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E-Government Integration through Implementation of web-based GIS on Community Health monitoring in Jembrana Regency, Bali

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Abstract

To achieved the goal of Healthy Indonesia, The Minister of Health, Republic of Indonesia issued a ministerial regulation, about Guidelines For The Program Of Healthy Indonesian Programs with Family Approach, and in the Ministerial Regulation states that Implementation of Healthy Indonesia Program with Family Approach implemented by Puskesmas (Community Health Centers), to support the achievement of a Healthy Indonesia goal which is mandated to the puskesmas, it is necessary to integrate it into the Blueprint for e-Government implementation in Jembrana Regency. Through implementation of E-Prokesmas, Head of Central Community Center and also Regency Health Office can monitor the achievement of healthy family in its working area, according to health indicators as government requirements on web-based GIS dashboard. The information displayed in E-Prokesmas not only display the health level status of the community (percentage of the healthy population, number of pre-healthy percentage and number of newborn mothers), but it can also be a source of information for officer action in conducting health monitoring of sick members in the residential district.

Keywords: e-Government; e-Health; GIS; Community Health Monitoring; Indonesia

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1. Introduction

There have been many successes in national development in the health sector, but the Indonesian people have not yet achieved the "Healthy Indonesia" as desired in the National Long Term Development Plan [1]. The unfulfilled maternal mortality rate is still high, infant mortality rate is still high, while there are still many short stunting children, and various nutritional problems. In the field of disease control, they are exposed to a double burden, infectious diseases such as AIDS, Tuberculosis and Malaria are still high prevalence, while non-communicable diseases such as Hypertension, Diabetes, Cancer, and Mental Disorders continue to grow. Although the source of funds for the health sector and also human resources of health sector in terms of quantity, type, quality, and even distribution continues to increase, the increase in resources has not been able to fully offset the increased needs.

Realizing such problems, to achieve Healthy Indonesia within the period of 2015 - 2019, the health sector efforts, now are directed to focus to:

* Reduce Maternal Mortality Rate and Infant Mortality Rate.
* Lower prevalence of short toddlers (stunting).
* Tackling infectious diseases, HIV-AIDS, Tuberculosis, and Malaria.
* Tackling non-communicable diseases Hypertension, Diabetes, Obesity, Cancer, and Mental Disorders.

In order for existing health sector resources can be utilized effectively and efficiently, those efforts has been conducted in an integrated manner from planning to implementation, monitoring and evaluation. The goal was focused on the "Family Approach".

To realize the goal of Family Approach in Healthy Indonesia program above, The Minister of Health, Republic of Indonesia issued a ministerial regulation. Regulation of the Minister of Health, Republic of Indonesia No. 39 Year of 2016 about Guidelines for the Program of Healthy Indonesia Programs with Family Approach, and in Article 5 of the Ministerial Regulation states "the Implementation of Healthy Indonesia Program with Family Approach implemented by Puskesmas (Community Health Center)" [1].

On the other hand, Jembrana Regency has been 10 years implementing Information Systems on its community service. So, to support the achievement of a Healthy Indonesia goal which is mandated to the puskesmas, it is necessary to integrate the health sector initiative into the Blueprint of e-Government Jembrana Regency. Through e-Government Jembrana Regency implementation, Jembrana's government services will take place in a transparent and traceable process, so it can be considered as accountable public services. Moreover, elements of irregularities can be avoided and services can be delivered effectively and efficiently. The E-Government Integration in this study called E-Prokesmas, a GIS Web-Based software application and expected to become a family-based health monitoring tool for Community Health Program in Jembrana Regency.

2. Literature review

2.1. Community Health Center

Community Health Center or Puskesmas is the forefront of public health services in Indonesia. Puskesmas is a functional organization, funded by the government and society to organize health services that are comprehensive, integrated, equitable, acceptable and affordable to the public.

Puskesmas has several functions such as a functional health organization unit, public health development center, building community participation and provide comprehensive and integrated services to the community under its coverage in the forms of principal activities.

