

Activity Based Costing Method as an Alternative to the Implementation of Management Policies Remote Sensing in Indonesia

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Abstract

This paper aims to look at is the remote sensing has done is in accordance with the efficiency concept as stipulated in the act of Indonesian aerospace. The concept of efficiency done by analyzing the results of the use of activity based costing (ABC) from the data of citra satellite of remote sensing, that obtained and distributed to the users of data in indonesia. The object of this research is aerospace giver to store and distribute data sensing far in indonesia in accordance with Impres no. 6 years 2012, and the Act number 21, 2013. Research methods that were used in this paper is called "mixed method", with collect the primary data (the interview and indepth focus group discussion) and secondary data (cost of raw materials, direct labor and overhead) of all the various (very high resolution, high, medium and low). The research results show that remote sensing activities is in accordance with due observance to the concept of efficiency in line with the in the rule of law in indonesia.

Keywords: *efficiency, activity based costing, remote sensing, policy*

I. INTRODUCTION

Development of current information technology can produces the accuracy of information and speed of time. Information technology be important in the current life. in various sectors. Discussion of information technology would not in spite of a device to obtain data. One is data obtained through a satellite higher technology, have been captured by ground stations. The data have obtained can produces maps and information can be used in various sectors. The activity process is one of activities in the field of remote sensing.

The remote Sensing activities in indonesia arranged in: (i) Space Law No. 21 years 2013 about Space, (ii) Inpres No. 6 years 2012 about given, the use of, quality control, processing and distribution satellite higher resolution remote sensing, data (iii) Presidential Regulation Republic of Indonesia number 45 years 2017 about Primary Planning is the implementation of Space years 2016 - 2040.

in accordance with arranged Inpres no. 6 years 2012, has sounded that Lembaga Nasional Penerbangan dan Antariksa Nasional (LAPAN) in this case be obligated to provide and carry out the provision of satellite remote sensing high resolution data with the Indonesian Governmen License. While in the act of indonesia number 21 years 2013 about space article 15 - 23 it states that an agency is obliged to store and distribute the Indonesian remote sensing data. In presidential instruction and the law reflected the importance of function in this boardt as a unit in the government sector in the development of remote sensing in indonesia.

Data and remote sensing information have been used in Indonesia since 1970-an (Kartasasmita, 2013). Its use has contributed to national development in various sectors in Indonesia. These developments include among others in the agricultural sector, forestry, maritime, the environment, and mining that can provide a great economic value for Indonesia. Until recently, the use of data and remote sensing information also continued to evolve to others sector such as, tax among others the eradication of narcotics, security and defence. The progress of the use of remote sensing data, a lot of developed countries continue to develop the remote sensing technology, not only for its national interests but also to global interests.

The remote sensing activities any benefit as above, management needs a good strategy to get maximum profit. The remote sensing benefits as written above using high tech high cost, and highly risks. Thus the cost variables be incredibly important to review. Fleeter and Spanulo 2013, said “financial issues will bring about more innovation. The management has to ensure the success of a project. Success is based on the industrial project and on maintaining commitments made in terms of cost estimates, maintaining time schedules and achieving results.”

In this study to see how much the cost of goods manufactured from the remote sensing activities in Indonesia, cost estimates used is activity based costing (ABC). That was conducted one of those to look at the level of cost efficiency

In cost accounting, known 2 (two) method of the determination of the based price is the cost of products using the system the cost of based on volume and product cost using the system the cost of based on the activity is called of activity based costing (ABC). Cost based volume, Does that apply in all parts of the company or each department, often leads to the cost of products that are not accurate, especially for the company with a complex production operations of the company with a variety of products or the heterogeneous production process. (Blocher, 2018).

ABC is the approach the cost of who imposes the cost of the cost of all resources object such as a product, or subscriber services by virtue of the activity which is being undertaken to its cost object (Blocher, 2018)

According to Kaplan ABC is a costing methodology that identifies activities in an organization and assigns the cost of each activity with resource to all products and services according to the actual consumption by each. ABC is cost approach system based on activities (Hongren, 2008). ABC is the first time system in tracking the cost of activities on his product.

Given the unique characteristics of economic space industry, the sign of real products produced visible palpable, but rather the products which are not visible palpable, as data who frequently used by institutions in determining their work program, hence the chosen method of ABC suitable for characteristic of the space industry.

