication network protocols, and inertial navigation. Electronic threat and countermeasure warning systems such as interference and bait techniques are also included in this technology. The skills and education that are important for companies in this market area include computers, mechanics, electricity, programming, and software engineering; information Technology; mathematics; physics; statistics; and earth science.[9]

3.2 Mitigation Disaster

Disaster management is a dynamic, continuous, and integrated process to improve the quality of measures related to disaster observation and analysis as well as prevention, mitigation, preparedness, early warning, emergency handling, rehabilitation and disaster reconstruction. There are three aspects when referring to the definition of disaster management above. These three aspects are pre-disaster (with stages of prevention, mitigation), aspects of handling during disasters, and post-disaster handling.[10]

In the stages before a disaster occurs, there are three aspects, (a) Prevention, namely activities that are more focused on efforts to draft various laws and regulations aimed at reducing disaster risk. For example, regulations concerning RUTL, IMB, land use plans, plans for making disaster- prone maps etc.; (b) Mitigation, efforts to reduce the impact caused by disasters, such as making dikes, sabo dam, check dam, Break water, Rehabilitation and normalization of channels; (c) Preparedness, namely counselling, training and education activities to the community, field officers and government operators, besides that it needs to be trained in the skills and skills and awareness of the community.[11]

The nature of disaster management is one manifestation of efforts to protect humans and their environment. Disaster management is a common duty and obligation of the government and society based on community participation and initiative. Disaster management focuses on prevention, mitigation, preparedness and awareness activities to minimize, reduce and soften the impacts caused by natural or non-natural disasters. Here the role of K3 is very necessary to support disaster management.[12]

Disaster mitigation is a term used to refer to all actions to reduce the impact of disasters

that can be taken before their occurrence, including preparedness and long-term risk reduction measures. This includes planning and implementing measures to reduce the risks associated with known natural and man-made hazards, and planning processes for effective responses to disasters that do occur. The purpose of this training module is to introduce trainees to basic mitigation concepts and to discuss various mitigation actions that can be considered as responses to various natural and man-made hazards that might be faced.[13] Mitigation means taking action to reduce the impact of hazards before they occur. The term mitigation applies to a variety of protective activities and actions that may be instigated, from physical, such as building stronger, procedural buildings, such as standard techniques for combining hazard assessment in land use planning.[14]

3.3 Asymmetric Warfare

The international system with the principles of openness and freedom that apply today also has a negative impact on the defense and security of Indonesian waters. Warfare that occurs is no longer just conventional but has undergone a shift to be asymmetrical. According to Payne (2002), asymmetric warfare prioritizes political methods (soft power) such as those carried out in the name of an identity (ethnic, religious, or tribal) in order to gain access to certain countries to achieve their country's war goals.[15] In contrast to conventional warfare which prioritizes the use of military capacity (hard power) such as the manufacturing industry and military equipment. In addition, conventional warfare also involves people's ideas for war such as doctrinal thinking, organizational structure, attack regulations and the purpose of the use of violence.

Furthermore, the term asymmetric warfare attracted the world's attention since the publication of the Why Big Nations Article Lose Small Wars by J. Mark which shows the fact that some countries that have large military power actually accept defeat over their colonies.[16] This is evident with Vietnam being able to expel the United States in the Vietnam war (1955-1975). The victory of the colony showed the application of the concept of asymmetric warfare, namely first, using unconventional war terminology such as guerrilla warfare, terrorism, and non-violent actions in the face of a country with high military power. Second, the decline of the political capacity of the great State to fight caused by the social action of the people in opposing the war. Third, a period of asymmetrical war that lasts a long time will require huge costs. The cost of war which is considered excessive will encourage efforts to limit war by the government in order to achieve more important state interests.
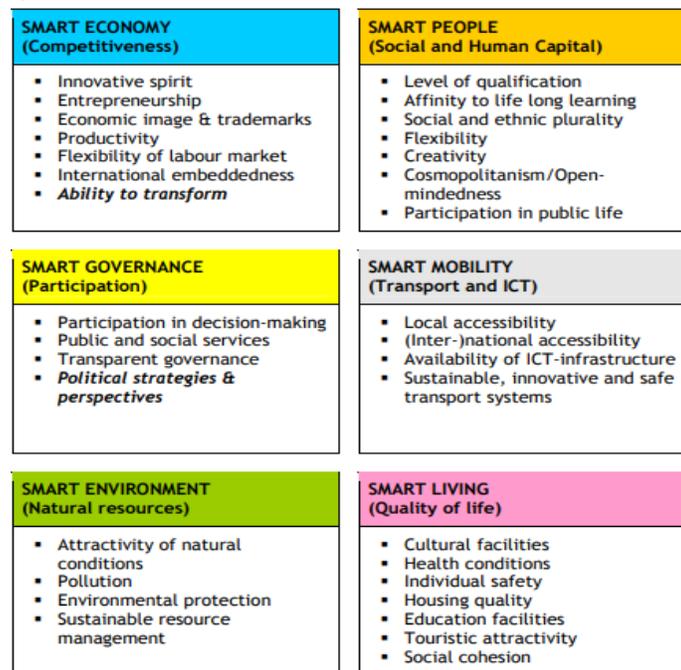
It can be concluded that asymmetric warfare is how actors (state and non-state) act, organize, and think of something different from their opponents in order to maximize their personal benefits, exploit the weaknesses of their opponents, achieve their own initiatives or increase their freedom of action. Such actions can be political strategies, military strategies or a combination of both. These things require methods, technology, values, organization, the right time and a combination of all.[17]