As Community Health Service, puskesmas coverage part of or the whole sub-district, depending on: population density, Geographic areas (for wide sub-district area, extended to have Supporting-Community Health Center or Puskesmas Pembantu), and infrastructure (personnel and facilities). Puskesmas should emphasize its public health services in order to achieve an optimal health standard. Kardiana [2] describes, Puskesmas as the place to implement a functional unit that serves as the development of health, fitness enhancement of community participation in health and the first layer of health care activities.

Implementation of Healthy Indonesia Program with Family Approach at Puskesmas is through:

* Health data collection of all family members;

- Create and manage the Puskesmas database;
- Analyze, formulate health interventions, and develop Puskesmas plans;
- Conducting home visits in promotive, preventive, curative and rehabilitative efforts;
- Carry out health services (inside and outside the building) through life cycle approach; and
- Implementing Information and Reporting System of Puskesmas.

2.2. E-Government Blueprint

Presidential Decree no. 3 Year of 2003 on National Policy and Strategy Development of e-Government has outlined the stages are clearly at the e-Government Development Strategy [3]. The 18th item describing a sixth strategy development of e-Government. The sixth strategy explains that the development of e-Government carried out systematically through the stages of realistic and measurable. Further to these points outlines four stages in the development of e-Government:
- Preparation, the existence of an information site on each institution, human resources meet the standards, access points for services provided, and the dissemination of information sites, either for internal or public.
- Maturation, which is a public information website and interactive interface to connect with other institutions.
- Stabilization, which are sites of public service transactions, and application and data high level of interoperability that can be utilized in other institutions.
- Utilization, application government to government services (G2G), government to business (G2B), and integrated government to citizen (G2C). Providers all e-Government services will be provided through the web site, one-stop service system (front-office), and the supporting systems (back-office). In the back office, a variety of applications developed to support of e-government creation that serves the community.

In a blueprint document -such as those in Jembrana regency-, function and component modules are arranged in a so-called Government Function Framework, as Decree of the Minister of Communication and Information Technology Number 57 of 2003, on Guidelines for the preparation of the Master Plan for the E-Government Institutions Development [4] [7] as shown in Fig. 1.

Fig. 1. Government Function Framework based on CIT Ministerial Decree.

On the other hand, the application system that developed, must meet the needs of government functions as it has been defined and grouped in the Governance System Functional Framework.

The application system functions and services, are then arranged and grouped in a system architecture framework, which on in the Blueprint document is hereinafter referred to as e-Government Solutions Application Map [3] as shown in Fig. 2.

In the e-Government application map solutions that developed by Jembrana Regency. Application systems grouped by function orientation matrix approach between the services and the nature of the application system functions.

Through this approach, the application system are is grouped into three (3) groups as follows:
- Group orientation application system functions directly provide services to its users (application front office)
- Group functions oriented application system more geared to furnish relief work that is government administration, as well as official functions and institutional (back office applications).
- Group application system functions are fundamental and common services, required by each user, or any other application systems that are more specific. The nature of the basic application services typically back-office.

2.3. Geographical Information Systems (GIS)

As described by Burrough and McDonnell [8], Geographical Information Systems (GIS) can be described as general-purpose computer-based technologies for handling geographic data is in digital form in order to capture, store, manipulate, analyze and display diverse sets of spatial or Geo-referenced data.
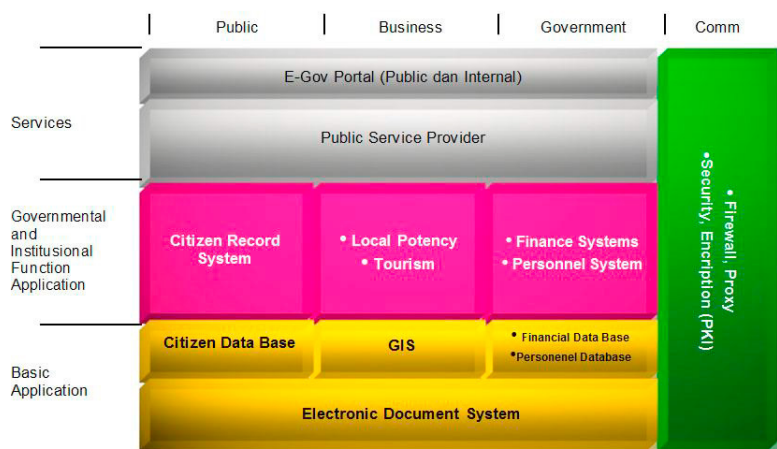

Fig. 2. E-Government Solutions Map.