Based on the data and phenomena above, then in this writing will examined the mechanism for determining the cost of goods sold the data based on a relevant method of space economic activity such as activity based costing (ABC), with the theme of: “activity based costing as an alternative in determining the cost of goods sold in remote sensing activities”

II. ANALYTICAL FRAMEWORK

A. Cost Accounting

Mulyadi (2007: 7) stated that cost accounting is a process of recording, the categorization of, summarized, and the presentation of the cost of making and products or services selling with specific method. According to Carter (2009: 11), cost accounting is a tool that is necessary to planning activities and control, improving the quality and efficiency, and the routine and strategic decision making. Cost accounting is part of the accounting science that have a role is essential to every company. Cost accounting activity has to do as the planning process, control, improvement and decision making. The company will be laid down in search of cost information so management could fulfill their function well.

B. Cost Concept

In accordance with space economy concept OECD 2012), cost to be taken into account starting from research activities and development, manufacturing and the use of space infrastructure such (ground stations) to various application or product derived from remote sensing and science resulting from these activities

Cost can be classified by according to correlation between cost and something funded. Cost classifications are divided into two groups i e direct costs and indirect cost that reflect factory overhead cost. Direct cost consist of raw materials and direct labor costs , while indirect cost known by the factory overhead cost (FOH). Factory Overhead Cost in economic value study of remote sensing in the form of cost issued to obtain the cost of goods sold remote sensing data , through the procurement and the annual fee.

Direct cost such as direct or indirectly labor will be included in this analysis. In 2017 was accounting for raw material costs based on its remote sensing data arranged in 2013 act RI no. 21 years 2013.,article 16 written that the receipt of remote sensing data carried out through the operation of satellite, the operation of ground stations and citra satellite. The data in the year 2017 through the operation of the satellite has not been done in indonesia , so that measured cost consisting of: (1) expenses incurred in the context of its data with how to operate ground stations to pay annual fees; (2) expenses incurred in the context of its Citra satellite and procurement in accordance with article 16. Citra Satellite obtained from data provider both commercially and non commercially.

C. *ActivityBasedCosting* (ABC)

Activity based costing is a system focused on accounting aktivitas-aktivitas carried out to produce products. / servicesActivity based costing provides information concerning aktivitas-aktivitas and resources needed to carry out the aktivitas-aktivitas.The activity of is any event or transaction costs which is a trigger (cost driver) namely, act as a factor in the expenditure in the organization. costsAktivitas-aktivitas this to be the point of the association of the cost of.In the system abc, the cost of ditelusur to activity and then to a product.(femala, fieda, 2007)

Definition of Activity Based Costing: (Hilton Maher and Setto. Ed 14, cost management 2008, page 147)

Activity Based Costing or ABC, is a costing method that first assign cost to activities and tan to goods and services based on how much each goodss or services uses the activities

Tahap-tahap Penerapan Activity Based Costing (Hilton Maher and Setto. Ed 14, costmanagement 2008, page 147)

Five level hierarchy of resources and activities: (Hilton Maher and Setto. Ed 14, costmanagement 2008, page 149)

1. *Unit-level resources and activiites : are resources acquired and activities performed specifically for individual units of product or services. Unit level resources could include materials, parts, and component and perhaps labor and energy resources if they are acquired for each unit of outputs;*
2. *Batch – Level resources and activities : are there sources acquired and the activities performed to make a group, or batch, of similar product. Batch level activities usualy include the work performed to set up the production machinery to produce a certain batch of product or to the test quality control for a batch of product*
3. *Product –level resources and activities: are the resources acquired and the activities performed to produce and sell a specific good or service. Product level resources could include specialized equipment, software and personnel that would not be needed except to provide that particular product, include design or advertisement, directly trace able to specific godos or services.*
4. *Customer-level resources and activities: are the resorces acquired and the activities performed to serve specific customer. Customer-level resources could include spesilized equipment, software and personnel dedicated to serving specific customers, include consulting with customerand making special distribution arrengeemnt.*

5. *Facility-level resources and activities: are the resources acquired and the activities performed to provide the general capacity to produce goods and services. Facility –level resources could include land, buildings, directly related to scale, scope, and locations of operations but indirectly to customer, product, and batch or individual unit produce*

Robert S Kaplan & Anthony A. Atkinson (Advance Management Accounting, 1998: 97) tujuan dari penerapan ABC: to measure and then Price out all the resources used for activities that support the production and delivery of product and services to customers

1. *Identify and classify the activities related to the Company's product*
2. *Estimate the cost of activities identified in step 1*
3. *Calculate a cost-driver rate for activity*
4. *Assign activity costs to products*

D. Joint Cost

Discuss about the space economics , cannot be separated from the joint cost concept with issued when data processing until data distributed . Joint cost is costs arising to produce two kind or more of product in a production process simultaneously. This cost is limited to split of point.