3.4 Smart City

The concept of smart cities or better known as smart cities is very popular developed as one of the concepts of structuring cities in the world in recent years along with the rapid development of technology. This concept originally grew since the 1990s where internet connections began worldwide since it was introduced in the 1960s. Smart City is a city that performs well with a forward perspective in six characteristics (economy, people, governance, mobility, environment, and living) built on a combination of endowments and smart activities from independent and self- conscious citizens. The following table describes 6 characteristics of smart city.[18]

Smart Economy covers factors around economic competitiveness such as innovation, entrepreneurship, trademarks, productivity and labour market flexibility and integration in (international) markets. Smart people are not only illustrated by the level of qualifications or education of citizens but also by the quality of social interactions regarding integration and public life and openness to the "outside" world. Smart Governance consists of aspects of political participation, services for citizens and administrative functions. Accessibility of medium-sized cities in Europe is an important aspect of smart mobility and the availability of information and communication technology and modern and sustainable transportation systems. [19]

Smart environment is explained by attractive natural conditions (climate, green space, etc.), pollution, and resource management and also by environmental protection efforts. Smart Living consists of various aspects of quality of life such as culture, health, safety, housing, tourism and others.[20] As for management related to the location of Indonesia in the ring of fire, there is one more dimension related to smart city, namely smart disaster management.

SMART ECONOMY (Competitiveness)	SMART PEOPLE (Social and Human Capital)
• Innovative spirit • Entrepreneurship • Economic image & trademarks • Productivity • Flexibility of labour market • International embeddedness • *Ability to transform*	• Level of qualification • Affinity to life long learning • Social and ethnic plurality • Flexibility • Creativity • Cosmopolitanism/Open-mindedness • Participation in public life
SMART GOVERNANCE (Participation)	SMART MOBILITY (Transport and ICT)
• Participation in decision-making • Public and social services • Transparent governance • *Political strategies & perspectives*	• Local accessibility • (Inter-)national accessibility • Availability of ICT-infrastructure • Sustainable, innovative and safe transport systems
SMART ENVIRONMENT (Natural resources)	SMART LIVING (Quality of life)
• Attractivity of natural conditions • Pollution • Environmental protection • Sustainable resource management	• Cultural facilities • Health conditions • Individual safety • Housing quality • Education facilities • Touristic attractivity • Social cohesion

Figure 1. Smart City Characteristics

4. ANALYSIS

Natural disasters are included in the dimensions of non-military defence threats because geographically Indonesia is in an area prone to natural disasters. Natural disasters then fall into the threat of a dimension of public safety because it can potentially disrupt national stability.[21] In the perspective of asymmetric warfare, natural disasters are one of the threats that occur in the current era of globalization. This is included in the threat that causes disruption especially in the costs incurred by the state to fight. Organized crime, racial crime, disease, drug trafficking, protest, natural disasters, peaceful civil disobedience or human trafficking as potential asymmetric threats.[22]

Various innovations need to be done as technology develops and the amount of individual and social demands, especially on human security. Nature disaster is a threat that is difficult to

avoid, but prevention, mitigation and reconstruction can certainly be a reference for the community and related agencies. Technology increasingly plays a major role in the disaster management cycle, both pre-disaster (with stages of prevention, mitigation), aspects of handling during disasters, and post-disaster handling.

The description of C4ISR will be difficult when considering the application of C4ISR outside the military and government, actually it isn't. The technological challenge in supporting the C4ISR concept in command and control (C2) to be applied in smart cities is to get the right information in a form that can be used so that assessment and situational responses are faster and more accurate. This is related to the system of smart disaster management.