Research on e-Government concerning the application of GIS has been carried out in Indonesia and other countries. Ramadhan et al [5], conducts a study to assess the implementation of the e-Government system provided by ninety institutions in Indonesia. Research conducted using several criteria, the first criterion, is used GIS in their availability and accessibility, the date of GIS manufacturing facilities and GIS technologies are used. In addition, the assessment carried out by seeing integration among agencies with other agencies use GIS. The results from studies above, shown that seventeen of the total official site assessed has implemented GIS facilities. Seven of the total GIS websites only displays a static map, while others in the form of a dynamic GIS facility. It also shows that there is no integration between institutions that have implemented of GIS facilities.

Joshua and Swastika [4], describes the implementation of GIS on data collection of government-owned buildings in Badung regency. The requirements related to managing of government-owned buildings set out in the term of reference issued by Badung regency administration with goals to be achieved is, how to build an information system that presents the data or information about the buildings -particularly the State-owned Building-, periodically, accurate and integrated. The existence of these needs, in line with e-government development blueprint that designed by regency administration. GIS that is implemented allows users to search for information, listings of State-owned building, providing detailed information about the building and status of building permits.

3. Methodology

3.1. Development Method and Data Collection Steps

To answer the technical demands, we have made the systems development from data collection, and the data collection was done by using several methods. The first method is interview method, conducted to interviews Head of Puskesmas II Jembrana.

The second method is the survey. This survey was conducted to see the indicators that will be recorded.

In order to implement a Healthy Indonesia Program with Family Approach, 12 (twelve) main indicators as a marker of family health status are as follows:
- Families follow Family Planning programs;
- Mothers perform deliveries at health facilities;

- Infants get the complete basic immunization;
- The baby gets exclusive breast milk;
- Toddlers get growth monitoring;
- People with pulmonary tuberculosis receive standardized treatment;
- Hypertensive patients perform regular treatment;
- People with mental disorders get treatment and not neglected;
- No family members are smoking;
- Families are already members of the National Health Insurance;
- Families have access to clean water facilities; and
- Families have access or use healthy latrines.
  Stages of data collection are described by Fig. 3.

Fig. 3. Collection Data Steps.

The process begins with Community Health Center officers recording family-based health conditions in their working areas. The data is then submitted to the operator for input to the E-Prokesmas system, the data then becomes a geographic map view that can be accessed by the head of the Community Health Center and the Regency Health Office to see the health status of each family in a particular region. The third method is a method software development System development using SDLC (System Development Life Cycle), Implementation of GIS in this study using Google API.

3.2. Data Grouping Method

In terms of data collection, data that have been obtained are grouped into several categories.
- Based on the source
  Based on the data source, the data can be grouped into primary data and secondary data. Primary data were obtained from the collection of data directly from the source by using several methods such as observation, interviews, and data obtained from relevant agencies. Secondary data were obtained from the data that has been documented and literature.
- Based on the rate of change

Based on the rate of change is divided into two parts, static data and dynamic data. Static data are the data rate of change relatively infrequently, such as common data (data villages and village citizen). While dynamic data are the data rate of change relatively frequently, such as family's village citizen health status.

