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Evaluating BMKG Public Information Services in Flood Disaster Areas Using ITO (Input-Throughput-Output) Model Approach

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ABSTRACT

Public information services from the Meteorology, Climatology, and Geophysics Agency (BMKG) play an important role in mitigating hydrometeorological disaster risks. This study analyzes the processes and factors that influence public information services at the Class I Radin Inten II Meteorology Station, especially in areas affected by flooding in Bandar Lampung City. With a qualitative descriptive approach, data were obtained through observation, interviews, and questionnaires involving 12 key informants and 41 respondents from the community. The results of the study indicate that although services have been digitized, the provision process is optimal, but regulations are needed as a legal umbrella for public service activities, and the need for audience understanding is still a challenge. These findings are the importance of optimizing communication strategies and collaboration with stakeholders to improve service effectiveness.

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1. INTRODUCTION

Public services are the government's responsibility to meet the needs of the community as regulated in various provisions. Public services are an indicator of government performance that can be directly assessed by the community based on the quality of services received [1], [2]. In this context, meteorological information services from BMKG are essential, especially in dealing with the risk of hydrometeorological disasters.

As a public organisation that has task with meteorology, climatology, and geophysics, BMKG is required to provide meteorological information services. These services include public and special information distributed to various parties, including the government and the community, to support safety, welfare, and environmental sustainability [3]. One of the BMKG technical implementing units that plays an important role in this service is Radin Inten II Meteorological Station in Lampung Province.

The Lampung region, including Bandar Lampung City, has a high level of vulnerability to flooding due to a combination of natural factors and human actions, such as poor drainage and land conversion. BNPB data shows that Bandar Lampung City experienced 51 floods during 2014-2023. In this context, meteorological information is an important basis for disaster risk mitigation through early warning and community preparedness.

Radin Inten II Meteorological Station has disseminated meteorological information through various media, including social media, radio, and television. However, the services provided are still hierarchical and do not understand the needs of the audience. To increase effectiveness, a more inclusive approach is needed, involving stakeholders, and ensuring that information can be accessed and understood by the wider community [4], [5].

Based on these challenges and potentials, this study aims to analyze BMKG's public information services in areas affected by flood disasters. It is hoped that the results can provide recommendations for optimizing services that are more systematic and oriented towards community needs, especially in Bandar Lampung City.

2. LITERATURE REVIEW

2.1 BMKG Public Information Services

Law Number 14 of 2008 defines Public Information as information produced, stored, managed, sent, and/or received by a public agency related to the organizer and administration of the state and/or the organizer and administration of other public agencies in accordance with this Law and other information related to the public interest.

Public Information issued by Stamet Raden Inten II is part of the Meteorological Information Service. This information consists of Daily Weather Forecasts and Extreme Weather Early Warnings. Its provision and distribution are carried out through communication and information media and/or directly according to the needs of the User, free of charge, and are carried out for the benefit of the general public, requested or not requested, in accordance with BMKG's policy in the Service Sector as stated in the BMKG Strategic Plan (Renstra) for 2020-2024 [6], namely Realizing MKG's prime service, which means providing integrated data services and information that has high accuracy, has precise area/location, is on target, is timely in its delivery, and is easy/accessible to the Public.

a. Daily Weather Forecast Information

Routine information issued by Stamet Raden Inten II is Weather Forecast Information that is provided and distributed by considering the time and duration adjusted to the type of information. The weather forecasts that have been made and distributed by Stamet Raden Inten II until now include the Daily Weather Forecast for the Lampung Region, Tourism Weather Forecast for the Lampung Region, Land Transportation Weather Forecast for the Lampung Region, Airport and Port Weather Forecast for the Lampung Region.

[7] stated that there is no single process for producing a Forecast, because it involves recognizing established patterns and rules related to the Forecast, knowledge of instruments, observations, models, products, social impacts and responses, collaboration with colleagues inside and outside the organization and constraints on message delivery.

[7] also added that Forecasters not only take into account meteorological elements, but also any foreign constraints in the Forecast environment such as hardware or personnel issues. Forecasters must understand the holistic nature of the shift, the purpose, and who the Forecast is being produced for, as approaches and strategies will differ depending on the type of Forecast being produced (e.g.; Subseasonal Forecast, Weekly Forecast, or Aviation Forecast). The Forecast objectives depend on the needs of the user, and the role of the Forecaster is tailored to the type of message and risk to be communicated.

b. Extreme Weather Early Warning Information

Extreme Weather Early Warning is information that is immediate and contains information on the potential for Extreme Weather (Regulation Number 9 of 2022). The aim is to provide sufficient time to reduce the risk of disaster hazards. Warning information must reach decision makers across disciplines, service areas and expertise. It is important that risk information is translated into actionable messages by those at risk and by those responsible for mitigating and managing the impacts of the hazard. [8].