By utilizing C4ISR technology, the system can gather information from various sources and locations, including from the point of occurrence, and be able to make effective strategies and decisions based on information from C4ISR (such as using drone integration, seismograph) and high-performance computing (HPC), and disseminate information to other devices directly. The use of cloud, exploits virtualization technology and because of that so it is able to provide interoperability where applications with other applications can interact and communicate through a protocol. In addition, in disaster situations, enabling snapshot time data and computation are stored (and transferred to other physical locations that are safer very quickly. Data and system backups can be easily carried out in remote locations.

The Disaster Management System Architecture needs to be structured in order to clarify the conditions and location of the tool that has good interoperability. Because of the territory of Indonesia, each zone has different characteristics, such as the type of traffic control, and different geometric designs (speed, visibility, direction movement, etc.).

Disaster scenarios are important to maximize the existing strategies in disaster mitigation systems. From various potential risks; human and natural disasters, we assume the city is affected by an explosion (for example) which requires an immediate and adequate response (in the form of various planned evacuation strategies). For example, an incident in the city occurred at 8:00 a.m. during rush hour, this time is the time when the maximum number of vehicles exists and moves throughout the transportation network, making it possible to suggest and recommend the right strategy.

Techniques or actions that can be considered by the authorities in preparing the right package for disaster mitigation can be classified in engineering and construction, physical planning, economics, management and institutions, and social. Technical actions produce structures that are stronger and more resistant to hazards, whose functions are primarily disaster protection such as dykes, dikes, or infiltration dams. The location of public sector facilities is easier to control than the location of the private sector. Careful location of public sector facilities can itself play an important role in reducing vulnerability. An important principle is the deconcentrating of risky elements is a service provided by a central facility, this is where C4ISR that has the character of interoperability plays a major role in concentrating various information from tools that have been placed at disaster-prone location points and giving that information to command to be mitigated adequate if there is a possibility of a disaster.

Furthermore, in handling post-disaster, the C4ISR concept is useful in gathering, disseminating information and being followed up to decision makers in particular so that the government can make decisions about which logistics department should be empowered including those who will assume responsibility. In addition, C4ISR is a reflection of the existence of civil-military cooperation that occurred in the disaster mitigation process. In the case of public safety threats related to mitigating the impact of natural disasters, civil-military cooperation acts to dynamize national forces in handling refugees, seeking victims, and concrete efforts in

overcoming the impact of disasters and reconstruction steps.

The use of C4ISR in smart cities can be compiled later in the form of a disaster mitigation architecture system. Starting from backing up data and systems that are in remote locations can be done easily. The use of C4ISR with a cloud architecture system can be used and also monitors transportation routes to describe the traffic models used to provide emergency transportation.

For this reason, it is necessary to introduce and map monitoring resources that have previously been around the disaster-prone areas, and insert C4ISR in the smart city concept with the advantages of a centralized, directed and experienced command system since its use in the military sphere.

5. CONCLUSION

Based on the above research it can be concluded that innovation is needed for disaster mitigation planning through C4ISR technology with a variety of advantages and the nature of interoperability calculated to be a provocation for related bodies to develop it to reduce risks and reduce the worst effects of disasters that occur. The consequences of physical damage are often more important than the damage itself. Damaged factories can no longer continue to produce work. Unemployment has no income to spend in their local stores and the entire local economy suffers. Damage to infrastructure and production equipment can reduce economic levels.

The worst effect of any disaster is death and injury caused. The scale of the disaster and the number of people they kill is the main justification for mitigation. Understanding how people are killed and injured in disasters is a prerequisite for reducing casualties. Among the sudden disasters, floods and earthquakes caused the most casualties in the entire world, compared to storms and strong winds that were not so deadly but the impact was far wider. In Indonesia recorded frequent disasters are earthquakes, landslides and tsunamis.

In order to suppress various effects both during disasters and post-disaster, it is better to reduce the existing risks by maximizing competent and reliable technology. The application of mitigation technology through C4ISR will be more maximal in the development of a smart city that is evenly distributed and has expanded further.

The author provides several suggestions for the parties involved, especially for the government as decision makers.

a. It is necessary to increase the use and understanding of C4ISR in smart cities for disaster mitigation in Indonesia
b. Smart city equity, especially in disaster-prone areas in Indonesia
c. Arranging smart disaster management related to early warning sensors and disaster mitigation options in related regions
d. The use of C4ISR is mainly centralized and fast command as a system, procedures and techniques used to collect, disseminate information and be followed up to command.
e. Designing a disaster management system architecture that has been integrated with C4ISR on the existing smart city concept to clarify the course of information towards command, and
f. Designing a disaster scenario, as a flow of notification and knowledge for the community technically and practically.

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