Point separation (split of point) is a the point where each products together and a by-product can be defined . In remote sensing , there are data that requires processing further , for example a kind of per resolution then combined so the data can become information by the user . generally, a kind of the joint cost in all the kind of product that produced by pustekdata lapan are consist of: price the acquisition and related cost to a human resources and infrastructure accumulated depreciation.

The Cost of goods or services is the price the arrest data over the ground stations and via satellite , until the data is ready to be used , that is generally consisting of : the cost of annual fee and procurement ,also including salary operator the operation of computer to arrest data .

(Hilton Maher and Setto. Ed 14, cost management 2008, page 342)

1. A joint process simultaneously converts a common input into several output.
2. Joint product are the product that jointly result from processing a common input.
3. Joint cost are the cost to operate joint processes including the disposal of waste. Depending on the technology used, joint process primarily use resources at the batch and facility levels.
4. The Split -off point is the point at which joint product appear in the production process.

(Hilton Maher and Setto. Ed 14, cost management 2008, page 350). There are 2 (two) shared cost allocation methods:

1. Net Realizable Value (NRV) method: allocates joint cost based on the NRV of each main product at the Split-off point.
2. The physical – measures method, is a joint cost allocation based on the relative volumen, weight, energy content or other physical measure of joint cost product at the Split off point.

Results of previous studies:

1. Activity – Based Costing For State and Local Goverments (Russel F Briner, Phd, CMA, CPA: Mark Alford, PhD; Jo Anne Noble ; Management Accounting Quartely vol no. 4, no. 3, Spring 2003), The results are the application of ABC on The Texas Department of Agriculture (TDA) produce more effective costing in cost management and cost control.
2. Cost Management Using ABC for IT Activities and Services (Bruce R. Neuman PhD; James H. Gerlach PhD;Edwin Moldeeur; Michael Finch; and Christine Olson, Management Accounting Quartely vol no. 4, no. 3, Spring 2003), the result is the model provides a managerial tool to measure productivity and efficiency and is currently being used for IT cost chargebacks and process improvements. Such activities have not been reported in professional publication or activity dictionary. Reengineering focusedon eliminating unnecessary activities and transferring people at the same time.

3. Designing a model and Historical Cost Calculation of Services by ABC Method and Budgeting By aBB Method (Fatemeh Jahandari; Mohammad Hossein Ranjibar, Mohammad Mohebbi, European On line Journal and Social Science 2013; vol 2, No. 3(s), pp 2184-2194, ISSN 1805-3602), The results indicate that there is significant difference between in the activity – based historical cost with available traditional costing method and also between activity based budgeting with budgeting by traditional method.
4. An Application of Activity Based Costing in Higher Learning Institution : Local Case Study (Ambalagan Krishnan; Curtin university of Technology; Contemporary Management Research, pages 75-90, vol 2, no. 2, September 2006), ABC costing system that improves operations and to better meet the needs of University Customers in a more cost-effective manner
5. Toward Understanding the Complexities of Service Costing: a review of Theory and Practice (Bulend Terzioglu, Elsie S.K Chan; Australian Catholic University, Jamar vol 11 no. 2, 2013), this study may provide a better understanding of the challenges associated with services costing for both practicing management accountants and members of academia
6. Activity Based Costing (ABC) in the public sector; benefits and challenges; (Emmanuel K . Oseifuah, 2014), Journal : *Problem and Perspective in Management/Business Perspectives*
7. Does It Always Make Sense to Share/ Costing in Shared services Environment (Cost Management Journal, March April 2015), the result: the application of managerial cost accounting methodologies in order to shed light on the true costs of providing shared services.

METHODOLOGY

Type of Research

According to explanation level, type of research used is associative research, which is a comparative causal relationship and is supported with descriptive research. Associative research aims to discover the connection between two or more variables. Comparative-causal relationship is an ex-post facto research which is a type of research on collected data after the occurrence of events or facts, so identification of facts and events can be conducted as affected variable (dependent variable) and also investigate the unaffected variable (independent variable). Moreover, according to its objective, this research belongs to applied research. According to Sugiyono (2008;8) quoted from Gay, said that: “applied research is conducted to apply, test, and evaluate the ability of a theory applied in solving practical problems”.