[8] also added that in Weather Early Warning a useful approach is to treat it as a form of program intervention. A program intervention is a strategy designed to bring about behavioral change or enhance capabilities among individuals or a population, such as an educational program, policy change, environmental improvement, or disaster mitigation promotion campaign. It involves actors and processes that are expected to impact service outcomes.

2.2 Service Process

The process is defined by [9] as a set of activities, agents, and objects, the relationships between the three entities, and the behavior of the entire series of entities and their relationships. Meanwhile, [10] defines the process as an activity that has a purpose, is carried out collaboratively by a group, often across functional boundaries, and is always driven by external parties (Stakeholders and the Community). From the definition that has been put forward, it can be concluded that the Process is a series of collaborative activities with certain steps to achieve predetermined goals. Thus, the service process is a collaborative activity with predetermined steps to meet the needs of individuals/groups.

2.3 Input-Throughput-Output Model

To analyze the Public Information service process at Stamet Raden Inten II, the Input-Throughput-Output Model [11] is used to describe and visualize all inputs, processes, and outputs needed in the Public Information Service process carried out by Stamet Raden Inten II. This model has been successfully applied to program planning in human services and performance measurement [11].

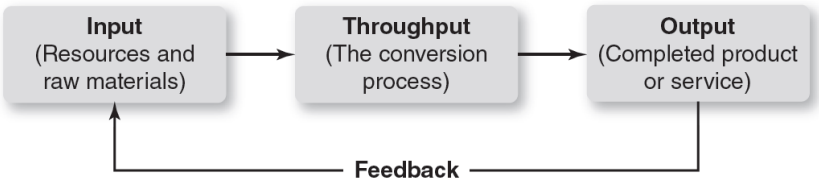

Figure 1. Input-Throughput-Output Model [11]

a. **Input** represents all the raw materials and resources needed by the organization to achieve its goals, such as data, human resources, facilities and infrastructure, and finances.
b. **Throughput** is the activity of converting or rearranging raw materials received from the Input stage to obtain output.
c. **Output** is the end result of the Input and Throughput process.
d. **Feedback** is a response where part of the Output is returned to the Input section with the aim of finding solutions, controlling the system to remain stable, and improving organizational performance.

According to [11] by using the Input-Throughput-Output Model,

services can be defined, implemented, tracked, monitored, and evaluated. This model helps define the organization as a living system where Input, Throughput, and Output provide information in the form of feedback that helps improve processes, maintain organizational stability, and recognize and handle the organizational environment. This model is also in line with the dimensions of the Public Service Delivery Compliance assessment [12] which focuses on four dimensions including input, process, output, and complaints.

2.4 Identification of Public Information Service Process at Stamet Raden Inten II

To be able to analyze the Public Information Service process at Stamet Raden Inten II, an identification of Input, Throughput, and Output is carried out as depicted in the following illustration:

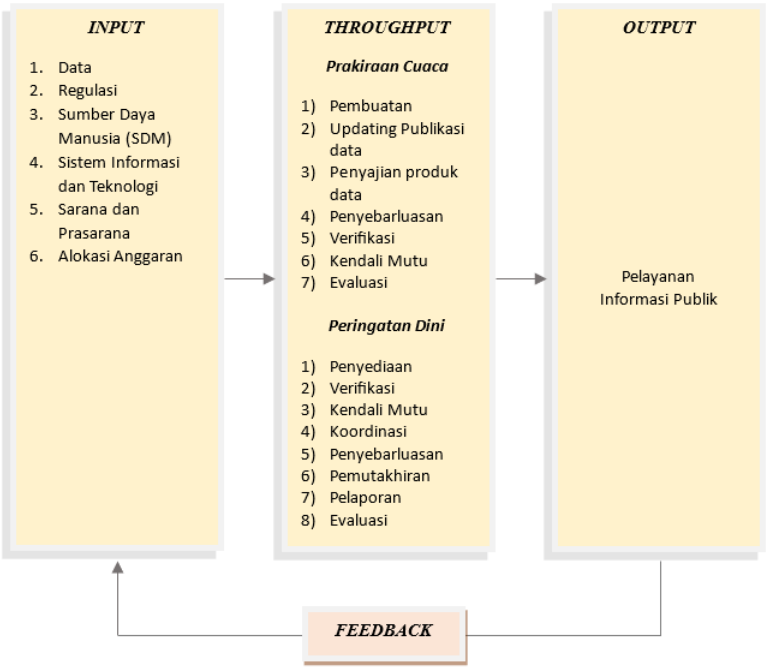

Figure 2. Identification of Public Information Service Process at Stamet Raden Inten II