4. Results

Jembrana is one of regency in Bali, Indonesia. It has an area of 841.8 km2 and a population of 261,618 at the 2010 Census. Its regency capital is Negara. The Jembrana regency, administratively divided into five sub districts (kecamatan), listed below with their 2010 Census populations: Melaya 50,381, Negara 77,818, Jembrana 51,634, Mendoyo, 56,222, Pekutatan 25,583 [6]

Puskesmas that become research implemented in this study is Puskesmas II Jembrana. Puskesmas II Jembrana is a Technical Imlementation Unit of Jembrana Regency Health Office, located in Yehkuning Village. Working area of Puskesmas II Jembrana is 320.942 km² with a population of 17439 people. Puskesmas II Jembrana is an expansion of the working area of Puskesmas I Jembrana, then based on Regent Regulation No. 30 of 2013 on the second change of Regent Regulation Number 75 Year of 2011 on Organizational Formation and Working Procedures of Technical Implementation Unit of Public Health Center, Health Office Jembrana Regency, then Puskesmas II Jembrana was formed and operates in January, 1th 2014. Puskesmas II Jembrana, responsible to Jembrana Regent through Head of Jembrana Regency Health Office. Puskesmas II Jembrana area covers of 4 Traditional villages (Desa) are, Yeh kuning Village, Air kuning Village, Budeng Village, Perancak Village and 1 Administrative village (Kelurahan), Sangkar Agung Village which consists of 16 Traditional Communities (Banjar) and 3 Administrative Communities [6].

E-Government Integration through Implementation of web-based GIS (E-Prokesmas) placed on the website of Puskesmas II Jembrana, under the official website of Jembrana Regency as shown in Fig. 4.
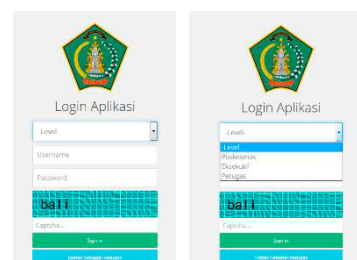

Fig. 4. E-Prokesmas interface.

Fig. 5. Login level.

Level of Login to E-Prokesmas application is divided into three parts, the community health center, executive and officer. The Interface of login page is shown by Fig. 5. The Dashboard application is used to view E-Prokesmas. When logged in as Community Health Center then on the dashboard will appear public health map in selected areas as shown by Fig. 6.
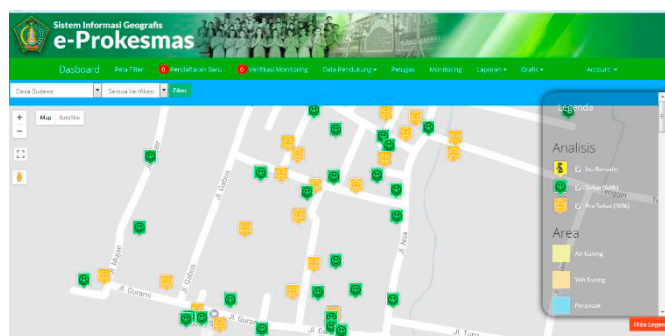

Fig. 6. Community health map.

The displayed map is the output of the data entered by the Community Health Center officer and displayed in the marker to see the health level in the community (percentage of the healthy population, number of pre-healthy percentage and number of newborn mothers).

When a mark or symbol is clicked it will show detail data of the family and family members, so policy makers in a region can know the health condition of every villager in the area. The view is shown by Fig. 7. The output shown by Fig. 7, can be displayed from the data collection related to 12 indicators of Community Health Condition based on Family Approach conducted by Community Health Center officers as shown by Fig. 8. The data displayed in E-Prokesmas not only can display the health level status of the community (percentage of the healthy population, number of pre-healthy percentage and number of newborn mothers), but it can also be a source of information for officer action in conducting health monitoring of sick members in the community. The view is shown by Fig. 9. For information on decision makers E-Prokesmas can also display regular public health monitoring charts as shown by Fig. 10.
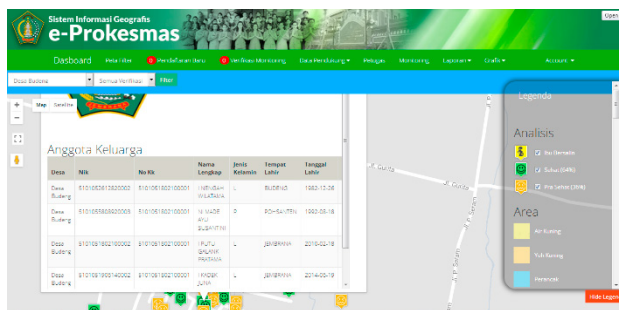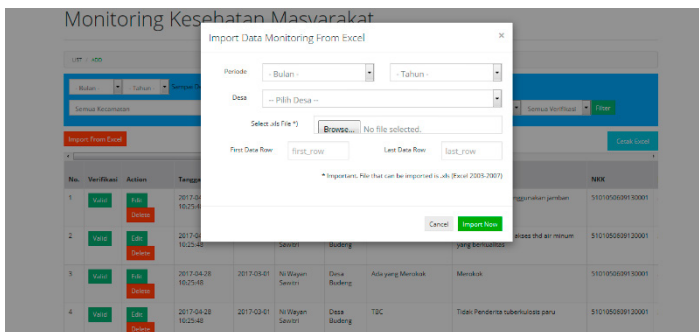