Object of Research

Object of research in this study is Space Administrator who are obliged to keep and distribute remote sensing data of Indonesia in accordance with Law No. 21 Year 2013 and Presidential Decree No.6 Year 2012, that is LAPAN (*Lembaga Penerbangan dan Antariksa Nasional*). Working Unit of LAPAN which own the data output and remote sensing information as the object of this study is the Remote Sensing Technology and Data Center or *Pusat Teknologi dan Data Penginderaan Jauh* (hereinafter will be referred to as Pustekdata), Remote Sensing Utilization Center or *Pusat Pemanfaatan Penginderaan Jauh* (hereinafter will be referred to as Pusfatja) and Parepare Remote Sensing Center.

Operationalization of Variable

“Research variable is basically everything in any form determined by the researcher to be examined to obtain information regarding the research variable and then drawn a conclusion” Sugiyono (2008; 58). “Variable used in this research are as follows:

- Value added remote sensing activity (Law No. 21 Year 2013, Article 15), which include:
 - a. Data Acquisition
 - b. Data Processing
 - c. Data Storage and Distribution
 - d. Utilization and Dissemination of Information
- Type of costs in activity group are including: annual fee, procurement, human resource, depreciation expense and renovation of several assets for remote sensing operational and other overhead fees (all resolutions: very high, high, medium, and low resolutions).

Type, Data Collection Method, Data Processing and Analysis

- **Type of Data**

Type of data used in this research are: (1) primary data by conducting FGD and in depth interview; (2) secondary data including financial statement and other data resources from Pustekdata working unit, Pusfatja and Parepare Remote Sensing Center.

- **Method of Data Collection**

Data collection is conducted by direct and indirect observation towards the object of research. The observation made is non-participant where the author did an observation as data collector without involving themselves or becoming part of the observed social environment.

- **Data Processing and Analysis**

Data processing and analysis in this study is conducted by following the steps of determining rate based on ABC:

- Identify value-added activity since data acquisition through data distribution;
- Classify activities into similar activities;
- Determine cost driver or trigger of every group activity;
- Determine total cost of each group activity, either according to direct allocation or indirect allocation;
- Divide total cost per-activity to determine cost rate per-activity, so the value/price of remote sensing data acquisition can be calculated.

III. RESULTS AND DISCUSSION

A. Remote Sensing Activity in Indonesia

Remote sensing activity in Indonesia is characterized with the pioneering establishment of ground segment of remote sensing data satellite which started in 1980's. The development is conducted by National Institute of Aeronautics and Space or *Lembaga Penerbangan dan Antariksa Nasional* (hereinafter referred to as LAPAN) in Pekayon, Pasar Rebo, East Jakarta. Data received in the ground segment is Landsat-4 satellite data belonging to the United States which currently the data is in category of medium resolution. Today, LAPAN has several ground segments which can receive data from satellite, including Rumpin Bogor which able to receive data from LAPAN-A/A2, NOAA-19, Feng Yung-3A, and Terra/Aqua Modis satellites. Meanwhile, Parepare ground segment can receive and process data from SPOT-6 and 7 satellites, and Landsat-7 and 8.

Other than LAPAN, there are some Ministries/Institutions in Indonesia which have ground segment that can receive data from satellite, namely Ministry of Maritime Affairs and Fisheries in Prancak Negara Bali which is able to receive data from NOAA satellite, Geospatial Information Agency in Parangtritis Special Region of Yogyakarta (DIY) can receive data from NOAA satellite, and Indonesian Maritime Security Agency in Bangka-Bangka Belitung (Babel) and Bitung North Sulawesi are able to receive data from MODIS satellite (Terra/Aqua).