3. METHODS

This study uses a descriptive qualitative method to obtain an in-depth picture of public information services in Stamet Radin Inten II. Primary data were obtained through direct observation, interviews with 12 key informants, and questionnaires to 41 community respondents. Secondary data were collected from official documents, literature, and related regulations. Data analysis used the Miles and Huberman model, which includes data collection, reduction, data presentation, and drawing conclusions.

4. RESULTS AND DISCUSSION

4.1 Results

The input stage in the Daily Weather Forecast Information Service involves six main components:

1) Meteorological Data: The data used includes observations, satellite imagery, and Numerical Weather Forecast Models (NWP). Forecaster utilizes applications such as Sidarma Nowcast to analyze atmospheric conditions in real time. Data from various sources such as the BMKG website, BOM, and Ventusky are also used to support the analysis.
2) Regulations: The regulations governing this service include

Agency Regulation Number 9 of 2014 and SOPs related to daily weather forecasts and early warnings for extreme weather. These guidelines cover the process of making, disseminating, and evaluating forecasts.

3) Human Resources (HR): Consists of 12 employees in the Data and Information Sector consisting of PMG (Meteorology and Geophysics Observer) positions at various levels. Most have undergone technical training related to meteorology, although some employees have not received the latest training due to budget constraints.
4) Technological Resources: Supporting technologies include Weather Radar, NWP, and the InfoBMKG application. Social media and websites are also used to disseminate information to the public.
5) Facilities and Infrastructure: Facilities such as weather radar, AWS (Automatic Weather Station), and modern communication equipment are available to support operations.
6) Budget Allocation: The budget comes from the APBN with details in the DIPA. However, there is no specific budget for public information services.

a. Throughput Stage

Weather Forecast Information Service

1) Creating: Data analysis is carried out by considering local, regional, and global phenomena. Forecaster uses a combination of numerical models and observations to produce forecasts.
2) Updating Data Publication: Data is updated twice a day for the public and four times a day for aviation. The amendment process is no longer carried out due to system limitations.
3) Presentation of Data Products: Information is presented in the form of graphics, maps, and audio-visual narratives. Social media is used to increase public reach.
4) Dissemination: Information is disseminated through social media, radio, television, and the BMKG website.
5) Verification: Verification reports are carried out monthly by Senior Forecasters. This aims to improve the accuracy and quality of forecasts.
6) Quality Control: Quality control is carried out through national briefings every morning and evening.
7) Evaluation: Evaluation is carried out together with the central BMKG through national briefings involving all Forecasters in Indonesia.

b. Throughput Stage

Extreme Weather Early Warning

1) Provision: The Sidarma Nowcast system is used to analyze extreme weather data.
2) Verification: The verification process is carried out automatically through Sidarma and by the central BMKG.
3) Quality Control: Quality control is carried out by checking the narrative and substance of the information before it is disseminated.
4) Coordination: Carried out through a WhatsApp group involving stakeholders such as BPBD, TNI, and mass media.
5) Dissemination: Information is disseminated through social media and other communication platforms.
6) Updates: Updates are made if there are significant changes in the weather data.
7) Reporting: Consists of early warning reports and extreme weather event reports. However, reporting has not been well documented.

8) Evaluation: Evaluation is carried out through confirmation reports of receipt of information by related parties.

c. Output Stage

The output of this service is daily weather forecast information and extreme weather early warnings that are disseminated through various platforms to improve community preparedness.

d. Feedback

Feedback was collected through interviews, online questionnaires, and offline. The results showed that most people considered the information presented easy to understand, although there were still some obstacles such as the use of technical language that was difficult for the general public to understand.

4.2 Discussion

a. Input Stage

1) Meteorological Data

[7] stated that the process of producing a forecast is not singular, because it involves recognizing patterns and applying rules relevant to the forecast. This also includes an understanding of instruments, observations, models, products, and social impacts and responses.

The data used in the process of providing Daily Weather Forecast Information is the Numerical Weather Forecast Model, or better known as Numerical Weather Prediction (NWP), which includes various different models sourced from several websites including; https://web-meteo.bmkg.go.id/id/, http://www.bom.gov.au/, https://www.ventusky.com/, and https://ncics.org/.

By utilizing these various data sources, the information produced is expected to provide more accurate and faster weather predictions.