Fig. 7. Community health map.

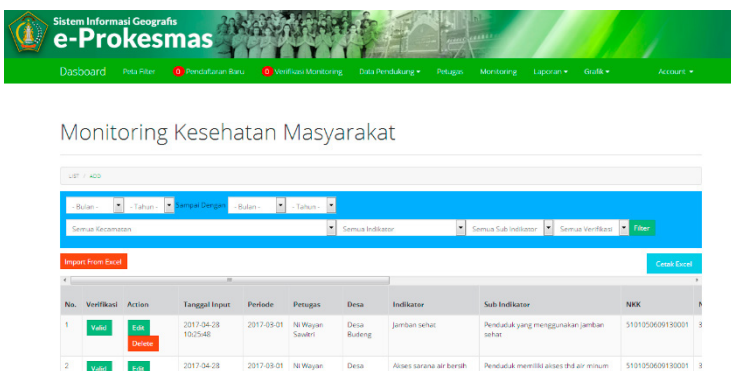Fig. 8. Data import of community health condition.

Fig. 9. Further Monitoring of Health Condition for the specific Community Member.
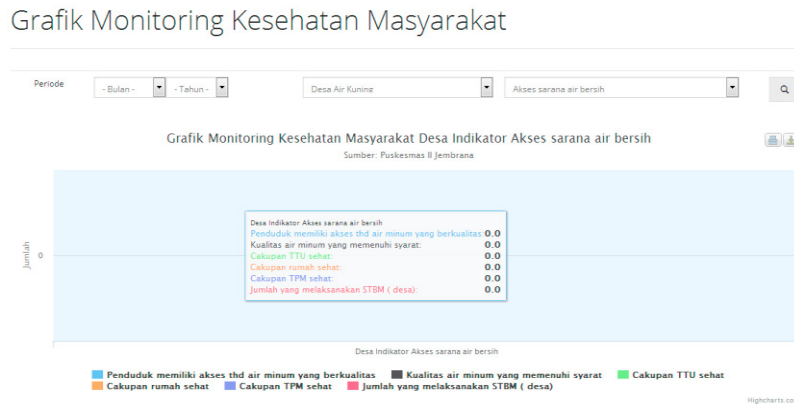
Fig. 10. Decision makers E-Prokesmas.

5. Conclusion

Development of e-Government and documented as a blueprint for e-government will make it easier to meet the specific needs, for a general nature or basic needs of government agencies. Through implementation of E-Prokesmas, Head of Central Community Center and also Regency Health Office can monitor the achievement of healthy family in its working area according to government Goal. GIS was built using a series of systems development methods and data collection methods related to 12 indicator as Regulation of The Minister of Health, Republic of Indonesia No. 39 Year of 2016, about Guidelines for the Program of Healthy Indonesia Programs with Family Approach. Methods for the development system conducted by interview with the head of Community Health Center, according to the technical needs required, surveys by the Community Health Center Officer in community and software development methods related to SDLC (system development life cycle), with Google API to form GIS in its development. Data collection methods are done by grouping the data into three categories based on their sources, based on the rate of change, and by designation, and finally data displayed in the form of maps with markers that can be used for public health decision making.

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