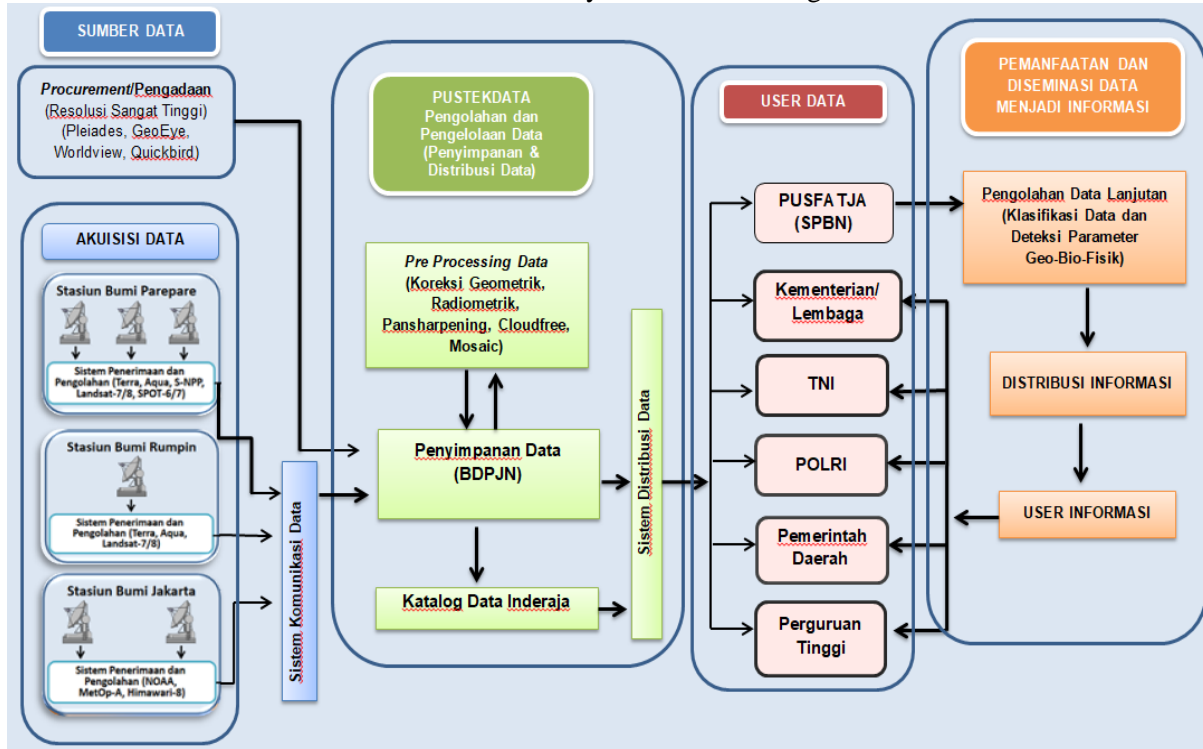
Satellites in which its data can be received by Indonesia's grounds segments are all belongs to other countries, except LAPAN-A1 and A2 satellite. To be able to receive data from satellite from another country there are paid satellite and free-charge satellite. For paid satellites such as SPOT and Landsat, LAPAN shall pay annual fee to receive data from those satellites. In addition to utilizing data received by ground segment, Indonesia also utilizing data which cannot be received by the station, especially for very high resolution satellite data such as PLEIADES, GEOEYE, Quickbird, and Worldview. As stated by Kartasasmita (2013), in Indonesia, the very extensive use of technology leads to the best strategy that is to keep utilizing world's satellites, especially those with high spatial resolution (usually operated commercially).

To obtain very high resolution data, Indonesia shall directly purchase it to the satellite owner or via vendors, both in Indonesia and abroad. Some vendors in Indonesia namely PT. Citra Bumi Indonesia, PT. Waindo, PT Bumi Prasaja, PT. Integrasia Utama, PT. Ametis Indo Geo, and EDP Media. Meanwhile, for storage and distribution of remote sensing data for national interest, as mandated in Law of Republic of Indonesia Number 21 Year 2013 on Aerospace, Article 20, that the storage and distribution of data will be carried out by Institutions (LAPAN). Other than LAPAN,

vendors in Indonesia as mentioned above also distribute data via remote sensing data service provider. Therefore, in Indonesia, there are two institution which can provide remote sensing data for users, that are government agencies and private agencies. The users also classified into government and private institutions. Government agency covers Ministry/Institution, College, and Provincial, District, and City Government. Meanwhile, the private agency includes among others industry and consultant service.

LAPAN's Remote Sensing Data and Information Reception, Process, Storage, and Distribution

Picture 1 above shows the value chain activity of remote sensing in Indonesia. The flow of data



and information was obtained through annual fee that is paid every year by Pustekdata via procurement system for very high resolution data. Then, Pustekdata distribute the data to users, one of which is LAPAN working unit, Pusfatja. Data received by Pusfatja LAPAN will then be processed using a certain methodology that will generate an information to be distributed to the users.