However, not all Forecasters use models from all of these websites in the process of providing Daily Weather Forecast Information. Some choose to use only one or two models, but some choose to use all models. The use of these various models has been going on for years, due to the absence of standardization regarding the provision of Daily Weather Forecast Information. However, according to the Forecaster of the Raden Inten II Meteorological Station, until now, of all the models mentioned, the most valid model (with a high level of verification) has not been found to be used in making Daily Weather Forecast Information.

2) Regulation

Referring to the Public Service Provider Service Standards stipulated in Law of the Republic of Indonesia Number 25 of 2009 concerning Public Services, BMKG's Public Information Service has several things that must be completed, such as Service Standards, Standard Operating Procedures, and Implementer Competency Standards. In terms of mechanisms, procedures, and evaluations, improvements still need to be made.

Specifically, BMKG does not yet have regulations regarding Daily Weather Forecast Information that can be used as guidelines in the implementation of Daily Weather Forecast Information Services. This results in the work process carried out by Data and Information Personnel not yet having standardization and resulting in differences in perception in the implementation of Daily Weather Forecast Information Services, such as; each personnel's understanding of the issue of updating publications, coordination, dissemination, and the need for human resources and infrastructure needed for the Public Information Services being implemented. It is also

necessary to create SOPs or Head Decrees that can be used as additional references so that the implementation of Daily Weather Forecast Information Services and Extreme Weather Early Warnings is more focused and standardized.

When comparing the number of Existing Positions with the 2019 BMKG Workload Analysis (ABK), the results are a surplus of Employees, an increase in the number of Middle Positions, and a shortage of HR in other Positions. If the number of employees is more than that required based on the ABK, this can lead to a waste of resources. Conversely, if there are other positions that are short of staff, the workload may not be evenly distributed. A re-evaluation of employee needs and workload at Stamet Raden Inten II is needed. This includes updating the workload analysis and considering factors that may have changed since 2019.

The imbalance between the number of existing Positions and the number needed results in an uneven distribution of tasks in terms of quality and quantity. Quantity is related to the number of Employees, while quality is related to competence. In accordance with Law Number 31 of 2009 and PP Number 11 of 2016, human resources who carry out certain work in the fields of meteorology, climatology, and geophysics are required to have a competency certificate in accordance with the requirements set. From the list of Education and Training that the Researcher obtained and processed, not all employees have attended Education and training related to Public Information Services. Several types of Education and Training also cannot be attended every year which results in non-simultaneous updating of knowledge and skills. This is due to budget limitations and also limited allocation of participants because the number of BMKG UPTs throughout Indonesia is in the hundreds. Adjustment of positions, training, development, work distribution, to ensure that each employee can contribute optimally is important, because as expressed by [13] that quality service is very dependent on various aspects, one of which is human resources. Likewise, [14] stated the same thing that quality service is very dependent on aspects, one of which is human resource support.

3) Technology Resources

[11] stated that technology resources refer to the level of technology applied in an organization. The level of technology within an organization can be very different from the latest technology available outside the organization. Therefore, organizations need to determine the level of technology that suits their goals, as well as the level of skills needed by human resources to be able to operate the technology effectively.

Radin Inten II Meteorological Station has used quite sophisticated technology to support the implementation of Public Information Services. However, there are several obstacles faced by Radin Inten II Meteorological Station, including:

a) Infrastructure Limitations

Radin Inten II Meteorological Station is located in the Branti area of South Lampung where the area still has inadequate information technology infrastructure.

b) Limited HR Capabilities

There are still employees who are not yet skilled and experienced enough in the field of information technology, although not too significant.

c) Limited Budget

The budget allocation for the development and maintenance of information systems is still limited. Meanwhile, without adequate financial support, technology resources cannot be implemented optimally.

d) Adaptation to Change

The need to increase adaptability to change by slowly changing the old way of working. Because changes to a technology-based system face challenges in terms of acceptance and adaptation.

4) Facilities and Infrastructure

Facilities are all things that can be used as tools to achieve goals or intentions. While infrastructure is everything that is the main support for the implementation of a process, be it business, development, projects, and so on (kbbi.kemdikbud.go.id).

The registered facilities and infrastructure show that the Radin Inten II Meteorological Station has been equipped with fairly modern and comprehensive technology. The use of monitors, PCs, and communication devices shows an effort to utilize technology in processing and disseminating public information.