Picture 1 also shows an idea about the input, process, and output of remote sensing data and information conducted by LAPAN. The input showing remote sensing data obtained by Pustekdata which then be processed in accordance with sequence process as stated in Law No.2 Year 2013. The data will be distributed later to the users (Ministry/Institution, Local Government, army/police, University), including Pusfatja.

B. Stages of Activity Based Costing

In this part, the researcher will first identify value-added activities for users, including:

- Data reception
- Data processing
- Data storage
- Data distribution and dissemination of information

Start from data reception up to data distribution. Value-added activity referred to Law No.21 Year 2013 supported with interview results with Pustekdata, Pusfatja and Parepare Working Unit.

Explanation about remote sensing activity in Pustekdata Lapan Year 2017 → DRS procurement (to receive CSRST data) → Data 400.000 (400.001) km² as well as reception system. Early 2018 →

no more purchase of equipment (data), but already able to receive data directly (via LAPAN Parepare ground segment)

DATA RECEPTION

Data reception according to its type:

- Low resolution → free (using antenna to receive data)
- Medium resolution → annual fee (LANDSAT-8), (using antenna to receive data)
- High resolution → annual fee (SPOT-6/7)
- Very high resolution

In 2017 → Pleiades contract had been done (receiver and data system (only archive, no direct record), the procurement is made in the end of period and data distribution is conducted in 2018, so assessment is recognized in 2018. Meanwhile, in 2018 → annual distribution and reception via direct receiving system, data starts to be received directly in January and already record the data directly).

In the stage of receiving data, there is a data acquisition process for a data that use segment ground in:

- Parepare, for very high resolution (for assessment in 2018 period), **high resolution, medium resolution** (covering east region of Republic of Indonesia). There are a total of 4 antennas, but only 2 antennas can be used. Pleiades: contract per-year approximately 400.001 km² data (shall be able to reach that amount of data every year, look for the best data (cloud-free)) the data amounting to 400.001 is not one at a time, but conducted in 4 parts of recording data.
- Pekayone for **low resolution**.
- Rumpin (remote directly from Pekayon), for **low and medium resolution** (to cover data in Western region).

DATA PROCESSING

There are 2 versions of data processing → data processing during Data Reception (ground segment level) and processing after the Data had been stored (further processing data conducted by human resource department)

- Data processing on ground segment level

Systematic level → when the data is received, the software will automatically process it (geometric and radiometric coorection).

Existing hardware and software – the system/application shall be upgraded and updated. In this case, it is one by data provider, but other than that, an automatic software for data processing is also developed by Pustekdata HRD.

Infrastructure used in data processing are: storage, server, software, hardware, and saprepart. There is regular maintenance fee for upgrade.

The amount of costs to be calculated will be considered not only from Ledger but also from its RKAKL (relatd costs/fees) associated with the account assignment.

Tools maintenance fee that is used for processing data is huge (example of range of costs), in this case, DIPA Pustekdata deemed less contributing (give a real example and reason).

Process:

Data is received by via Ground Segment, there is an acquisition process



Standard Data Processing

Direct geometric and radiometric correction by the system



Data storage in Remote Sensing Data Bank

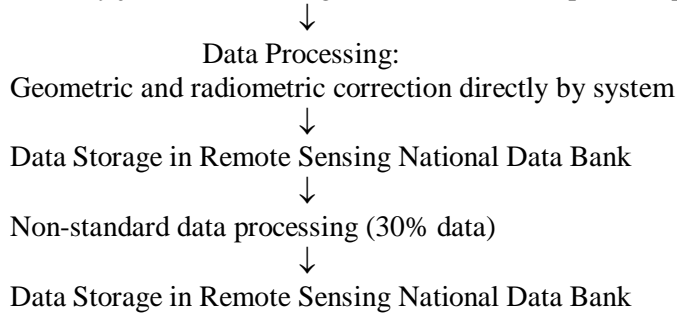
- There is 30% out of 100% data from Pustekdata that need further processing which will be done by Pustekdata HRD.

That 30% of data processing is conducted by request from users → conducted if the data is non-standard (not ground segment level) so further data processing is neccessary. Including in this classification are (1) if there is an inappropriate position, then geometric process will be done to

adjust position from object (ortho systematic/orthorectification correction) and (2) towards color object appearance, if deemed not then radiometric correction shall be conducted (sun correction), (3) multispectral and panchromatic (pansharpen) merging (4) process of omitting cloud (cloud masking), (5) mosaic data that is the output of data processing. Later on, this mosaic can be input into the catalog (mosaic is a routine production).

Data processing conducted in this level also doing geometric correction (object position, accuracy) and radiometric correction (color correction). Those corrections are completed by using software/system done by expert personnel with specific education background to do the corrections). Process:

Data received by jk via Ground Segment, there is an acquisition proces



Notes for Processing Data:

- a. If data is obtained through Procurement, then the data will directly be stored in Remote Sensing Nasional Data Bank.
- b. Systematic processing (geometric, radiometric correction by tools/software in ground segment) into standard data.
- c. Catalogue (input to web which can be accessed directly by users).
- d. Radiometric and geometric correction can be conducted together by 1 person also in certain location. A high resolution data and CSRT (2018) are harder if its radiometric/geometric need correction.
- e. For CSRT Data 2015-2017 that is received still in primary level, meanwhile data before 2015 is Ortho (already complete only need to be stored and used, no need further processing).
- f. Pustekdata also develop its own software to process data (automation software).
- g. Related to Presidential Decree and data provider for RDTR (*Rencana Detail Tata Ruang*) or detailed spatial plan, then the task will be divided between LAPAN and BIG (radiometric and spectral correction done by LAPAN, meanwhile geometric correction (orthorectification) will further conducted by BIG (Ortho Data) → however, this does not have any direct connection to data calculation distributed by LAPAN.
- h. Personnel in Data Processing:
 - ✓ Research and Development (R&D) and Operational
 - ✓ Operational: Pleiades (Pansharpen) → 3 people (2 members 1 coordinator), High Resolution (Mosaic) → 6 people (5 members 1 coordinator), Medium → 4 people (3 members 1 coordinator), TerraSAR-X → 4 people (3 members 1 coordinator)
 - ✓ From those 10 people there are 4 non-pns (2 in high resolution, 2 in medium resolution).
- i. First process to be done is radiometric correction even though it takes longer time and more difficult. Comparison of duration and level of difficulty between Geometric and Radiometric is 60% : 40%..
 - Radiometric → cloud condition
 - Geometric → topography condition
 - Pansharpen → combination between multispectral and panchromatic data (increase spatial resolution) example: 4 meter become 1,5 meter for SPOT 6/7 data, 2 meters into 0,5 meter for Pleiades data and 30 meter into 15 meter for Landsat-8 data
 - Cloud masking → removing cloud
 - Mosaic → combining processed data through stages mentioned above into one area of province/district/city or big islands (Sumatera, Java, etc) or Indonesian region as a whole.

Data processing for data process classification and parameter detection is done in Pusjatta. However, Pustekdata also done a little for general Parameter Detection (geophysical) such as vegetation index (NDVI) since it is directly related to remote sensing data.

STORAGE

Storage is in Remote Sensing Data Bank or Bank Data Penginderaan jauh (hereinafter referred to as BDPJN). Storage is used together for all stored data.

DATA DISTRIBUTION AND INFORMATION DISSEMINATION

Technical training and socialization

Basic level technical training (regular) conducted by Pustekdata – Regular 10 times/year. Advance technical training (thematic) by request from user (funds from users).

➤ Management (Data Storage, Data Distribution)

Costs to be calculated in accordance with activity on Figure 1 is classified into a clear costs calculation and classification of cost allocation calculations. The classification is classified into material costs, direct labor and overhead. Cost mapping according to activities as mentioned above are as follows:

- a. Low resolution
 - Acquisition cost free
 - Employee/HRD costs
 - Infrastructure (depreciation+overhead)
- b. Medium Resolution
 - Acquisition cost → Annual fee (Landsat)
 - Employee/HRD costs
 - Infrastructure (depreciation+overhead)
- c. High Resolution
 - Acquisition cost → Annual fee
 - Employee/HRD costs
 - Infrastructure (depreciation+overhead)
- d. Very High Resolution (CSRST)
 - Acquisition cost → procurement (Annual Distribution and Reception)
 - Employee/HRD costs
 - Infrastructure (depreciation+overhead)

Human Resource Development (HRD) cost: direct and indirect. Main cost to be calculated, shall look at the main cost subject to:

- a. Each resolution
- b. Each resolution plus main cost of the process of advanced data processing activities → 30% data.

Infrastructure cost is calculated based on depreciation corresponding to the year calculated. Allocation cost is calculated based on data capacity obtained, only for low resolution data, because it is free. Then allocation cost is charged using average calculation of users download for 3 years divided 3. This will be clarified to Pustekdata whether for low resolution data the procurement system is also similar to system existing in other 3 resolutions, so the amount obtained is not the same with the distorted. Meanwhile, in a used calculation of assumptions is that low resolution data acquisition is equal to distributed data, provided only by request.