The existence of meteorological observation equipment and Automatic Weather Station (AWS) allows for accurate and real-time data collection. This is very important for producing accurate weather forecasts and providing effective early warnings. The use of weather radar as a remote sensing tool for real-time weather condition observation increases efficiency in monitoring, allowing for a quick response to extreme weather conditions.

The existence of data and information space indicates a commitment to good data processing. This allows Staff to work with data effectively and produce quality information.

The Radin Inten II Meteorological Station also uses a website (lampung.bmkg.go.id) and social media (Instagram, Facebook, and Whatsapp Group) to disseminate information, demonstrating awareness of the importance of information accessibility for the public. In addition, communication tools provided specifically for public service activities help maintain connectivity between the Station, Stakeholders, and the Community, as well as facilitate the direct delivery of important information. This is quite in line with the meaning of the facilities and infrastructure themselves.

5) Budget Allocation

The budget allocation from the APBN shows that the Radin Inten II Meteorological Station receives support to carry out various activities. However, the absence of a special budget allocation for public information services indicates a lack of attention to this important aspect. Public information services are crucial to improving accessibility and responsiveness to community needs. The absence of a budget for Public Information Services can hinder the Station's ability to provide the information needed by the Community, which can negatively affect public trust and the effectiveness of the information services provided.

b. Throughput Stage

Throughput Stage of Daily Weather Forecast Information Service

1) Provision

The process of producing a forecast is not only one way, because it involves identifying

patterns and applying rules relevant to the forecast. This also includes an understanding of instruments, observations, models, products, and social impacts and responses. In addition, collaboration with colleagues both inside and outside the Organization, as well as obstacles in delivering information, also play a role in this process [7].

Until now, the Daily Weather Forecast Information issued by BMKG still does not have an objective Daily Weather Forecast Method. So that the implementation of the provision of Daily Weather Forecast Information at Stamet Raden Inten II is still subjective according to the subjectivity of the Analysis of each Forecaster.

According to the interview conducted by the researcher with Forecaster Stamet Raden Inten II, Objectivity itself cannot be done in making Daily Weather Forecast Information due to the nature of the weather which is always dynamic and also the influence of global warming which causes climate change.

2) Updating data publication

The Radin Inten II Meteorological Station has the task of carrying out updating of data publication and presentation of data products and Daily Weather Forecast Information regularly in the service area that is its responsibility in graphic/map displays, tabulations, and/or audio-visual sound recordings as needed. This is stated in Agency Regulation Number 9 of 2014 concerning the Description of the Duties of Meteorological Stations.

As previously stated, the implementation of updating itself has been carried out. However, not all Forecasters consider this implementation as a form of updating. This is because there is no clear definition regarding updating data publication. Another reason is because there are no specific rules regarding Daily Weather Forecast Information Services, this has resulted in differences in perception among Forecasters.

3) Presentation of data products

BMKG's public information products, especially those of a technical nature, may be difficult for some people to understand. Low media literacy skills and understanding of meteorology can hinder and limit the use of this information, so that the public cannot fully benefit from the data provided. This is very important, especially in the context of delivering weather information that is directly related to safety and daily activities.

Raw forecast information analyzed by technical experts, for example, cannot be communicated outside the expert group, because it requires special knowledge and skills to understand and interpret the information [5].

In addition, the presentation of information that is one-way can also reduce opportunities for the public and stakeholders to provide feedback or ask questions about the information provided. Limited interaction between the Radin Inten II Meteorological Station and the Community in Bandar Lampung City can create a distance that hinders a deeper understanding of weather

phenomena. Without dialogue, the public may feel uninvolved or do not have access to clarification about the information they receive. Therefore, it is very important for the Radin Inten II Meteorological Station to develop a more interactive presentation strategy, which not only presents information, but also encourages community participation in the process of delivering and utilizing the information. Thus, it is hoped that the community's understanding of weather information can increase, so that they can be more prepared and alert to potential risks.

4) Dissemination

Dissemination is the dissemination of information aimed at a specific audience. It is important for the Radin Inten II Meteorological Station to develop more segmented and integrated dissemination media that can be used as the main reference for the community. With a consistent and comprehensive source of information, the community no longer needs to seek information from various media that may not always be in line, thus reducing the potential for confusion and ensuring that the community gets accurate and reliable data.

The Radin Inten II Meteorological Station must also be proactive in understanding and collecting feedback from the community and stakeholders. Exploring their perspectives and needs will provide valuable insights into how information is perceived and used. If the Radin Inten II Meteorological Station does not pay attention to this input, the gap between community needs and the information provided will widen, which can reduce the effectiveness of information delivery.

Thus, the Radin Inten II Meteorological Station Radin Inten II to not only focus on delivering information, but also actively interact and communicate with the public. Through surveys, discussion forums, or social media platforms, BMKG can create space for the public to provide input and ask questions. This will allow BMKG to adjust their information delivery strategy, so that they are more responsive to the needs of the community and ultimately increase community resilience to weather changes that may occur.

5) Verification

Judging from the definition, verification is the process of examining or checking the truth of a report or statement, as explained in the Big Indonesian Dictionary (KBBI). In the context of weather forecasting, verification of daily weather forecast information is an important step to ensure the accuracy and reliability of predictions provided to the public. At the implementation level, this activity is carried out together with quality control and evaluation activities.

6) Quality Control

[15] defines control as a process to ensure that actual activities are in accordance with planned activities. According to [15] an important part of the control process is taking corrective action as needed.

Daily Weather Forecast Information quality control activities have been carried out in the form of national briefings conducted via Zoom media. This process is carried out every

morning and evening, involving Senior Forecasters, BMKG Center, and Forecasters on Duty from UPT BMKG throughout Indonesia. This activity is in the form of checking and correcting the Daily Weather Forecast Information that has been produced.

However, the current quality control process does not yet have documentation, so it is very possible that there will be difficulties in evaluating the effectiveness of information services and making necessary improvements.

7) Evaluation

[16] define evaluation as an activity to collect information about how something works, which information is then used to determine alternatives in making the right decision. Furthermore, [17] said that evaluation is an activity that is usually carried out to make an assessment of the feasibility of planning, implementation, and results of a program or policy.

In its implementation, the same as verification activities, evaluation activities are also carried out in the form of national briefings that are carried out routinely via Zoom media. This evaluation process involves Senior Forecaster, BMKG Center who is tasked with leading discussions and analysis, and Forecaster on Duty (FOD) who is in the BMKG Technical Implementation Unit (UPT) throughout Indonesia every morning and evening.

Judging from the definition, both verification, quality control, and evaluation have different meanings. The evaluation structure is also more complex where it concerns the entire process. Standards and guidelines are needed for the three things above so that the implementation is optimal.

Extreme Weather Early Warning Throughput Stage

1) Provision

The implementation of the provision of extreme weather early warning information at the Radin Inten II Meteorological Station is carried out by utilizing the Sidarma Nowcast system as a sophisticated tool for Forecasters. This system enables the process of digitizing early warning areas based on the results of monitoring, analysis, and forecasting from data available in real time.

The provision of this information has been carried out in accordance with the Standard Operating Procedure (SOP) Number: SOP/025/KB/VIII/2023, which regulates the Provision and Dissemination of Momentary Extreme Weather Early Warning (Nowcasting) for a Period of One to Three Hours Ahead.

2) Verification

As previously explained, Verification of Extreme Weather Early Warning at the Radin Inten II Meteorological Station is carried out automatically through the Sidarma Nowcast website application system. This automation process not only increases efficiency, but also reduces the possibility of human error in delivering information that is crucial for public safety.

In addition, this verification activity also involves the Central BMKG. The team at the Central BMKG conducted additional checks to ensure that all warnings issued met the established standards and their validity could be accounted for.

With these two levels of verification, namely through an automated system and through manual review by the Central BMKG team, it is hoped that it can improve the accountability of the data produced and disseminated.

3) Quality Control

The provision of Extreme Weather Early Warnings and the dissemination of Extreme Weather Early Warnings must be carried out by implementing quality control aimed at ensuring the provision and dissemination are fast, precise, accurate, broad, and easy to understand. The quality control process for extreme weather early warning information at the Radin Inten II Meteorological Station involves checking oral and written information by the Forecaster on Duty, Senior Forecaster, Data and Information Coordinator, and central technicians if problems occur. This process is carried out before the information is disseminated to various media. In this case, the Sidarma Nowcast system also helps in detecting if there are errors.

However, just like the quality control in the Daily Weather Forecast Information Service Process, in this Extreme Weather Early Warning Service, the quality control process also does not have process documentation, so it is very possible that there will be difficulties in evaluating the effectiveness of information services and making necessary improvements.

4) Coordination

Coordination is the core of organizational operations, which allows organizational goals to be achieved [18]. [19]) defines coordination as a collaborative effort between agencies, units in carrying out certain tasks in such a way that there is mutual support, mutual assistance and complementarity.

[15] explains that the extent of coordination needed depends on the nature of the work being done and the level of interdependence of the people in the various jobs carrying out the task. If the task requires coordination between units, then tight coordination is best. Likewise, if the exchange of information is not so necessary, then it can be completed more efficiently with less interaction.