Results of cost calculation by using activity based costing according to its activity since the data is received until it is distributed into information is shown in Table 1 and 3.

Table 1 Results of Cost Calculation (Current Value)

BIAYA-BIAYA	NILAI CURRENT		
	2015	2016	2017
VH		202.259.695.397	15.593.822.428

	10,359.919.688		
H	85.649.808.970	79.103.464.642	75.584.850.625
M	56.298	54.363	12.564

Source: data processed

BIAYA- BIAYA	BI RATE		
	2015	2016	2017
VH	7.75%	5.11%	4.56%
H	7.75%	5.11%	4.56%
M	7.75%	5.11%	4.56%

After current cost value is calculated, then inflation rate will be calculated if assessed in the year the cost is calculated (2018). Calculation rate using basic exchange rate value of BI rate, as the following table:

By taking BI rate into account, then the cost in each resolution by using constant value is as follows:

Tabel 2. BI Rate

Source: BI rate

Table 3. Cost Calculation Result (Constant Value)

	NILAI KONSTAN		
	2015	2016	2017
VH	11.733.233.231	212.595.165.832	15.593.822.428
H	97.003.569.060	83.145.651.685	75.584.850.625
M	63.761	57.140	12.564

Source: data processed

The table shows current value and constant value, that is the current value and a value that already takes future inflation into account. Highest cost is at the very high resolution, both using current value and constant value.

Constant value distribution that is generated based on calculation for year 2015, 2016, and 2017 for current value and constant value, resulting in a higher benefit value of 30 times, 28 times and 92 times compared to the cost.

With that results, shows that an efficient remote sensing activity and in accordance with what's mandated in aerospace law of Indonesia.

IV. CONCLUSION

The results shows that aerospace activity of remote sensing has already appropriate by paying attention to efficiency concept as stated in applicable law in Indonesia. This shows that policy related to the management of remote sensing space activities in Indonesia is already appropriate.

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REFERENCES

1. Femala, Fieda, 2007, *Skripsi “Penerapan Metode Activity-Based Costing System Dalam Menentukan Besarnya Tarif Jasa Rawat Inap (Studi Pada Rsud Kabupaten Batang)*, Fakultas Ekonomi, Universitas Islam Indonesia, Yogyakarta, Hal. 7.
2. Hilton, R.W., Maher, M.W. and Selton, F.H. (2000). *Cost Accounting: Strategies for Business Decisions*, New York: Irwin/McGraw Hill.
3. Horngren, Charles T., Srikant M. Datar & George Foster. 2008. *Akuntansi biaya. Edisi kedua belas*. Diterjemahkan oleh P.A.Lestari. Jakarta: Erlangga.
4. Kartasasmita, Mahdi, 2013, *Perkembangan Pemanfaatan Teknologi Inderaja Satelit di Indonesia*, Media Dirgantara, LAPAN 1963-2013.
5. Kementerian Sekretariat Negara RI, 2017, Peraturan Presiden Republik Indonesia Nomor 45 Tahun 2017 tentang Rencana Induk Penyelenggaraan Keantariksaan Tahun 2016-2040, Lembaran Negara Republik Indonesia Nomor 80 Tahun 2017, Jakarta.
6. LAPAN, 2013, *Undang-Undang Republik Indonesia Nomor 21 Tahun 2013 Tentang Keantariksaan*, Lembaga Penerbangan dan Antariksa Nasional, Jl. Pemuda Persil No.1, Jakarta.
7. LAPAN, 2015, *Laporan Tahunan 2015*, Biro Kerja Sama, Hubungan Masyarakat, dan Umum LAPAN.
8. LAPAN, 2017, *RPP Penginderaan Jauh*.
9. OECD, 2012, *OECD handbook on measuring the space economy*, <http://browse.oecdbookshop.org/oecd/pdfs/free/9212011e.pdf>.
10. Pusfatja LAPAN, 2015, *Sistem Pemantauan Bumi Nasional*.
11. Pustekdata, 2016, *Dashboard*, Pusat Teknologi dan Data Penginderaan Jauh, LAPAN, wiki-pustekdata.lapan.go.id.
12. Robert S. Kaplan, Anthony.A.Atkinson. (1998). *Advanced Management Accounting*. London: Prentice Hall.