[15] also added in his book that high-level coordination is likely to be beneficial for non-routine and unpredictable work, namely for work with changing environmental factors, and for work that has high interdependence.

Based on the results of interviews conducted by the Researcher with all Employees in the Data and Information Sector of the Radin Inten II Meteorological Station, that coordination in the Extreme Weather Early Warning Information Service has been implemented through the use of WhatsApp groups involving various stakeholders, including government agencies and the Community in it.

However, there are differences in understanding regarding the terms used. Employees still think that information dissemination and coordination are two of the same things, even though the two have different definitions, concepts, and objectives. As a result, coordination is considered to

have been implemented, while what is being implemented is still at the information dissemination stage.

This difference in understanding the definition and concept occurs because there is no reference limit in the regulatory framework that regulates the issue of Extreme Weather Early Warning Information Services. This can potentially hinder the effectiveness of communication and coordination between the parties involved, so efforts are needed to clarify and differentiate between the two concepts.

5) Dissemination

According to [5] warning information needs to be repackaged and adapted to different user conditions. Evaluation of the effectiveness of communication warnings is needed to assess whether the information, including the level of risk, is understood by users, whether it is considered useful, according to needs and can be followed up.

The dissemination of Extreme Weather Early Warning Information carried out by the Radin Inten II Meteorological Station has been implemented but its implementation needs to be optimized. This is important so that the public can receive accurate and timely information, so that the public can take the necessary actions in dealing with weather changes, and help increase public awareness and preparedness for potential weather risks that can be dangerous.

Although infographics have been used by the Radin Inten II Meteorological Station as a tool to present information visually, not all-weather information products make good use of data visualization. Narratives that are too long can also make it difficult for the public to understand the information conveyed, so they may ignore important warnings.

Until now, the Radin Inten II Meteorological Station still does not have adequate information regarding the most effective strategies and media to convey daily weather forecast information and early warnings of extreme weather to the Community and Stakeholders. This limitation is a challenge in itself, considering the importance of delivering accurate and timely information in helping the community prepare for changing weather conditions.

In addition, an evaluation of the media that has been used so far has never been carried out. Without a systematic analysis of the effectiveness and efficiency of the information delivery methods used, it is difficult to know to what extent the community is able to receive and understand the information conveyed. This has the potential to result in dissatisfaction and a lack of public trust in the information provided by BMKG.

Therefore, it is important for the Radin Inten II Meteorological Station to conduct an in-depth study of the appropriate media and methods, as well as to conduct routine evaluations in order to improve the quality and reach of information delivery to the community. With a more targeted approach, it is hoped that weather forecast information and early warnings can be more

easily accessed and understood by all groups.

6) Updates

The Radin Inten II Meteorological Station has carried out updates to the Early Warning of Extreme Weather. This update is carried out before the warning period ends and/or in accordance with the time of provision of information related to extreme weather, in accordance with Regulation Number 9 of 2022. This process is important to ensure that the Community always gets the latest and accurate information, so that the Community can take the necessary actions to protect themselves and their environment. By carrying out information updates, the Radin Inten II Meteorological Station has made efforts to increase Community preparedness for potential extreme weather risks that may occur.

7) Reporting

Reporting of early warnings for extreme weather has been carried out by the Radin Inten II Meteorological Station. However, several reports have not been documented because they are in the form of narratives delivered via WhatsApp media, making it difficult to archive systematically and in a structured manner. This form of delivery also has the potential to result in important information being lost or not stored properly, thereby reducing the effectiveness of future analysis and evaluation.

Therefore, steps need to be taken to improve a more formal and documented reporting system, such as the use of platforms that allow for more efficient data recording and storage. In this way, the Radin Inten II Meteorological Station can ensure that every early warning report is not only delivered quickly, but can also be accessed and analyzed for evaluation and service improvement purposes in the future.

8) Evaluation

As previously described, the evaluation and monitoring of the implementation of the Extreme Weather Early Warning information service if referring to Agency Regulation Number 9 of 2022, then the evaluation is in the form of a Confirmation Report, which is expected to function to ensure that all related parties have received the Extreme Weather Early Warning information.

This Confirmation Report is a response given by the Community and Stakeholders through the WhatsApp group. However, this Confirmation Report has not been recorded, compiled, and documented properly. This is a challenge in itself in ensuring that the information disseminated has been received by the Community/Stakeholders or not.

Therefore, it is necessary the development of a more systematic method in collecting and documenting information, so that the evaluation results can provide a clearer picture of the effectiveness of information services and increase public participation in the evaluation process. Thus, it is hoped that in the future, the evaluation process will not only be a formality, but can also be a means to improve the quality of service and response to the Extreme Weather Early Warning provided by the

Radin Inten II Meteorological Station.

Output Stage

As previously explained, the output of the input and throughput processes implemented by the Radin Inten II Meteorological Station is the BMKG Public Information Service, which includes Daily Weather Forecast Information Services and Extreme Weather Early Warning Information with the aim of increasing public preparedness for weather changes and reducing disaster risks.

This information is distributed through websites, mobile applications, and social media as an effort to ensure that the information can be accessed by users. In addition, this service aims to help the public understand the importance of weather information so that they can be more vigilant and take preventive measures.

However, although various media have been used to convey this information, there is no concrete data on the number of users or the effectiveness of the Daily Weather Forecast Information Services and Extreme Weather Early Warning Information that have been implemented by the Radin Inten II Meteorological Station so far.

It may be necessary for the Radin Inten II Meteorological Station to collect specific data such as conducting analysis to collect data on the number of users, analyzing the impact of the services provided, or conducting monitoring that can provide statistical information on the use and effectiveness of the information provided. This data will be useful as evaluation material to make necessary improvements in order to improve services.

Community involvement also needs to be considered by creating two-way communication channels, such as online forums to receive feedback from the community, holding activities that involve the community in the process of delivering information, such as workshops or discussions, or becoming a collaboration with local communities. Developing educational programs that focus on understanding the weather and the importance of weather information for safety, for example through seminars, workshops, or awareness campaigns can also be done as an effort to reach out to the community to be more aware of the importance of knowing weather information and early warnings.

c. Feedback

Based on interviews and questionnaire data obtained, several stakeholders have their own choice of communication media that they think are more effective as a means of communicating with the Radin Inten II Meteorological Station.

For example, the Lampung Basarnas prefers ready-to-use communication, namely by 24-hour telephone. Because their task of handling disasters, accidents, or disasters is on-site, unpredictable. So it takes accuracy and speed in receiving supporting data for search and rescue purposes.

Meanwhile, the TNI, Lampung Police and BPBD tend to use WhatsApp group communication media and personal WhatsApp to each Personnel to help carry out their operational tasks in the field. This shows the importance of a variety of communication channels to reach more people.

These stakeholders also considered that the information conveyed by the Radin Inten II Meteorological Station was good, with some emphasizing the need to simplify the language so that it is easier for the general public to

understand. This shows that although the information conveyed already exists, the format and method of delivery need to be improved to improve understanding. Stakeholders also hope for better coordination between the Radin Inten II Meteorological Station and other agencies, to ensure fast and accurate information dissemination. Socialization on how to access weather information is also recommended to make it easier for the public.

Regarding Information Dissemination, from the questionnaire data involving 41 respondents, based on Gender, 20 people stated that information dissemination was effective, while 21 people felt that it was not yet effective. There was quite significant dissatisfaction, especially among women.

Respondents from the age range of 19-44 years and 45-59 years showed a similar trend, where more felt that it was not yet effective than those who stated that it was effective. This may reflect the need to adapt communication approaches that are appropriate for different age groups.

In terms of income, the majority of those who felt that it was effective came from the group with an income between IDR 3,000,000 - IDR 5,000,000. However, there was high dissatisfaction in the income group below IDR 3,000,000. This suggests that there may be a gap in access to information for groups with lower incomes.

Education level also influences views on receiving information. Respondents with lower education (elementary and junior high school) tend to feel that information is not yet effective, while respondents with a bachelor's degree are more likely to consider it effective.

Regarding the presentation and delivery of public information, from the data obtained, it can be seen that the majority of respondents from various groups, both based on gender, age, income, and education level, consider the presentation and delivery of public information by the Radin Inten II Meteorological Station easy to understand.

Overall, although the majority feel that the information is easy to understand, there is a significant proportion who feel otherwise, indicating that there is room for improvement in the delivery of this public information and the need for more inclusive and easily understood information delivery by all levels of society.

Regarding the Radin Inten II Meteorological Station's Social Media, based on the data obtained, there are a number of respondents who follow the Radin Inten II Meteorological Station's Social Media, with variations based on gender, age, income, and education level.

5. CONCLUSION

This study confirms that the effectiveness of BMKG public information services in Bandar Lampung City depends on optimizing internal processes and strengthening external cooperation. A more inclusive and community-based approach is needed to ensure that meteorological information can be used effectively in disaster risk mitigation. Community involvement in planning and implementing services is also an important factor in increasing the success of mitigation programs.

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